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ORCHIDS

THE BULLETIN OF THE AMERICAN ORCHID SOCIETY

VOL. 89 NO. 9 SEPTEMBER 2020



Spots and Stripes

Orchids supplement for 2020

coming this October!



Spotted Vandas
by Robert Fuchs

Spotted Catasetinae
By Fred Clarke

Harlequin Phalaenopsis
by Steve Gonzalez

Cheetahs of the Cattleya World
by Laura Newton

Spotted and Striped Masdevallias
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***Dendrobium bifalce* and Striped Dendrobiums**
by Pam Porteous
and much more!

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ORCHIDS

The Bulletin of the American Orchid Society

RON MCHATTON
Chief Education and Science Officer
Editor, *Orchids* Magazine
rmchatton@aos.org

AWARDS REGISTRAR
Laura Newton
laura@aos.org

ADVERTISING
Kevin Hall
Advertising Sales Executive
Allen Press
810 East 10th Street
Lawrence, Kansas 66044
khal@allenpress.com
785-865-9143

SUBSCRIPTIONS AND MISSING ISSUES
Membership Services Department
Tel 305-740-2010 Fax 305-747-7154
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Volume 89, Number 9 September 2020 *Orchids* (ISSN 1087-1950) is published monthly by the American Orchid Society, Inc., at Fairchild Tropical Botanic Garden Editorial Office: 10901 Old Cutler Road, Coral Gables, Florida 33156 (telephone 305-740-2010; fax 305-747-7154; email theaos@aos.org; website www.aos.org). ©American Orchid Society, Inc. 2017. Printed by Allen Press, 810 East 10th Street, Lawrence, Kansas 66044. Subscription price of *Orchids* is \$79 a year within the US, \$99 Canada and Mexico and \$119 for all other countries. Single copies of current issue cost \$8.50 (plus shipping and handling). Prices are subject to change without notice. Although *Orchids* endeavors to assure the reliability of its advertising, neither *Orchids* nor the American Orchid Society, Inc. can assume responsibility for any transactions between our advertisers and our readers. Periodical postage paid at Miami, FL and additional offices. POSTMASTER: Send address changes to: *Orchids*, PO Box 565477, Miami, FL 33256. The American Orchid Society follows the *World Checklist of Selected Plant Families* with regard to questions of botanical nomenclature and synonymy in orchid species names and the International Orchid Register for hybrid nomenclature and parentage in editorial. The opinions and recommendations that appear in *Orchids* regarding the selection and use of specific plant-care products, including but not limited to pesticides, fungicides and herbicides, are those of the individual authors, and not those of the American Orchid Society, which neither adopts nor endorses such opinions and recommendations and disclaims all responsibility for them. When selecting and using such products, readers should seek and obtain the advice of the manufacturer and of responsible government agencies. Mail date: August 24, 2020.



Printed on 10 percent post-consumer recycled paper.

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FRONT COVER

Aerangis fastuosa, photographed in-situ by Clare and Johan Hermans during their studies of the orchids of Madagascar. This spectacular miniature is readily available in cultivation and a very rewarding species to grow.

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at Fairchild Tropical Botanic Garden

10901 Old Cutler Road, Coral Gables, Florida 33156
Mailing address: PO Box 565477, Miami, Florida 33256

Tel 305-740-2010

Email theaos@aos.org Website www.aos.org
Main Office Monday–Friday (by appointment only)



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Source Directory

Naya Marcano (naya@aos.org)

Director of Administration and Member Services (305-740-2010)

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Business Operations

Accounting (victor@aos.org)

Victor Parera (305-740-2010 ext 104)

Advertising (khall@allenpress.com)

Kevin Hall — Advertising Sales

Manager, Allen Press, Inc. (785-865-9143)

Orchids, *Orchid Source Directory*

Affiliated Societies (sandra@aos.org)

Sandra Kurzban (305-740-2010 ext 102)

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PRONUNCIATION GUIDE

Pronunciation of orchid names can be daunting for the novice and experienced grower alike. Presented below is a simplified pronunciation guide specific to the names found in this issue of *Orchids* magazine. An attempt has been made to represent each syllable using easily recognized sounds or words separated by hyphens and not standard phonetic symbols. Check out the Orchidist's Glossary on our website at <https://www.aos.org/orchids/orchidists-glossary.aspx>.

<i>Acianthera</i> (ay-see-AN-ther-a)	<i>echinophorum</i> (eh-kine-OFF-ore-um)	<i>Phragmipedium</i> (frag-mih-PEED-ee-um)
<i>adventurae</i> (add-ven-TUR-ee)	<i>elongata</i> (ee-long-AY-ta)	<i>phyllocardia</i> (fill-oh-KARD-ee-a)
<i>Aerangis</i> (air-RANG-iss)	<i>Epiblema</i> (ep-ih-BLEM-a)	<i>picta</i> (PIK-ta)
<i>Aeranthes</i> (air-RAN-theez)	Epidendreae (eh-pih-DEN-dree)	<i>plantaginea</i> (plan-ta-GIN-ee-a)
<i>alata</i> (a-LAY-ta)	Epidendroideae (eh-pih-den-DROY-dee)	<i>Platystele</i> (plat-ee-STEE-lee)
<i>amazonica</i> (am-a-ZON-ih-ka)	<i>Eulophia</i> (yew-LOH-fee-a)	<i>Pleurothallis</i> (plur-oh-THAL-liss)
angraecoid (an-GRAY-koid)	<i>examen-culicum</i> (eks-a-men-KEW-ih-kum)	<i>polyanthemus</i> (pol-ee-AN-the-muss)
<i>Angraecum</i> (an-GRAY-kum)	<i>fastuosa</i> (fast-yew-OH-sa)	<i>Polystachya</i> (pol-ee-STAK-ee-a)
<i>antennifera</i> (an-ten-NIF-fer-a)	<i>flexuosa</i> (fleks-yew-OH-sa)	<i>Protectum</i> (proh-TEK-tum)
<i>anthurioides</i> (an-thur-ee-OY-deez)	<i>foxii</i> (FOKS-ee-eye)	<i>Psychopsiella</i> (sy-eh-kop-see-ELL-la)
<i>aristata</i> (air-ist-AY-ta)	<i>Gastrorchis</i> (gast-RORE-kiss)	<i>Psychopsis</i> (sy-eh-KOP-sis)
<i>Arnottia</i> (are-NOT-tee-a)	<i>gerritsenianum</i> (gair-it-sen-ee-AY-num)	<i>Psychopsychopsis</i> (sy-eh-koh-syeh-KOP-sis)
<i>austiniæ</i> (aws-TIN-ee-eye)	<i>glanduligera</i> (gland-yew-LIDJ-er-a)	<i>putida</i> (PEW-dih-ka)
<i>beatricis</i> (bee-a-TREE-sis)	<i>glandulosa</i> (gland-yew-LOH-sa)	<i>pulchellus</i> (pull-KELL-luss)
<i>Beclaria</i> (bee-KLAR-dee-a)	<i>Glossodia</i> (gloss-OH-dee-a)	<i>pulcherrima</i> (pull-KER-rih-mah)
<i>besseae</i> (BESS-ee-eye)	<i>Gomesa</i> (GOH-meez-a)	<i>punctata</i> (punk-TAY-ta)
<i>bispiculata</i> (bye-spik-yew-LAY-ta)	<i>Gomopsiella</i> (goh-mop-SEE-ell-la)	<i>radula</i> (RAD-yew-la)
<i>Brownlea</i> (BROWN-lee-a)	<i>Habenaria</i> (hab-ih-NARE-ee-a)	<i>ramosa</i> (ram-OH-sa)
<i>Bulbophyllum</i> (bulb-oh-FILL-lum)	<i>Holothrix</i> (hoh-LOH-thriks)	<i>Raphus</i> (RAF-uss)
<i>bulbosa</i> (bul-BOH-sa)	<i>incarnata</i> (in-kar-NAY-ta)	<i>recta</i> (REK-ta)
<i>Burchardia</i> (bur-CHAR-dee-a)	<i>Intervallatae</i> (in-ter-VAL-la-tee)	<i>rectipetala</i> (rek-tih-PET-a-la)
<i>cadetii</i> (ka-DET-tee-eye)	<i>ixioides</i> (iks-ee-OY-deez)	<i>rhynchoglossum</i> (rink-oh-GLOSS-sum)
<i>caespitosa</i> (kay-spih-TOE-sa)	<i>Jumellea</i> (joo-MELL-a)	<i>rosea</i> (ROH-zee-ah)
<i>Caladenia</i> (kal-a-DEE-nee-a)	<i>kramerianum</i> (kray-mer-ee-AY-num)	<i>Satyrium</i> (sa-TEER-ee-um)
<i>calanthoides</i> (kal-an-THOY-deez)	Laeliinæ (lay-LEE-ee-nee)	<i>scopulifera</i> (skop-yew-LIF-er-a)
<i>Calochilus</i> (kal-oh-KYE-luss)	<i>Lalexia</i> (la-LEKS-ee-a)	<i>septemtrionale</i> (sep-tem-tree-oh-NAY-lee)
<i>caloglossum</i> (kal-oh-GLOSS-sum)	<i>lanceanum</i> (lance-AY-num)	<i>sesquipedale</i> (ses-kwi-peh-DAY-lee)
<i>Calypso</i> (ka-LIP-so)	<i>Lepanthopsis</i> (lep-an-THOP-sis)	<i>silvae-pacis</i> (sill-vay-PAK-iss)
<i>canaliculata</i> (kan-a-lik-yew-LAY-ta)	<i>lilacina</i> (lye-la-SEE-na)	<i>Sophrontis</i> (so-fro-NYE-tis)
<i>candidum</i> (KAN-did-um)	<i>limminghei</i> (lim-MING-ee)	<i>speciosa</i> (spee-see-OH-a)
<i>Carpodacus</i> (kar-POH-da-kus)	<i>lindleyana</i> (lind-lee-AY-na)	<i>Stelis</i> (STEE-liss)
<i>Cattleya</i> (KAT-lee-a)	<i>longifolia</i> (lon-gee-FOL-lee-a)	<i>stenostachya</i> (sten-oh-STAK-ee-a)
<i>Cephalanthera</i> (sef-a-LAN-ther-a)	<i>luna-crescens</i> (loo-na-KRESS-enz)	<i>Styandra</i> (stye-PAN-dra)
<i>cernua</i> (SIR-new-ah)	<i>Lycaste</i> (lye-KAS-tee)	<i>sulphurea</i> (sul-FUR-ee-a)
<i>coerulea</i> (see-ROO-lee-ah)	<i>Macdonaldia</i> (mak-don-ALD-ee-a)	<i>superbum</i> (soo-PER-bum)
<i>compacta</i> (kom-PAK-ta)	<i>macropetala</i> (mak-roh-PET-a-la)	<i>tenella</i> (ten-EL-la)
<i>compressa</i> (kom-PRESS-a)	<i>macrostachya</i> (mak-roh-STAK-ee-a)	<i>Thelionema</i> (thel-ee-oh-NEE-ma)
<i>conchoglossum</i> (kon-koh-GLOSS-sum)	<i>major</i> (MAY-jor)	<i>Thelymitra</i> (thel-ee-MIT-ra)
<i>conopodes</i> (kon-oh-POH-deez)	<i>mauritanum</i> (more-ee-tee-AY-num)	Thelymitrinæ (thel-ee-MIT-ree-nee)
<i>cordata</i> (kore-DAY-ta)	<i>Microcoelia</i> (mye-kroh-SEE-lee-a)	<i>Trichocentrum</i> (trih-koh-SEN-trum)
<i>coriophorum</i> (kore-ee-OFF-or-um)	<i>Montanum</i> (mon-TAY-num)	<i>Trichosensiella</i> (trih-koh-sen-see-ELL-la)
<i>Corypha</i> (KORE-ih-fa)	<i>moramanganum</i> (more-a-mang-AY-num)	<i>trinerve</i> (trye-NER-vee)
<i>crescentilabia</i> (kreh-sen-tih-LAY-bee-a)	<i>Mystacidium</i> (mih-sta-SID-ee-um)	<i>tuberculosa</i> (too-ber-kew-LOH-sa)
<i>crinita</i> (KRY-nye-ta)	<i>nuda</i> (NOO-da)	<i>uliginosa</i> (yew-lij-ih-NOH-sa)
<i>cucullatus</i> (kew-kew-LAY-tus)	<i>Oberonia</i> (oh-ber-OH-nee-a)	<i>umbellata</i> (um-bell-LAY-ta)
<i>cultriformis</i> (kul-tree-FOR-miss)	<i>oculata</i> (ok-yew-LAY-ta)	<i>umbraculifera</i> (um-brak-yew-LIF-er-a)
<i>Cymbidium</i> (sim-BID-ee-um)	<i>Oeonia</i> (ee-OH-ee-a)	<i>utricularia</i> (yew-trik-yew-LAIR-ee-a)
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<i>Cypripedium</i> (sip-rih-PEED-ee-um)	<i>ophiuchus</i> (off-ee-YEW-kuss)	<i>viride</i> (VEER-ih-dee)
<i>dalessandroi</i> (dal-ess-AN-droh-ee)	<i>ortiziana</i> (ore-tee-ee-AY-na)	<i>viridis</i> (VEER-ih-diss)ep
<i>Dendrobium</i> (den-DROH-bee-um)	<i>papilio</i> (pa-PEE-lee-oh)	
<i>digoelense</i> (dee-goh-el-EN-see)	<i>patersonii</i> (pat-er-SON-ee-eye)	
<i>Disa</i> (DEE-sa or DYE-sa)	<i>pauciflora</i> (paw-see-FLOR-a)	
<i>Disperis</i> (DIS-sper-iss)	<i>peculiaris</i> (pee-kew-lee-AIR-iss)	
<i>Diurideae</i> (dye-UR-ih-dee)	<i>Phaius</i> (FYE-us)	
<i>Diuris</i> (dye-UR-iss)	<i>Phalaenopsis</i> (fail-en-OP-sis)	
<i>eburneum</i> (ee-BURN-ee-um)		

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Call For Nominations

The AOS Board of Trustees seeks nominations for members of the Board of Trustees of the American Orchid Society, for four trustees (for 2021–2024). Members may nominate any member in good standing, including themselves, and shall provide a rationale as to why they should be considered. All nominations will be evaluated by the Nominating Committee and a slate will be announced, in accordance with the by-laws, prior to the election at the Members Meeting in the spring of 2021. The following competencies have been determined by the Board and will be used in the evaluation.

All nominees shall:

- be members of the AOS, and embrace the mission and priorities of the AOS;
- exhibit integrity and ethical behavior;
- possess strong interpersonal and communications skills;
- have board experience (preferred but not required), preferably with a non-profit organization.

Expertise in some of the following is desirable and will weigh in the evaluation:

- finance, business and/or investment strategies,
- legal background,
- development/fund raising,
- strategic planning and implementation,
- marketing,
- conservation, research or education.

Responsibilities:

- attend conference-call type meetings when called (potentially two per month for officers, one for trustees);
- attend two face-to-face members' meetings annually (must pay own travel expenses, there is no compensation);
- actively participate and contribute in Board activities and work;
- financially support the organization in a manner commensurate with one's ability, while seeking additional financial support elsewhere;
- advocate on behalf of the organization and be ambassadors to the orchid community.

Send nominations to:
 nominating_committee@aos.org
 Nominations will be accepted up to close of business October 15, 2020.

PRESIDENT'S MESSAGE

THE AMERICAN ORCHID Society did not happen by chance. Anything that lasts 100 years did not get there by being lucky. It was borne from people. People who were dedicated, committed, believed in the orchids and lived them. That was the design plan of the American Orchid Society. And, during those almost 100 years, thousands of people rode the train of the AOS to make it what it is today. There is not enough paper in the world to write about all those people. From the weekend hobbyist to the greatest botanist and everyone in between, they are the foundation of the creation that is the American Orchid Society.

But every once in a while, we come across someone that we know makes a difference. They make an indelible mark that cannot be erased. One such person is Tom Mirenda. If you were to pick up any issue of *Orchids* magazine from the last several years, you will no doubt find an article in there written by Tom.

Tom has been growing orchids since the 1980s. He has worked for many botanical gardens in New York and has written countless articles for publications throughout the world. His travels have taken him all over the world, all in the name of orchids — their conservation, ecology and cultivation. For more than 15 years he was the Smithsonian Gardens' orchid collection specialist. The man knows orchids.

Anyone can find this information about Tom online any time. But that does not properly define him. He is so much more than that.

He is the personification of that committed, dedicated person who believes in orchids and lives it...every day. "Orchidology" runs through his veins. He is never at a loss for words where orchids are concerned and will share any amount of time with you to discuss his passion.

Orchids are the beneficiaries of his total character. His level of commitment to them knows no bounds. His dedication to orchids is second nature to him. His knowledge about them is off the charts. It is not work for him; he loves it. There is no question his life is orchids. And the American Orchid Society owes a debt of gratitude to him for all he does.

He believes in the continued struggle to save orchids worldwide so everyone may enjoy them. He has orchid conservation in his crosshairs. The loss of an orchid species due to human intervention would be a tragedy. The

origins of the AOS come from people like Tom Mirenda. One hundred years ago, he would have been traversing all over the earth in the study, preservation and cultivation of Orchidaceae.

And, he sings a mean opera!

Fast forward 100 years — the AOS has not waned in this area of orchid study. Orchid conservation is a major focal point today. Proceeds from the American Orchid Society's centennial celebration are earmarked for orchid conservation. This is a cardinal objective for what the AOS is today. Without orchids, the AOS ceases to exist.

Remember that it is people like you, dedicated to their passion, that are responsible for the success of this society.

I urge you to be a part of the American Orchid Society's centennial celebration, to help in orchid conservation for today, tomorrow and always. Contact the AOS for more information. Find more about this at www.aos.org.

— Robert F. Fuchs, AOS President
(bob@rforchids.com).



Tom Mirenda (right) with the late Mark Whitten in Ecuador.

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ANNIVERSARY
1921-2021



September: The Month of Indigenuity

By Thomas Miranda

ONE OF THE things I love most about the orchid world, is its international nature and the cultural diversity each of us, from every region of our planet, bring to our vast banquet table. Even though most of us grow orchids from mostly tropical regions around the globe, we may be less aware of the orchids indigenous to our own countries and regions. It is rewarding to learn of your personal native orchid heritage. No matter where you may be living (save Antarctica) you have orchids growing that are specific to your region. To look at it another way, every orchid species is indigenous somewhere, except maybe for coryanthes, which are clearly from another planet.



Thomas Miranda

All kidding aside, my point is that all orchid species are native plants *somewhere* and are part of the legacy of that unique *place* where they evolved.

That is why efforts at their conservation must include local stakeholders who appreciate and cherish them. This is one of many reasons I am so proud of the American Orchid Society's conservation grants, which support programs and projects around the world that are focused on the preservation of indigenous plants by the local people that love them, grow them and visit them, living their own lives alongside them.

A SENSE OF PLACE Understanding where your orchids come from is crucial to your growing success. Aside from their home country, you must try to get information about whether your plants are terrestrial or epiphytic, from high mountains or torrid lowlands, from seasonally dry or consistently wet habitats. It is enough to dismay even the most ardent plant enthusiasts. Luckily, we have many books and this incredible *Orchids* magazine, as well as myriad online resources to help us sort out our information. Happily, many regions around the world share similar environmental conditions so we can generalize care into a few categories, such as warm-, intermediate- and cool-growing. Perhaps the most important resource for you to reference is your local orchid society where you will find many like-minded locals who have found techniques and



TERRY BOTTOM

September and October mark the beginning of the fall blooming season as temperatures moderate.

regimes that work for them in your own region.

BEFORE THE FALL For many of us, September is simply the tail end of summer, and the cultural care we practice during July and August should continue. But the observant grower (you) will notice that growth is slowing down, pseudobulbs are thickening as they store nutrients, leaves are maturing and hardening, and clearly change is in the air. In the northern hemisphere, nights are becoming noticeably cooler and somewhat longer. These subtle environmental changes will soon manifest themselves in the initiation of flower spikes in phalaenopsis, cymbidiums and dendrobiums. Be on the lookout for them and make sure plants are spaced well enough and oriented in such a way that their inflorescences are able to emerge with their natural grace unobstructed.

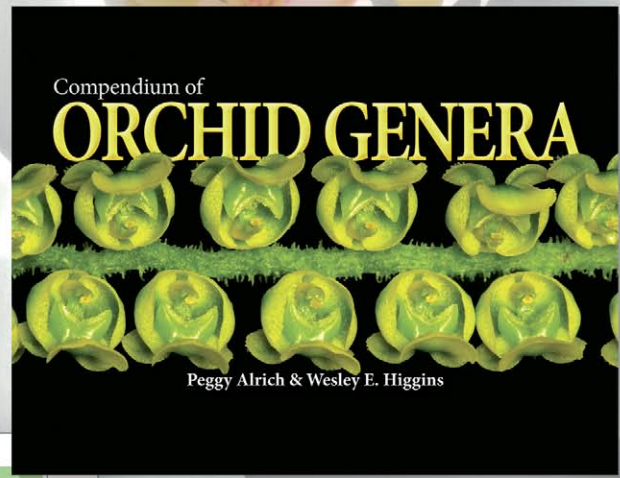
WEATHERING THE STORM Many of us still have our collections out-of-doors this month. This is fine and is actually advisable. The cooler nights and diminishing day lengths (photoperiod) your orchids experience this month are excellent triggers for blooming and dormancy, many plants (such as lycastes, as well as certain cattleyas and dendrobiums) need to bloom properly in season. By the end of the month, there should be evidence of imminent spikes and blooms on many of your orchids.

Beware however, of the possibility of severe weather this month. If you live in a more temperate zone, it may be advisable to at least start bringing plants back inside soon to protect them from volatile winds and wild temperature fluctuations that can occur this month.

FALLING IN LOVE While many are simply born there and have a long historical relationship with our "place," many of us choose the regions in which we live. It may be that we landed there for a job, or for a partner, or for a new way of life, but we stay because there are wonders present in each region of the world that we have come to develop a deep understanding and affinity for. It is those affinities that make us unique lovers and stewards of the natural world, no matter where on this incredible planet we may be. Love your region as well as your world, and understand that we can only protect that world by engaging with others who love their regions just as much. It is only through such indigenous connections and collaborations that we have a chance of protecting the natural world.

— Thomas Miranda has been working professionally with orchids for over three decades and is the past chair of the AOS Conservation Committee. He is an AOS accredited judge in the Hawaii Center (email: biophiliak@gmail.com).

Presenting
**The Compendium
of Orchid Genera**
by Peggy Alrich
and Wesley Higgins



Angraecum Reyer
Epiphytanthus Vahl; *Angraecium*
Upp. Bot. Africae, 1: 396, t. 19 (1866).

ETYMOLOGY: From the Latinized form of the Malay word (*Angraek* or *Angraek*) for the epiphytic orchids that resemble *Aerides* and *Vanda* in habit. The name *Angraecum* originated with Georg Eberhard Rumphius (1628-1702), who coined it from the word *Angraek*, a name also given by the Malabars to "parrot-like" *Lycodiscus* plants, the meaning of which has not been discovered. From *Fragehört Kämpfer* (1851-1730) we learn that *Angraek* or *Angraek* is also the name used by the Indians for these plants.

GENETIVE: *Angraecum chrysanthum* Reyer
(Illustration: Angraecum sp.)

More than two-hundred twenty-one, very small to very large monopodial epiphytes, a few lithophytes or rare terrestrials have a wide range of distribution in humid, low to mid elevation, coastal to hill scrub, savannas to montane evergreen forests of mainly tropical Africa (Guinea to Somalia, Calicut to Zanzibar and South Africa), Madagascar, Mauritius to Réunion, although one species is found as far away as the Seychelles and Sri Lanka. These miniature to large, rambling to clump-forming, warm to cool growing plants are vegetatively and florally quite diverse. The short to long, sometimes branched stems are leafy throughout with fleshy to leathery, channelled, unequally bilobed, usually ditch-like leaves. The one to several, short to long, solitary to few-flowered inflorescences have long-lasting, small to large flowers in shades of white, ivory or green with sepals and petals free, usually spreading. The flowers are noted for their spots of widely varying lengths from quite long to short. The flowers have a thick, almost leathery texture, an exceptionally long flowering period, and an extraordinarily heavy nocturnal fragrance (usually within the long spurred species) and the lip is larger than the other segments. The shell or boat-shaped, simple or obscurely lobed lip is usually quite concave, its base more or less encircles the column, and it has a central callus. The flowers have a very short, footless column with deeply divided lobes. Pollinia 2, waxy, each attached to its own narrow or elliptic viscidium. **Culture:** Growing conditions and habitat options vary widely from species to species. Generally they do best mounted on a fern slab with good drainage and most of the species benefit from a resting period of reduced watering. Provide intermediate conditions, bright to diffused light, high humidity and good air movement.

Valid Angraecum Synonyms

Aerobion Kuntze ex Sprengel
Syst. Sig. (Sprengel), ed. 18, 8: 479 & 716 (1826).
Ernoecus Greek for air and life. Referring to the epiphytic habit of the plants.
Lectoceras *Aerobion asperulum* (Thunberg) Sprengel (*Angraecum* Thomson)
Angraecum Cass. *Bot. Ind.*, 80: 161 (1817).
 Now recognized as belonging to the genus *Angraecum*, *Aerobion* was previously considered to include twenty-four epiphytes found in warm, mid elevation, montane forests of Madagascar and the Mascarene Islands.

Angraecoides (Candolle) Schlachter, Mytnik & Grochoccka
Biologicalia, *Bot. Conservation*, 28: 9 (2013).
Ernoecus, *Angraecum*, a genus of orchids, and Greek for likeness or form. Refers to a similarity to *Angraecum*.
Tve Seices *Angraecoides pinguis* (Frappet) Schlachter, Mytnik & Grochoccka (*Angraecum pinguis* Frappet)
 Now recognized as belonging to the genus *Angraecum*, *Angraecoides* was previously considered to include twenty-five epiphytes found in cool, mid elevation, hill scrub and montane forests in northwestern Madagascar, Mauritius and Réunion.

Arachnangraecum (Schlechter) Schlachter, Mytnik & Grochoccka
Biologicalia, *Bot. Conservation*, 28: 11 (2013).
Ernoecus, Greek for spider and *Angraecum*, a genus of orchids. Refers to the long, spider-like segments.
Tve Seices *Arachnangraecum ramosum* (Thunberg) Schlachter, Mytnik & Grochoccka (*Angraecum ramosum* Thunberg)
 Now recognized as belonging to the genus *Angraecum*, *Arachnangraecum* was previously considered to include thirteen epiphytes found in cool, mid elevation, hill scrub and montane forests in found in northwestern Madagascar, Mauritius and Réunion.

Bonnieria Condamine
Rev. Gén. Bot., 11: 416, Pl. 10-11 (1899).
Ernoecus, In appreciation of Eugène Marie Gaston Bonnier (1853-1932), a French botanist, editor of *Revue Générale de Botanique* and publisher of Candolle's notes on the orchids of Réunion.
Tve Seices *None designated*
 Now recognized as belonging to the genus *Angraecum*, *Bonnieria* was previously considered to include two epiphytes found in mid to upper elevation, bushy montane rain forests of Réunion.

Boryangraecum (Schlechter) Schlachter, Mytnik & Grochoccka
Biologicalia, *Bot. Conservation*, 28: 12 (2013).
Ernoecus, Named for Jean Baptiste Bory de Saint-Vincent (1778-1848) a French naturalist and author of *Voyage dans les îles d'Afrique*. And *Angraecum*, a genus of orchids.
Tve Seices *Boryangraecum pumilio* (Schlechter) Schlachter, Mytnik & Grochoccka (*Angraecum pumilio* Schlechter)
 Now recognized as belonging to the genus *Angraecum*, *Boryangraecum* was previously considered to include thirteen epiphytes found in cool, mid elevation, hill scrub and montane forests in found in Madagascar, Mauritius and Réunion.



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COLLECTORS' ITEM

Introducing *Bulbophyllum* section *Intervallatae*

Ever-Blooming Bulbophyllums — And They Do Not Stink?

Text and photographs by Charles Wilson



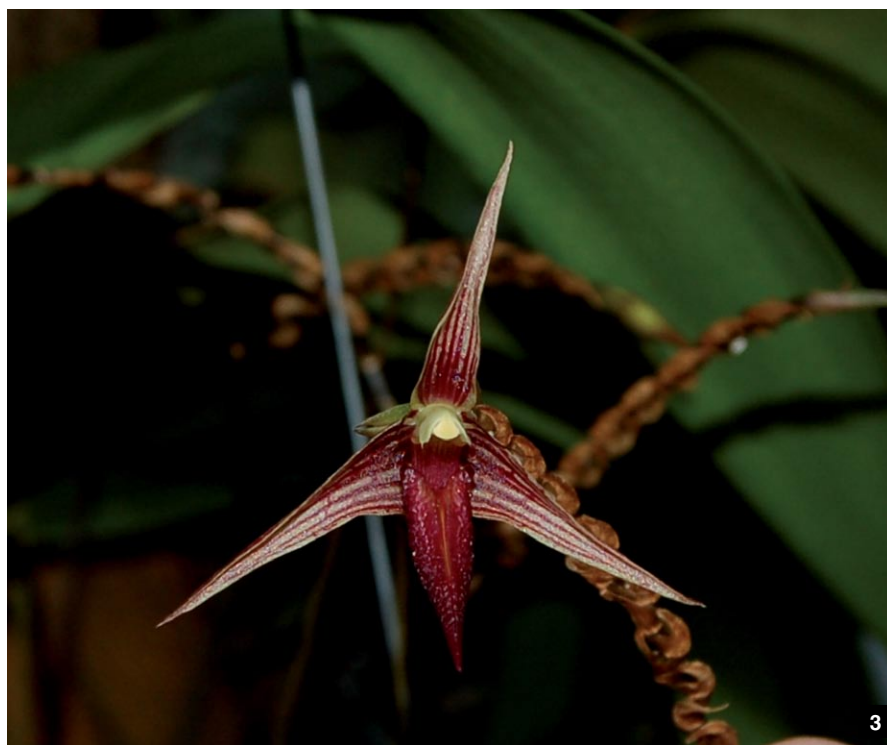
THE GENUS *BULBOPHYLLUM* is generally considered to be the largest orchid genus, with more than 2,000 valid species names (one of the largest genera of all flowering plants). In the past, several attempts were made to divide the genus into multiple smaller genera, but these did not prove tenable over time and they have all been recombined into the one genus, *Bulbophyllum*. The genus has been more successfully divided by taxonomists into as many as 78 sections based on structural similarities of flowers.

One of these sections, the *Intervallatae* (Ridley 1879) contains about 45 species and has the most interesting and desirable trait of having inflorescences that are persistent and continue to put forth flowers regularly for several years. A well-grown plant in a 10-inch (25-cm) pot can easily produce 20 or more inflorescences, providing a near-continual parade of flowers for many years.

The upright, long peduncles of the inflorescences (to 24.4 inches [62 cm]) are very thin and wirelike, topped with a somewhat pendent sequentially flowering rachis from which the flowers emerge one at a time. Although each rachis only produces a single flower at a time, each can produce over 35 flowers over the several-year life of the rachis. New inflorescences are produced on a regular basis as the plants continue to grow, and can literally be in constant bloom for many years. The flowers in this section can be quite large, with a natural horizontal spread up to 4 inches (10 cm), and each flower lasts about two weeks. The flowers have a subtle, earthy aroma, not as overpowering and offensive as some of the other species of *Bulbophyllum*.

If the inflorescences are staked early while still elongating, they will typically remain upright after the growth has hardened and the stakes may then be removed or shortened to continue to provide some direction to their arrangement. The pseudobulbs range in size from about 0.5 to 1.5 inches (1 to 3 cm) tall, and are topped with single leaves to 6 inches (15 cm) long. Most species produce rhizomes with short internodes, often less than the width of the pseudobulbs — a benefit in keeping plants in a pot.

TEMPERATURE The species in section *Intervallatae* are found in the forests of peninsular Malaysia, Sumatra, Borneo, Sulawesi, the Philippines, New Guinea, and the western Pacific islands. Although



mostly lowland species preferring warm temperatures and high humidity, some species can be also found at elevations up to 4,600 ft (1,400 m). Such elevations at those latitudes do not always translate into cooler temperatures.

[1] *Bulbophyllum septemtrionale* 'Chasus'
HCC/AOS

[2–3] *Bulbophyllum digoelense* 'Chasus'
AM-CCM/AOS



Bulbophyllum caloglossum 'Chasus' CHM/AOS

The species in this section prefer warm growing temperatures with night minimums of 60 F to even 75 F (15.5–23.8 C), and can tolerate day temperatures into the 90s F (>32.2 C), provided they have excellent air movement and high humidity (75% or more). These species will grow year-round if kept warm and watered. Temperatures below 55 F (13 C) will slow growth and retard blooming.

LIGHT Most species in this section, like most bulbophyllums, thrive in bright, indirect light. Many actually can enjoy the higher light levels often appreciated by some cattleyas if provided adequate air movement and humidity.

POTTING AND WATERING Because *Bulbophyllum* have threadlike or fibrous fine roots, a shallow layer of potting mix

(e.g., we use seven parts small bark, one part small perlite and one part small charcoal) atop an ample bottom layer of expanded polystyrene "peanuts" in a shallow pot or basket will provide perfect drainage. This shallow layer of medium allows the grower to water nearly every day without much worry of rotting the mix. This method of shallow potting also closely resembles the way *Bulbophyllum* grow in the wild — on top of tree trunks and branches that dry out quickly. The advantage of this shallow rooting in nature is in capitalizing on the high humidity of the tropics coupled with morning dew. In nature they seldom totally dry out for long periods, even in the drier seasons. For those species with a somewhat longer rhizome spacing

between pseudobulbs, rafting on a tree fern slab or totem may best accommodate their rather scrambling growth habit.



Charles Wilson

— Charles Wilson is an accredited AOS judge in the Pacific Northwest Judging Center, Chair of the AOS Conservation Committee and a member of the Species Identification Task Force; he has been growing orchids for over 40 years. His special interests include *bulbophyllums*, *cattleyas*, *coelogyne*s, *dendrobium*s, *paphiopedilum*s and about everything else, too (email: Zooemeritus@gmail.com).

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Presenter	Ron McHatton Chief Education and Science Officer	Mike Curtin AOS Student Judge and member of Oregon Orchid Societies	Ron McHatton Chief Education and Science Officer	Dave Sorokowsky Owner Paph Paradise Awarded grower and AOS Judge

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Sylvia Strigari

Pleurothallis luna-crescens

Text by Melissa Díaz-Morales and Franco Pupulin/Watercolor by Sylvia Strigari

Tribe EPIDENDREAE
 Sutribe PLEUROTHALLIDINAE
 Genus PLEUROTHALLIS R.Br.

Pleurothallis luna-crescens Pupulin, J. Aguilar and Mel. Fernández, *Lankesteriana* 17(2):158–163. 2017. Type: Costa Rica. Cartago, Turrialba, Tayutic, Grano de Oro. On the road to the premontane forest, next to the road between Grano de Oro and Llanos del Quetzal, 2 km after crossing a river with a broken bridge. 9°48'23" N 83°26'53" W, 1,000–1,200m, July 30, 2005, A. P. Karremans 881 and P. Ferreira (holotype, CR; isotypes, JBL).

An epiphytic, caespitose, erect herb up to 30 cm tall. Roots slender, flexuous, ca. 1 mm in diameter. Ramicauls terete, slender, 7.5–28.0 cm long, ca. 3 mm in diameter, pale green, with a basal, tubular, truncate sheath, 2.5–4.2 cm long, and a subbasal, tubular, obtuse, tight sheath 2.3–5.2 cm long, green, glumaceous when developing, dry-papyraceous, brown when mature. Leaf borne erect at the apex of the ramicaul, becoming subpendent with age, thinly coriaceous, flexible, sessile, lanceolate, acute, shortly subacuminate, 6.5–12.5 × 3.0–5.5 cm, deeply cordate at the base, the basal lobes occasionally upcurved, green, sometimes irregularly mottled with purple along the margins, matte. Inflorescence a solitary flower from an erect, rectangular-subclavate, truncate, spathaceous bract 2.2–2.6 cm long, glumaceous, green, becoming brown, dry-papyraceous with age. Peduncle terete, ca. 10 mm long, completely hidden by the spathe. Pedicel terete, green, to 2.2 cm long. Ovary terete, subclavate, 6–7 mm long. Flowers spreading and complexly incurved-reflexed, crescent moon-shaped when seen from the side, the sepals and petals purple-red, the lip dark purple. Dorsal sepal incurved, lanceolate, acute, 15.0–16.5 × 6.5–7.0 mm, the margins reflexed, three-veined. Lateral sepals connate into an ovate, obtuse synsepal, incurved, the margins slightly reflexed, 14.8–15.3 × 8.0–8.5 mm, five-veined. Petals narrowly ovate, acute, dentate, 8.7–9.0 × 2.8–3.0 mm, strongly reflexed, single-veined. Lip unguiculate, hinged to the column foot, ovate, basally truncate with obtuse angles, obtuse, minutely apiculate, 4.0–4.5 × 2.2–2.8 mm,

the adaxial surface minutely papillate throughout except the area surrounding the glenion; glenion raised on a thick callus on the disk, ca. 0.6 mm long. Column short, stout, transversely subrectangular, dorsiventrally complanate, ca. 2.0 × 1.3 mm, the anther apical, incumbent, the stigma apical, bilobed. Anther cap cucullate, ovate, subcordate, truncate, bilocular, ca. 0.9 × 0.7 mm. Pollinia two, narrowly ovate-pyriform, 0.8 mm long, attached to an elliptic viscidium.

Pleurothallis luna-crescens belongs to the informal group of *Pleurothallis phyllocardia*. A combination of characteristics helps to recognize the species of the group. The plants with soft, coriaceous, elastic leaves, without a distinctly protruding midvein, matte on the upper surface and frequently mottled or spotted with purple, ovate to lanceolate, deeply cordate at the base when mature, are the main vegetative characters that distinguish the group. With a few exceptions, the spathaceous bract that protects the flower bud during development is erect to suberect in all species. Florally, the species closely related to *Pths. phyllocardia* are mainly concolorous dark purple, rarely purple-brown with darker veins or entirely yellow; the flowers are coriaceous and remain spreading during anthesis (while in other groups they open during the day and close at night until they eventually fade), the sepals and petals are mostly reflexed, with the erect dorsal sepal narrower than the synsepal; the lip is simple, triangular-lanceolate, very thick, with complex indumentum varying from low papillae to irregularly crenate, flattened warts. Unique to this group of species ranging from Central America to the Andes (where it is more diverse) is that, while in most taxa the flowers are erect and forward-facing, in some species (i.e., *Pths. phyllocardia*, *Pths. pudica*) the flowers are reclinate toward the leaf, literally facing down at the foliar surface, so that the lip and the reproductive organs cannot be seen unless the pollinator slides itself between flower and leaf.

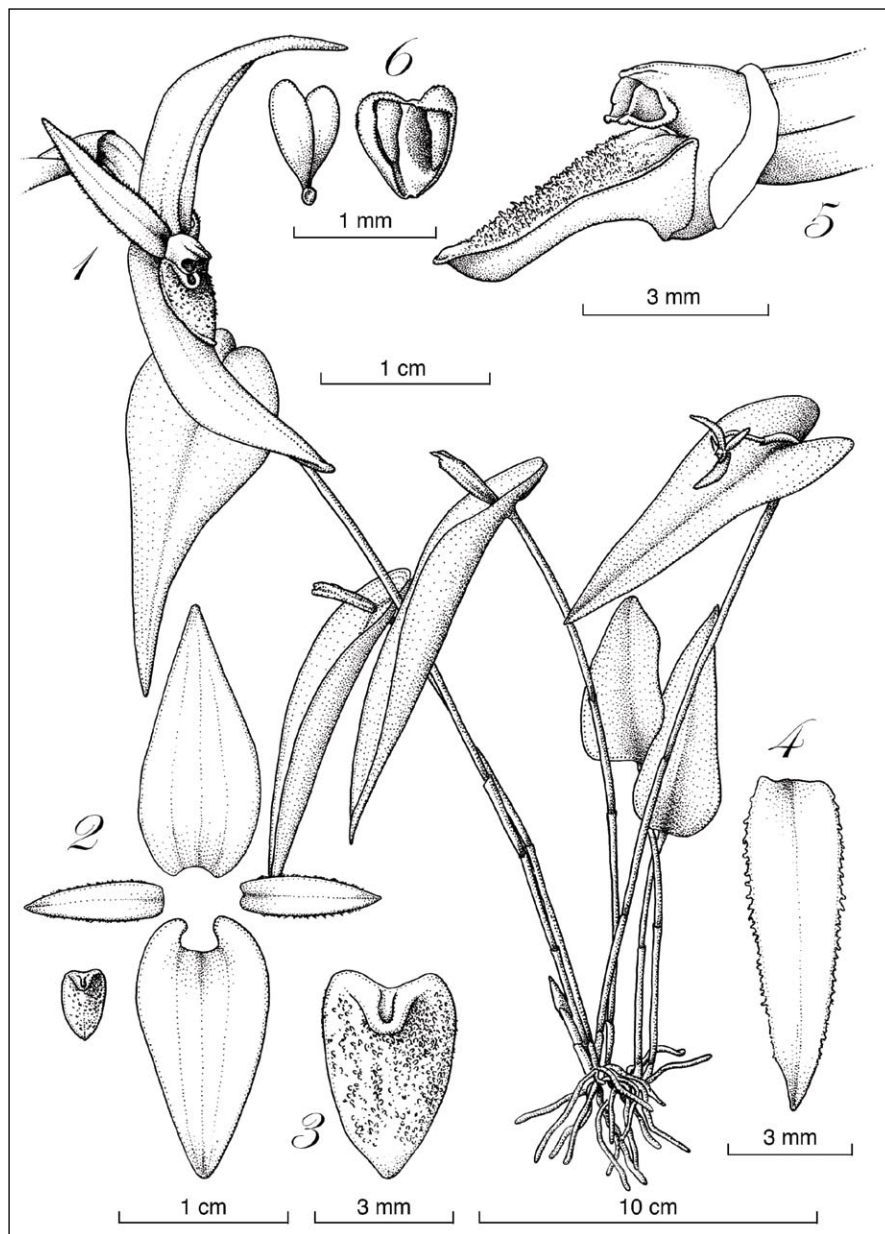
Although the phylogenetic relationships between the species in the group and among other species in the genus are not

yet clarified, the informal circumscription of the group includes about 35 species (Luer 2005, Wilson et al. 2016, Pupulin et al. 2017). In Costa Rica, where the group has been studied extensively, about 10 species are known: *adventuratae*, *anthurioides*, *compressa*, *luna-crescens*, *peculiaris*, *phyllocardia*, *pudica*, *radula*, *rectipetala*, and *silvae-pacis* (Pupulin 2002, Luer 2003, Karremans and Bogarín 2011, Karremans and Muñoz 2011, Pupulin et al. 2017). The last could perhaps be a taxon of hybrid origin with species from a different group of *Pleurothallis*, but the number of species and nothospecies in the group will increase with upcoming studies from scientists at the Lankester Botanical Garden.

Pleurothallis luna-crescens is recognized from other species in the group by the crescent-shaped, purple flowers with a finely rugulose lip, and the long, strongly dentate petals. The specific epithet comes from the Latin *luna crescens*, meaning crescent moon, and makes reference to the characteristic shape of the flower seen in profile, due to its strongly reflexed-incurved sepals.

This species is considered so far endemic to the Caribbean slopes of the northern Talamanca chain in central Costa Rica. Although this species was described only recently (Pupulin et al. 2017), herbarium records show that it has been collected back to 1978, but it was treated as a variation of the altogether different *Pths. radula*. The natural habitat of *Pths. luna-crescens* is the lower montane and premontane rain to wet forests of the Talamanca chain, where it has been recorded growing at 1,000–1,650 meters. The species mostly flowers in June–August, but there are also records of early flowering in February and March.

Notwithstanding the high diversity of the genus, probably encompassing over 500 species in its strictest sense (Karremans 2016), species of *Pleurothallis* have been featured only sporadically in the *Refugium Botanicum*. In the original work edited by W. Wilson Saunders (1869–1879), only six species out of the 72 orchid plates of the series were illustrated under the generic name of *Pleurothallis*, and none of them actually belongs there



Pleurothallis luna-crescens. The plant.

1. Flower.
2. Dissected perianth.
3. Lip, ventral view.
4. Left petal.
5. Lateral view of column and lip.
6. Pollinarium and anther cap.

All drawn from Karremans 881 by Sara Poltronieri.

according to a phylogenetic classification of the Pleurothallidinae (the species of the *Refugium Botanicum* are now best treated as members of *Acianthera*, *Lalexia*, and *Lepanthopsis*). Checking back through our own series of the *New Refugium Botanicum*, we have done no better, as only a single species of *Pleurothallis* has been featured so far, *Pths. crescentilabia* (Pupulin and Aguilar 2016). This probably reflects the limited popularity of *Pleurothallis* among orchid growers and collectors, which in turn is, in our opinion, the result of the difficulty to recognize, understand, and properly name the species of this taxonomically difficult group of orchids, in many cases morphologically very similar to each other. Nevertheless, the importance to give a “recognizable face” to the species of *Pleurothallis* through a

careful illustration of their characteristics, transcends the limits of pure botany. Mo and Cetzal-Ix (2015) recently recorded the use of species of *Pleurothallis* as a remedy in traditional q’eqchi (quekchi) indigenous medicine in Guatemala. Interestingly, they report that the younger members of the q’eqchi communities have serious difficulty in distinguishing *Pleurothallis cardiothallis* from other morphologically similar species that do not have the same pharmaceutical properties, as they do not have any instrument to recognize the species from each other.

At the Lankester Botanical Garden, *Pths. luna-crescens* is mostly grown in plastic pots, with a fine mix of bark, perlite and charcoal, taking care that the pots are perfectly drained. The medium is not kept wet, but it is almost never allowed to dry out completely. Plants of this species grow equally well on large plaques of hardwood, but in this case watering must be applied more frequently; even on a daily basis during the hottest summer months.

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Selected Botanical Terms

abaxial – lower or reverse surface
 acuminate – tapering to a long point
 acute – pointed
 adaxial – upper or front surface
 anthesis – period during which flowers are fully open
 apiculate – ending abruptly in a small point
 basal – at the very base of a segment
 bilocular – two-chambered
 caespitose – clumped together
 circumscription – limit of a grouping
 clavate – club-shaped
 complanate – held in a single plane
 concave – curved inward like the inside of a sphere
 concolor – of one color
 connate – united to form a single part
 cordate – heart-shaped
 coriaceous – leathery
 crestate – crested
 cucullate – hooded
 dentate – toothed
 dorsiventrally – flattened with distinct upper and lower surfaces
 elliptic – oval
 epiphyte – growing on another plant for support and not as a parasite
 flexuous – full of bends and curves

glabrous – smooth
 glenion – circular spot or crest at the base of the lip, directly in front of column
 glumaceous – chaffy
 hysteranthous – having leaves emerge after flowers are open
 incumbent – resting on another segment
 incurved – curve inward
 indurium – hairy or fuzzy covering
 lacinate – divided into deep, narrow, irregular segments
 lanceolate – narrow oval tapering to a point at each end
 linear – elongate and parallel-sided for most of its length; grass-like
 oblanceolate – narrow at attachment, rounded apically
 obovate – egg-shaped with the wide end up
 obtuse – blunt or rounded
 ovate – egg-shaped, narrow end up
 ovoid – egg-shaped, narrow end up
 papillate – bearing minute, pimplelike protuberances
 papyraceous – papery or paperlike
 pedicel – a stem carrying a single flower
 petiole – stalk connecting leaf to stem
 phylogenetic – evolutionary history

phylogeny – evolutionary history of a group of species
 polyphyletic – a group of taxa that do not share a single common ancestor
 pyriform – pear-shaped
 rachis – portion of the inflorescence carrying flowers
 ramicaul – slender stem
 reclinate – reclined or bent downward
 recurved – bent or curved backward
 rugulose – wrinkled
 sessile – joined without a stalk
 spathaceous – resembling a spathe
 sub – somewhat less than; i.e., subspherical would refer to almost but not quite a sphere
 sympodial – having a main stem that stops growing at the end of each season. A new lead branch then grows from the lead base
 synsepal – united to form a single part
 terete – cylindrical or pencil-shaped
 truncate – abruptly terminated as if cut off
 unguiculate – clawed
 viscidium – sticky pad to which orchid pollinia are attached.

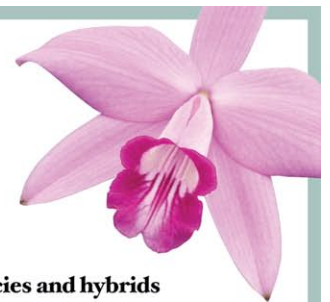
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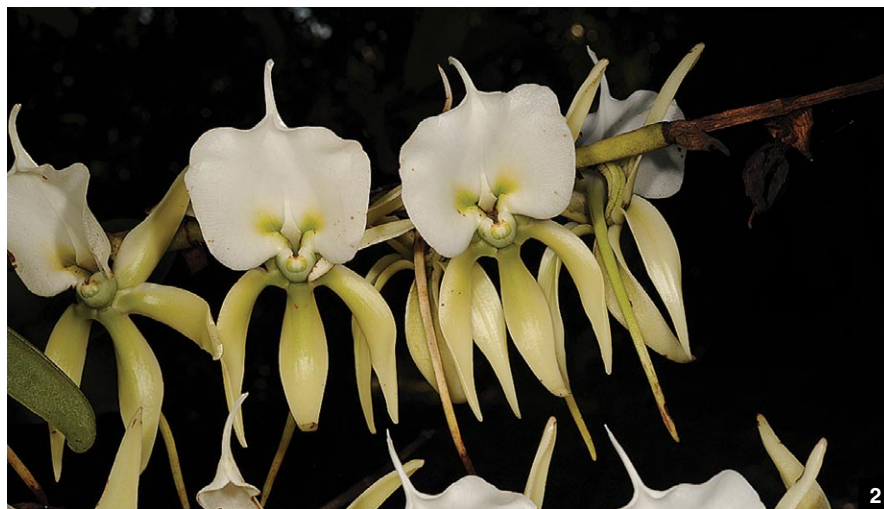
New Conservation Grants on Madagascar

Thomas Mirenda/Photographs courtesy of ADAFAM

THE CALL TO preserve and cultivate the outstanding and unusual orchids native to the African continent, as well as the incredibly species-rich high islands off its coast, such as Reunion, Mauritius and, of course, Madagascar, is a most worthy cause for the conservationists of the world. After my eye-opening goodwill trip there last fall, the AOS Conservation Committee received some superb applications for extremely worthwhile projects. It is with great pride that the committee announces the two recipients listed here. These projects have the potential to preserve hundreds of species within their natural ranges (the Circa Situm Conservation Strategy) and we hope that some truly effective outcomes result from these efforts. You can expect reports and features on these three Africa projects to appear in future issues of *Orchids*.

As an astonishing botanical hot spot with practically unmatched endemic biodiversity, the island of Madagascar is home to some of the most spectacular, most interesting and, unfortunately, most endangered of orchids. With humanitarian crises and extreme poverty in many of its provinces, the protection of forests and the biodiversity within them has been difficult to justify. Even so, the conversion of biodiversity to subsistence fuel has been well documented there and the loss to our planet of these species is incalculable. Therefore, we selected two project proposals on Madagascar, each of which has the potential to preserve 10 to 15 percent or more of Madagascan orchid biodiversity. The two projects are in separate areas of northeastern forest, and we have connected the principal investigators of the two in the hopes of synergy and cooperation between them.

The Association des Amis de la Foret d'Ambodiriana-Manompana (ADAFAM) is a nongovernmental organization that protects one of the most pristine and beautiful places on Madagascar from destruction by deforestation. The forest holds species of orchids that have been found only once, and it is expected that more species will be discovered there when it is adequately botanized. The organization is actively training native Malagasy villagers to be guides, guards and protectors of the forest and all its inhabitants, including lemurs, endemic



CONSERVATION COMMITTEE

birds and astounding orchids. Once a survey of the Ambodiriana forest is complete and they know the entirety of the forest's richness, an orchidarium within the forest will be created that will be used for propagation, reintroduction and education. The project involves the creation of wildlife corridors through deforested or burned areas to aid and heal the ranges of plants and animals that have been damaged or fragmented by human activity. You can see a small portion of the extremely rare orchids present on their website (<http://www.adafam.org/index.php/phototheque/orchidees-2/>).

One of the greatest groups working in Africa is the collaboration of Drs. Vincent Droissart and Tariq Stevart of the Institut de Recherche pour le Développement (France) and the Missouri Botanical Garden. These names should be familiar to *Orchids* readers as we have featured their work in previous issues. Together with a team of local scientists such as Dr. Murielle Simo-Droissart and Dr. Archange Boupoya, they have developed a network of shade-house collections throughout Central Africa and work on describing, preserving and studying the rich diversity of orchids hitherto unknown to most of the orchid world. The fact that they are adding species-rich Madagascar to their network is timely and fortunate for the world. This group has a great track record of success and has developed and provided opportunities for local investigators. Engaging local communities and leaders is the best way to inspire conservation and instill a sense of ownership of and fellowship in the conservation world.

The Conservation Committee also funded the work of another group protecting wild *Disa* species in the Fynbos Habitat near Capetown, South Africa,



another incredible biodiversity hot spot. There will be a feature on this group's work appearing in a future issue of the magazine.

The Conservation Committee hopes that you, our readers, can see that the preservation of wild orchids is a priority: indeed, one of the three pillars of our organization. We hope you will consider getting involved with our conservation efforts, here and around the world. A world without orchids would be very sad. Help us preserve them in the places where they evolved.

— *Thomas Mirenda, past chair of the AOS Conservation Committee, has been working professionally with orchids for over three decades. He is an AOS accredited judge in the Hawaii Center (email: biophiliak@gmail.com).*



- [1] *Angraecum sesquipedale*
- [2] *Angraecum eburneum* subsp. *superbum*
- [3] *Bulbophyllum moramanganum*
- [4] *Microcoelia bispiculata*
- [5] *Cynorkis calanthoides*
- [6] *Gastrorchis tuberculosa*

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Into Africa, Part 5: Mauritius and its Orchid Wonders

A Blueprint for Orchid Heaven?

By Thomas Mirenda

THERE ARE MANY places on our planet blessed with outstanding natural beauty. One could argue that every region on earth has its own unique splendors and it is a futile task to compare them. All of them are memorable, beautiful and fantastic places to visit. Each visit a frozen moment in time and in our memories, creating a snapshot that exists only in our minds' eyes — well, maybe also on memory cards inside our smart phones! In these times of isolation, social distancing and travel restrictions, it is comforting to know that across the globe, astounding landscapes persist on our troubled planet with myriad unimaginable creatures, both plant and animal, still extant and surviving against all odds. Indeed, the current state of industry is likely helping our incredible Earth heal and recover from its exploitation. Nowhere is this more brilliantly exemplified than on the exquisite island of Mauritius.

Sometimes, I think I am the luckiest of men, in that orchids have found me and have provided me with a career, a rewarding avocation and tremendous opportunity to travel to the most exotic and remarkable places. Several years ago, after some email correspondence identifying some species orchids found on the island, I received an invitation from the president of the Orchid Society of Mauritius, Serge L'Ecluse, to visit Mauritius if in Africa. When the opportunity to judge the outstanding Kenya Orchid Society show presented itself, I could not resist contacting Serge to see if a visit before or after the Nairobi show might be possible. Incredibly, the Mauritius show was scheduled so that I might be there the week before Nairobi. I will forever be grateful to the Kenya Orchid Society as well as the wonderful orchid community on Mauritius for their generosity to me.

Some believe that Mauritius was the original site of the Garden of Eden, others, including the American writer Mark Twain believed the island was an early work of the divine that preceded and informed the creation of Heaven so



MELINA LECOURT



MELINA LECOURT



KERSLEY PYNEE



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that it could be used as a model for God's own dwelling. He wrote: "You gather the idea that Mauritius was made first, and then Heaven, and that Heaven was copied after Mauritius."

Hawaii has similar connections to the heavens, as some of our peaks are said to be vortices, or portals to heaven. No matter what your religious beliefs, it is impossible not to feel the loving presence of something beyond our normal senses when traversing both our exquisite landscapes. It may indeed be that both our islands are sacred places where God and man may cohabit and interact, shortening the distance between Heaven and Earth. It was immediately apparent to me, the minute I got off the plane, that Mauritius is an exceptional place with unique and amazing flora and fauna, diverse ethnic mix, fabulous climate, exquisite and impressive topography and, most importantly a gentle, loving island spirit, very similar to what we call "aloha" here in Hawaii. I felt very much at home and cared for by all the wonderful people I got to meet.

The two volcanic archipelagos have much in common, including apocalyptic origins of cataclysmic eruptions that, at least in Hawaii, continue to this day. Both island chains have endemic flora and fauna, existing nowhere else on our planet, many of which have either succumbed or are teetering on the brink of the precipice we refer to as extinction. Our island homes also share a history of sugar cane cultivation, a practice that, in another age, brought us great prosperity, but also a fair amount of ecological devastation to both our islands. Although it was shocking to discover how much native forest has been lost on Mauritius, the same is true of Hawaii Island as well.

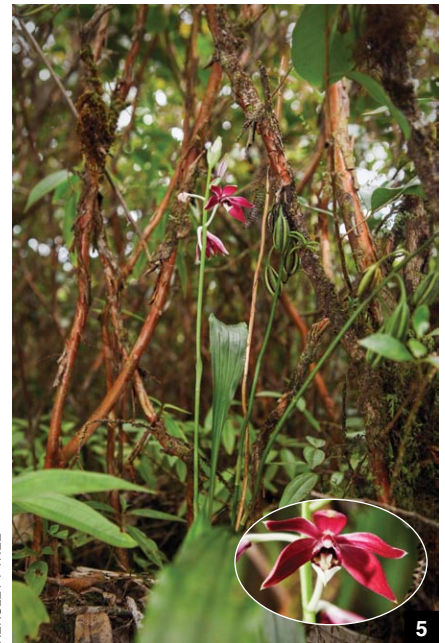
Although I did not have the chance to get in the water on my brief visit, the island is surrounded by lush coral reefs which prevent devastating tsunamis and protect the island's peaceful lagoons from large pelagic, marine predators. On my next visit I plan to explore this "other world" but for now, I had the pleasure of being the guest of honor at a superb orchid show, a marvelous display of gorgeous plants expertly cultivated by superb local growers. Lucky me! While there, I had the opportunity to see outstanding local collections and gardens featuring both local species and amazingly well-grown plants, both species and hybrids from around the world.

With outstanding hospitality, my new Mauritian friends saw to it that I

got to see native orchids in their natural habitats; particularly on the visit to the National Park of Black River Georges/Petrin. There I was overwhelmed by the sight of not only thousands of naturally occurring angraecoids, bulbophyllums and oberonias, but also terrestrials such as their endemic *Phaius* and unusual, cryptic, rarely observed things such as benthamias and others. It was an unforgettable day of strange and wonderful endemic species of many other types of plants, especially palms, ferns and pandanus.

The island is also home to the oldest botanical garden in the Southern Hemisphere, Sir Seewoosagur Ramgoolam Botanical Garden (shortened to the SSR Botanical Garden), also known as the Pamplemousses Botanical Garden, famous for its outstanding collection of palms including a mature stand of giant Talipot palms (*Corypha umbraculifera*), and a pool famous for its magnificent gigantic Victoria waterlilies (*Victoria amazonica*). Its venerable history has included the planting of legacy trees by royalty and world leaders such as Princess Margaret, Countess of Snowdon; Indira Gandhi; François Mitterrand and Robert Mugabe.

Orchids are beloved on Mauritius and there is growing interest in their cultivation, preservation and conservation. The community is ethnically diverse, including French and English colonists, Creoles, and African descendants, as well as immigrants from India who came originally to work the sugar plantations and Chinese merchants. And now, as ecotourism and real estate ventures have added an even greater air of the cosmopolitan to the island, Mauritius continues to grow its prosperity with this unprecedented ethnic mix all living together in peace. The orchid community there is committed to preserving and restoring its biodiversity for future generations to cherish and enjoy. It is of the utmost importance to save and cultivate as many of the unique Mauritian species as possible, there, on this exceptional island oasis. Why? The coming decades may likely be a time of increased extinction due to anthropogenic factors such as climate change and continued deforestation. Let us not allow our precious orchid biodiversity to go the way of the dodo (*Raphus cucullatus*), or the Hawaiian honeycreepers (*Carpodacus* spp.). My ultimate goal is to help, and hopefully connect the orchid conservationists of the world to do exactly that. I intend to return to Mauritius regularly to establish orchid



KERSLEY PINEE

- [1] *Disperis cordata*
- [2] *Beclarida macrostachya*
- [3] *Angraecum cadetii*, one of the rare species not pollinated by long-tongued hawk-moths. Inset closeup by Melina leCourt. Mauritius has at least one species known to be pollinated by crickets — the only known case of pollination by a herbivore simultaneously feeding on the flowers.
- [4] *Angraecum mauritianum*. Inset closeup photograph by Melina leCourt.
- [5] *Phaius pulchellus*

conservation gardens and additional reserves so that we can begin to protect and heal what is left of our distinctive and cherished orchid heritage. To this end, I look forward to closing the huge physical distance between us and seeing and working with all my great, new Mauritian friends for many years to come.

I cannot wait to return. Perhaps some of you would like to join me when travel restrictions ease once again.

— Thomas Mirenda has been working professionally with orchids for over three decades and is the past chair of the AOS Conservation Committee. He is an AOS accredited judge in the Hawaii Center (email: biophilialk@gmail.com).

2020 Keenan Award Recipient

Native Orchids at GROWISER — Grande Ronde Overlook Wildflower Institute Serving Ecological Restoration
Text and photographs by Andy Huber



I REMEMBER SEEING my very first native orchid. It was a beautiful pink *Cypripedium acaule*...near where I grew up in central Wisconsin.

I had the same wonderful feeling, when I saw my first mountain lady's slipper, *Cypripedium montanum*, after I had moved to northeast Oregon.

In 1992, I bought a 160 acre (64.75 ha) parcel of land atop an ancient volcano; approximately half forest and half prairie. A few days after the purchase, I was elated to find several mountain lady's slippers in bloom. Eventually, I would find 10 species of native orchids growing on the site.

In 1993, I created the nonprofit, GROWISER, because I wanted to protect the wildflowers there. The land still had most of its native plants, because it had not been heavily grazed, and had not been logged since the 1940s.

The preserve has now grown to 275 acres (111.29 ha), with at least 206 native plant species.

Because I had been educated as a seed scientist, I immediately began harvesting seeds on the Oregon property and replanting them...especially *Cypripedium montanum* seeds. Surprised I was, however, after reviewing the literature, to find that they did not emerge for several years. At that time, I had not understood that native orchids have no endosperm, and must parasitize mycorrhizal fungi before the seeds can germinate.

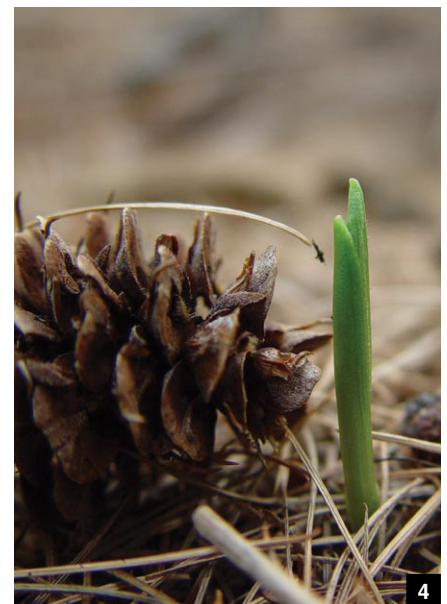
But eventually germinate they did! This was usually no sooner than three years, and I have observed them taking as long as 10 years to emerge. Then they must have at least five leaves to produce a flower. The earliest I have seen a *Cypripedium montanum* make a flower, is 10 years after placing the seed in the soil. It is a very happy occasion, when one does!

Perhaps the rarest orchid, *Cephalanthera austiniiae*. They are almost completely white, and probably entirely parasitic on mycorrhizal fungi. I had one plant emerge in the mid-1990s and did not have another until 2018. It has flowered the past three years, but this could be the last time I see it. They are appropriately called the “ghost orchid.” Not only are they white, but they disappear for long periods of time.

I give many tours for schools and wildflower enthusiasts. Everyone especially wants to see the mountain lady’s slippers. They usually are in bloom during the last week of May, and first week of June. There are three species of orchids in bloom at that time. Earlier in May, *Calypso bulbosa*, the fairy slippers, are open. The other species flower during July.

If anyone would like a tour, simply contact me. The details are on my website, <http://www.growiser.net/>.

— Andrew Huber grew up on the family farm seven miles (11.2 km) from Aldo Leopold’s Wisconsin “shack” and 13 miles (20.8 km) from John Muir’s boyhood farm, Fountain Lake Farm, in Marquette County, Wisconsin. He describes himself as a reincarnation of Leopold. Huber holds an MS degree from Oklahoma State University, Stillwater and a PhD from Oregon State University in Corvallis, Oregon and was honored as OSU’s Distinguished Professor,



- [1] *Cypripedium montanum* on the GROWISER reserve in eastern Oregon.
- [2] *Cypripedium montanum* in association with native mushrooms in the area.
- [3] Ghostly white flowers of *Cephalanthera austiniiae*.
- [4] *Cypripedium montanum*, first time emerging.
- [5] *Calypso bulbosa* is also found on the reserve.

Teacher of Year, 1991. Huber founded GROWISER, a not-for-profit native plant preserve in 1992 and says he is currently helping humanity understand unity of the physical and nonphysical.

What is a clade anyway?

By Wesley Higgins

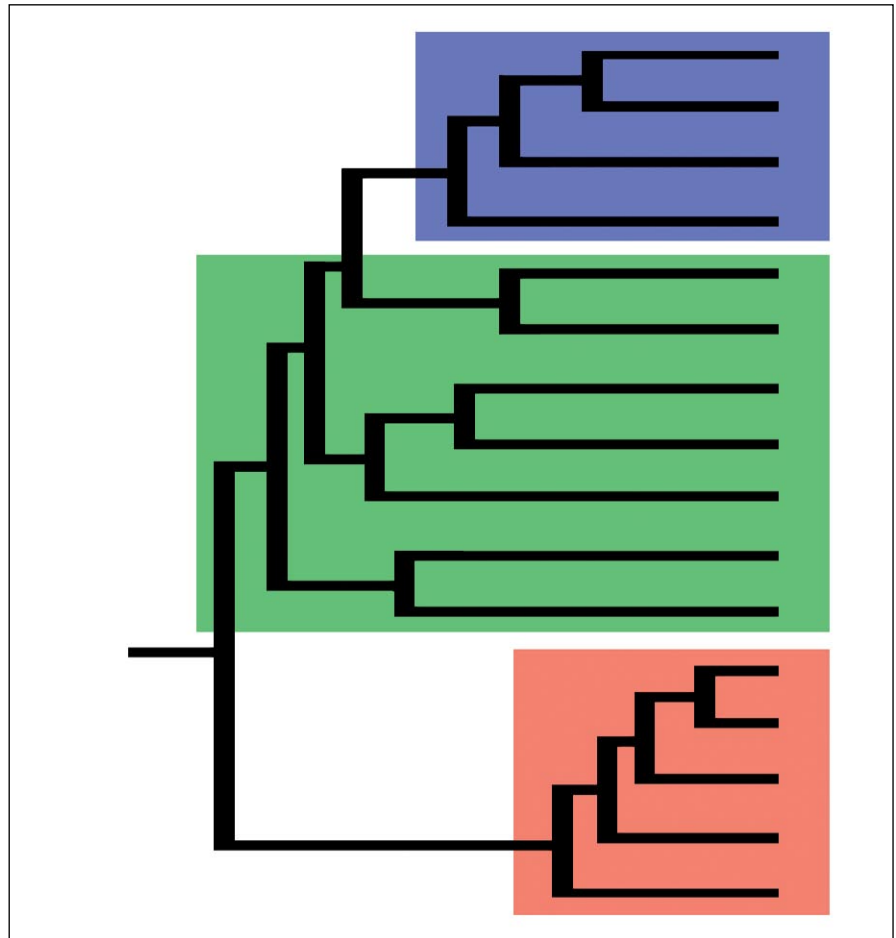
THE QUESTION OFTEN arises during plant entry at orchid shows “Why did the genus (or nothogenus) name change?” The answer goes back to the World Checklist of Selected Plant Families maintained by the Royal Botanic Gardens, Kew. The WCSPF is an international collaborative program that provides the latest peer reviewed and published opinions on the accepted scientific names and synonyms of selected plant families, including *Orchidaceae*. The AOS accepts this list as the standard for species names. The Royal Horticultural Society maintains the orchid hybrid list. When a genus name for a species changes, the hybrid genus name may also change. This is why a plant labeled one name, when it gets to the show, is relabeled something else.

But why did the name change in the first place? The taxonomic community bases classification on evolution. When taxa (genus, species, etc.) are determined to be in the wrong group, they are moved to the proper clade, which may require a name change.

What is a clade anyway? Simply put, a clade is group organisms that contains a common ancestor and all its descendants. This makes a clade an evolutionary group. The common ancestor may be an individual, a species, a population, right up to a kingdom or above. Clades are nested, one in another, as each group splits into smaller groups. These splits reflect evolutionary history as populations diverged and evolved independently.

The study of clades is known as cladistics, which is a method of classification of organisms according to the amount of characteristics that they have in common. The assumption is that the higher the quantity of characteristics that two organisms share, the more recently they diverged from a common ancestor. Another term for a clade is a monophyletic group (Greek: “one clan”). In this example, the blue and red groups are monophyletic clades while the green group is not because it does not contain all the descendants of a common ancestor.

The original methods used in cladistic analysis are derived from the work of the German entomologist Willi Hennig. The cladistic method interprets each shared character state change as a piece of evidence for grouping. The outcome



of a cladistic analysis is a tree-shaped diagram (cladogram or dendrogram) that is interpreted as the best hypothesis of phylogenetic relationships. Hennig referred to his approach as “phylogenetic systematics” while others referred to it as cladistics.

Phylogenetic systematics is the name for the field within biology that reconstructs evolutionary history and studies the patterns of relationships among organisms. These relationships are based on traits (apomorphies) that are derived from ancestral characters. A synapomorphy is a shared derived character that distinguishes a clade from other organisms.

So what does all this science have to do with orchids? Group names have meaning and misapplication of terms causes confusion. Hierarchical classification is based on nested clades. In this orchid example each level is a clade nested in the preceding level.

- ◆ Family — Orchidaceae

- ◆ Subfamily — Epidendroideae
- ◆ Tribe — Epidendreae
- ◆ Subtribe — Laeliinae
- ◆ Genus — *Cattleya*
- ◆ Subgenus — *Cattleya*
- ◆ Section — *Sophronitis*
- ◆ Species — *Cattleya cernua*

I cringe when I overhear someone say “the cattleya family.” In this example, *Cattleya* could be a genus or subgenus but not a family. Another term that is often misused is “alliance.” An alliance is an informal grouping of organisms considered to be closely related. However, the group is not an evolutionary clade. The term alliance in *Cattleya Alliance* is not interchangeable with subtribe *Laeliinae*.

May your phylogeny live long and prosper!

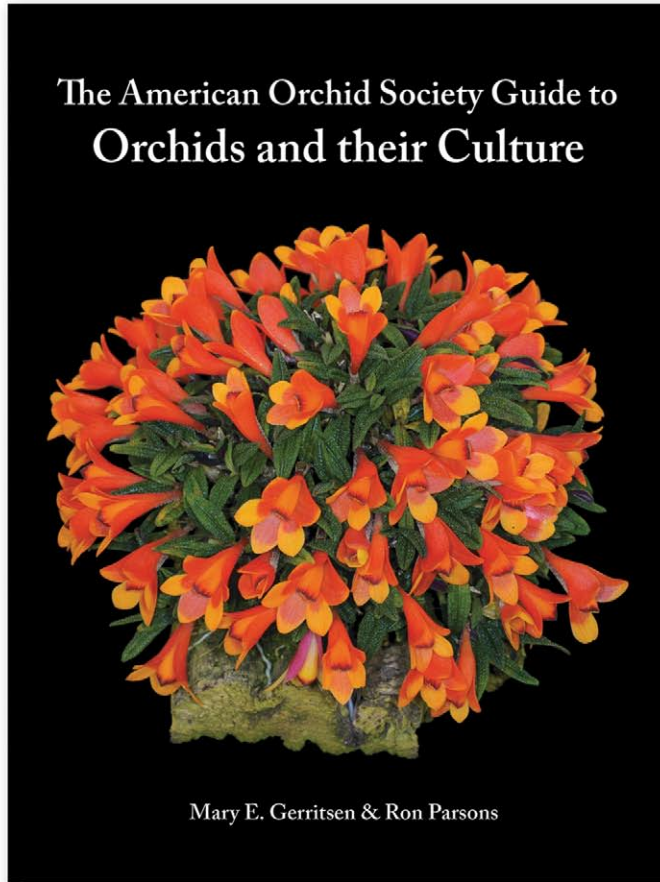
— Wesley Higgins is an AOS accredited judge in the Florida North-Central Center (email wesley.higgins@comcast.net).

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Thelymitra by Peggy Alrich and Wesley Higgins

The Sun Orchid



MOST SUN ORCHIDS close their flowers at night or in cloudy or cool weather, giving rise to their common name. In sun orchids all three petals are similar in size, shape and color, lacking a highly modified lip.

The showy, flat-faced flowers are pleasant-smelling and vary in color from yellow, pink, purple, brown, white to true blues, a very rare color in orchids. The first *Thelymitra* was collected on the North Island of New Zealand by Joseph Banks during Cook's first expedition to the South Pacific. However, the formal description of that species was made by Johann R. Forster and his son Georg after Cook's second expedition to Australia.

THELYMITRA

J.R. Forster and G. Forster

Char. Gen. Pl., 97, t.49 (1776).

Orchidoideae • Diurideae • Thelymitrinæ

GENERITYPE: *Thelymitra longifolia*

J.R.Forst. and G.Forst.

ETYMOLOGY The name "*Thelymitra*" is derived from the Greek words *thelys*, meaning "belonging to women" and *mitra*, meaning "headdress"

or "turban," referring to the hooded column present in most species. One hundred twenty-one species, two subspecies, two varieties and five natural hybrids are currently recognized. These sympodial, perennial, deciduous, herbaceous terrestrials are found in low to middle elevation, coastal to hill scrub, rocky crevices, savannas and sphagnum swamps of Australia, with a few species scattered throughout Indonesia (Timor, Java and Borneo), central New Guinea, New Zealand, New Caledonia and the southern Philippines.

These plants have a pair of oval-shaped tubers, with a few inconspicuous fine roots, often forming huge colonies. The slender, erect plants have unbranched stems, each with a solitary, erect, somewhat fleshy, spirally twisted, smooth or hairy leaf that is often prominently ribbed lengthwise surrounding the lower part of the inflorescence. The erect, wiry, solitary- to few-flowered inflorescence has flowers of quite variable color, even within a single species. The oblong, simple lip is similar to the other floral segments

and has an entire or wavy margin. The flowers have a footless column with short, sharp appendages and fused wings that surround the column.

Recent molecular phylogeny studies show that *Thelymitra* clades largely correspond to previously recognized morphological groups. The well-supported phylogenetic analyses clarified the intergeneric relationships within Thelymitrinæ; with *Epiblema* being sister to *Thelymitra* plus *Calochilus*.

Using maximum likelihood and Bayesian inference with a relaxed molecular clock, the divergence time estimation placed the Australasia origin of *Thelymitra* in the late Miocene (c. 10.8 Ma).

FURTHER READING

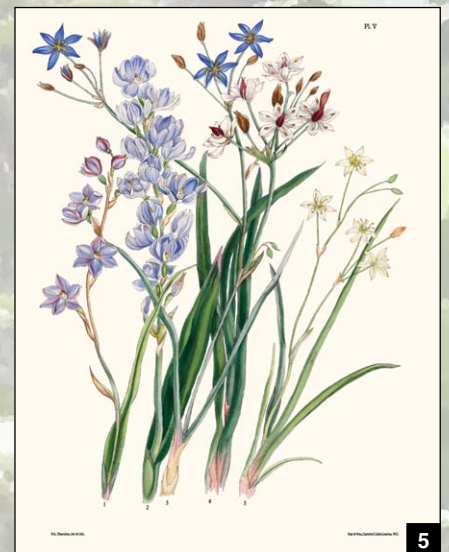
Nauheimer, L., R.J. Schley, M.A. Clements, C. Micheneau, and K. Nargar. (2018). Australasian Orchid Biogeography at Continental Scale: Molecular Phylogenetic Insights from the Sun Orchids (*Thelymitra*, Orchidaceae). *Mol Phylogenet Evol* 127:304–331.

—Peggy Alrich is a freelance graphic designer (sunflowerltd@earthlink.net).

—Wesley Higgins is an AOS accredited judge (wesley.higgins@comcast.net).

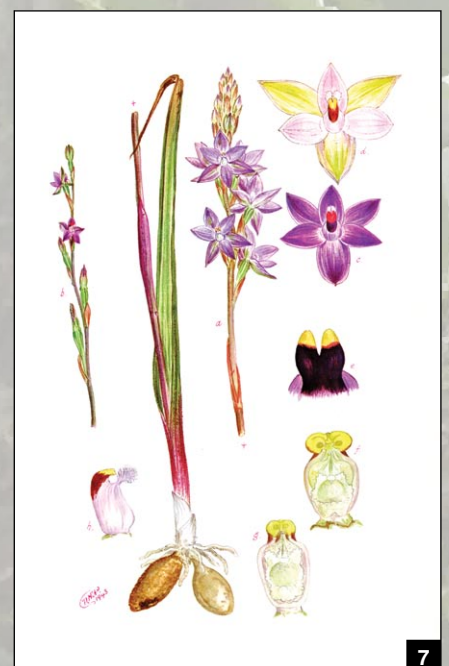


Edgar Dell



Antique Plates — *Thelymitra*

- [1] *Thelymitra antennifera* (as *Macdonaldia antennifera*), 2. *Diuris punctata* (as *Diuris elongata*), 3. *Diuris sulphurea* (as *Diuris oculata*), 4. *Caladenia major* (as *Glossodia major*), 5. *Caladenia alata*, 6. *Utricularia uliginosa* (as *Utricularia lilacina*), and 7. *Caladenia patersonii* (as *Caladenia pulcherrima*) — *The Wildflowers around Melbourne* t.7 (1867).
- [2] *Thelymitra crinita* — *West Australian Wildflowers* t.15 (1935).
- [3] *Thelymitra nuda* and *ixioides* — *The Botany of the Antarctic Voyage (Flora Tasmaniae)*, 3(2): 103 (1860).
- [4] *Thelymitra canaliculata* and *ixioides* — *Australian Orchids* 2(3): 96 (1887).
- [5] 1. *Thelymitra ixioides* and 2. *T. aristata*, 3. *Burchardia umbellata*, 4. *Thelionema caespitosum* (as *Stypandra caespitosa*) and 5. *Thelionema umbellatum* (as *Stypandra umbellata*) — *The Wildflowers around Melbourne* t.5 (1867).
- [6] *Thelymitra crinita* — *Orchids of Australia* t:17 (1969) (courtesy of Swiss Orchid Foundation).
- [7] *Thelymitra pauciflora* — *Orchids of Australia* t:25 (1969) (courtesy of Swiss Orchid Foundation).



Platystele

Try Growing Something Different

BY LARRY SEXTON



LOOKING FOR SOMETHING different to test your growing skills? You might try the genus *Platystele*. These species are diminutive, floriferous, stay in bloom for a long time, and are not too difficult to grow. They range as far north as Mexico, down through Central American, and into the Andes.

Platystele are most prominent at higher elevations (4,900–8,200 ft [1,500–2,500 m]) in Panama, Costa Rica, Colombia, Ecuador and Peru. There are currently 95 species recognized, with new ones being discovered every year. The first species of *Platystele* was described in 1844 by Reichenbach as *Pleurothallis stenostachya*. By 1910 there were 11 species of *Platystele*, all still described as species of *Pleurothallis*. The first use of the name *Platystele* was in 1922 by Oakes Ames, when he transferred his *Stelis compacta* to *Platystele compacta* (Ames 1922, Luer 1990a). During the next 40 years, taxonomists bounced these species back and forth between *Pleurothallis* and *Platystele*. Hawkes (1965) recognized two species of *Platystele* stating “*Platystele* is a genus of perhaps two species. They are dwarf epiphytes mostly inhabiting cloud forests. The tiny flowers are amazingly intricate. Neither of the *Platystele* appears to be in cultivation at this time.” He failed to name either one of them, preferring to say only that one was from Costa Rica and the other from Venezuela.

My how times have changed! They are now quite easy to get and grow. There are multiple references for different *Platystele* species for sale on the internet, or by multiple different North and South American vendors. Let us start with what I consider to be one of the easiest to find and to grow, *Platystele stenostachya*. It was one of the first to be described with mention of it by Reichenbach in literature dating back to 1844 (Luer 1990b). The adaptable species (Pfahl 2019) is widely distributed from Mexico to Ecuador, and grows at about 4,900–5,600 ft (1,500–1,700 m). I have had my plant since 2014, and it is in constant bloom. It has minute flowers that are produced successively, forming tiny, long inflorescences of translucent yellow–orange flowers. Flowering slows a little when I move the plant outside for the summer (I live in the Chicago area), but picks back up in the fall when the weather cools. It is always a showstopper at fall and winter orchid shows.

Another of my personal favorites because it is easy to procure and grow is *Platystele umbellata*. Colombia is the



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country of origin where it grows from 2,000 to 5,200 ft (600 to 1,600 m). It is also an adaptable species, tolerating a wide range of temperatures from warm to cool conditions and produces tiny umbels (like tiny bouquets) of 6–10 minute purple flowers. This last spring, my *Pls. umbellata* had over 70 inflorescences with over 700 flowers. There are also a few other species that have this umbellate form; *Platystele ortiziana* produces minute, translucent, light maroon flowers, and *Platystele beatricis* has translucent green flowers stippled rose, with a striking wine red lip. Both species bloom in the spring and I consider them to be easy intermediate growers.

Examples of species that produce more typical inflorescences are *Platystele viridis* and *Platystele examen-culicum*. Both are cool growers, coming from cloud forests at 4,900–9,200 ft (1,500–

- [1] *Platystele stenostachya* ‘Memoria Barb Sexton’ CCM/AOS; exhibitor: Larry Sexton; photographer Nile S. Dusdieker.
- [2] *Platystele compacta* ‘Orquifollajes’ CCM/AOS; exhibitor: Francisco V. Villegas.
- [3] *Platystele umbellata* ‘Tiberio’ CBR/AOS; exhibitor: Tiberio Lozano.
- [4] *Platystele ortiziana* ‘Rojohn’ CBR/AOS; exhibitor: Claire Rojohn, MD.

2,800 m) in the Andes of Colombia and Ecuador. *Platystele viridis* has a few- to many-flowered erect inflorescence with uniform light green flowers; *Pls. examen-culicum* also has an erect, many-flowered inflorescence up to 6 inches (15 cm) long. The flowers of this species are brown, stellate (star-shaped), small, and lightly spotted magenta. The mass of flowers open at one time give the impression of a swarm of mosquitoes, hence its common

name — the mosquito swarm platystele.

An additional favorite species of mine is *Platystele scopulifera*. It was identified by Luer (Luer and Dodson 1991). This is another small, stellate-flowered species. The sepals and petals are translucent light green overlaid purple basally with a dark purple lip. Flowers are successive, produced one at a time on the inflorescence, but the plant puts on a great show over several months.

A new species identified by Doucette and Portilla (2016) is *Platystele gerritsenianum*. Flowers of this species are small, stellate and have translucent light yellow sepals and petals. A stunning purple lip is set against this light yellow backdrop. The species is distinguished from other very similar-looking species by the long-acuminate lip apex. The up to 4-inch (10-cm) inflorescences arise from the apex of the ramicaul and are erect, producing successive single flowers, thus staying in bloom for months! So far, I have only found this available from a single source in South America.

CULTURE Platysteles make great growers if you have a terrarium, or orchidarium. The shady, humid environments of these containers match well with conditions the plants need to grow into specimens over a period of a couple of years. I grow most of my 15 species mounted, and they do well under my conditions. Almost all are placed in an east-facing location and get filtered sun until about noon. After that they are shaded the rest of the day. My humidity is high — generally running from 70 to 80% relative humidity. To keep it high, I mist my collection on a daily basis. My growing area has a cement floor, so I do not need to worry about floor damage. These plants are not for the dry orchid grower. If you water only once or twice a week plants will become severely dehydrated; possibly to the point of death. To mitigate this problem, I suggest taking a large plastic pot and hanging the plants inside it from the rim. Set this pot in a saucer and maintain a little water in the saucer at all times. This will provide enough humidity for most species and still keep the plants out of the water.

I place some plants out of doors during the summer. I will put them out as early as the first of May, and bring them in as late as early- to mid-October, depending on the weather. Temperatures in my growing area generally from 60 to 75 F (15.6 to 23.9 C) in my indoor growing area but will go as low as 50 F (10 C) to as high as 85 F (29.4 C). I usually run an



5 NILE S. DUSZIEKER



6 ANNE KOTOWSKI

overhead fan for 1–3 hours after I water to help the plants dry off a little but still maintain high humidity.

Pick out one or two *Platystele* species to give them a try. I highly recommend *Platystele stenostachya* as a starter. It is a true all-star of the *Platystele* world. Remember, orchid growing is one big science project. Go ahead, work with your culture, and start a new experiment!

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- [5] *Platystele examen-culicum* 'Orkiddoc' CCM/AOS; exhibitor: Larry Sexton.
- [6] *Platystele scopulifera* 'Zulu Golf' CBR/AOS; exhibitor: Jennifer Gruber.
- [7] A group of the author's platysteles hung from the inside of the rim of a large plastic pot provides a semi-closed environment to maintain adequate humidity.
- [8] *Platystele gerritseniana* 'Orkiddoc' CBR/AOS; exhibitor: Larry Sexton.
- [9] *Platystele beatricis* 'Missy' CCE/AOS; exhibitor: Larry Sexton.



LARRY SEXTON

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ystele (Orchidaceae). *Orchids* 85(11):872–874.

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NILE S. DUSDIEKER

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NILE S. DUSDIEKER

9

Phragmipedium dalessandroi

A Somewhat Controversial Species of the Genus *Phragmipedium*
Dedicated to the memory of the late Calaway Dodson

BY OLAF GRUSS



GRUSS

Phragmipedium dalessandroi Dodson & O. Gruss 1996. *Die Orchidee* 47(4):216; 1996.

Synonyms:

Phragmipedium besseae 'ecuadorian form', *nomen nudum* (Bergstrom 1988).

Phragmipedium besseae var. *dalessandroi* Dodson & Wimber, *nomen nudum* (Wimber 1994).

Phragmipedium besseae Dodson & J. Kuhn var. *dalessandroi* (Dodson & O. Gruss) Moon et Cribb (Moon & Cribb 1997).

DISTRIBUTION The species is found in southern Ecuador northeast of Zamora, in the Cordillera del Condor at the upper course of the Rio Bombuscarua at elevations between 2,953 and 4,265 feet (900 and 1,300 m).

HABITAT The plants grow lithophytically on ledges. The greatest danger to them is the intensive collection of the species, where one habitat is extremely threatened. In another habitat, the plants grow so high up on the rocks that they are difficult to collect. In this location, the species is not threatened by settlement or intensive agriculture. There is also no danger from orchid lovers, because the hike in first leads over a sometimes raging river and then is steep and slippery, making it uninviting for visitors. Therefore, it is imperative that artificial propagation of the species is utilized.

According to Dodson, hummingbirds may be the pollinator for *Phrag. dalessandroi*. However, even today, the exact pollinator has not been established.

CLIMATE The rainy seasons in the habitat are from April to August and September to October. The daytime temperature is between 77 and 82 F (25 and 28 C), and nighttime temperatures are between 59 and 64 F (15 and 18 C).

HISTORY The first collection of this species in the habitat was on March 3, 1986 by Dennis D' Alessandro from Ecuador. Then in January of 1987, he found additional plants on a second site. Plants collected from both habitats were classified initially as a *Phrag. besseae*.

The first cultivated plant was derived from one seed capsule obtained by artificial propagation at the Eric Young Orchid Foundation. Dr. Donald E. Wimber received the capsule from Calaway Dodson in 1986. The capsule proved to be purely *Phrag. dalessandroi* (not of hybrid origin), and all plants raised from the capsule were almost identical in their appearance.

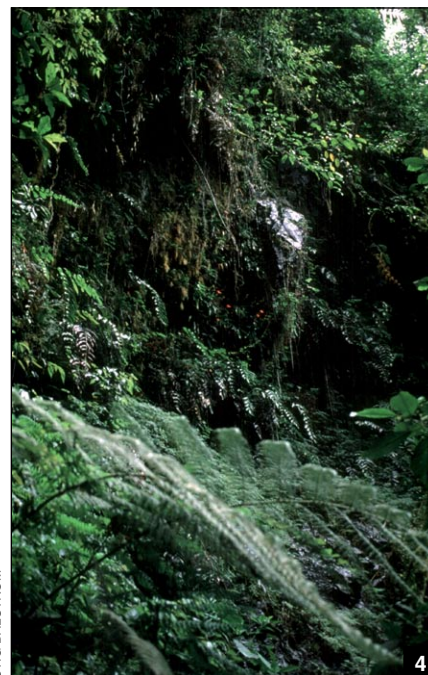
The plants exhibit, both in form and coloring of the flower, as well as the



STIG DALSTRÖM



GILBERTO MERINO



STIG DALSTRÖM



GILBERTO MERINO

- [1] Various clones of *Phragmipedium dalessandroi*. The leftmost insert illustrates the typical inflorescence of this species. Photographs by Olaf Gruss.
- [2] *Phragmipedium dalessandroi* photographed in situ.
- [3] *Phragmipedium dalessandroi* photographed in situ in Ecuador.
- [4] *Phragmipedium dalessandroi* habitat.
- [5] *Phragmipedium dalessandroi* Ecuadorian habitat.

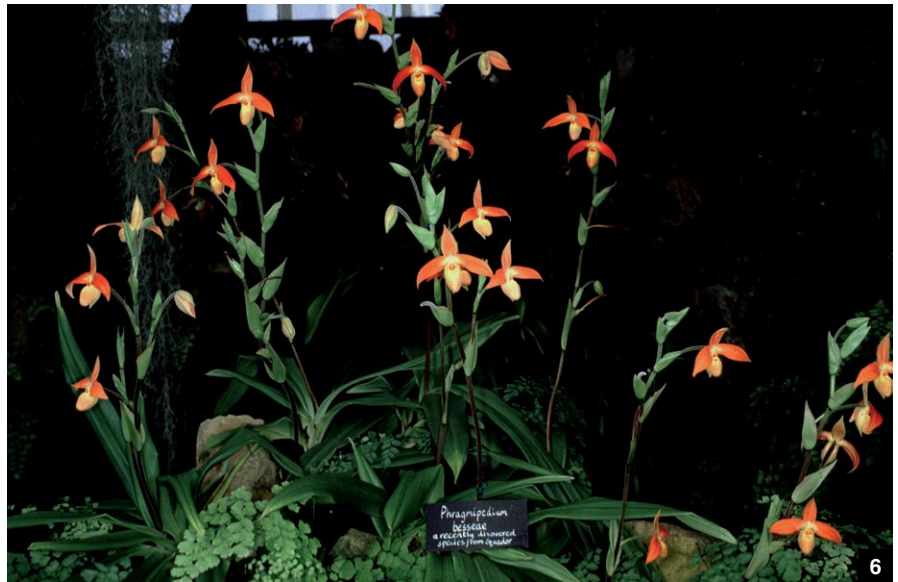
growth habit, clear differences from the normal form described in 1981 as *Phrag. besseae* by Dodson and Kuhn (1981). Plants that had been in culture for some time could be differentiated by the clearly branched inflorescence and the large number of simultaneously open flowers (up to 12 per inflorescence); especially in plants that were well-grown in cultivation by Alan Moon and Martin Ahring at the Eric Young Orchid Foundation on the Isle of Jersey.

In 1993, Donald E. Wimber introduced this new variety of *Phragmipedium besseae* as var. *dalessandroi* in a lecture at a symposium during the World Orchid Conference in Glasgow (Wimber 1993). Wimber determined the chromosome number as $2n = 28$ in *Phrag. dalessandroi*, whereas that of true *Phrag. besseae* is $2n = 24$. In the past, this new species was designated by different authors (Embree, Bergstrom) as the 'ecuadorian form' of *Phrag. besseae*. The same authors also called the significantly more common form as the 'peruvian form.' However, both species are known to occur in Ecuador, whereas only *Phrag. besseae* is found in Peru.

These clear differences between the newly discovered species and *Phrag. besseae* motivated the authors to call the so-called 'ecuadorian form' an independent species — *Phragmipedium dalessandroi*. In addition, further discussion made them come to realize that the name *Phrag. besseae* var. *dalessandroi* did not appear meaningful, as it does not differentiate between the two species.

During a visit to the Isle of Jersey, Olaf Gruss was asked by Alan Moon to describe the new species in collaboration with Calaway Dodson to bring clarity to the hybrids already in cultivation. However, Moon later changed his mind and, together with Phillip Cribb, chose to describe the new species as a variant of the well-known *Phrag. besseae*, because a description as a new species would have created, back in those days, a number of problems in hybrid registration (Cribb and Purver 2017). If one accepted *Phrag. dalessandroi* as a new species, many registered hybrids would have to be examined for actual parentage, and possible name changes, because this species had been frequently used for breeding masquerading as *Phrag. besseae*.

Horticultural interests are often at conflict with botanical interests when it comes to the treatment of taxa at either



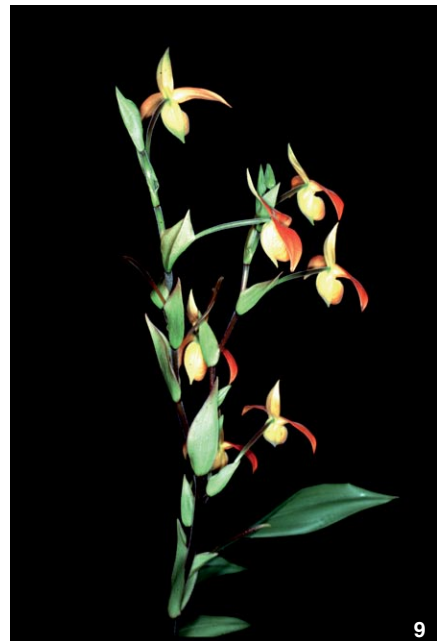
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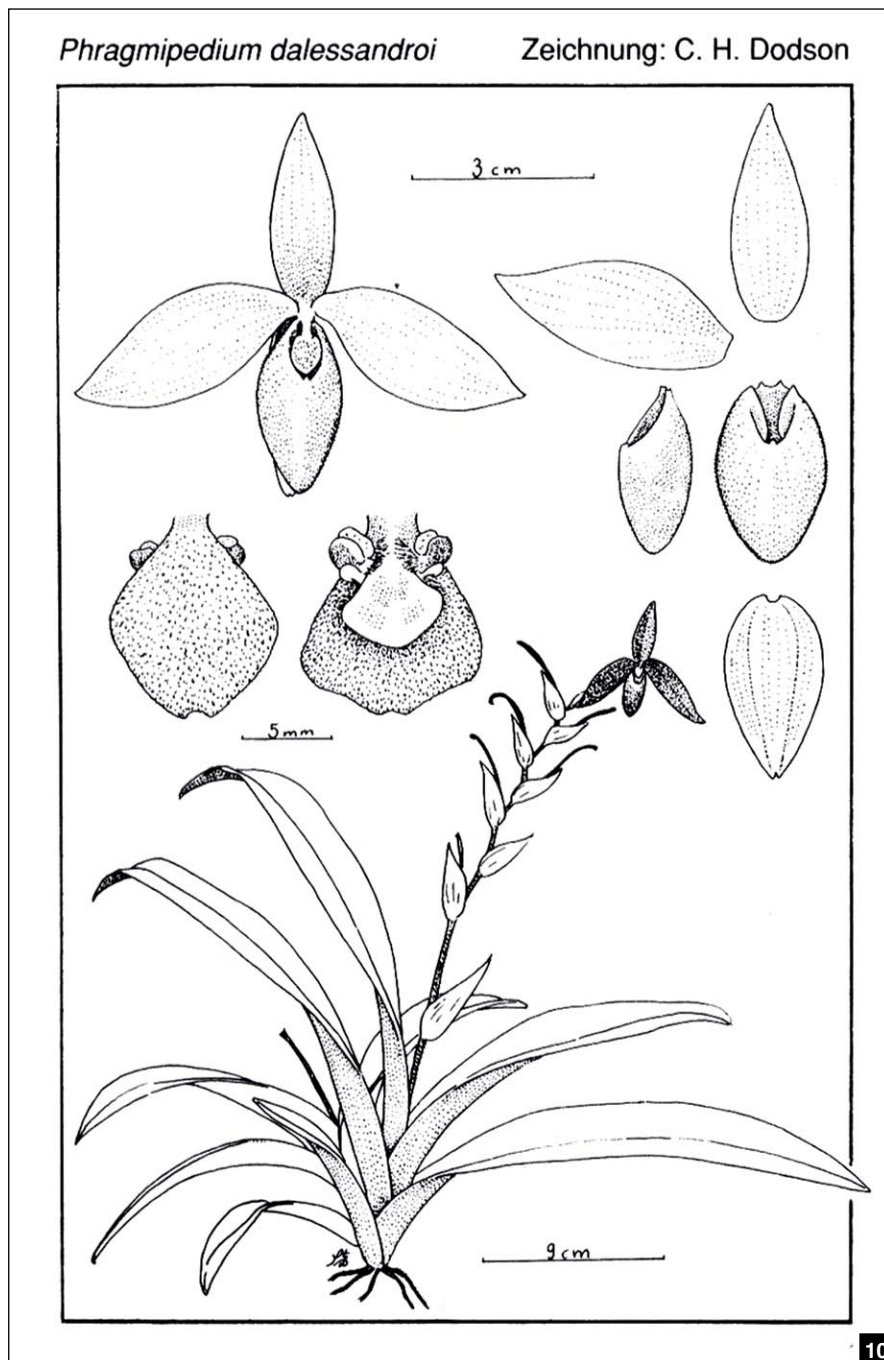
OLAF GRUSS

subspecific levels or distinct species and this could be the first time that a species was downgraded to a variety to avoid problems in hybrid registration, Cribb and Purver (2017) did finally accept *Phrag. dalessandroi* as a distinct species.

Unfortunately, in the last few years a confusion of this species with *Phrag. besseae* has resulted out of ignorance or possibly intentionally. The intentionality is not necessarily nefarious, but rather out of a desire to produce compact plants without stolons while retaining the branched inflorescence and more flowers open simultaneously. However, this has made it more difficult for the orchid lover to identify the true *Phrag. dalessandroi*. Maintaining the pure species is important to identify this species clearly when it is reproduced.

ETYMOLOGY *Phragmipedium dalessandroi* is named after the discoverer of the species, Dennis d'Alessandro.

DESCRIPTION Plant: up to 15.75 inches (40 cm) high with 5–7 leaves per growth, with short stem subtended basally by leaflike bracts; young growths close together (caespitose). Leaves: distichous, 5.9–11 inches (15–28 cm) long and 1.6–2 inches (4–5 cm) wide, linear-oblong, acuminate, usually distichous, coriaceous, upper surface dark green, lower surface somewhat brighter, longitudinally veined, margins brighter green, underside midvein sharp keeled. Inflorescence: erect, 13.75–19.7 inches (35–50 cm) high; with good culture, strongly branched; brown, pubescent, with 1–5 sheathlike bracts, from which flowers or branches develop, bracts 2–2.4 inches (5–6 cm) long and 1.2 inches (3 cm) wide, green, ovate, acuminate, strongly folded. Ovary: 1.6–2.2 inches (4–5.5 cm) long, brownish green, very finely pubescent. Lower bracts: 1.2–1.6 inches (3–4 cm) long, 0.7–0.9 inch (1.8–2.2 cm) wide, acuminate, bright green, darkly veined, strongly folded, glabrous. Flowers: 3.2 inches (8 cm) wide and 2.4 inches (6 cm) high, all segments finely pubescent. Dorsal sepal: 1.1–1.2 inches (2.8–3 cm) long and 0.4–0.6 inch (1–1.4 cm) wide, elliptic, acute, bright orange to bright red, velvety, irregularly somewhat yellow-veined. Synsepal: 1.1–1.2 inches (2.7–3 cm) long and 0.2–0.7 inch (1.4–1.8 cm) wide, yellow, concave, covering more than $\frac{3}{4}$ of the back of the pouch. Petals: 1.5–1.7 inch (3.8–4.2 cm) long, 0.6–0.7 inch (1.5–1.8 cm) wide, somewhat oval-elliptic, apices downswept, bright orange to bright red, basally yellow with long white pubescent, velvety. Pouch: slipper-shaped, 1.2 inch



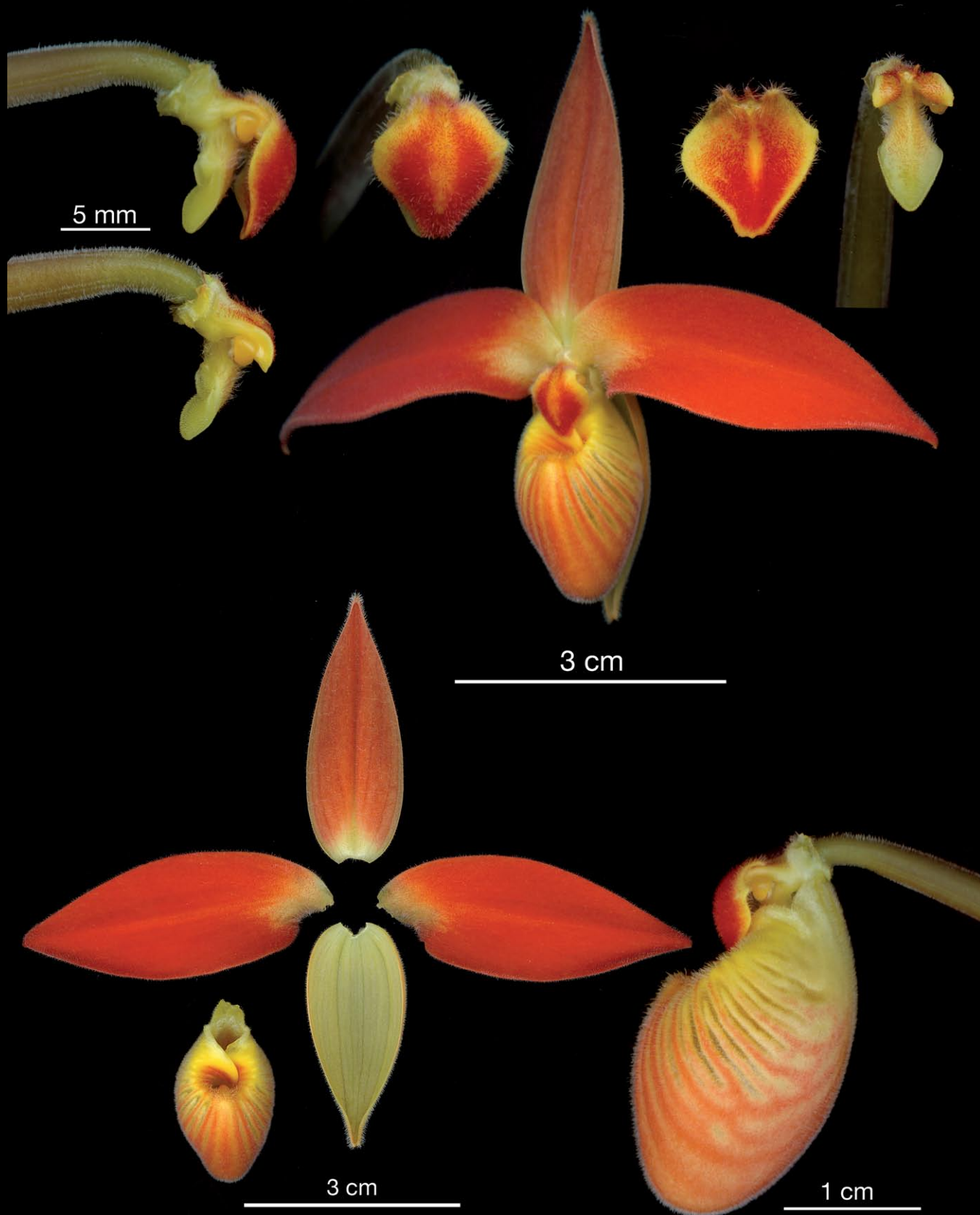
(3 cm long) by 0.6 inch (1.5 cm) wide, opening diameter 0.3 inch (0.7 cm) wide, oblong to almost oval, narrowing to the apex, yellow margins with clear windows so that only a small opening remains at the base, yellow basally, back of pouch opening pinkish. Staminode: 0.3–0.4 inch (0.8–0.9 cm) long, 0.3–0.4 inch (0.9–1 cm) wide, rhombic, apex bilobed, broadly obtuse, yellow marked, pubescent. Column: short, up to 0.4 inch (1 cm) long, yellowish in color. Chromosome count: $2n = 28$. Variability: the petal width and the degree of the inclination angle, as well as the intensity of pubescence are all observed variabilities.

[6] *Phragmipedium dalessandroi* exhibited as *Phragmipedium besseae* at the Eric Young Orchid Foundation, Jersey.

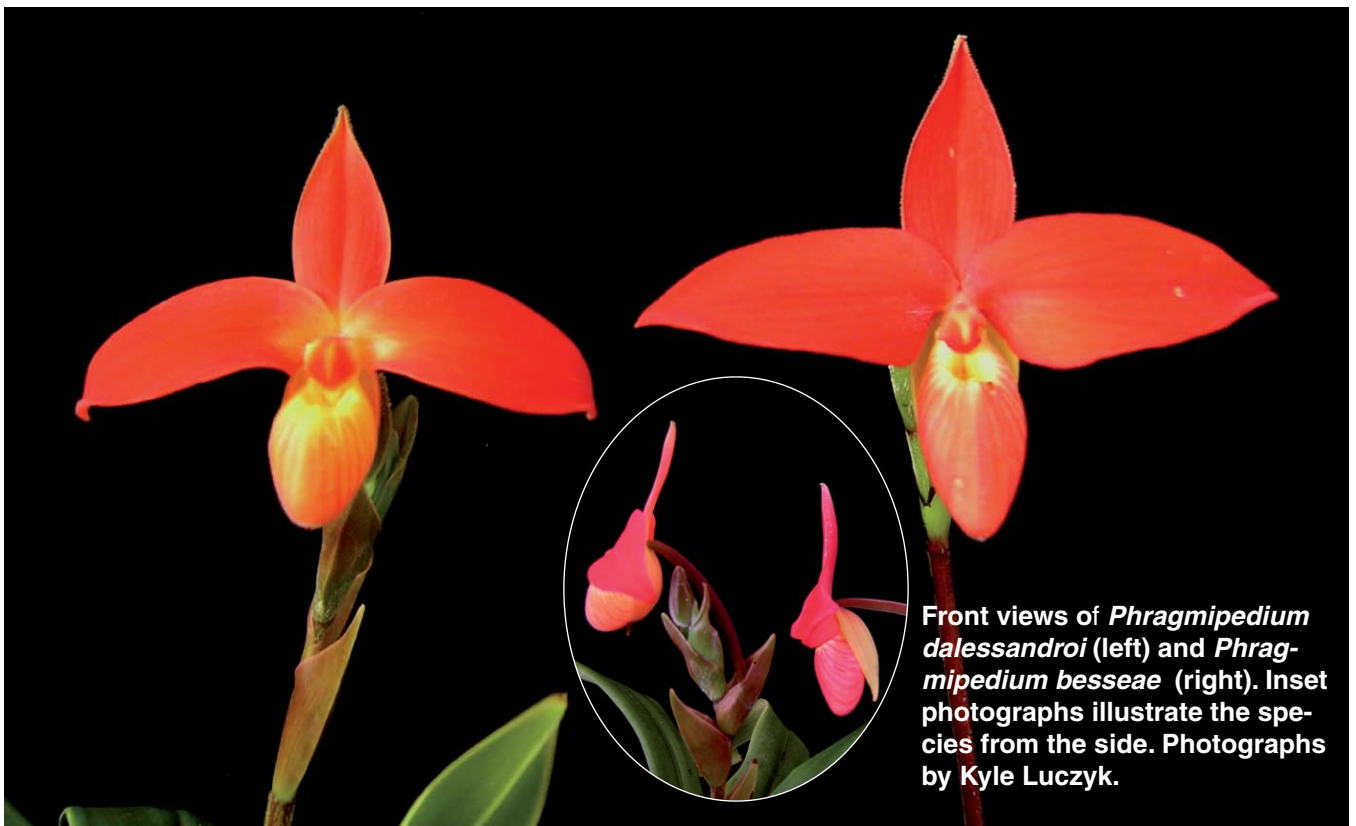
[7–9] Front, side and reverse of the type of *Phragmipedium dalessandroi*.

[10] *Phragmipedium dalessandroi* type drawing by Calaway Dodson.

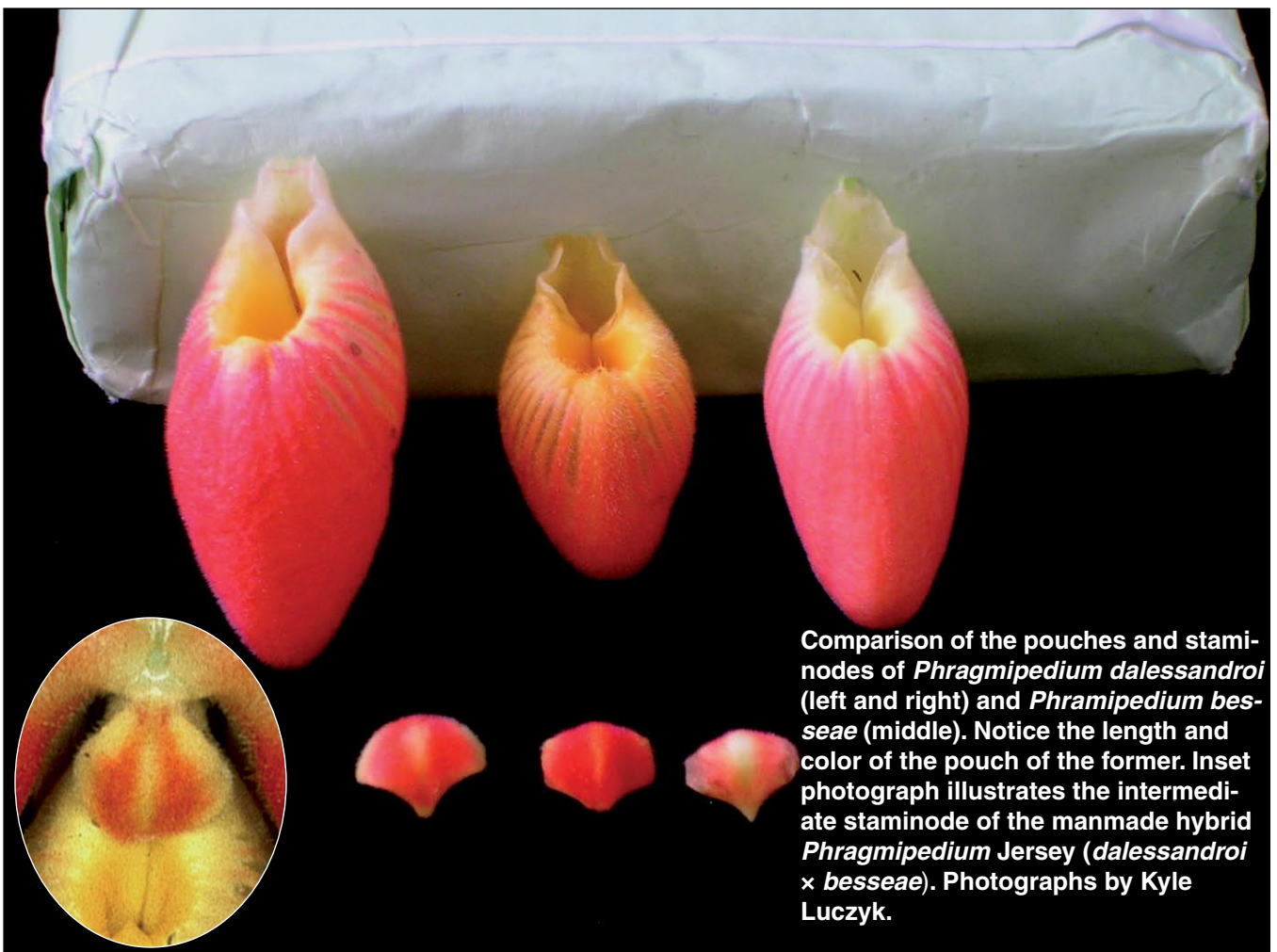
POSSIBLE REASONS FOR CONFUSION *Phragmipedium dalessandroi* is clearly different and distinguishable from *Phrag. besseae* by its clumping growth habit, shaggy pubescence, usually multibranched inflorescences, often oblique downturned petal apices, and orange- to red-colored



Color plate of *Phragmipedium dalessandroi* prepared by Hugo Medina (Ecuagenera).



Front views of *Phragmipedium dalessandroi* (left) and *Phragmipedium besseae* (right). Inset photographs illustrate the species from the side. Photographs by Kyle Luczyk.



Comparison of the pouches and staminodes of *Phragmipedium dalessandroi* (left and right) and *Phragmipedium besseae* (middle). Notice the length and color of the pouch of the former. Inset photograph illustrates the intermediate staminode of the manmade hybrid *Phragmipedium Jersey* (*dalessandroi* × *besseae*). Photographs by Kyle Luczyk.



11
KYLE LUCZYK



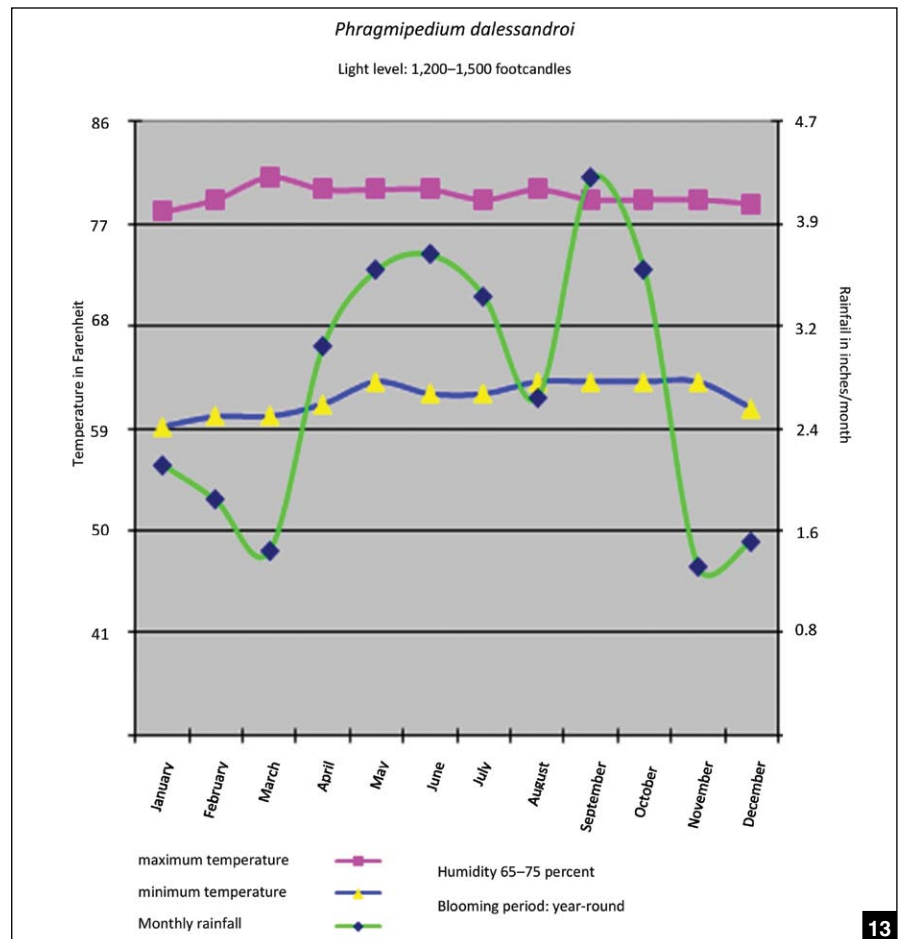
12
KYLE LUCZYK

flowers.

According to Kyle Luczyk, the ovary of *Phrag. dalessandroi* is shorter and not completely erect. Other clear differences are apparent in the arrangement of the bracts. In *Phrag. dalessandroi*, the bracts are distinctly distichous, standing side by side while those of *Phrag. besseae*, although still very closely spaced and overlapping are distinctly alternate. The first flower in *Phrag. besseae* develops in almost all plants (approx. 95%) from the second bract, whereas those of *Phrag. dalessandroi* are produced from the third bract. If a branch forms, it will appear from the second bract. However, exceptions to these rules can sometimes be observed. Another difference is apparent in the leaves, which are clearly wider in *Phrag. dalessandroi*; however, in young plants, this difference is not recognizable, so that this feature is not suitable for differentiating the species.

The best method to differentiate the two species is based on the difference in the shape of the staminodes. The typical staminode of *Phrag. besseae* exhibits an elongated apex at the lower margin. Such an elongated apex has not been observed in plants of *Phrag. dalessandroi* examined; to the contrary the lower margin is always blunted. Moreover, the staminode of *Phrag. besseae* is, as a rule, convex, whereas that of *Phrag. dalessandroi* is noticeably more flattened.

CULTURE *Phragmipedium dalessandroi* plants should be cultivated in intermediate conditions with a minimum temperature of 59 F (15 C) and a maximum temperature up to 82 F (28 C). The location should be quite bright, but protected from direct sunlight. The species has a relatively high water requirement and should be watered approximately every 3–4 days. The plants can also be grown standing in a small amount of water, as long as it is not continuously wet and the water is refreshed regularly. Care should be taken in fertilizing the plants. They are not heavy feeders and are sensitive to dissolved salts in the water and potting medium. Low concentrations (no more than ¼ strength) every fourth watering is a good place to start. Fresh air and good air movement are desirable to promote healthy growths. As for potting medium, substances that have proven themselves useful for other *Phragmipedium* species and hybrids are all acceptable for *Phrag. dalessandroi* including the various bark mixtures. Because of the need for very frequent watering, potting media degrades very quickly and should therefore be changed



13

annually. Inflorescences continue to produce flowers for long periods of time and should not be cut off until it is clear that they have completely dried.

FLOWERING PERIOD The species can bloom almost the entire year; however, flowering mainly occurs during the cooler months from November to April.

Acknowledgment

My thanks to Judith Rapacz-Hasler for the German-to-English translation.

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[11] *Phragmipedium dalessandroi* growth habit has closely spaced growths.

[12] *Phragmipedium besseae* produces an undesirable climbing growth habit. [Kyle Luczyk]

[13] Climate data for *Phragmipedium dalessandroi* prepared by Tom Kalina.

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— Olaf Gruss is internationally recognized for his work with *paphiopedilums*, *phragmipediums* and *phalaenopsis*. He has written books about the genus *Phalaenopsis* and the albino forms of the genus *Paphiopedilum*, as well as a booklet about the genus *Phragmipedium*. He has been a member of the editorial board of the journal of the German Orchid Society, *Die Orchidee*. Gruss resides in Germany and lectures throughout Europe, Japan, Taiwan, China and the United States. In der Au 48, 83224 Grassau, Germany (email: a-o.gruss@t-online.de).

Orchids in Watercolor

Cypripedium candidum

BY MARCIA WHITMORE

A FEW YEARS ago I was fortunate to visit a prairie remnant in northeast Illinois. This remnant contained *Cypripedium candidum* and other rare prairie plants. I took lots of pictures and recently decided to do a watercolor from those pictures.

Cypripedium candidum, the white lady's slipper, grows in wet prairies often in full sunlight and often in limestone barrens. *Cypripedium candidum* begins blooming while the shoots are still emerging from the soil when the leaves are small and clustered near the base. The plant grows to a height of 7.9–14.2 inches (20–36 cm) and is one of the smallest *Cypripedium* species of North America. It was listed as endangered in 1980, downgraded to threatened in 1998, and delisted in 2014, when the Illinois Endangered Species Board considered it to be “recovered or more common than originally thought.”

This watercolor is a departure from my normal paintings on white watercolor paper. This time I used an excellent quality Strathmore blue-grey paper hoping to make an interesting contrast between the white lady's slipper and the paper. I have done several watercolor or colored pencil works on this paper and find that it is very easy to work with but also very unforgiving. If I make a color mistake I have to live with it!

Marcia Whitmore began growing orchids in a basement room under fluorescent lights in 1972 and moved into a 14-ft × 18-ft (4.3 m × 5.5 m) greenhouse in 1984. Marcia is a retired teacher and fine arts coordinator and taught in public schools for 35 years. She has earned many AOS awards and is a member of the Illowa Orchid Society, Eastern Iowa Orchid Society, American Society of Botanical Artists and the Great River Chapter of Botanical Artists (whitbrits@gmail.com, <https://asba-art.rog/member-gallery/marcia-whitmore>, www.marciawhitmore.com).



*Cypripedium
candidum*

M. Mitmore '20

Psychopsiella limminghei

Count Alfred Marie Antoine van den Berghe de Limminghe

BY RUDOLF JENNY/PHOTOGRAPHS, UNLESS OTHERWISE CREDITED, BY RUDOLF JENNY

Psychopsiella limminghei (E.Morren ex Lindl.) (Lückel and Braem 1982)

Oncidium echinophorum Barb.Rodr (Barbosa Rodrigues 1881)

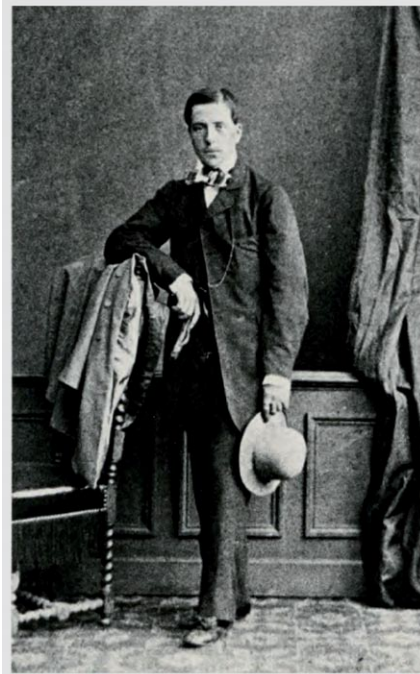
Oncidium limminghei E.Morren ex Lindl. (as *Onc. limminghii*) (Lindley 1855).

Psychopsis limminghei (E.Morren ex Lindl.) (Chase 2005)

THERE ARE ORCHIDS that do not really fit in any of the existing orchid genera, and for which position in one or the other genus is still in discussion today. One of those species is *Psychopsiella limminghei*, first mentioned but not formally described as *Oncidium limminghei* by Édouard Morren from Liège. Today all experts are in agreement that the plant definitely does not represent an *Oncidium*. However, whether it belongs to the genus *Psychopsis* Rafinesque — as proposed by Mark Chase in 2005 and again in 2009 (Pridgeon, et al. 2009) in *Genera Orchidacearum* — or whether it forms its own monotypic genus *Psychopsiella* Lückel and Braem is still in discussion. Chase (2005) recombined *Psychopsiella limminghei* to *Psychopsis limminghei*: "It make sense to transfer this species also to *Psychopsis*; monospecific genera are a redundancy in taxonomy, unless they are singular species that is related to a clade composed of many genera, which is not the case here."

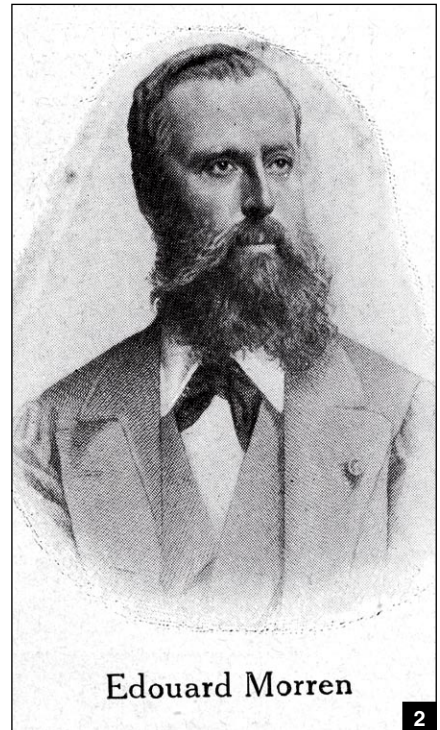
Nevertheless, in 2012 Mark Chase and his collaborators decided in the *Botanical Journal of the Linnean Society* to accept *Psychopsiella* as a monospecific genus (Neubig et al. 2012).

In August 1855 an unknown orchid flowered in the greenhouses of the Botanical Garden Liège in Belgium. Édouard Morren wrote a letter (January 21, 1856) to Alfred de Limminghe, informing him of the fact that he was not able to name the plant and that he had sent material for identification to John Lindley. The latter confirmed that the plant represented a new *Oncidium* species and asked Morren how he wanted to name it. In his letter, Morren asked Limminghe for



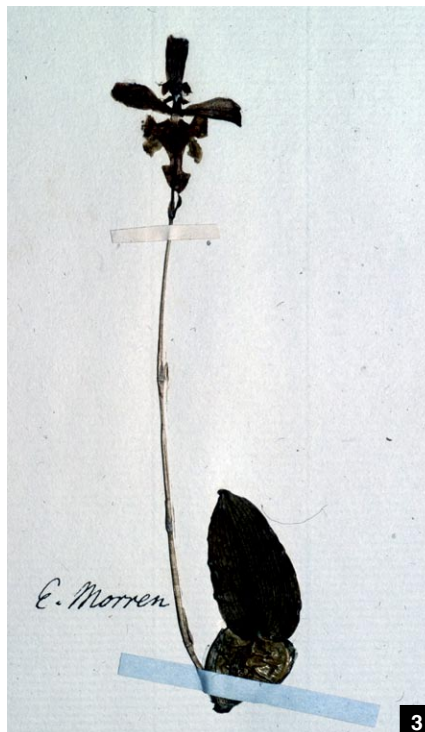
Le Comte Alfred de Limminghe

1



Edouard Morren

2



3



4

permission to use the epithet *limminghei* for the new species.

Charles Jacques Édouard Morren (1833–1886), son of Charles François Antoine Morren (1807–1858), was a professor of botany and from 1857 to 1886 director of the botanical garden at Liège, Belgium. Charles was editor of the famous Belgian journal *La Belgique Horticole*.

The formal scientific description of *Psychopsiella limminghei* as *Oncidium limminghei* was published by John Lindley in 1855. In his book *Folia Orchidacea*, Lindley created within the genus *Oncidium* the Section *Glanduligera* in order to accommodate *Oncidium papilio* and *Oncidium kramerianum* (today both species are included in the genus *Psychopsis* Rafinesque). Simultaneously Lindley validated the name *Oncidium limminghei* as proposed earlier by Morren, therefore to be cited as *Oncidium limminghei* È.Morren ex Lindl. (species name proposed by È. Morren, formally described by Lindley). The description was based on a single pseudobulb with leaf and a single flower, sent by Morren. Lindley wrote: “*198. O. Limminhghii E.Morren.f.in litt. For this very curious plant I am indebted to Mr. Edward Morren, of Liège, who has named it after Count Alfred de Limminghe, a distinguished Orchidophilist. M. Morren informs me that it was sent to Belgium, it is *believed*, from the Caracas, by Mr. Van Lansberghe, consul for the Netherlands. It has entirely the aspect, at first sight, of O. papilio on a very small scale.”

The type is kept in Lindley’s herbarium at Kew. The word “believed” in Lindley’s text makes it clear that the author doubted the origin. As it is known today, his doubts were justified. Lindley’s spelling of the epithet *limminghii* is not correct, as it should be *limminghei*. Reichenbach (1868) wrote about the species: “Dr. Lindley was very much astonished at this plant. ‘Have you seen the wonderful little Oncidium?’ he asked, when he arrived at home, meeting with the writer of these lines amidst his Orchids,” and “Prof. E. Morren, now our confrère and colleague, made, we believe, his first step in science, when christening the little vegetable gem in honour of the Count Alfred de Limminghe, who was a zealous botanist and Orchidophilist (alas! He dealt also with politics).”

The first colored illustration of *Psychopsis limminghei* as *Oncidium limminghei* was published by Édouard Morren in 1856 in the journal *La Belgique*



- [1] Portrait of Comte Alfred de Limminghe from Livres de Fleurs du XVIe au XXe siècle dans les collections de la Bibliothèque Universitaire Moretus Plantin, 1984.
- [2] Portrait of Charles Jacques Édouard Morren.
- [3] Type specimen of *Oncidium limminghei* from the Lindley herbarium at Kew. Photograph courtesy of E. Lückel.
- [4] Illustration of *Psychopsis limminghei* as *Oncidium limminghei* from *Belgique Horticole*, 1856.
- [5] Illustration of *Psychopsis limminghei* as *Oncidium limminghei* from *Lindenia*, 1885.
- [6] Drawing of *Psychopsis limminghei* as *Oncidium limminghei* from Kupper and Linsenmaier, *Orchideen*, 1952.

Horticole (Morren 1856). The plant flowered for the first time in August 1855 in the greenhouses of the Botanical Garden Liège, Belgium, cultivated by the head gardener Emile Rodembourg (1831–1879). The drawing was made by George Severeyn. Morren himself wrote: “Son origine n’est pas bien certaine, mais nous pensons qu’il est originaire de l’ancienne province de Caracas dans l’Amérique méridionale et qu’il faisait partie d’une collection de plantes envoyées en Belgique par M. Van Lousberghe, consul des Pays-Bas.”

Basically Morren repeated Lindley’s comments about the origin of the plant. Whether the material was sent to Europe by Frans Reinhard Cornelis van Lansberghe (1804–1873) or by his son Johan Willem van Lansberghe (1830–1905) is not absolutely clear. The drawing in Garay and Dunsterville (1976) was made from a cultivated plant without exact origin and is not proof of the distribution of *Psychopsiella limminghei* in Venezuela. Morren seems to have been fascinated by *Psychopsiella limminghei*; he published a pamphlet of four pages under the title: “Description d’une nouvelle espèce du genre *Oncidium*, *Oncidium limminghei* introduite dans les serres du jardin botanique de l’Université de Liège” (Morren 1857). Besides a very detailed description of the species and some background about its systematic position, Morren also gave some cultural advice.

The same plate as in 1856 in *La Belgique Horticole* was published back-to-front again in 1869 *Flore des Serres* (Van Houtte 1869). In the same volume we find a drawing of flower parts of *Psychopsiella limminghei* (p. 56). The nursery of Hugh Low in England got a consignment of the species, collected by Henry Blunt in Brazil; some of them were sold to Van Houtte. Later Linden in Ghent (Compagnie Continentale d’Horticulture) got plants and a plate of *Psychopsiella limminghei* (as *Oncidium limminghei*) was published in *Lindenia* (Linden and Rodigas 1885).

Lückel and Braem (1982) resurrected Rafinesque’s old genus *Psychopsis*. Constantine Samuel Rafinesque-Schmaltz created the genus *Psychopsis* in 1838 in his *Flora Telluriana*, and typified his genus with *Psychopsis picta*, based on Lindley’s *Oncidium papilio*. The generic name is valid, but not the binomial *Psychopsis picta*. In the same article Lückel and Braem created for *Oncidium limminghei* the new genus *Psychopsiella*; the decision taken based on morphological features only.

Joao Barbosa Rodrigues described in



1881 in *Genera et Species Orchidearum Novarum* *Oncidium echinophorum*. The author knew Lindley's *Oncidium limminghei*, he declared his new species as "O. limminghei affinis," separated mainly by the color of the flowers. Barbosa Rodrigues mentioned in his text a plate (t.596); so far this plate seems to be lost. It is not included in any of the six known volumes of his drawings kept in Rio de Janeiro and Harvard. Nevertheless *Onc. echinophorum*, is without doubt a synonym of *Psychopsiella limminghei*.

Psychopsiella limminghei is not very variable in color, although there are plants known with almost pure yellow flowers and others with much less intensity of the typical color pattern on the leaves. The species is not easy in cultivation and it seems to be a bit difficult to keep it alive for long periods. There are only a few hybrids with *Psychopsiella limminghei* as a parent known. These are

Gomopsiella Judi's Pride (*Psychopsiella limminghei* × *Gomesa macropetala*) Carl Manning, 1990

Psychopsychoopsis Holm's Little Butterfly (*Psychopsiella limminghei* × *Psychopsis papilio*) M. Holm, 2012

Psychopsychoopsis Jewel (*Psychopsiella limminghei* × *Psychopsis krameriana*) Ruben in Orch., 1969

Trichocensiella Little Lance (*Psychopsiella limminghei* × *Trichocentrum lanceanum*) G. Monnier, 1985

Alfred Marie Antoine van den Berghe de Limminghe was born on September 2, 1834 as the second son of Eugène van den Berghe, Count of Limminghe. For a part of his education he lived in Freiburg, Switzerland, and studied in Estavayer, a small town close to Freiburg. From there he went to Tournai and later to Namur, where he studied philosophy at the Collège Notre Dame de la Paix. His interest in botany was raised by one of his teachers, August Bellynck (1814–1877), Jesuit and botanist. Back in the family castle of Gentinnes near Marbais, Belgium, Alfred started to build up a large plant collection, including orchids, and he also amassed a large herbarium and a huge botanical library. In 1858 a report of the collection and the herbarium was published as *Notice sur les collections botaniques de M. le Cte. De Limminghe a Gentinnes*. According to Alfred's biographer (Pruvost 1861), the collection of books and periodicals at the Chateau Gentinnes was at the time the most complete in Belgium. One of Limminghe's main interests were the fungi, and he published in 1855, 1856 and 1857 the

Flore mycologique de Gentinnes and several papers in the journals *La Belgique Horticole* and *L'illustration Horticole*. In 1860 Alfred left Belgium to serve in the army of Pope Pius IX. He was severely wounded in the battle of Castelfidardo against the piedmontese troops of King Victor-Emmanuel II on September 18. After a short time as prisoner of war, he returned to Belgium. In February 1861 he went back to Rome, and on April 15 he was shot on the street and again severely wounded, dying two days later. The exact circumstances of his death at the age of 27 are still not clear. The major part of his collection of books was given to the Collège Notre Dame de la Paix in Namur and his herbarium is today kept at the Jardin Botanique de l'État, Bruxelles. It is not known what happened to his plant collection, most probably at least parts of it were sold or given to the Jardin Botanique de l'Etat. Besides *Psychopsiella limminghei*, Jean Jules Linden and Reichenbach dedicated in 1858 in Berliner Allgemeine Gartenzeitung *Chysis limminghei* to Alfred Limminghe.

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[7] Flower of *Psychopsis limminghei*.

[8] Plant of *Psychopsis limminghei* with typical color pattern. Some plants (inset) possess darker and more uniformly marked foliage.

[9] *Psychopsychoopsis* Holm's Little Butterfly. Photograph courtesy of Norbert Dank.

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In The Footsteps of Dr. Fox

Joseph Tregelles Fox, Medical Missionary and his Orchid Discoveries in Madagascar

TEXT AND PHOTOGRAPHS BY CLARE HERMANS AND JOHAN HERMANS



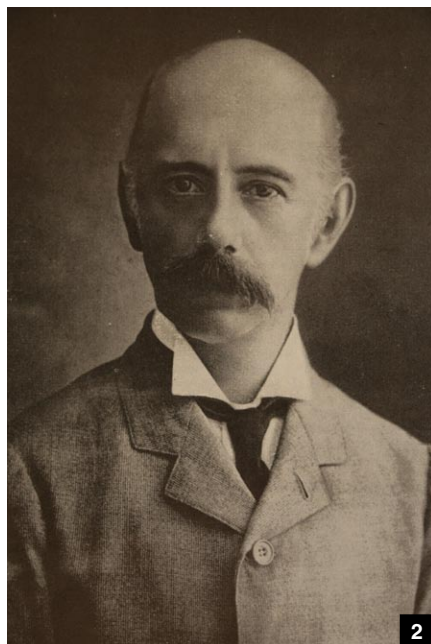
WHEN ONE STUDIES the orchids of Madagascar one might notice that one collector's name, "Fox," regularly appears on late 19th century herbarium sheets; sometimes there are the initials "Dr J. T." and "Dr R. H." Very little is recorded in the literature on either of these Foxes. Recently an intriguing volume of 95 Fox herbarium specimens arrived at the Royal Botanic Gardens Kew donated by the University of Leeds, and this led to an exploration of the story behind these Foxes.

FOX, THE PHYSICIAN Surprisingly few reliable records are to be found, but it became apparent that "J. T." stands for Joseph Tregelles and "R. H." for Richard Hingston. Joseph Tregelles was born in 1855 in Stoke Newington, London, one of nine children of a prominent Quaker medical doctor from Cornwall. Tregelles, known by his middle name, had eight brothers, seven of whom, including Richard Hingston, became medical doctors. Tregelles was the fourth to qualify and graduate from the London Hospital in 1877, having obtained a first degree in botany the year before. In 1878 he volunteered as a medical missionary for the Quaker organization Friends' Foreign Mission Association (FFMA). He was appointed to open a medical mission in Madagascar's capital Antananarivo (Tana for short).

Before leaving London in 1880 he married Sarah Davies and together they traveled to the Indian Ocean Island. They would remain in the country for the next seven years; three of their five children were born in Tana between 1881 and 1886 and all survived to adulthood. This was a remarkable achievement, given that infectious diseases, in particular malaria, were a constant threat.

After their arrival in August 1880 it soon became apparent that the challenges were huge. Tregelles was the only European doctor in the country, and treated the local people plus the missionaries and their families. Each morning his garden was filled with patients waiting to be seen; Tregelles would read a scripture and say prayers with everyone before starting his consultations. Apart from his many duties, Tregelles also started to train local students as doctors, an aspect of his work he apparently thoroughly enjoyed.

Politically it was a difficult period in Madagascar. The French and Malagasy governments were at war following the death of Queen Ranavalona II in 1883; a peace treaty was not signed until



December 1885. The major impact for Tregelles was the constant threat of conscription of his students. In 1886 he cofounded the country's first medical school, the Medical Missionary Academy. By the time of French Colonial rule in 1896, 30 doctors had graduated and were working throughout the island.

Each year Tregelles submitted a report to the FFMA on his work. In his 1887 report he stated there had been more illness, in particular malaria, affecting the missionary families in the previous two years, and that he was planning a vacation in the United Kingdom for summer 1887. In fact, Tregelles and his family returned to England permanently owing to his ill health. They stayed initially in Stoke Newington, London with his parents before he found another job. They then moved to Strathpeffer, Ross-shire, Scotland in 1888 when Tregelles became the medical officer at the Hospital. In the early 1900s the family moved to Leeds, Yorkshire where he worked as a physician. In about 1904 Tregelles emigrated to Oregon, following his son. Sarah died in 1926 and Tregelles in 1937 in San Diego, California under the care of his second son, Joseph Sanger. His obituary in *The Lancet* describes him as "short of stature, an optimist by conviction, full of energy and resource, at times showing diligence but never indolence."

Sadly, we have been unable to source a reliable picture of this remarkable man.

FOX, THE PLANT COLLECTOR Like many British missionaries of the time, Tregelles collected plants, principally orchids. He was part of an active

[1] *Oeonia rosea* is still relatively common and widespread in the humid forests of Madagascar. *Oeonia rosea* was described by Ridley and collected by Fox in the Eastern forest near Ankeramadinika. Inset: Herbarium sheet reproduced with kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew.

[2] The botanist Henry Ridley was the first to examine the Fox herbarium from which he described several new species.

[3] James Sibree, a contemporary of Tregelles Fox, vividly described the life of missionaries and their botanical explorations in Madagascar.

scientific network whose members were predominantly from the protestant London Missionary Society (LMS). The FFMA worked closely with the LMS and the Norwegian Lutheran Mission, and together they supported the new medical school. The LMS missionaries first arrived in the country in 1818 and include the better-known Rev. William Ellis and the Rev. Richard Baron (Tregelles' contemporary), who were also involved in plant collecting. Baron, together with James Sibree, edited a journal called *The Antananarivo Annual & Madagascar Magazine*, detailing many of the missionaries' scientific discoveries and observations.

Tregelles' main collecting sites were Ankeramadinika and Ambatovory, both situated on the route east from Tana to the coast. Both places had sanatoria, where he stayed to rest and recuperate either as a holiday or after his serious illness. He made at least two, often three duplicates

of his collections. One set was sent to his brother Hingston in England, arriving in October 1885. Hingston was two years older and had a more conventional medical career. After qualifying he joined their father in general practice in Stoke Newington. Like Tregelles, he was involved with the FFMA, fundraising and helping to promote its work amongst the Friends. He settled in Beaconsfield, Buckinghamshire a short distance from London, where he died in 1924.

Hingston took the specimens to the Royal Botanic Gardens at Kew, and they were researched by Henry Ridley, assistant in the Botanical Department of the British Museum. At that time Ridley was developing a reputation as an orchid expert. Another set of specimens was kept by Tregelles and brought home with him when he returned to the United Kingdom. These, together with specimens of other monocotyledons, ferns and lycopods he deposited at Leeds University Herbarium, probably just before he moved to the United States. More than 100 years later these same orchid specimens were donated to the herbarium at Kew by the University of Leeds. The orchids are contained in a leather bound volume with an introduction by Tregelles confirming they were collected between 1881 and 1887. He stated the first 48 had been examined and identified by Ridley in 1885, and then follows six pages of extensive notes. First was Tregelles' attempt at identification, then Ridley's, whether it had been compared to a Baron collection at Kew, if a specimen had been sent home, if there was a duplicate or not; descriptions of the specimen including details of the pseudobulb, leaves, inflorescence, flowers, lip and fruit. In effect it was a form of spreadsheet. In addition, there were a couple of orchid watercolors, possibly by Tregelles, of *Oeonia rosea* and *Aeranthes ramosa*.

THE HERBARIUM COLLECTION Ridley described Tregelles' collections in a paper presented to the Linnean Society, London in December 1885. It was titled "On Dr. Fox's collection of Orchids from Madagascar, along with some obtained by the Rev. R. Baron from the same Island." Ridley in his foreword thanked Kew for allowing him to study the 50 or so specimens containing "a large proportion of novelties." In the paper he described 11 new species from the Fox specimens and three new genera for the flora, *Arnottia*, *Brownleea* and *Holothrix*. Of the genera only *Brownleea* has been retained as *Brownleea coerulea*, and of the



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new species six are still valid (*Bulbophyllum ophiuchus*, *Cynorkis glandulosa*, *Cynorkis speciosa*, *Cynorkis tenella*, *Habenaria conopodes* and *Habenaria foxii*.) The Tregelles Fox specimens for these species are types of the species, and those at Kew were annotated by John Gilbert Baker, First Assistant in the Kew Herbarium, with "Dr. J. T. Fox com. Dr. R. H. Fox Oct. 1885," meaning collected by Dr. J. T. Fox communicated by Dr. R. H. Fox. Baker named any duplicates and sent them to the British Museum in December 1885, but without the additional annotation. In addition, there are small line drawings by Ridley of some of the Fox orchids in the Kew herbarium.

Ridley's extensive correspondence is in the archive at Kew. There is only one letter from Tregelles to Ridley dated

- [4] *Aeranthes ramosa* is now becoming uncommon in Madagascar.
- [5] Fox added a watercolor of *Aeranthes ramosa* to his herbarium; it was wrongly named as *Aeranthes grandiflorus*. Reproduced with kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew.
- [6] *Bulbophyllum coriophorum*, one of the largest bulbophyllums collected by Fox in the eastern forest.
- [7] *Mystacidium viride* was described by Ridley from Fox's collections. It is now known as *Angraecum rhynchoglossum*. At one stage it was called *Angraecum foxii*. Tregelles described the flower in his notes "the expanded flower was like a bird flying with long tail."

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October 10, 1887, following his return to the United Kingdom, giving his address as Lordship Terrace, Stoke Newington. In it he thanks Ridley for the articles about Madagascan orchids he sent to Tana the previous year. He writes: "My time during the latter part of my stay in Madagascar has been so taken up that the orchids have to a large extent been pushed [to] one side. So far I have scarcely been able to follow out your kind and valuable hints about collecting. I have now come home for a furlough, but on account of health it seems at present very probable that I shall have to give up returning to my work in Madagascar. This will be a great grief to me and part of my sorrow will be caused by ceasing to take a practical interest in the Madagascan orchids!" He then writes about his garden in Tana: "We had growing in the open in our garden in Antananarivo specimens of many of the orchids and other of these. I brought home as many as I could, endeavouring also to gather living specimens on the way down country. I regret to say that they have, especially the latter, which grow in quite a different climate to the former, suffered much by the voyage home. Most have died. There are perhaps a dozen meagre specimens many of them barely alive. Can you give me any advice as to what to do with these as I am unwilling if possible to let them die this winter especially as some of them may be of value. I would gladly give them up to any one who would know how to give them their best chance of recovering and living rather than act the dog in the manger with them and have them all die." There follows a list of species, including *Jumellea maxillarioides* and *Aerangis ellisii*, both collected from Ankeramadinika, where he had stopped on the way to catch the boat home. Unfortunately, it is not known what happened to the remaining plants, but we can probably guess.

THE ORCHIDS Tregelles annotated his specimens to indicate if he had grown them in his garden in Tana, together with their flowering time. The majority he cultivated were from Ankeramadinika in the eastern rainforest and were collected in November 1885. Most flowered the following year, including the *Aeranthes ramosa* he painted. It was a rich locality and he collected many well-known species, including *Aerangis citrata*, *Aerangis fastuosa*, *Bulbophyllum baronii*, *Bulbophyllum coriophorum*, *Liparis cespitosa* and *Oeonia rosea*, which he also drew. However, there were only two of the 11 new species Ridley described in



[8] *Angraecum viguieri*.

[9] Herbarium specimen annotated in 1885 by Tregelles Fox as a "Beautiful brownish *Angraecum*." It was described by Schlechter as *Angraecum viguieri* in 1922. Reproduced with kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew.

[10] *Bulbophyllum protectum* is an unusual Madagascan endemic with the inflorescence "protected" by the concave leaves.

[11] Fox collected *Bulbophyllum protectum* in 1885 in Ankeramadinika but it was not named until 1937 by Perrier de la Bâthie. Herbarium sheet reproduced with kind permission of the Board of Trustees of the Royal Botanic Gardens, Kew.

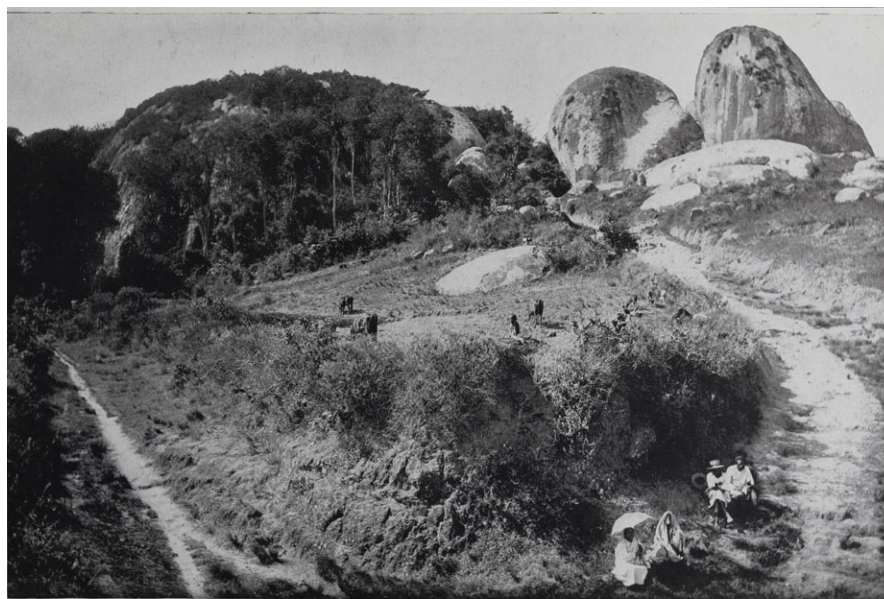
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his Linnaean paper from Ankeramadinika. First was *Mystacidium viride*, now known as *Angraecum rhynchoglossum*. It had a brief interlude as *Angraecum foxii* when Victor Summerhayes, Keeper of the Orchid Herbarium, Kew, renamed it in 1948, but the name did not last, as another had precedence. Tregelles described the flower in his notes “the expanded flower was like a bird flying with long tail.” The second was *Bulbophyllum ophiuchus*, an equally modest species. Following their arrival at Kew in 2018 the herbarium sheets were all examined and identified. Among the unidentified ones were some now well-known species including *Angraecum compactum*, *Angraecum conchoglossum*, *Angraecum viguieri*, *Aerangis fastuosa*, and *Aerangis punctata*, *Bulbophyllum protectum*, *Jumellea recta* and *Phaius pulchellus*.

ANKERAMADINIKA AND AMBATOVORY Fox’s principal collecting localities were Ankeramadinika and Ambatovory. Ankeramadinika was a small town situated in the eastern rainforest on the descent from Tana to the port of Toamasina (or Tamatave). It was near the Mandraka River and 31 miles (49.6 km) from Tana at an altitude of c. 3,900 feet (1,200 m). Here the FFMA opened a sanatorium in 1883, and this is where in November the same year Tregelles had a seven week rest.

The area had already been extensively explored by travelers on their way to the capital, including Rev. William Ellis. Before the sanatorium was built Ankeramadinika was a convenient overnight stopping place on the journey from Toamasina by palanquin, the usual means of long-distance transport. A palanquin was an armchair or recliner suspended between two long wooden poles carried by two or four bearers. James Sibree, in *The Antananarivo Annual & Madagascar Magazine* describes traveling in one as like “being danced about like a pea in a frying-pan.” As the speed of travel was at a quick walk or trot, only 9–10 miles (14.4–16 km) could be managed in a day, so it took 13 days to cover the 220 miles (352 km) to Tana from the coast.

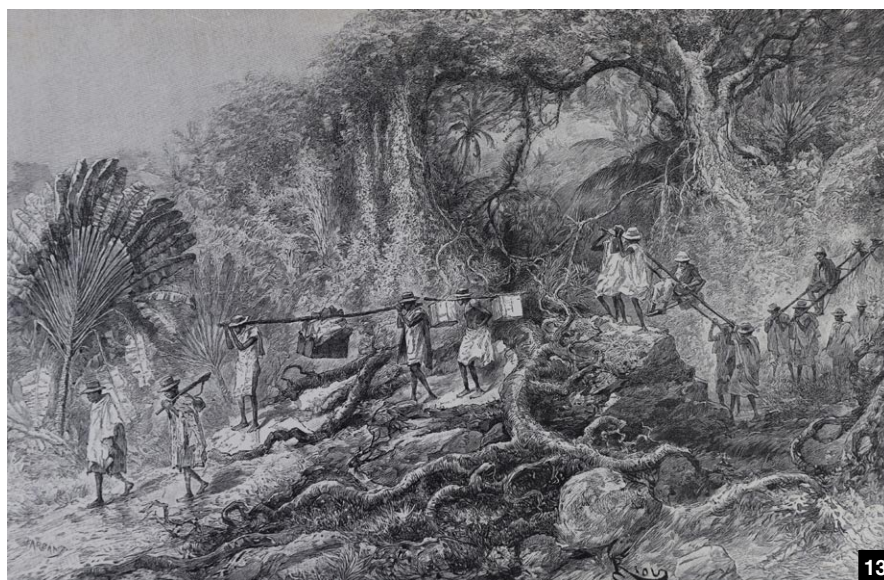
Unfortunately, the name Ankeramadinika has disappeared from current maps and there is no longer a town of that name. Much of the vegetation in the area has been destroyed; the original narrow path through the rainforest used by the palanquins has become a wide tarmac road, the busy Route National 2. The road has meant access to the forest is much easier and therefore few areas of primary forest remain.



ROCKS NEAR AMBATOVORY

This shows the remains of the original forest. Cattle are grazing with a boy in charge

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Of the 48 Fox specimens Henry Ridley studied and described in his paper "On Dr Fox's collection," only six came from this locality, including two new species; the rest, including the other nine new ones, came from Ambatovy, meaning "round rock," in the Highlands of Madagascar. The *Antananarivo Annual* provides a rich source of information about Ambatovy. In an article in 1895 by Sibree titled "Ambatovy, one of our holiday resorts in Madagascar: with natural history and other notes," he describes in great detail the fauna, insects and reptiles found in the area. He wrote the grounds had paths and it took only two minutes to reach the primary forest near the summit of a granite inselberg or hill called Ambònilóha; inselbergs are large isolated rock formations commonly seen in the Madagascan Highlands. Like Ankeramadinika it too was on the main route east to the coast, but located in the hills rather than in the rainforest, and had a more agreeable climate than the capital.

In addition, it was closer to Tana, but nonetheless getting there still took a day in a palanquin. It was an excellent place to holiday or to recuperate. Each missionary was entitled to two or four weeks' vacation after a year's work, and Tregelles took full advantage of the facilities. In his annual report for the FFMA in 1886 he comments he spent time at Ambatovy, from early February to late April 1885, recovering from his severe illness. Judging by the dates of the Leeds specimens he spent February and March there most years between 1882 and 1886.

IN THE FOOTSTEPS It was fortuitous that we had another trip to Madagascar planned for January 2019, so we decided to try to find Ambatovy and some of the species Fox collected. We were helped by the Sibree article, as he wrote it was near the village of Isoàvina, a mission station. From our research we knew the house at Ambatovy had burnt down during unrest in 1895 following the French invasion, prior to the country's colonization. We were optimistic we could find the area, although Ambatovy, like Ankeramadinika, was not indicated on modern maps. Travel nowadays is much faster than in a palanquin; it took us less than 30 minutes to reach Isoàvina from Tana. Our driver and guide, Nirry, stopped and asked the locals about Ambatovy; after much merriment and to our amazement, they knew the place and indicated which of the many large rocks was Ambatovy. So we drove on a



- [12] A contemporary view of Ambatovy: from Sibree's *A Naturalist in Madagascar* published in 1915.
- [13] The Palanquin was a common mode of transport in 19th Century Madagascar; it was like "being danced about like a pea in a frying-pan" according to Sibree. From Catat, *Voyage a Madagascar*, 1890).
- [14] A view of the Ambatovy rock and wood in the distance, in January 2019. Note the modern tarmac road in the foreground.
- [15] *Disa incarnata* is becoming rare in the Highlands of Madagascar where it grows in marshy areas.
- [16] *Satyrium trinerve* is also found on mainland Africa, it is still locally common in the Highlands of Madagascar where it grows in marshy areas.
- [17] *Cynorkis flexuosa* is still a common grassland species around Ambatovy.
- [18] *Cynorkis speciosa* was described by Ridley in 1886, based on Fox's herbarium collection from Ambatovy. It is a variable species still common in the Highlands.
- [19] The grand entrance to the Angavokely reserve.



little further to admire it across the rice paddies. Much of the landscape remains the same as in Fox's day. The fertile valley was still planted with rice, nearby were traditional houses, grassland covered the higher slopes with occasional trees and bare granite summits. The only difference was that any small pockets of primary forest in the gullies between the large rocks was long gone and been replaced with nonnative eucalyptus.

Many of the orchids Fox found can still be discovered in the area. January to March is the rainy season, and the peak flowering time for terrestrials and coincided with the longest time he spent at Ambatovy during his recuperation. In boggy land next to rice paddies we found some of his species. The striking orange *Disa incarnata* and the white *Satyrium trinerve* both originally found by Dr. Robert Lyall, the British Agent in Madagascar 1827–1829, and described by John Lindley in 1838. Nearby were some *Cynorkis* — the yellow *Cynorkis flexuosa* and the mauve *Cynorkis lindleyana* almost in the water, similarly found by Lyall, and in a grassier area *Cynorkis speciosa*. The latter was one of Ridley's new descriptions. Also common was another of Fox's collections, *Eulophia plantaginea*. It often occurs on the roadside or beside rice paddies, and because of its tall size and white flowers is an easy one to spot.

ANGAVOKELY Fox collected at another large inselberg near Ambatovy called Angavokely in March 1883 and 1886. As a locality it has been better protected than Ambatovy because during French colonial times it became a forestry station and had large pine forests



[20] The authors likewise ended up on a flat area nearly at the top of the inselberg with superb panoramic views of the countryside and it was just the place, as Sibree said, for a picnic but rain was fast approaching.

[21] *Polystachya rosea* in Angavokely. It is variable in color and generally grows as terrestrial.

[22] *Polystachya cultriformis* in Angavokely where it is still common.

[23] *Aeranthes polyanthemus* was first described by Ridley in 1886, based on plants from Ambatovy, collected by Fox. It is one of the very few *Aeranthes* with several flowers on an inflorescence.

[24] *Oberonia disticha* is still a common species in the forest remnants of Angavokely.



planted. An impressive headquarters and outbuildings were built and still remain; the forestry station continues and is now promoted as a hiking destination with a few marked trails.

In his Ambatovory article Sibree describes how he and some companions went for a picnic at Angavokely. It took them between two and three hours to reach the base of the mountain in a palanquin; they then had to hike up to the top about 5,200 ft (1,600 m), taking another couple of hours. Our initial route was much easier, but lasted nearly as long; at the start the mud track from the main road was slippery from recent rain. After paying the entrance fee and collecting a local guide we drove into the reserve. It was slow going up the rutted track; fallen trees and live electricity cables dangled dangerously across and needed moving before we could reach the base of one of the giant rocks where the track petered out. From here we set out on foot, and found our first orchid in flower; on the rock face, in a thin layer of humus, was Fox's *Cynorkis grandiflora*, described by Ridley but later recognized to be the same as Lindley's *Cynorkis uniflora*. Despite the name each inflorescence can have two or occasionally three large, pretty, sweetly scented flowers. At higher elevation some patches of native trees remained, here we found a few of the epiphytes discovered by Fox, including the common *Angraecum calceolus* and *Polystachya rosea*. Scrambling through the trees was *Oeonia rosea*, the white flowers shining out from the undergrowth. *Oeonia rosea* has a long flowering season and can be seen from September through to April in different places. There also was *Aer-*

anthes polyanthemus, first collected by Fox. Ridley named it *Aeranthus multiflorus* on the Fox Herbarium sheet, but then published it with the former name.

The muddy trail became steeper, tree cover thinned and soon we reached the first crevice between the rocks taking us to the other side of the inselberg. Here the track took us along a narrow ledge with a steep drop down — not for the faint hearted. It then became an almost vertical path, staircase like, between two enormous moss and fern covered slippery rocks. It is likely Sibree was describing the exact same route when he wrote that they ascended between two walls of granite with “beautiful embroideries of lichens and ferns,” followed by a level platform several hundred square yards in extent where they “threw themselves down.” We likewise ended up on a flat area nearly at the top of the inselberg with superb panoramic views of the countryside and it was just the place, as Sibree said, for a picnic. Orchid-wise there was not much in flower apart from the common *Polystachya cultriformis*, *Oberonia disticha* and a few scattered *Cynorkis gibbosa*. Here the parallel with Sibree's excursion ended; while we watched from the viewpoint the clouds started to gather and it was obvious we would be in for a drenching. Rather than risk the treacherous descent in the pouring rain we decided to retreat rapidly and postpone our picnic. Sibree and his friends were luckier; they managed to have their picnic on the plateau and then scramble down to their palanquins before the rain started.

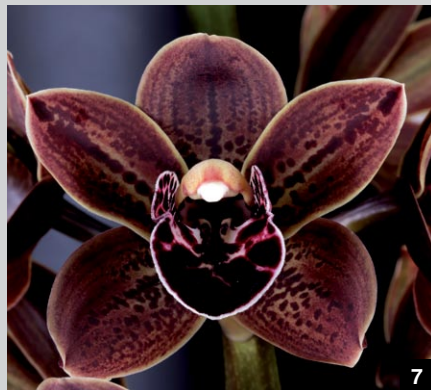
— Clare Hermans is chairman of the RHS Orchid Committee. (email: clare.



- [25] A very colorful Madagascan bug makes a meal of *Eulophia plantaginea*.
 [26] *Cynorkis uniflora* in Angavokely, despite the name each inflorescence can have two or occasionally three flowers. Fox's *Cynorkis grandiflora* was described by Ridley but later recognized to be the same as Lindley's *Cynorkis uniflora*.
 [27] *Cynorkis gibbosa* can still be found on the top of the Angavokely inselberg.

jepson@btinternet.com)

— Johan Hermans is an honorary research associate of the Royal Botanical Gardens, Kew and vice-chairman of the RHS Orchid Committee (email: orchids1@





- [1] *Cymbidium* Charles Weckerle Thrun 'Pat' AM/AOS (George Formby x *devonianum*) 83 pts. Exhibitor: Hatfield Orchids; photographer: Ramon de los Santos. Pacific South Judging
- [2] *Cymbidium* Charles Weckerle Thrun 'Butch' AM/AOS (George Formby x *devonianum*) 82 pts. Exhibitor: Hatfield Orchids; photographer: Arthur Pinkers. Pacific South Judging
- [3] *Epidendrum* Pacific Charisma 'Watermelon Cream' AM/AOS (Pacific Challenge x Pacific Fairyland) 81 pts. Exhibitor: Cal-Orchid, Inc.; photographer: Ramon de Los Santos. Pacific South Judging
- [4] *Epidendrum* Pacific Caldera 'Red Cape' AM/AOS (Pacific Beauty x Pacific Kiwi) 83 pts. Exhibitor: Cal-Orchid, Inc.; photographer: Ramon de Los Santos. Pacific South Judging
- [5] *Cymbidium* Charles Weckerle Thrun 'Puerto Rico' AM/AOS (George Formby x *devonianum*) 80 pts. Exhibitor: Hatfield Orchids; photographer: Ramon de los Santos. Pacific South Judging
- [6] *Paphiopedilum* Lola Bird 'SVO Sorbet' AM/AOS (*emersonii* x *micranthum*) 82 pts. Exhibitor: Fred Clarke; photographer: Ramon de los Santos. Pacific South Judging
- [7] *Cymbidium* Charles Weckerle Thrun 'Beth' HCC/AOS (George Formby x *devonianum*) 77 pts. Exhibitor: Hatfield Orchids; photographer: Arthur Pinkers. Pacific South Judging
- [8] *Cymbidium* Charles Weckerle Thrun 'Passion' HCC/AOS (George Formby x *devonianum*) 79 pts. Exhibitor: Hatfield Orchids; photographer: Ramon de los Santos. Pacific South Judging
- [9] *Cymbidium* Mighty Moon 'Cinnabar' HCC/AOS (Mighty Tracey x Full Moon) 79 pts. Exhibitor: Weegie Caughlan; photographer: Ramon de los Santos. Pacific South Judging
- [10] *Epidendrum* Pacific Amarillo 'Oriole' AM/AOS (Pacific Classic x Pacific Songbird) 83 pts. Exhibitor: Cal-Orchid, Inc.; photographer: Ramon de Los Santos. Pacific South Judging
- [11] *Cymbidium* Elle Ronis 'Loyola' HCC/AOS (Khan Flame x Kabuki Moon) 79 pts. Exhibitor: Weegie Caughlan; photographer: Ramon de Los Santos. Pacific South Judging
- [12] *Cymbidium* Pacific Sparkle 'New Horizon' AM/AOS (*devonianum* x Red Beauty) 82 pts. Exhibitor: Cal-Orchid, Inc.; photographer: Ramon de Los Santos. Pacific South Judging
- [13] *Phragmipedium* Tall Tails 'Huntington's Gateway' AM/AOS (*caudatum* x *warszewiczianum*) 84 pts. Exhibitor: Huntington Botanical Gardens; photographer: Ramon de Los Santos. Pacific South Judging
- [14] *Cymbidium* Charles Weckerle Thrun AQ/AOS (George Formby 'Geyserland' x *devonianum* 'Firefal' HCC/AOS) 82 pts. Exhibitor and hybridizer: Hatfield Orchids; photographer: Arthur Pinkers. Pacific South Judging
- [15] *Cymbidium* Charles Weckerle Thrun 'Ohana' AM/AOS (George Formby x *devonianum*) 82 pts. Exhibitor: Hatfield Orchids; photographer: Arthur Pinkers. Pacific South Judging
- [16] *Cymbidium* Charles Weckerle Thrun 'Tab' HCC/AOS (George Formby x *devonianum*) 77 pts. Exhibitor: Hatfield Orchids; photographer: Arthur Pinkers. Pacific South Judging





- [1] *Cymbidium Memoria* Dick Swain 'Santa Barbara' CCM/AOS (Sarah Jean x Itsy Bitsy) 87 pts. Exhibitor: Hatfield Orchids; photographer: Ramon de los Santos. Pacific South Judging
- [2] *Dendrobium* Jiaho Candy 'Diamond Orchids' AM/AOS (Hsinying Frostymaree x *bellatulum*) 81 pts. Exhibitor: Peter T. Lin; photographer: Arthur Pinkers. Pacific South Judging
- [3] *Brassomicra* Doña Estela 'Clau - Cot' HCC/AOS (*Tetramicra canaliculata* x *Brassavola nodosa*) 79 pts. Exhibitor: Claudia Cotarelo; photographer: Irma Saldaña. Puerto Rico Judging
- [4] *Ceratosiella* LOC Hello Kitty 'Diamond Orchids' HCC/AOS (*Amesiella monticola* x *Ceratocentron fesseli*) 76 pts. Exhibitor: Peter T. Lin; photographer: Arthur Pinkers. Pacific South Judging
- [5] *Rhyncholaeliocattleya* Circle of Nine 'Diamond Orchids' AM/AOS (Loud Nine x *Cattleya* Circle of Life) 83 pts. Exhibitor: Peter T. Lin; photographer: Arthur Pinkers. Pacific South Judging
- [6] *Dendrobium discolor* 'Karlo Javy' AM/AOS 81 pts. Exhibitor: Carlos Javier Maldonado and Louis F. Santiago Leon; photographer: Ricardo Valentín. Puerto Rico Judging
- [7] *Cattleya* Arizona (1983) 'Tiny Shark' HCC/AOS (*brevipedunculata* x *coccinea*) 79 pts. Exhibitor: Kelly McCracken; photographer: Karl Siegler. Rocky Mountain Judging
- [8] *Cymbidium faberi* 'Qing Hua Mei' JC/AOS 0 pts. Exhibitor: Baozhong Zhu; photographer: Arthur Pinkers. Pacific South Judging
- [9] *Dendrobium* Rambo 'E Orchids' AM/AOS (*Doctor* Uthai x Ly) 82 pts. Exhibitor: Edwin A. Perez; photographer: Irma Saldaña. Puerto Rico Judging
- [10] *Paphiopedilum* Druid Spring 'Vernal Equinox' AM/AOS (*druryi* x *primulinum* var. *primulinum*) 82 pts. Exhibitor: Ian Rich; photographer: Mark Van der Woerd. Rocky Mountain Judging
- [11] *Clowesetum* B-C Fernande 'Snow-drift' AM/AOS (*Clowesia* Rebecca Northen x *Catasetum* Marsh Hollow) 80 pts. Exhibitor: B. Butts- C. Lefaive; photographer: Albert Mok. Toronto Judging
- [12] *Dendrobium* Lorrie Mortimer 'Marianne' CCE-AM/AOS (Caesar x Samarai) 90-84 pts. Exhibitor: Marianne Giraud; photographer: Irma Saldaña. Puerto Rico Judging
- [13] *Vanda* Ubuntu 'Genesis' AM/AOS (Aurawan x *tessellata*) 80 pts. Exhibitor: Ricardo Molina; photographer: Irma Saldaña. Puerto Rico Judging
- [14] *Chiloschista lunifera* 'Dude' JC/AOS. Exhibitor: Mary Mancini; photographer: Mary Mancini. Shreveport Judging
- [15] *Vanda* Motes Adorbs 'Snookie' HCC/AOS (*ampullacea* x *christensoniana*) 78 pts. Exhibitor: Mary Mancini; photographer: Mary Mancini. Shreveport Judging
- [16] *Phragmipedium* Perufflora's Spirit 'Main Street Orchids' CCM/AOS (*kovachii* x Eric Young) 81 pts. Exhibitor: Main Street Orchids; photographer: Jennifer Lang and Margaret Folwell. Toronto Judging





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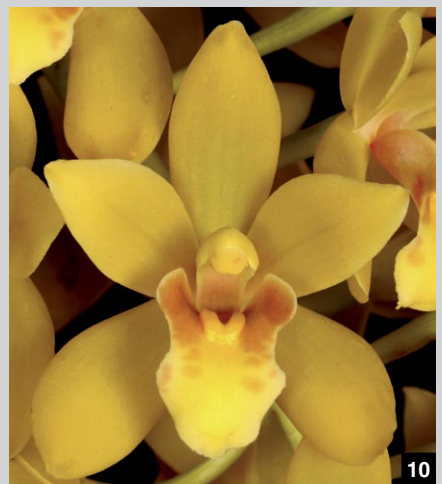
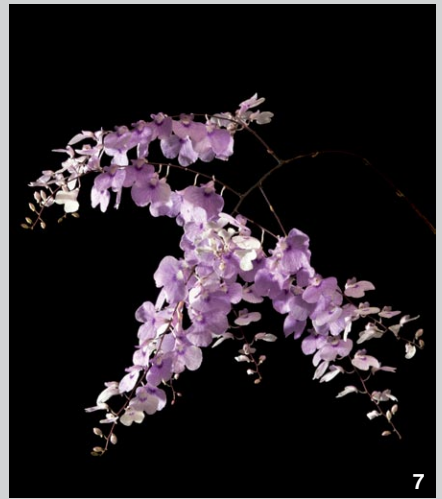
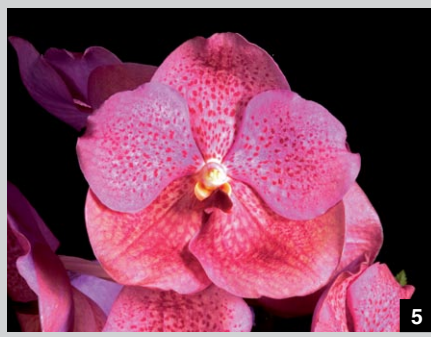


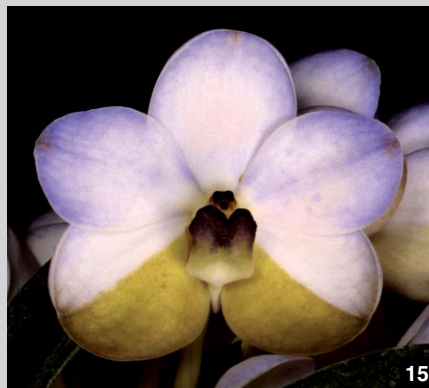
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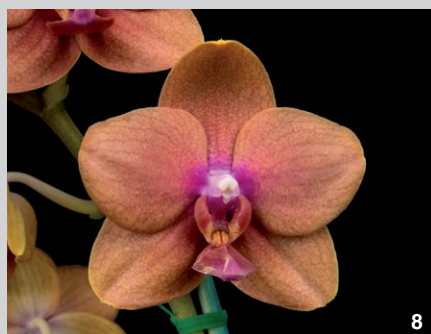
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- [1] *Paphiopedilum* Leeanum 'Sarah' CCM/AOS (*insigne* x *spicerianum*) 84 pts. Exhibitor: Sean Moore; photographer: Albert Mok. Toronto Judging
- [2] *Paphiopedilum haynaldianum* 'Sheila' CCM/AOS 82 pts. Exhibitor: John Marcotte; photographer: Albert Mok. Toronto Judging
- [3] *Phalaenopsis cornu-cervi* f. *flava* 'Golden Years' HCC/AOS 77 pts. Exhibitor: Daryl Yerdon; photographer: Jennifer Lang Margaret Folwell. Toronto Judging
- [4] *Paphiopedilum* Howard Martin 'Howard P. Martin' AM/AOS (Fumi's Gold x Via Del Sol) 87 pts. Exhibitor: Howard Peter Martin; photographer: Jennifer Lang Margaret Folwell. Toronto Judging
- [5] *Dendrobium* Rainbow Dance 'Hanamizuki' HCC/AOS (*Kurenai* x *unicum*) 78 pts. Exhibitor: Catherine Frutiger; photographer: Alexey Tretyakov. Western Canada Judging
- [6] *Phalaenopsis* LOC Mahogany Gem 'Bee Boppin' AD/AOS (*chibae* x *honghensis*). Exhibitor: Phil Matt; hybridizer: Louisiana Orchid Connection; photographer: Jennifer Lang Margaret Folwell. Toronto Judging
- [7] *Paphiopedilum delenatii* 'Double Bubble' HCC/AOS 75 pts. Exhibitor: Sean Moore; photographer: Albert Mok. Toronto Judging
- [8] *Sarcochilus* Kulnura One 'Crystal Star' HCC/AOS (*Bonanza* x *Sweetheart*) 77 pts. Exhibitor: Crystal Star Orchids Ellen and Eric Lee; photographer: Thang Dam. Toronto Judging
- [9] *Phalaenopsis* Cindy Li 'Paige' AM/AOS (*Marie's Delight* x *gigantea*) 80 pts. Exhibitor: Pat van Adrichem; photographer: Judith Higham. Western Canada Judging
- [10] *Guarianthe* Guatemalensis 'Shawn Marie' CHM/AOS (*aurantiaca* x *skinneri*) 83 pts. Exhibitor: Carolyn Edwards; photographer: Jennifer Lang and 4Margaret Folwell. Toronto Judging
- [11] *Pleione formosana* 'Meetings at CVIOS' CCM/AOS 87 pts. Exhibitor: Alexey Tretyakov; photographer: Judith Higham. Western Canada Judging
- [12] *Phragmipedium* La Hougette 'Faust's Spirit' AM/AOS (*dalessandroi* x *Beaufort*) 81 pts. Exhibitor: Jean-Pierre Faust; photographer: Thang Dam. Toronto Judging
- [13] *Paphiopedilum* Franz Glanz 'Tak Fai' HCC/AOS (*armeniicum* x *emersonii*) 77 pts. Exhibitor: Calvin Wong - Tropical Gardens Orchids; photographer: Judith Higham. Western Canada Judging
- [14] *Dendrobium* Keshmakesh 'Contessa' AM/AOS (*Pixie Princess* x *Livingstone*) 80 pts. Exhibitor: Anita Debona; photographer: Brian Monk. West Palm Beach Judging
- [15] *Phalaenopsis* Jiaho Panthers 'Anzuelo' CCM/AOS (*mannii* x *pantherina*) 84 pts. Exhibitor: Pat van Adrichem; photographer: Alexey Tretyakov. Western Canada Judging
- [16] *Bulbophyllum flaviflorum* 'J & L' CHM/AOS 80 pts. Exhibitor: J & L Orchids; photographer: Thang Dam. Toronto Judging





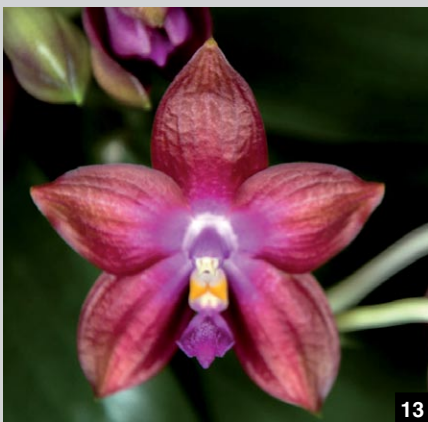
- [1] *Paphiopedilum* Green Shield Album 'Kent's Choice' HCC/AOS (Hsinying Heron x *sukhakulii*) 76 pts. Exhibitor: Kin Mok; photographer: Albert Mok. Toronto Judging
- [2] *Phalaenopsis* OX Black Face 'Odom's Orchids' AM/AOS (OX Queen x OX Spot Queen) 80 pts. Exhibitor: Odom's Orchids, Inc.; photographer: Nick Nickerson. West Palm Beach Judging
- [3] *Rhynchoaeliocattleya* Taiwan Chief Wine 'Uncle Miltie's Wine' AM/AOS (Village Chief Tearoom x Sunstate Colorchart) 83 pts. Exhibitor: Everglades Orchids; photographer: Nick Nickerson. West Palm Beach Judging
- [4] *Vandachostylis* Pine Rivers 'Claudia' AM/AOS (*Vanda* Peggy Foo x *Rhynchosstylis coelestis*) 86 pts. Exhibitor: R.F. Orchids, Inc.; photographer: Willie Alleyne. West Palm Beach Judging
- [5] *Vanda* Barbara Walker 'Crownfox' AM/AOS (Susan Best x Bruce Danforth) 86 pts. Exhibitor: R.F. Orchids, Inc.; photographer: Willie Alleyne. West Palm Beach Judging
- [6] *Aeridachnis* Bogor 'Claudia Maraj' JC/AOS (*Arachnis hookeriana* x *Aerides odorata*). Exhibitor: Claudia Maraj; photographer: Willie Alleyne. West Palm Beach Judging
- [7] *Ionopsis utricularioides* 'Rhys' AM/AOS 82 pts. Exhibitor: June Knight; photographer: Willie Alleyne. West Palm Beach Judging
- [8] *Renanthera vietnamensis* 'Crownfox' AM/AOS 84 pts. Exhibitor: R.F. Orchids, Inc.; photographer: Willie Alleyne. West Palm Beach Judging
- [9] *Phalaenopsis* Zheng Min Jacaranda 'Yungho' AM/AOS (Ohl Flame x Hannover Passion) 83 pts. Exhibitor: Michael Marshall; photographer: Willie Alleyne. West Palm Beach Judging
- [10] *Cymbidium* Mad Cindy 'Esthercita's Delight' HCC/AOS (*madidum* x Cindy Lou) 79 pts. Exhibitor: Antonio Cotarelo; photographer: Tom Kuligowski. West Palm Beach Judging
- [11] *Dendrobium* Jairak Helix 'MIM's Nya' AM/AOS (Jairak Twist x *tangerinum*) 85 pts. Exhibitor: Michael Marshall; photographer: Willie Alleyne. West Palm Beach Judging
- [12] *Cymbidium* Australian Midnight 'Naya's Obscura' HCC/AOS (*canaliculatum* x *atropurpureum*) 79 pts. Exhibitor: Naya Marcato Cotarelo; photographer: Tom Kuligowski. West Palm Beach Judging
- [13] *Sarcochilus* Kulnura Firemist 'Elizabeth' HCC/AOS (Zoe x Bunyip) 77 pts. Exhibitor: James G. Morris; photographer: Ramon de los Santos. California Sierra Nevada Judging
- [14] *Vandachostylis* Memoria Linda Lou Tarr 'Sugar Plum' HCC/AOS (*Viboon Velvet* x *Vanda* Wilas) 77 pts. Exhibitor: Mike Pitiriciu; photographer: Tom Kuligowski. West Palm Beach Judging
- [15] *Vandachostylis* Viboon Velvet 'Florea' HCC/AOS (*Vanda* Tubtim Velvet x *Rhynchosstylis coelestis*) 77 pts. Exhibitor: Mike Pitiriciu; photographer: Tom Kuligowski. West Palm Beach Judging
- [16] *Vanda* Mario Vega Solorzano 'MIM's Olivia' AM/AOS (Suksamran Spots x Gordon Dillon) 80 pts. Exhibitor: Michael Marshall; photographer: Willie Alleyne. West Palm Beach Judging



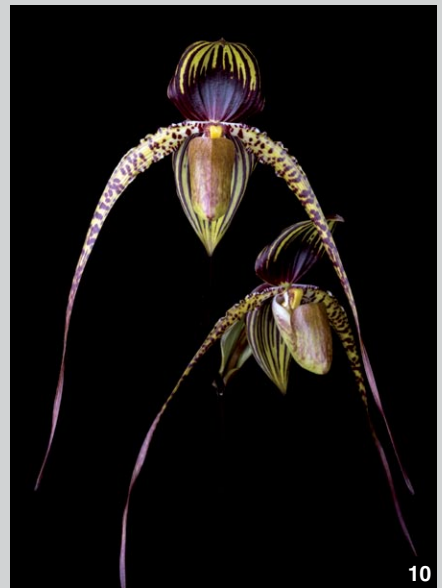
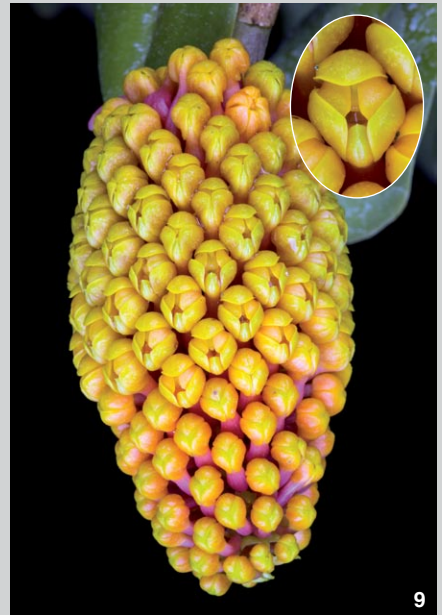


- [1] *Renanthera citrina* 'Fat Man' CCM/AOS 83 pts. Exhibitor: Carson Barnes; photographer: Carson Barnes. Atlanta Judging
- [2] *Cymbidium* Alfredo Kraus 'Hi Jinx' HCC/AOS (Parish Green x Memoria Amelia Earhart) 77 pts. Exhibitor: Ed and Jaybee Dumaguin; photographer: Ramon de los Santos. California Sierra Nevada Judging
- [3] *Cymbidium* Amelian Odyssey 'Wild Thing' AM/AOS (Terry Kamikawa x Memoria Amelia Earhart) 81 pts. Exhibitor: Ed Dumaguin; photographer: Ramon de los Santos. California Sierra Nevada Judging
- [4] *Leptotes bicolor* 'Goodstuff' AM/AOS 83 pts. Exhibitor: Tom Pickford; photographer: Ramon de los Santos. California Sierra Nevada Judging
- [5] *Dendrobium speciosum* var. *curvicaule* 'In Situ' CCM/AOS 81 pts. Exhibitor: Jeff Tyler; photographer: Ramon de los Santos. California Sierra Nevada Judging
- [6] *Dendrobium* King Zip 'Red Splash' CCM-AM/AOS (Kathking x Zip) 88-86 pts. Exhibitor: Jeff Tyler; photographer: Ramon de los Santos. California Sierra Nevada Judging
- [7] *Paphiopedilum* Ruby Boy Wonder 'Malbec' AM/AOS (Ruby Voodoo x Wood Wonder) 80 pts. Exhibitor: Dave Sorokowsky; photographer: Ramon de los Santos. California Sierra Nevada Judging
- [8] *Phalaenopsis* Springbrook Ruby 'Orange Glow' HCC/AOS (Tying Shin Forever Love x H. P. Norton) 78 pts. Exhibitor: Joe Armstrong; photographer: Paige Ramsey Moody. Carolinas Judging
- [9] *Paphiopedilum micranthum* (Eburneum) 'Yeti' AM/AOS 82 pts. Exhibitor: Ramon de los Santos; photographer: Ramon de los Santos. California Sierra Nevada Judging
- [10] *Cymbidium* Jaybee's Wild Side 'Tygr Jade' JC/AOS (Son of Kuramura x Yowie Flame). Exhibitor: Ed and Jaybee Dumaguin; photographer: Ramon de los Santos. California Sierra Nevada Judging
- [11] *Paphiopedilum* Hawaiian Love 'Slipper Zone Sepal Splendor' HCC/AOS (Hawaiian Illusion x Love Song) 75 pts. Exhibitor: Lehua Orchids; photographer: Ed Cott. Toronto Judging
- [12] *Aciopea* Ecuagenera Passion 'Aidan' AM/AOS (*Acineta superba* x *Stanhopea stevensonii*) 81 pts. Exhibitor: William Jasen; photographer: Ross Leach. Pacific Northwest Judging
- [13] *Phalaenopsis* Zheng Min Swallowtail 'Sunflower' HCC/AOS (Yungho Gelb Canary x Chang Maw Evergreen) 77 pts. Exhibitor: Mike Mims; photographer: Paige Ramsey Moody. Carolinas Judging
- [14] *Phalaenopsis* Sim Kheng Wah 'Crystal Star' HCC/AOS (Brother Sara Gold x *bellina*) 79 pts. Exhibitor: Crystal Star Orchids Ellen and Eric Lee; photographer: Denis Maheux. Toronto Judging
- [15] *Scuticaria salesiana* 'Whisper Blessed Be RBA' HCC/AOS 77 pts. Exhibitor: Laura and Wes Newton; photographer: Wes Newton. Florida North-Central Judging
- [16] *Paphiopedilum* Petula's Love Song 'Slipper Zone Glowing Dark' AM/AOS (Love Song x Petula's Flame) 82 pts. Exhibitor: Lehua Orchids; photographer: Ed Cott. Toronto Judging





- [1] *Phalaenopsis* Citrus Candy 'Marley' AM/AOS (Tying Shin Forever Love x Tying Shin Golden City) 83 pts. Exhibitor: Mike Mims; photographer: Paige Ramsey Moody. Carolinas Judging
- [2] *Phragmipedium* Perufflora's Spirit 'Looking Glass' AM/AOS (*kovachii* x Eric Young) 82 pts. Exhibitor: Looking Glass Orchids; photographer: Paige Ramsey Moody. Carolinas Judging
- [3] *Paphiopedilum* Pink Queen 'Pink Passion' AM/AOS (White Queen x Amanda-hill) 83 pts. Exhibitor: Marriott Orchids/Hadley Cash; photographer: Paige Ramsey Moody. Carolinas Judging
- [4] *Phalaenopsis tetraspis* f. *imperatrix* 'Parliament' AM/AOS 80 pts. Exhibitor: Bryan Goddard; photographer: Paige Ramsey Moody. Carolinas Judging
- [5] *Rhyncholaeliocattleya* Perfect Choice 'Purple Lady' HCC/AOS (Tokyo Bay x Cattleya Lake Casitas) 77 pts. Exhibitor: James Curtis; photographer: James Curtis. Carolinas Judging
- [6] *Paphiopedilum* Hudson Hyde 'Blue Ridge' AM/AOS (Wayne Booth x *lowii*) 85 pts. Exhibitor: Mike Mims; photographer: Paige Ramsey Moody. Carolinas Judging
- [7] *Dendrobium chrysotoxum* 'Puddin' CCM-AM/AOS 85-84 pts. Exhibitor: Graham Ramsey; photographer: Paige Ramsey Moody. Carolinas Judging
- [8] *Paphiopedilum* Rosy Egret 'Pink Flyer' CCE/AOS (*appletonianum* x *acmodontum*) 91 pts. Exhibitor: Arnold J. Klehm, Grower; photographer: Nile Dusdieker. Chicago Judging
- [9] *Paphiopedilum* Kolosand 'Ben Belton' HCC/AOS (*kolopakii* x *sanderianum*) 78 pts. Exhibitor: Ben Belton; photographer: Paige Ramsey Moody. Carolinas Judging
- [10] *Paphiopedilum* Julius (*rothschildianum* 'Looking Glass' x *lowii* 'Dotty') AQ/AOS Exhibitor and hybridizer: Looking Glass Orchids; photographer: Paige Ramsey Moody. Carolinas Judging
- [11] *Paphiopedilum* Woluwense 'Crystelle' CCE-AM/AOS (*niveum* x *rothschildianum*) 95-84 pts. Exhibitor: Krull-Smith; photographer: Paige Ramsey Moody. Carolinas Judging
- [12] *Phalaenopsis* Pylo's Girl 'Anne Garner' AM/AOS (Texas Passion x Penang Girl) 82 pts. Exhibitor: Ben Belton; photographer: James Curtis. Carolinas Judging
- [13] *Phalaenopsis* Tying Shin Fly Eagle 'Cherry Bomb' AM/AOS (*tetraspis* x Dragon Tree Eagle) 82 pts. Exhibitor: Ben Belton; photographer: James Curtis. Carolinas Judging
- [14] *Paphiopedilum* Metolius River 'Sunlight Serenade' AM/AOS (Donna Hanes x Sheila Hanes) 85 pts. Exhibitor: Marriott Orchids/Hadley Cash; photographer: Paige Ramsey Moody. Carolinas Judging
- [15] *Rodrumnia* Orchidom Russell 'Looking Glass' AM/AOS (Orchidom Dancer x Orchidom Tom's Fantasy) 82 pts. Exhibitor: Looking Glass Orchids; photographer: James Curtis. Carolinas Judging
- [16] *Catasetum* SoftPlay 'Grant' HCC/AOS (Doris's Choice x True Love) 79 pts. Exhibitor: Marc Burchette; photographer: James Curtis. Carolinas Judging





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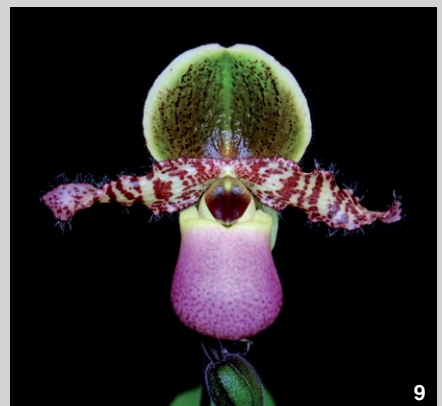


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- [1] *Guarianthe skinneri* 'Heiti Jacobs' CCM/AOS 83 pts. Exhibitor: William Rogerson; photographer: Nile Dusdieker. Chicago Judging
- [2] *Phalaenopsis* Lioulin Diana Lip 'Iowa Orchids' HCC/AOS (Lioulin Thick Lip x KS Big Diana) 77 pts. Exhibitor: Robert Bannister; photographer: Nile Dusdieker. Chicago Judging
- [3] *Cattleya lueddemanniana* 'Krull's Primavera' AM/AOS 84 pts. Exhibitor: William Rogerson; photographer: Nile Dusdieker. Chicago Judging
- [4] *Paphiopedilum* Jerry Spence 'Hood-winked' HCC/AOS (*rothschildianum* x *Berenice*) 77 pts. Exhibitor: Kim Weldon; photographer: Richard Noel. Cincinnati Judging
- [5] *Maxillaria pacholskii* 'Joyce' CBR/AOS. Exhibitor: Larry Sexton; photographer: Nile Dusdieker. Chicago Judging
- [6] *Vandachostylis* Ben Mianmanus 'Garrett's Vandaland' AM/AOS (Evergreen Magic x *Vanda tessellata*) 84 pts. Exhibitor: Sharon and David Garrett; photographer: David Nickerson. Florida North-Central Judging
- [7] *Vandachostylis* Ben Mianmanus 'David's Favorite' AM/AOS (Evergreen Magic x *Vanda tessellata*) 83 pts. Exhibitor: Sharon and David Garrett; photographer: David Nickerson. Florida North-Central Judging
- [8] *Rhyncattleanthe* Toshie's Charm 'Becky's Garden' AM/AOS (*Rhyncholaeliocattleya* Little Toshie x Izumi Charm) 80 pts. Exhibitor: Katherine Weitz; photographer: Nile Dusdieker. Chicago Judging
- [9] *Robiquetia cerina* 'Dona's Treasures' AM/AOS 82 pts. Exhibitor: Oakwood Orchids; photographer: Richard Noel. Cincinnati Judging
- [10] *Paphiopedilum* Henri Dupont 'Peggy' HCC/AOS (*Shin-Yi's Pride* x *adductum*) 77 pts. Exhibitor: Michael Hinshaw; photographer: Richard Noel. Cincinnati Judging
- [11] *Epidendrum ciliare* 'Carolyn's Joy' CCM/AOS 84 pts. Exhibitor: Carolyn Robinson; photographer: H. A. Russell III. Florida North-Central Judging
- [12] *Rhyncattleanthe* Jon Tumilson's Crush It 'Vera Simone' HCC/AOS (*Rhyncholaelia* Aristocrat x Afternoon Delight) 77 pts. Exhibitor: Susan Smith; photographer: Wes Newton. Florida North-Central Judging
- [13] *Paphiopedilum* Toni Semple 'Memoria Shawn Smallwood' AM/AOS (*haynaldianum* x *lowii*) 83 pts. Exhibitor: James Arnold; photographer: Walter Wager. Florida North-Central Judging
- [14] *Paphiopedilum* Shin-Yi Williams 'Flamevine' HCC/AOS (*William Ambler* x *rothschildianum*) 77 pts. Exhibitor: Richard Zoehrer; photographer: Wes Newton. Florida North-Central Judging
- [15] *Paphiopedilum haynaldianum* 'Flamevine' AM/AOS 84 pts. Exhibitor: Richard Zoehrer; photographer: Wes Newton. Florida North-Central Judging
- [16] *Brassocattleya* Glorious May 'Margie's First' AM/AOS (*Cattleya* Gene May x Morning Glory) 81 pts. Exhibitor: Margie Johnson; photographer: Walter Wager. Florida North-Central Judging





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- [1] *Aerangis modesta* 'Gabriel Amaru' CCE/AOS 91 pts. Exhibitor: Ben Oliveros and Orchid Eros; photographer: Glen Barfield. Hawaii Judging
- [2] *Paphiopedilum* Hilo Black Eagle 'Mid-Michigan' HCC/AOS (Johanna Burkhardt x *rothschildianum*) 77 pts. Exhibitor: Jack Shumaker; photographer: Katie Payeur. Great Lakes Judging
- [3] *Octomeria micrantha* 'Bryon' CCM-AM/AOS 85-81 pts. Exhibitor: Bryon K. Rinke; photographer: Bryon K. Rinke. Great Plains Judging
- [4] *Phalaenopsis* Fuller's Paint Brush 'Mayfield' AM/AOS (Fuller's Miss x Sung Woei Rosaria) 82 pts. Exhibitor: Mayfield Village Orchids; photographer: Ed Cott. Great Lakes Judging
- [5] *Paphiopedilum* Red in Flight 'Reyna's Spring Wings' HCC/AOS (Flighty Fred x Memoria Jacob Jake Piloto) 77 pts. Exhibitor: Sarah Waddoups; photographer: Bryon Rinke. Great Plains Judging
- [6] *Paphiopedilum* Ho Chi Minh 'Jana Butcher' CCE-AM/AOS (*delenatii* x *vietnamense*) 90-83 pts. Exhibitor: Jana Butcher; photographer: Bryon Rinke. Great Plains Judging
- [7] *Paphiopedilum delenatii* 'Littlefrog' AM/AOS 81 pts. Exhibitor: Littlefrog Farm; photographer: Katie Payeur. Great Lakes Judging
- [8] *Guarianthe skinneri* 'Roberts' AM/AOS 85 pts. Exhibitor: Roberts Flower Supply; photographer: Ed Cott. Great Lakes Judging
- [9] *Paphiopedilum* Amarantine 'Lydia' AM/AOS (*liemianum* x *moquetteanum*) 81 pts. Exhibitor: Roberts Flower Supply; photographer: Ed Cott. Great Lakes Judging
- [10] *Bulbophyllum taiwanense* 'Bryon' AM/AOS 80 pts. Exhibitor: Bryon K. Rinke; photographer: Bryon Rinke. Great Plains Judging
- [11] *Vanda* Alan Ashe Patterson 'Potts's Dink Dink' HCC/AOS (*testacea* x *garayi*) 76 pts. Exhibitor: Ray and Annette Potts; photographer: Bryon Rinke. Great Plains Judging
- [12] *Paphiopedilum* Oriental Green 'Slipper Zone Well I Never' AM/AOS (Oriental Jewel x *sukhakulii*) 81 pts. Exhibitor: Lehua Orchids; photographer: Glen Barfield. Hawaii Judging
- [13] *Paphiopedilum* Petula's Sensation 'Slipper Zone Red Promise' AM/AOS (Macabre Contrasts x Petula's Flame) 80 pts. Exhibitor: Lehua Orchids; photographer: Glen Barfield. Hawaii Judging
- [14] *Paphiopedilum* Macabre Illusion 'Slipper Zone Fifth Version' HCC/AOS (Hawaiian Illusion x Macabre Contrasts) 78 pts. Exhibitor: Lehua Orchids; photographer: Glen Barfield. Hawaii Judging
- [15] *Paphiopedilum* Petula's Sensation 'Slipper Zone Red Promise' AM/AOS (Macabre Contrasts x Petula's Flame) 80 pts. Exhibitor: Lehua Orchids; photographer: Glen Barfield. Hawaii Judging
- [16] *Sarcochilus* Kulnura Whomping 'Bryon' HCC/AOS (Kulnura Flash x Kulnura Impact) 78 pts. Exhibitor: Bryon K. Rinke; photographer: Bryon Rinke. Great Plains Judging

Cypripedium montanum

Pollination Biology of a Leading-Edge Population of *Cypripedium montanum* (Douglas ex Lindl) in South-Central Alaska

By Tara Luna

ABSTRACT A leading-edge population of *Cypripedium montanum* Douglas ex Lindl. (Orchidaceae) was examined in south-central Alaska to determine pollinator activity and reproductive ecology between two color forms. Forma *praetertinctum* is genetically and morphologically distinct and has straight, pure yellow or yellow-green sepals and petals, pure white pouches and smaller exit holes, and lacks spotting on the staminode. The column consists of nearly sessile anthers and some plants are autogamous. Forma *montanum* has larger exit holes and longer anthers than f. *praetertinctum* but the exit holes are smaller when compared with f. *montanum* from lower latitudes. Both forms are scentless and are visited by small pollen-feeding Diptera (Empidinae or Rhaginidae). Both color forms could be recognized at the varietal level. Forma *praetertinctum* may be a subtaxon that has recently evolved as a result of isolation, drift and selection or it may be a Pleistocene relict that recruited from an older seed bank. Intermediate color forms are the result of gene mixing between sympatric forms. Processes of drift, selection and speciation can be found in isolated *Cypripedium* populations in recently deglaciated, high-latitude mountain environments and emphasizes their conservation value.

INTRODUCTION High-latitude environments subjected to repeated periods of glaciation are highly dynamic resulting in temporal and spatial barriers between surviving plant populations. When gene flow rates are interrupted by extended periods, genetic drift and natural selection drive differentiation and local populations evolve independently (Tremblay and Ackerman 2003). Selection can be intense in small populations with highly restricted gene flow (Tremblay et al. 2005) and in regions with short unpredictable growing seasons that enforce a fitness shift to autogamy or to the regional pool of available pollinators.

Cypripedium montanum Douglas ex Lindl. (Orchidaceae) has a deceptive pollination strategy and is pollinated by small solitary bees at lower latitudes. Diptera are abundant and important pollinators in high-latitude environments (Larson et al 2001) and can be nectar or pollen feeders. Flies are pollinators of some *Cypripedium* species (Li et al. 2012) with myiophilous or saphromyiophilous traits. Hover flies (Syrphidae) were the most frequently observed insects found in northernmost population of *Cypripedium calceolus* L. in the Murmansk region of northwestern Russia (66–70°N) (Blinova 2002). Bumblebees (*Bombus* sp.) are often more common than solitary bees in mountainous regions and can occasionally transfer pollen by exiting the lip mouth (Sugiura et al 2001). North-temperate and boreal *Cypripedium* species can exhibit shifts between pollination strategies when populations are stranded or isolated.

Cypripedium montanum f. *praetertinctum* is genetically (McCormick 2019) and morphologically distinct from f. *montanum* and from other populations of



f. *montanum* sampled at lower latitudes. It has scentless flowers, longer and shallower pouches, smaller exit holes and nearly sessile to absent filaments (<1.0 mm) fused to the column. Some plants are autogamous. Pollinaria essentially block the exit hole from inside the pouch. Both forms at this site have shifted their reproductive strategy from solitary bees to small flies and facultative autogamy. *Cypripedium montanum* f. *praetertinctum* has not been found in pure stands but occurs in mixed stands with f. *montanum* in Alaska, British Columbia (Sheviak 2002) and Montana. At this site, f. *praetertinctum* is stable, constituting 25 percent of the total population and is found at the mid and lower toe-slope positions.

The reproductive column of f.



praetertinctum consists of short to nearly sessile filaments bearing pollinaria. The distance between pollinaria and stigma averaged only 0.78 mm and a small percentage of plants appear to be autogamous morphotypes. The inside channel wall leading to the exit hole measured 1.5 mm and prevents exit by small solitary bees and larger flies. *Cypripedium montanum* f. *praetertinctum* has long, wide and shallow boat-shaped pouches that are pure white, lacking windows and internal red-maroon guidelines. The sepals and petals are pure yellow to yellowish green and the staminode spotting is usually absent or confined to the staminode edges or tips.

Cypripedium montanum f. *montanum* has larger and wider pouch mouths and shorter and deeper pouches than f. *praetertinctum*. Exit-hole size averages 3.0 mm although a few plants examined had smaller exit holes. In the south-central Alaskan population, pouch depth is greater and the shape is more oval to almost round. Windows may or may not be present but internal maroon guidelines and staminode spotting are usually present. The amount of coloration on the sepals and petals can range from pure brownish-black to faint brown with irregular red spotting.

POLLINATOR OBSERVATIONS Both forms could accommodate small bumblebees or solitary bees that enter and exit the pouch mouth. *Bombus mixtus* were observed in all plots and average body size (length, height, width) is compatible with pouch mouth size in both forms. Greater body mass, size and hair density can potentially result in pollen removal and stigma contact during escape from the pouch mouth when compared with most native solitary bees. Although female *Bombus mixtus* were observed in all plots, they did not approach or land on the pouches.

We did not observe any solitary bees (*Andrena*, *Lasioglossum*, *Nomada*, *Osmia*) known to successfully pollinate *Cyp. montanum* flowers, although these genera are found in south-central Alaska. Depending on species, native solitary bees emerge at different times of the year and preferentially visit co-occurring nectar- and pollen-rewarding flowers. Moreover, crab spiders (*Musumena vatia*), commonly found preying solitary bees on *Cypripedium* flowers, were not observed, indicating that solitary bees may be very uncommon at this site.

Hundreds of small Diptera were observed to enter and exit the pouch



orifice in both forms. One dance fly (Empidinae) was found that died trying to escape through the exit hole of f. *praetertinctum*. Snipe flies (Rhagionidae) and common flies (Muscidae) were found inside pouches and on reproductive structures.

Small dance flies may serve as primary pollinators for *Cyp. montanum* and *Cypripedium parviflorum* at high latitudes. Most species are of Holarctic distribution and several genera (*Iteaphila*, *Anthepiscopus*, *Anthalia*, *Allanthalia* and *Euthyneura*) feed exclusively on pollen (Downes and Smith 1969, Grimaldi 1999, Larson et al. 2001). Dance flies feed on pollen and nectar from *Dryas integrifolia* (Larson et al. 2001) commonly found on Alaskan calcareous mountain slopes. *Anthepiscopus* (Empidinae) are known pollinators of the nectar-producing orchid *Platanthera stricta*. Snipe flies (Rhagionidae) are also known to be anthophilous (Larson et al. 2001) and also predate smaller flies. Flies have been observed to successfully remove pollen smears from *Cyp. montanum* (Fulkerson et al. 2017) and were also observed on *Cyp. parviflorum* var. *pubescens* in southwestern coastal Alaska (Dillman 2019).

At late-stage anthesis, dance flies

[1] *Cypripedium montanum* var. *praetertinctum* in south-central Alaska.

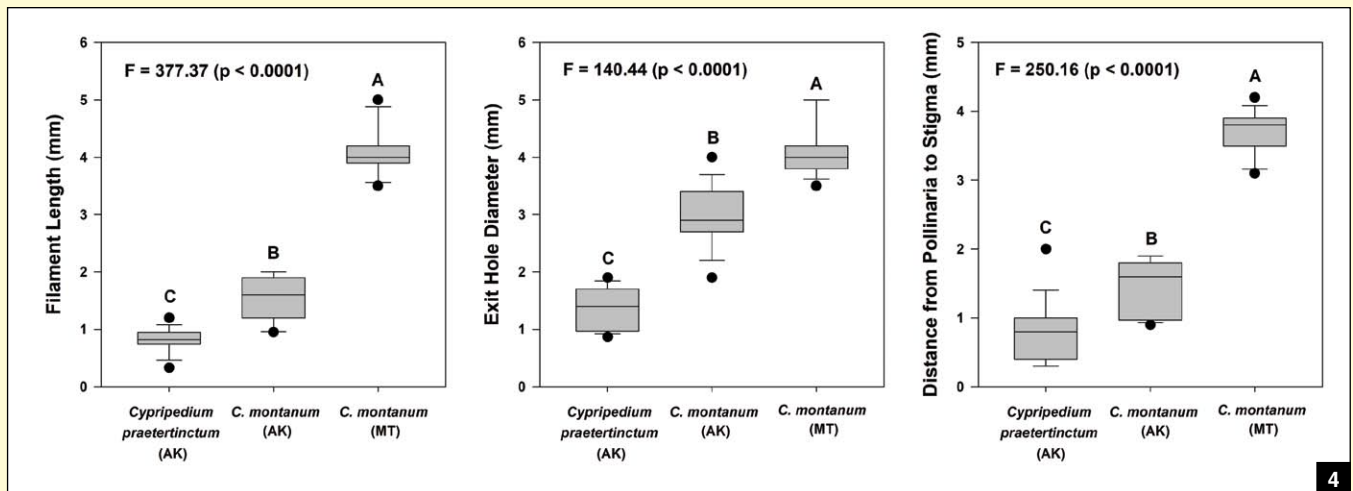
[2] *Cypripedium montanum* var. *montanum* in south-central Alaska.

[3] A dance fly (Empidinae) (black arrow) found caught in an exit hole of *Cypripedium montanum* var. *praetertinctum*

may be attracted to odors from senescing flowers and remove pollen. Pollination may only occur when the cuticle-like covering over the pollen mass softens and is more easily removed. At this site, total viable pollen per flower may be extremely low.

FLORAL MEASUREMENTS Analysis of variance (ANOVA) using Proc. Glimmix (Version 9.4) was used to compare filament length, distance from pollinaria to stigma and exit-hole size between both Alaskan color forms and *Cyp. montanum* flowers from northwestern Montana. The *P* value was <0.0001 (95% confidence) for all three floral measurements between f. *praetertinctum*, Alaskan f. *montanum* and *Cyp. montanum* f. *montanum* from northwestern Montana. A total of 15 flowers per color form were sampled and compared with flowers collected from northwestern Montana.

The distance between pollinarium and the posterior stigmatic surface averaged



0.78 mm in *f. praetertinctum* and 1.6 mm in *f. montanum*. We did not detect any immature seed capsules from the previous year that would indicate moderate rates of self-pollination and this is likely due to low-viability pollen, low rates of transfer or seed capsule predation. *Forma montanum* had, on average, larger exit holes than *f. praetertinctum* and slightly longer filaments (1.5 mm). Flowers with larger exit holes may be occasionally pollinated by small solitary bees. In northwestern Montana, *Cyp. montanum* have sweetly scented flowers, larger exit holes (4–5 mm) and longer filaments (3–5 mm) bearing the pollinaria above the exit hole, positioned inside or outside the pouch margin. Pollinaria are borne inside the pouch in both forms in the south-central Alaska population.

All fresh and newly opened flowers of both Alaskan color forms did not have an obvious scent even during periods of higher than normal temperatures (28 C day/22 C night) with no wind or cloud cover, and no scent was not detected in flowers temporarily stored in sealed plastic bags. *Cypripedium montanum* flowers found at lower latitudes have an obvious sweet scent (Sheviak 2002, Bernhardt et al. 2014). The lack of fragrance in this isolated Alaskan population is due to a shift from bee to fly pollination. Island orchid populations can contain both scented and unscented flowers, with unscented forms having highly restricted pollination rates (Ackerman et al 1997). This is also true for “island” populations of boreal species isolated by enormous ice fields and historically restricted to nunataks during periods of ice advance and climate cooling.

POPULATION VARIABILITY At this site, the greatest range of flower form variability is found at the leading

population edge at the base of a steep mountain slope, just above an older glacier trimline and less than 1,000 m from a glacier ice-field. Plants with peloric and pseudopeloric flowers were also found at the population edge. Mutation rates increase with increasing seed age and atypical plants may be the result of old seed-bank recruitment. Active deglaciation, avalanche slides, permafrost thaw and wildlife diggings can potentially release older, viable seeds preserved in permafrost or surficial glacial ice that can intermix with the nunatak population, resulting in two distinct forms, intermediate forms and surviving mutations.

Forma montanum may have survived in situ as a nunatak population above the glacier ice-fields as this was the only form found at the upper elevation limit of the population. *Forma praetertinctum* may represent an older taxonomic entity that survived the Pleistocene ice advances and climate in ice-free refugia. It may have evolved during an earlier cycle of climate cooling and ice advance when few native bees were available and has more recently intermixed with *f. montanum*

It may also be derived from a founder population of *f. montanum* that has recently undergone drift and selection. *Forma praetertinctum* may have also recruited from well-preserved old seed banks that remained viable in permafrost and later intermixed with *f. montanum*.

Other seed-bank studies from Alaska have shown seed survival at subfreezing temperatures in zones near permafrost for longer than 200 years (McGraw et al. 1991) and genetic differentiation between young and old seed populations can occur in less than 200 years (Vavrek et al. 1991)

Genetic variation within a population provides important clues to the species’

response to environmental shifts (McGraw 1995) and may also indicate locations of refugia or seed banks that have remained viable during periods of ice readvance and climate cooling. Gene mutation rates increase with increasing seed age, resulting in higher rates of surviving mutations that can intermix with extant populations. This may also explain the frequency of individuals with peloric and pseudopeloric flowers on the population edge.

On steep mountain slopes, periodic disturbance from snow slides, rock slides, wildlife diggings and annual freeze–thaw cycles can result in germination of more deeply buried seeds. Calcareous soils may be more affected by cryoturbation and soil movement on steep slopes (Bamberg and Major 1968, Michalet et al. 2002). Recent permafrost thaw can cause cryoturbation due to repeated freezing and thawing.

Permafrost thaw and cryoturbation occur more frequently on exposed sites with fine-textured soils. The combination of permafrost thaw, cryoturbation, soil movement and melting glaciers near this population may have yielded some older, viable seeds that later intermixed with the nunatak population.

CONSERVATION Leading population edges and isolated populations in recently deglaciated environments contain high levels of diversity where processes of drift, selection and speciation are found. Such populations are valuable conservation targets that contain founder and contemporary genes resulting in new adaptations and are the source populations from which novel lineages develop under more recent environmental change.

Northern range expansion is crucial when core populations are subjected to increasing frequency and intensity



of anthropogenic and climate-induced changes. Conserving areas that also include historic refugia, leading-edge populations and disjunct isolated populations that foster evolutionary processes are prime conservation targets. Conservation efforts that include both large landscapes and small refugium populations are needed to ensure that a range of genes are preserved for future adaptation under contemporary climate change.

Glacial ice and permafrost can serve as an in-situ cryopreservation seed bank, releasing seeds and mycorrhiza fungal spores that can colonize areas during periods of climate warming, thus contributing to ecological and evolutionary processes that are crucial for biological conservation. Regions of permafrost and active glaciers may play a compelling but understudied role in the dynamics and patterns of vegetation communities, population variability and genetic diversity.

Acknowledgments

Funding for this study was provided by the American Orchid Society. I thank National Park Service personnel, Peter Frank, Caroline Ketron, Morgan Gantz and Mark Miller for providing assistance, entomologist Jessica Rykken PhD (Denali National Park) for identifying insect collections, and Amy Ross-Davis (Corvallis, Oregon) for ANOVA data analysis. Special thanks to Chris Whelpley for assisting with the field study.

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- [4] Floral measurements ($p < 0.0001$) between sympatric Alaskan varieties *praetertinctorum*, *montanum* (61.5°N) and *montanum* (48.5°N) from northwestern Montana.
- [5] *Cypripedium montanum* var. *montanum* pollinated by native solitary bees in northwestern Montana.
- [6] Intermediate form found at the study site in south-central Alaska.

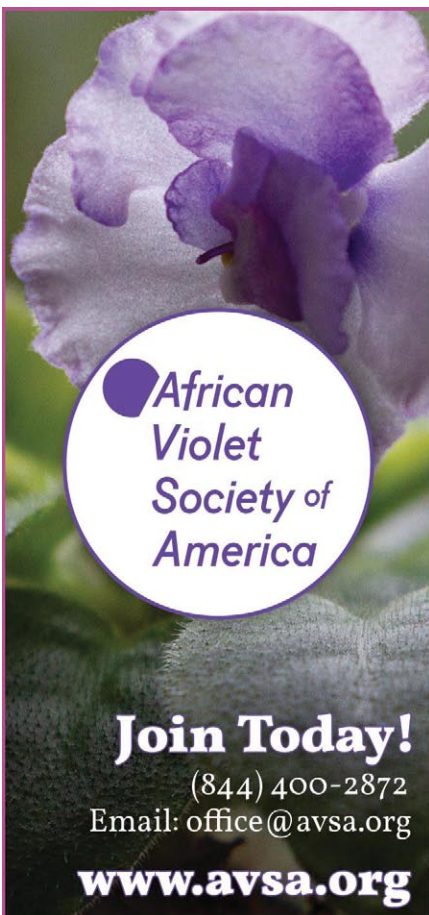
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— Tara Luna is a field botanist and ecologist in northwestern Montana who has collaborated with several tribes in the western United States and US Forest Service on restoration, conservation and vegetation monitoring projects. Recent work has included documenting rare and culturally significant plants and plant community diversity, including rare orchid habitats. She has been interested in rare plant biogeography and rare orchids of the Pacific Northwest for over 25 years (email: tluna@3rivers.net).



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The Ingenuity of a Visually Impaired Orchid Grower: The Healing Power of Orchids

By Courtney Lynn Miles

ORCHIDS ARE NOT just beautiful and exotic flowers to be admired. To me, orchids have been both healers and teachers. Several years ago I lost the majority of my sight. I had slipped into a bit of depression. I was thinking I would never enjoy or be able to do things anymore. I was no longer the social person I once was. Because I was not handling the new circumstances well, my mother, an avid orchid grower for years, began bringing me to her monthly society meetings. After six months, the wonderful members of my society broke through. I began wanting to feel the enjoyment that they received through orchids. I have never been one to be described as having a green thumb. Put a fern, mum, or ficus in my care for any time period longer than a breath and I would be sure to either drown, burn, or starve it. So the idea of ME ever attempting to actually grow one had never crossed my mind. I began to wonder if I could possibly keep one of these beautiful plants alive. With the help of my supportive society, I learned the correct way of potting and mounting by feeling and detecting the growth of the new pseudobulbs. It took six more months before I was comfortable and confident enough to purchase my first orchid. I started as every beginner does with the basics. I learned the culture and chose the one that would work best with my growing situation.

Even though I live on two acres with over 30 oak trees, it only took one snake mistaken for a hose to rule out the outdoors. I decided to begin my adventure with phalaenopsis. With its light requirements being so low, I could grow them indoors. It was not until the first watering when my mother's voice called, "Watch the crown!" that my first issue occurred. After many failed watering cans and hose nozzles, I was still unable to keep the crown dry during watering. I had to go back after with cotton swabs and paper towels with my mother's assistance. I was determined to devise a solution to be able to water them on my own. With some thought I had a plan. I potted my 'chids in plastic pots and put those into clay pots without drain holes. At watering

time I take the plastic pot out and fill the clay pot partially with water and place the plastic pot back in it to absorb the water. My only problem now was my air roots were drying out and shriveling. I needed a way to get to those above the pot. I solved that problem last Thanksgiving while buying a new turkey baster. The light bulb came on and I shrieked in excitement, causing several strange looks. With the baster I am able to control the amount and direction of the water.

With that solved, I faced insects, heat and the Florida sun. My most important tool to successful growing has been my hands. I use them to detect how much sun the leaves are receiving by the heat's intensity. By using touch, I become aware if the plant is getting too much or not enough water by the texture and turgidity of the leaves. When lightly running my fingertips up the flower spike, I am able

to determine where to clip the spike to the stake. I feel for any raised or ragged areas when checking for insect damage. I also use them for my least favorite insect detection test: the bite test. I have learned that when things begin to crawl up your arm and bite while you are inspecting your orchid, there is a good chance you have bugs.

After two years of growing orchids, I am still learning new ways to adapt and improve my growing techniques. I have learned through orchids that I may face different challenges than others, but by adapting I can accomplish almost anything. My mother may still hide the razor blades and the blow torch, but I now grow and love over 40 orchids.

— Courtney Lynn Miles, 8011 SW Sunny Oaks Drive, Arcadia, Florida 34269 (email: courtneymiles@centurylink.net).

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November 5-7, 2021

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- World-Famous Speakers
- International Orchid Vendors
- AOS Judging
- BBQ & Auction
- Krull-Smith Nursery Open House

Details and Registration Available Soon at:

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Sponsored & Hosted by Krull-Smith

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