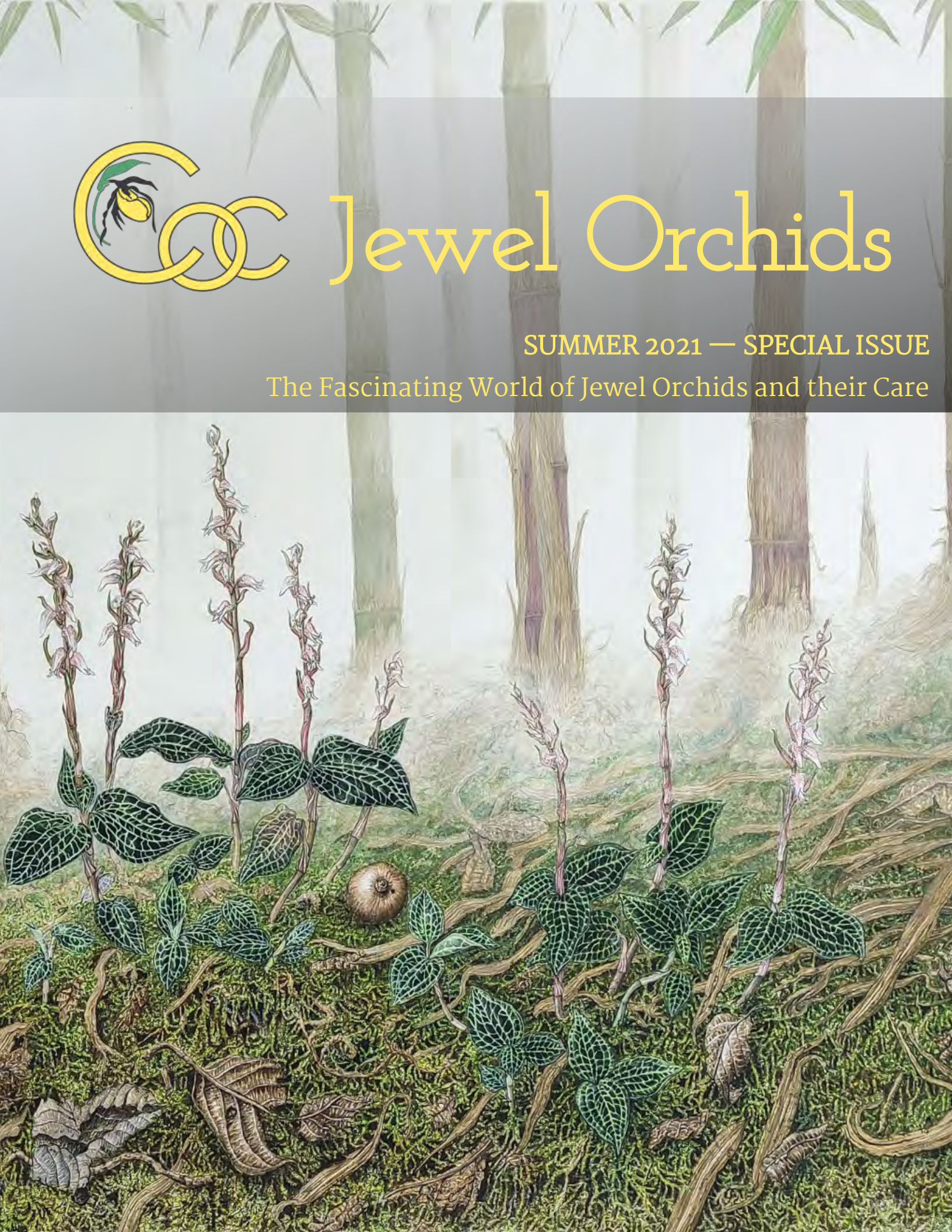
Jewel Orchids

SUMMER 2021 — SPECIAL ISSUE

The Fascinating World of Jewel Orchids and their Care



Credits

Front and back cover: A beautiful painting of "*Goodyera hemsleyana* in its natural habitat" by Hemlata Pradhan.

All pictures in articles, unless otherwise stated, are photographs taken by the author and provided for use in this issue.

Opinions and recommendations expressed in this Special Jewel Issue are those of individual authors and are not necessarily endorsed by the Canadian Orchid Congress, which disclaims responsibility for them.

CANADIANORCHIDCONGRESS

All funds raised are specifically for efforts related to orchid education and the conservation of wild orchids.

If you love jewel orchids and their friends, come and meet some of the contributing authors of this Special Jewel Issue online and unlock more of their secrets.

Canadian Orchid Congress Speaker's Day

What: Zoom Webinar **Registration Fee:** $20 CAD

When: Saturday, August 21, 2021 1 p.m. to 4:15 p.m. EDT (Eastern Daylight Time)

Click here to register: https://www.eventbrite.ca/e/canadian-orchid-congress-speakers-day-jewel-orchids-registration-165532284519

Udai Pradhan, West Bengal, India

Video: *Jewel Orchids of the Himalayas*

Xavier Loubresse, Zuidbroek, The Netherlands

Jewel Orchid Horticulture

Live Q and A

Nicholas Rust, Georgia, USA

Jewel Orchids Culture

Live Q and A

Break (Jewels of the World Slideshow)

Andrew Geimar, Toronto, Canada

Jewel Orchids at Home

Live Q and A

John Alexander, Toronto, Canada

Video: *Jewel Orchids of Canada*

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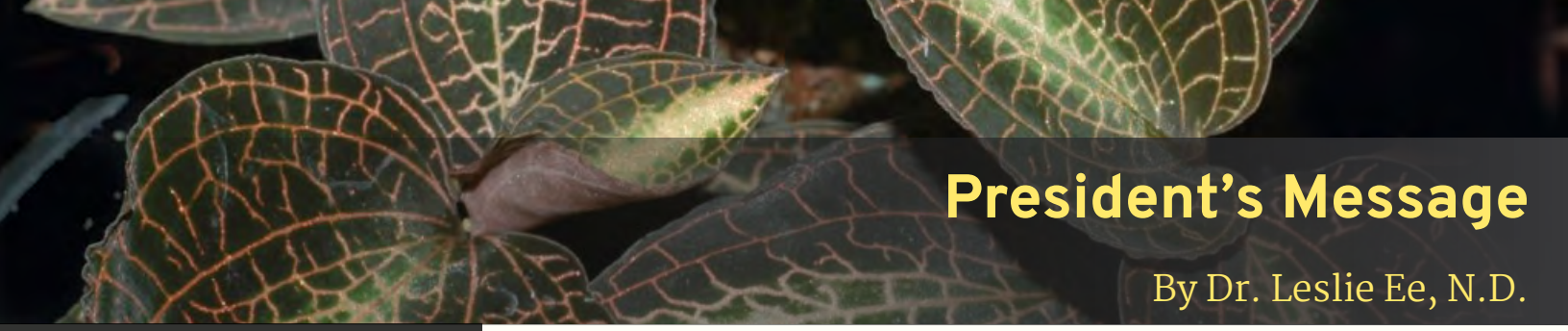


President's Message

By Dr. Leslie Ee, N.D.

The Canadian Orchid Congress (COC) is an association of Canadian orchid societies dedicated to serving the Canadian orchid-growing public. It is federally registered as a non-profit organization. The COC represents affiliated societies and their members on Canada wide issues and promotes the cultivation of orchids through exhibitions, publications, lectures and seminars; it supports the conservation of orchids and it makes awards in the form of medals or trophies for excellence in the development and culture of orchids.

Over the last decade the popularity of jewel orchids has exploded over social media. Sales have risen dramatically. They became so popular that market demand exceeded the availability which has put these orchids at risk in the wild. The advent of tissue culture has allowed more plants to be reproduced to satisfy market hunger and thankfully, the pressure to overcollect these plants has decreased. Harvesting from the natural habitat has ranged in the hundreds (if not thousands) per area in Southeast Asia, wiping out vast populations. Deforestation and land clearing have destroyed their delicate habitat. Conservation efforts are rare in these areas, but a movement by locals, breeders and hobbyists to maintain and continue the species at a healthy population will ensure their survival. On a positive note, these collection trips have led to the discovery of many new species, forms and varieties. These were distributed locally and internationally and used to breed jewels with novel leaf patterns. More breeders entered the scene to produce both old and new hybrids with dazzling colors and patterns. Common brown and red *Ludisia* are now offered alongside green and alba varieties. Some hybrids even produce interesting flowers to complement their stunning foliage.

As more new jewel orchids enter the market with their unique growing requirements, the literature and social media abound with confusing and misleading information. The COC has produced this Special Jewel Issue to address various concerns arising from this popular topic. We have been fortunate to acquire original articles from both well-known authors and new writers with considerable experience growing these unique plants. The combination of old-school knowledge together with novel approaches gives the reader a unique window into the world of these delightful plants.

You will be introduced to the world-wide habitat of the jewel orchids from the low montane forests of India, Burma and Bhutan, to the tropical valleys of Thailand and Indonesia, and even here in Canada. You will explore old and newer hybrids from Europe and Asia and their history. Detailed culture with practical applications and problem diagnosis with solutions for the jewel grower offer you a complete overview of this brilliant group. A compendium of the major genera categorized to be jewel orchids is matched with a stunning centerfold picture gallery. This detailed species list will outline the extensive differences in leaf patterns and varieties with their individual cultural needs.

The COC is grateful to our authors for generously sharing their expertise and to the design team and editors who helped put it together. We are excited to share this comprehensive collation of expert information on this topic with you.

Welcome to the secret world of 'Jewel Orchids'!

Section 1
An Introduction to the Jewels of the World

Editor's Notes on the Use of Jewel Orchids for Traditional Herbal Medicine

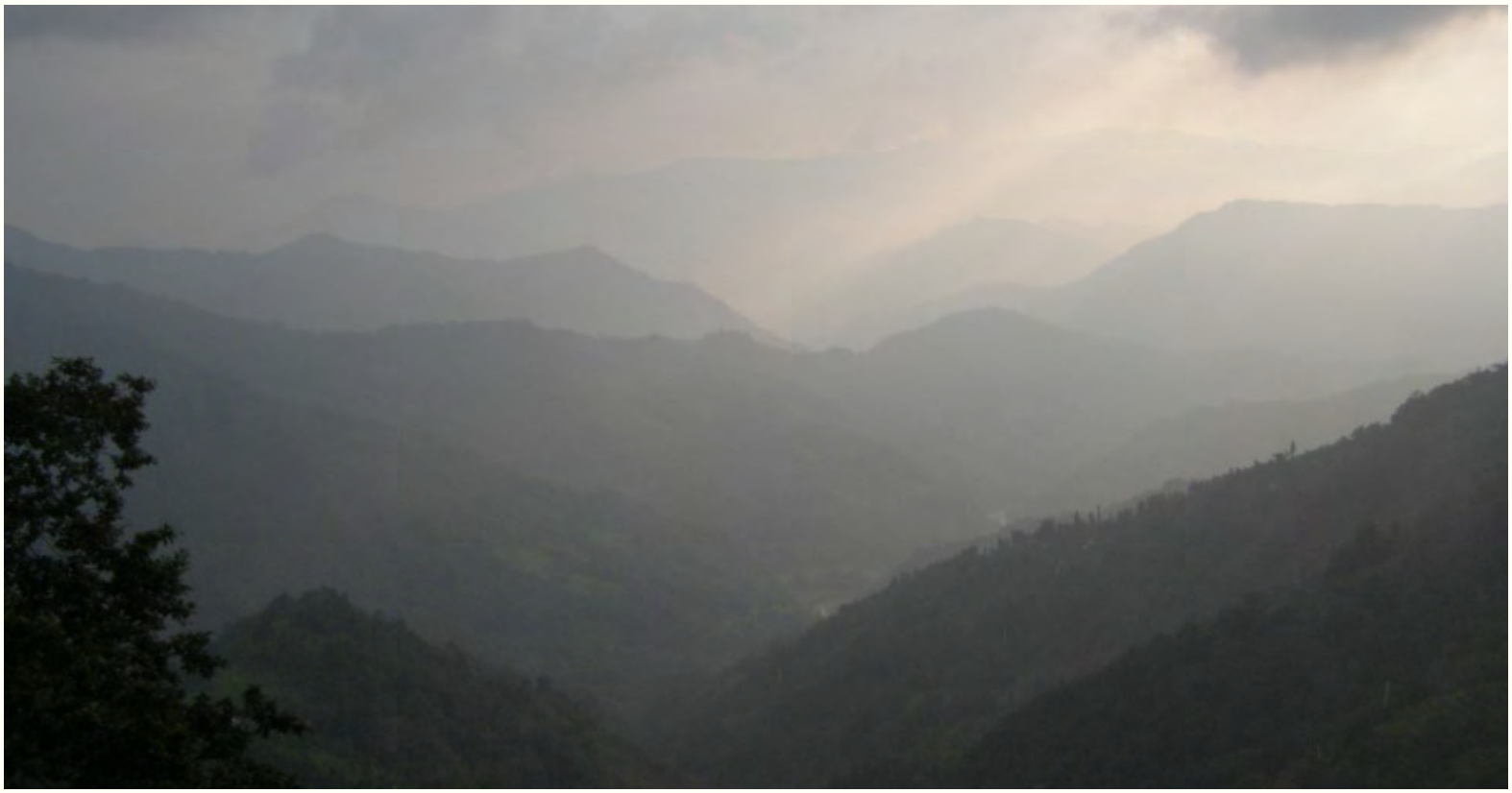
The use of jewel orchids in traditional herbal medicine has not been validated with scientific studies for conventional medical use. However, there are current ethnobotanical studies underway to assess their efficacy. The following is a meta-analysis of the phytochemistry and pharmacology of different orchids, including jewel orchids:

https://www.researchgate.net/publication/267796483_Orchids_A_review_of_uses_in_traditional_medicine_its_phytochemistry_and_pharmacology

Please consult with professionals in regards to the use of any herbal supplement or remedy, and be aware of potential interactions with prescription medications.

Jewels Orchids of the Himalayas

By Udai C. Pradhan, Kalimpong, West Bengal, India



Jewel orchid habitat (photo: Alister Adhikari)

The Himalayan region, having hills of around 500–2000 m above sea level, plays host to more than 600 known orchid species, many of which though highly ornamental are seldom seen in orchid collections. At these altitudes, the hills are cool and breezy and have subtropical to temperate evergreen forests. Copious humidity from the monsoon rains, or from the fog and mists that arise during wintertime from the river valleys, keeps the surroundings moist and humid. The often large trees in virgin forests are covered with dangling lianas and green-black mosses and the dead leaves from trees provide a deep layer of decaying humus that is conducive to terrestrial orchids and many species of ferns and shade loving plants.

One such exquisite group are the jewel orchids because of their highly ornamental and glistening jewel-like leaves. The small mountain streams flowing through provide perpetually wet and moist areas that are suitable for their habitation. The monsoon rains beginning at the end of June last till September, providing high humidity during the growing and flowering period of several jewel orchid species. The rainfall decreases from October onwards but the hills are covered in mists that arise from the valleys. Even during the very dry months of December to May, condensation helps to keep the forest floors moist. It is in these conditions that the jewel orchids make their home and one may come across them in isolated stands or in large breathtaking colonies.

In several instances they can also be found on secondary trees growing in moss, with their leaves standing out against the moss. Any slight changes in the forest canopy can spell disaster for these tender beauties of the orchid world. Clear felling operations, degradation of wild habitats, etc. can literally wipe out populations in a matter of hours. Many of the species have discontinuous, localized distribution, making them most vulnerable.

***Goodyera fusca* with *Cassiope fastigiata* at 5000m (photo: Alister Adhikari)**

The Himalayan region has about 50 species of jewel orchids and more await to be discovered. What intrigues us is their habit, their distinctive floral and vegetative characteristics and the manner in which they have adapted to their surroundings. How and why are they here, and how have such sensitive plants survived and evolved over the millennia? It is therefore imperative that we explore and study their requirements closely and learn to cultivate them. Several species of this subtribe are less attractive in countenance—the aim is to see if we can take care of the seemingly uninteresting ones through our interest in the more beautiful and rewarding ones. This would definitely assist and support the conservation of biological diversity ex situ.

In the preface of our little book, *Himalayan Jewel Orchids*, published in 2005 and released during the 18th World Orchid Conference in Dijon, France, my son Satyam and I had written, "Who knows, the little insignificant ones may one day provide mankind with answers to biological riddles that we are unable to comprehend or address today?" Our assumption rang true when Harvard biologists discovered a bee species, *Proplebeia dominicana*, preserved in amber and carrying orchid pollinarium of a relative of genus *Goodyera* and dated to be over 20 million years old. This fossil, apart from being the first definitive fossil record of the orchid family, indicates that this orchid species was already highly evolved then. This throws the subtribe *Goodyerinae* into the prominence it so urgently deserves.

***Goodyera hemsleyana* in habitat**

Himalayan folklore relates that jewel orchids rose out of the bits and pieces of celestial dresses left behind by fairies, who had once descended on Earth to swim and frolic in a river valley in the Himalayas. In the days gone by, even until about the early to mid-1900s, the menfolk in the Sikkim and Darjeeling Himalayas wore a leaf of the jewel orchid *Anoectochilus sikkimensis* (now *A. brevilabris*) as boutonnieres. They fondly called the jewels *makhamal pate* (*makhamal* = velvet; *pate* = leaved), literally meaning "velvet-leaved." The Nepali tribes call these orchids *seem-phool* (*seem* = wet, moist; *phool* = flower), meaning a flower that inhabits wet and moist places.

***Anoectochilus brevilabris* inflorescence**

Anoectochilus brevilabris* in habitat with *Begonia josephii

Habitat of *Anoectochilus brevilabris* (photo: Alister Adhikari)

The genus *Goodyera* was the earliest jewel orchid genera to be described in 1813 by an English botanist, Robert Brown, in William Aiton's *Hortus Kewensis*. It now comprises 15 species in the Himalayan region. Later, in 1825, Carl Blume established the genera *Anoectochilus, Cheirostylis, Erythrodes* and *Hetaeria* in his *Bijdragen tot der Flora van Nederlandsch Indie*. In 1826, John Lindley established *Zeuxine* in *Collectanea Botanica*. It is apparently the largest jewel orchid genus with some 70 species known to science. In 1837, John Lindley described *Herpysma* in the *Botanical Register* with one species, and again in 1857 the genus *Rhomboda* was established in the *Journal of the Linnean Society*. In 1858, Carl Ludwig Blume erected the genera *Myrmechis* and *Odontochilus*. The genus *Chamaegastrodia* is the most recent and was established by Tomitaro Makino and Fumio Maekawa in *The Botanical Magazine (Tokyo)*. The jewel orchids became extremely popular during Victorian times and much effort was made in growing them to great perfection. They are now gaining in popularity once again as more new species emerge from India, China and South East Asia.

Clockwise from top left: *Anoectochilus roxburghii* in cultivation; *Odontochilus elwesii*; *Zeuxine goodyeroides* in habitat; *Anoectochilus roxburghii* flower

Udai C. Pradhan and his team studying *Zeuxine goodyeroides* in habitat (photo: Alister Adhikari)

Jewel Orchids are rare in cultivation, and more efforts must be made to bring all species into cultivation. Unless well cared for and regenerated through cuttings, seeds and tissue culture, there is a good chance that they may be lost forever. Ex situ conservation is the only sure way of preserving these fragile gems from the ongoing decimation of forests and delicate ecosystems in which they survive. At the turn of the last century, the Orchid Specialist Group (OSG) Chair of the IUCN Species Survival Commission, Dr. Phillip Cribb, Royal Botanic Gardens, Kew, England gave me the task of organizing the Indian Subcontinent Regional OSG, (ISROSG) (1) . I had already been with the OSG since its inception in 1984 and had been involved with the Indian orchid conservation movement since the 1970s. One of the basic goals of the ISROSG is to identify the most endangered species of orchids for red-listing through individuals and organizations making field studies and bringing those endangered by habitat destruction or other factors to cultivation irrespective of their ornamental value.

***Odontochilus lanceolatus* in habitat**

Rhomboda lanceolata

During the first meeting of the ISROSG in Trivandrum, India, it struck me that if any group of orchids were in imminent danger of extinction in the region, it was the jewel orchids. Their rather sporadic distribution, limited population and the direct effect of any environmental changes render these fragile gems of the orchid world most vulnerable. The first species that was assessed immediately after the first meeting of the ISROSG was *Aenhenrya rotundifolia* (2,3,6,7) . Meanwhile, my son Satyam and I began selfing and raising seeds of the species that were ornamental and that would serve as good advertisement for the group (5). The idea was to raise the species found in India using this method so that it can form a base for further research into this group. The isolation and maintenance of mycorrhizal associates would be another important aspect to look into that may have to be undertaken by a more sophisticated laboratory. To date we have cultured several ornamental species successfully, including the very rare and fascinating *Aenhenrya rotundifolia* (6) from South India. Efforts are now on to have all the known species of Indian jewel orchids in culture.

The third meeting of the ISROSG, hosted by the Royal Society for the Protection of Nature (RSPN), in Thimphu, Bhutan in conjunction with the International Year of the Mountain was a great success in terms of bringing about awareness on jewel orchids.

***Aenhenrya rotundifolia* seedlings out of flask**

***Aenhenrya rotundifolia* flowers**

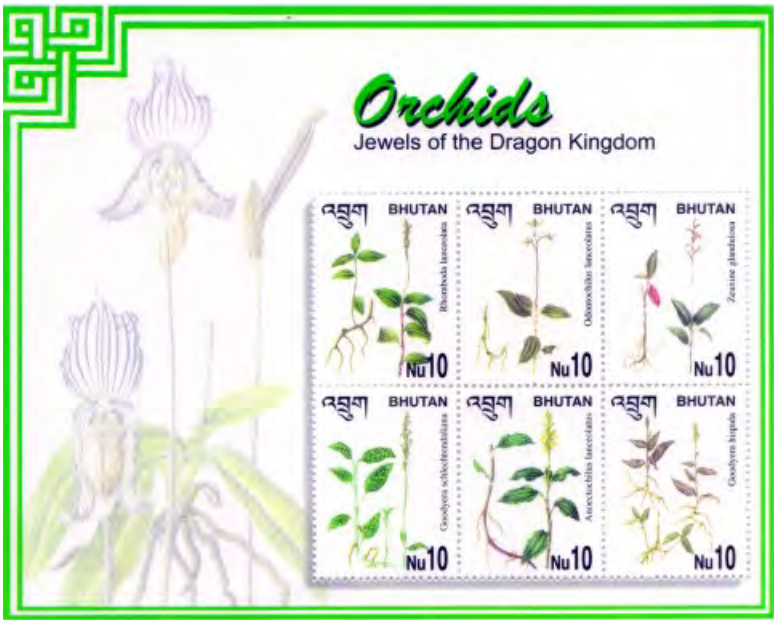
***Goodyera hispida* in cultivation**

***Goodyera schlechtendeliana* in cultivation**

The meeting was inaugurated by Her Majesty, Queen Asi Wangchuk by releasing stamps on the Jewel Orchids of the Dragon Kingdom, produced by the postal department of the Royal Government of Bhutan from Hemlata Pradhan's paintings of the Himalayan jewel orchids that had won her the RHS Gold Medal in 2002 (4) . This was the first time the OSG was also featured on a First Day Cover. Most of these original paintings of jewels were retained by Kew.

Concluding, I would like to take this opportunity to invite everyone growing jewel orchids around the

world to form jewel orchid forums within the auspices of all prominent orchid societies worldwide to enable exchange of seeds, cultures and information with the goal of refining the techniques of growing, studying and conserving them. We should aim to bring to cultivation all 620 and more species in the group and be able to transfer this world plant heritage to our future generations in a more responsible manner. Once again, ex situ conservation is the only sure way of preserving these wonderful gems from the ongoing decimation of forests and delicate ecosystems in which they survive.



A set of six postage stamps of Jewel Orchids of Bhutan for which Hemlata's paintings of the species were used

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Life Membership with the American Orchid Society— Udai C. Pradhan

As a college student, I had been contributing articles to the American Orchid Society Bulletin. In the year 1970 I finally wrote to Mr. Gordon W. Dillon, the then Executive Secretary to the American Orchid Society, expressing my desire to become a Life Member of the AOS. I requested that the accumulated payment for my articles be credited towards payment of the life membership, which was $200 then. My request was accepted and I finally received my life membership card in 1972 with a formal letter of welcome from Gordon. This year, I will be completing 50 years with them while they celebrate their Centenary year. I wish to express my heartfelt gratitude to the Board of Directors of the Canadian Orchid Congress for agreeing to donate part of the funds raised from the Jewel Orchid presentation to the AOS Centennial to celebrate this lifetime event as a token of thanks for this fifty years of friendship.

Udai C. Pradhan photographing *Aenhenrya rotundifolia* (photo: Tej K. Pradhan)

American Orchid Society
INCORPORATED

CERTIFICATE OF LIFE MEMBERSHIP

Udai Ch. Pradhan

The Board of Trustees welcomes you as a Life Member of the American Orchid Society, Inc., elected on April 16, 1972.

Secretary

The AOS Board of Trustees welcomes Udai C. Pradhan as a Life Member

Rattlesnake Plantains, the Jewel Orchids of Canada

By John Alexander, Toronto, Ontario, Canada

The genus *Goodyera* contains over 20 orchid species worldwide, four of which are found in Canada. All four of these species produce a rosette of leaves that lie flat to the ground, or slightly elevated, marked with varying white or light silvery green patterns that are reminiscent of a snakeskin. They also resemble the common herbaceous plantains, (genus *Plantago*) hence the common name 'rattlesnake plantain'.

Like many orchids that have a wide distribution, there are many local or common names that make it difficult to distinguish between the species unless the Latin form is used. In the case of the *Goodyera* genus, many cross-pollinated varieties exist in the field; this also contributes to difficulty in identification. All of them enjoy the partial sunlight near the edge of a damp to well-drained cedar forest.

In addition to setting seeds, this genus reproduces via rhizomes. After each rosette of leaves has produced a floral spike, the tips of the rhizome generate a new rosette that may bloom next. The rosettes that have produced a flower spike can last four years or more. Consequently you may see a large colony of leaves, with minimal evidence of flowering. All four species have a similar blooming time, from early and mid-July through August and even later depending on the season. The floral spikes are topped by up to 50 small white or whitish green blossoms forming a loose spiral or one-sided display. The mouth of the blossom has a somewhat teapot-like shape.

***Goodyera oblongifolia* flowers showing the teapot-like shape of the lip (photo: Sasha Kubicek)**

Goodyera repens (lesser or dwarf rattlesnake plantain)

This species is 5–20 cm tall. The spotted leaf markings of the North American species identify it as var. *ophoides*. This circumpolar species is the only one that can be found throughout Canada. Early settlers may have used a cold tea made from its leaves to treat earache and colds (1).

***Goodyera repens* var. *ophiodes* in situ**

***Goodyera oblongifolia* in situ**

Goodyera oblongifolia (Menzies' or giant rattlesnake plantain)
Distinguished by a light stripe on the centre of the leaves, this is the largest in the genus ranging from 15–50 cm in height.

Goodyera tesselata (checkered or rattlesnake plantain)
This grows up to 35 cm tall. It is formed from a cross between *Goodyera repens* and *Goodyera oblongifolia*.

Goodyera pubescens (downy rattlesnake plantain)
This species grows up to 45 cm tall, but is most often under 30 cm. It is the fuzziest.

Folklore and medicine yield several stories about this genus. German immigrants to Pennsylvania believed that if you stepped on downy rattlesnake plantains, you would become lost in the woods (1). A really good reason to stay on the path! In other references it is noted that the leaves of this genus were used as a poultice for snake bites (2) or chewed to ease pain during childbirth (3) by our First Nations.

The easiest way to find these orchids is to look for their leaves. It is also the easiest way to distinguish between the individual species. This genus has evergreen leaves, so even in the late fall and early winter when

there is only a dusting of snow, the leaves of the *Goodyera* genus can be observed. This enables you to return the following summer to check for blossoms. All of the *Goodyera* species found in Canada have pubescent (hairy) stems.

Our native orchids grow in very specific places, and any disturbances to their environment can result in the death of the plants. Please respect their space and do your part. Like all our native orchids, these should be left in the wild for others to enjoy.

***Goodyera tesselata* in situ**

***Goodyera pubescens* in situ**

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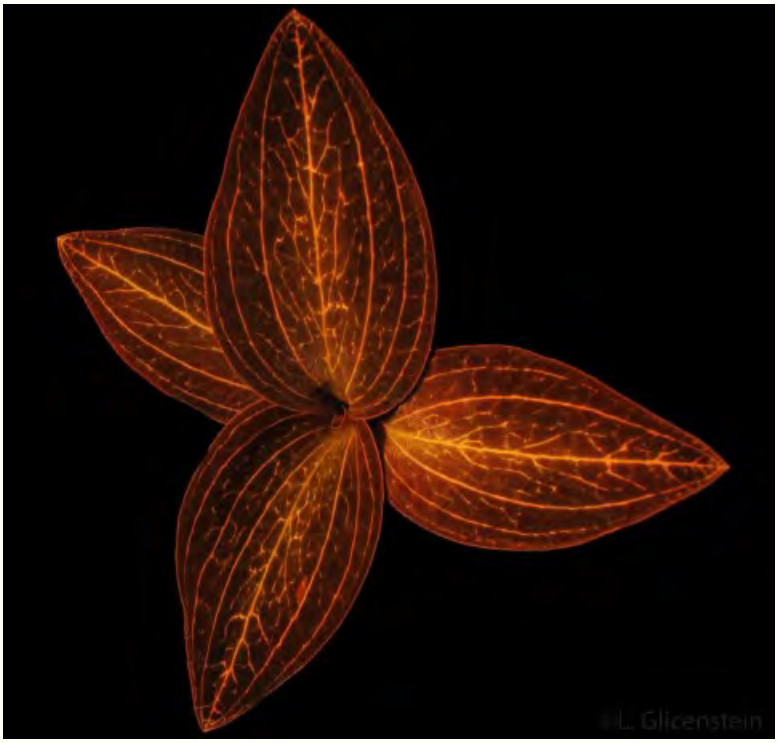
An Introduction to Jewel Orchids and Their Hybrids

By Leon Glicenstein, Ph.D., Indianapolis, Indiana, USA

By training I am a chemist and a plant breeder and, like many, I enjoy making orchid hybrids—sometimes the weirder the better. Many people know that the first artificially made orchid hybrid to flower in 1856 was *Calanthe* Dominii, a cross in modern taxonomic terms of *Calanthe* (*triplicata* × *masuca*). I indicate 'to flower' because there were other artificial hybrids being made and grown at this time, but they had not yet flowered. What many people do not know is that the first artificial intergeneric orchid hybrid was a jewel orchid hybrid. It flowered in 1861 and was first registered as a cross of *Haemaria* (*Ludisia*) *discolor* × *Dossinia marmorata*. It received the name of *Dossimaria* (now *Dossisia*) Dominyi, named after John Dominy, the hybridizer at the Veitch Nursery in England who made the cross. Only three or four other jewel orchid hybrids were made in the 19th century.

I was a breeder for Hoosier Orchid Company in Indianapolis, Indiana, U.S.A. and was interested in making jewel orchid hybrids both for attractive foliage and flowers. At that time, no other jewel orchid plant had ever received a flower award from the AOS or elsewhere, to my knowledge. We began hybridizing them in 1998 and registered a number of jewel orchid hybrids, some of which I will illustrate here. We also created a number of new nothogenera (intergeneric hybrid names).

My first hybrid was made knowing nothing about the history of jewel orchid breeding. I crossed *Ludisia discolor* with *Dossinia marmorata* var.



***Dossisia* Dominyi**

marmorata. Since *Ludisia discolor* was so easy to grow and there could be problems growing *Dossinia marmorata,* I thought that if it took, this would be a good combination. I was pleasantly surprised when I obtained fruits, then seed, then plants. I was amazed when it flowered with white flowers stained with some red. When doing research and about to register it, I found out that I had reproduced the first artificially made intergeneric orchid hybrid some 150 years after the fact. One should always check the literature first!

However, in 2012 I decided to intentionally remake *Dossisia* Dominyi but use other cultivars and varieties of the original parent species. I used the *Ludisia discolor* cultivar 'Sandstone' and *Dossinia marmorata* var. *dayi*. As the seedlings grew, I could

see that there were two foliage forms: one like many of the previous *Dossisia* Dominyi, and another form that was much more attractive. I am calling this new type *Dossisia* Dominyi "Judy", named for my partner. (Editor's note: "Judy" is not a cultivar name but refers to a group of jewel orchid seedlings from the same seed pod selected by the author for their particularly attractive markings). The flowers are identical to those of the usual *Dossisia* Dominyi but the inflorescences, unlike any other jewel orchids, are branched.

***Dossisia* Dominyi "Judy"**

The hybrid *Dossinochilus* Dreamcatcher (*Ludisia discolor* × *Anoectochilus brevilabris*) marked the beginning of a new nothogenus in the hybrid orchid world. It is a fast grower that will rapidly fill in a pot, and is still being propagated by tissue culture and therefore available. The leaf is dark green with metallic copper, silver and gold veins. The flower is about 2 cm long, with greatly enlarged apical lobes when compared to the parents.

Dossinodes (another new nothogenus) Indra's Net (*Macodes petola* × *Dossinia marmorata* var.

***Dossinochilus* Dreamcatcher**

***Dossinodes* Indra's Net**

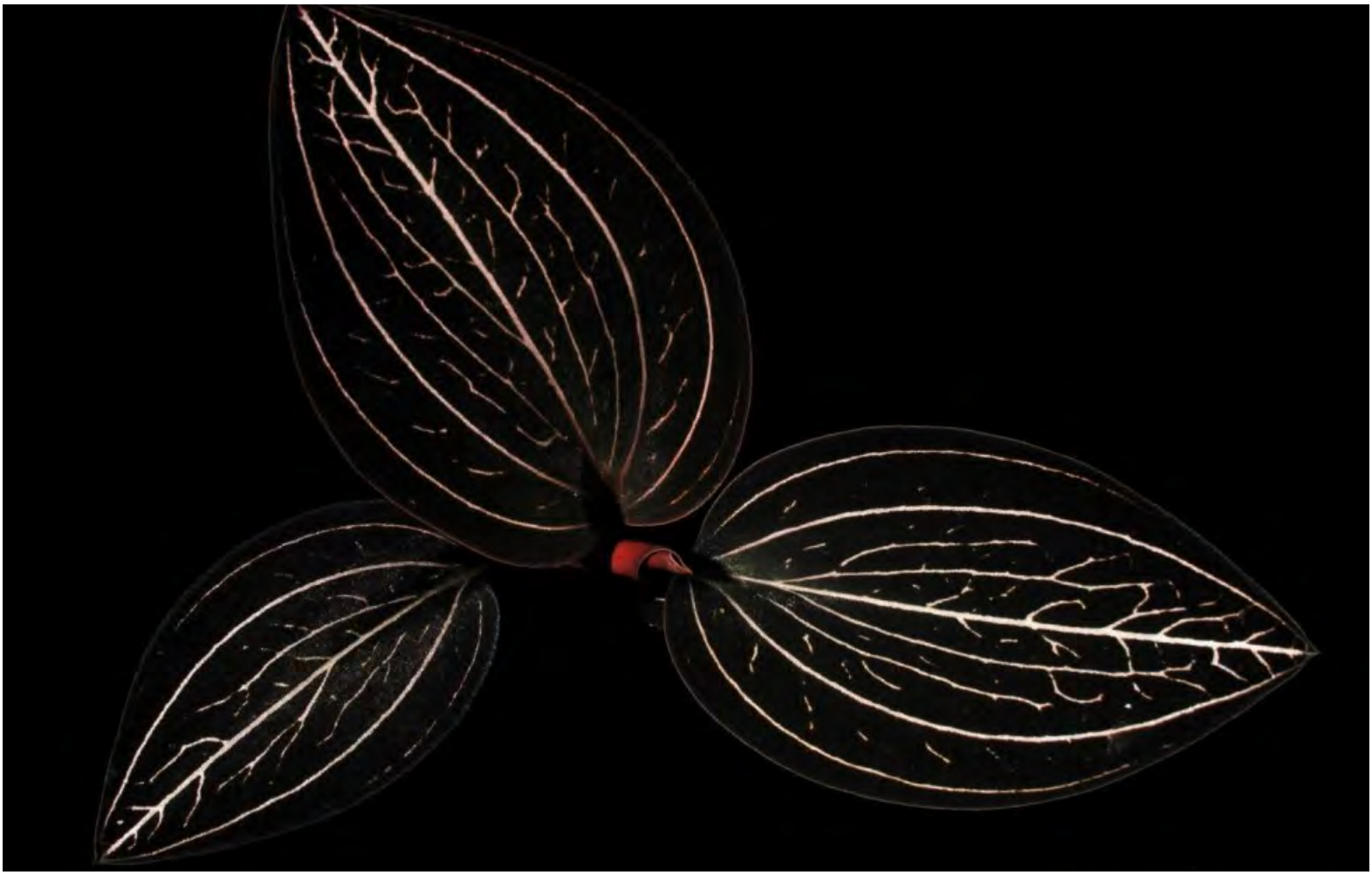
marmorata) is a favorite of mine. The concept of Indra's Net is a Hindu-Buddhist myth first put forward by the ancient Buddhist Tu-Shun. It provides an allegory of the interdependence of all organisms. A net exists around the goddess Indra's palace in the firmament and extends infinitely in all directions like a three-dimensional orb spider's web, with the palace at the center. At each node of the net, where the threads cross, is a perfectly clear gemstone that reflects all the other gems in the net. A change in one gem is reflected in and therefore changes all the others. You can't damage a single strand of the net without setting off a cascade effect of destruction. Also, represented at each node is everyone who is, has been and ever will be. As each gem reflects every other one, so are we all affected by each other and everything else in our environment. The rosette of *Dossinodes* Indra's Net is about 10 cm in diameter with leaves of a dark green color, and neon-like veins of glowing gold and copper. You would definitely not grow this for the flowers.

Another new nothogenus was created with *Dossinia marmorata* var. *marmorata* × *Goodyera pubescens*. Registered as *Dossinyera* Tapestry, this is possibly one of my favorite jewel orchid hybrids. It is a cross of a tropical jewel orchid from Borneo in the Old World and a temperate one from Indiana, U.S.A. in the New World. It is also a cross of a plant from the Northern Hemisphere with one from the Southern Hemisphere. I really never expected the cross to take. The rosette is about 10 cm in diameter. The leaves are variable in venation, dark green with veins of white and many hues of pink and salmon colour. The plants try to flower, and they do put up a flower spike with buds, but the buds never open. I did pry some open, as I wanted to attempt further breeding to obtain cold hardy jewel orchids, but this plant wanted to be a dead end. There were absolutely no sexual parts in the flowers.

***Dossinyera* Tapestry**

We did send some plants to be planted outside in Prunedale, California, where they would get winter cold and even some snow, but not the hard cold of Indianapolis, Indiana. The plants came through the winter only to be eaten by black-tailed deer the following spring. So I guess they are tasty as well as hardy.

I made a hybrid that I registered as *Ludochilus* Friar Tuck (*Ludisia discolor* × *Anoectochilus burmannicus*) which did have nice flowers, though



Top and right: foliage and flowers of *Ludochilus* Tuck's Angels 'Judy'

the foliage was not that great. Because I liked *Ludochilus* Friar Tuck but not its foliage, I decided to try a back-cross to the veined *Ludisia discolor* parent. The results were interesting.

A few seedlings had beautifully veined leaves, just as I wanted. The best of them were a dark green with bright silver veins. Finally, the plant produced a flower spike with a good head of flowers. The flower's natural spread was about 2.54 cm. The sepals were rosy salmon-pink, the petals white, and the lip pale yellow that faded to white. This backcross was registered as *Ludochilus* Tuck's Angels. I liked it so much that I took it to an AOS judging, and it became the first jewel orchid to

receive a flower award from the AOS—with a HCC (Highly Commended Certificate). Now I have to breed to get an AM (Award of Merit), the next step up, while still keeping beautiful foliage.

My most recent hybrid, registered in January 2020, is *Godisia* Spanish Shawl, a hybrid of *Goodyera pusilla* × *Ludisia discolor* cultivar 'Sandstone.' The rosette is about 8 cm in natural spread, the leaves dark green with reddish overtones, and copper venation with a broad copper longitudinal stripe in the center of the leaf. I had been hoping for a central silver overlay, like that which is found in *Goodyera pusilla*, but it didn't happen.

This article is just an introduction to the world of jewel orchid hybrids. There is so much more that can be written about them, so many more species to see and grow and much more breeding to be done. I have barely touched on the potential. I continue to do breeding, but now have a limited number of plants in my small collection under lights. However, anything that comes out of breeding this fascinating group of plants, whether by me or someone else—like Mike Dorris in the United States or Charlot Teng in Taiwan—can eventually lead to more beautiful plants for our collections, be they grown in a greenhouse, terrarium, windowsill or under lights.

***Godisia* Spanish Shawl**

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Jewel Orchids in Europe

By Xavier Loubresse, Zuidbroek, The Netherlands

Jewel orchids have been popular since the 19th century in Europe. Along with *Disa*, they were both easy to grow and popular potted plants in those days. In fact, the industrial culture of *Ludisia discolor* has been continuous since then in Belgium, Germany and Holland. Some nurseries in the 1980s–1990s specialized solely in *Ludisia*. The only species that was commercially cultivated and propagated was *Ludisia discolor* and this was for a simple culture reason we will see later. (Editor's Note: The author's horticultural guide will be at a later section of this issue.) During this decade *Macodes*, which had been long gone from culture, reappeared in large batches on the potted plant market; there were massive imports of *Paphiopedilum sukhakhulii* and *callosum*, *Macodes petola* and other *Macodes* species which were sold as potted plants all around Europe. These species were more of a pot-grow-sell-throw away model than a planned production crop.

Albeit not in Europe, jewel orchids have remained extremely popular in Russia. Very old *Macodes* cultivars, some extremely rare today, as well as plants coming from countries that were allied to the old USSR, such as Vietnam, were cultivated. There was even a specific club for jewel orchids in Russia. In the 90s, orchid collector Igor Belitsky brought a lot of interesting varieties to Europe as well; most of them disappeared (died due to a lack of understanding of their culture). He exhibited them at various orchid conferences around Europe and was in those days the only one to bring new species to Europe. During those times, *Macodes petola* plants were being exported from Indonesia to Europe, where they were potted, sold and disappeared after a while.

More recently in the 2010s, some European nurseries started to propagate different varieties of *Ludisia* along with *Macodes petola*, as well as a couple of plants that are said to be hybrids of *Anoectochilus chapaensis*, on a much larger scale. In addition, there is a strange plant in circulation under the name of *Macodes sanderiana* that does

Goodyera ustulata

not look like the natural wild type. It is much more compact and might well prove to be a hybrid. Several nurseries in Taiwan and Thailand started to offer a lot of hybrids, sometimes as new species, with a very poor record of the breeding involved. Clearly some are complex hybrids, like some *Ludisia* varieties that are hybrids with *Anoectochilus*. These are becoming increasingly common on the European market, with three nurseries specializing in them now in the Netherlands. It is anticipated that, due to their success, more nurseries will propagate them for sale, though without a good track record on their true species identification.

One mass use of *Anoectochilus* (and anything related) in Vietnam and China is for traditional medicine. They are sold in bulk, and different healing properties are attributed to them based on the leaf patterns and rarity. For example, albino varieties are said to be the absolute best to control some cancers. The damage done to the plant colonies in the wild is extensive, with Laos and Myanmar (Burma) selling many species, some unknown to science, by the kilogram to China for medicinal purposes. Some people feel that these plants are inefficient and might be useless medicinally. This is similar to the poaching of the endangered rhinoceros for its horn. When people are in critical condition, such as end-stage cancer, it is understandable that they try everything that is said to work. It is also to be noted that wild plants are the only ones acceptable. The artificially propagated ones, such as *Anoectochilus formosanus*, have a very marginal use in traditional medicine. The 'forest power' is said to be transferred to the plants themselves when they grow in the wild. As such, propagating them to avoid mass extermination is futile. (Editor's Note: Please see **Notes on the Use of Jewel Orchids for Traditional Herbal Medicine** on page 2 at the beginning of Introduction to Jewels of the World .)

Out of these mass collections, some suppliers buy batches and sell them to the hobby market. There has been an epidemic of exports as well, but the biggest shame is that most of those plants will be dead within some months or a year. In truth, it is important that a few of each of those wild collected batches be propagated, which is not the case as of now. Many new varieties and forms exist in the wild and can be extinct overnight due to overcollection. Other than jewel orchids, many *Dendrobium* species are also overcollected for traditional medicine. As artificially propagated ones are deemed 'energetically' powerless and worthless, there does not seem to be a satisfying solution that will allow preservation of species in the wild. A lot of wild jewel orchids sold as of now, except for those in Malaysia, Indonesia and the Philippines, are a by-product of mass poaching for the 'medicinal' industry. Plants are small and tons are needed each year. I will always remember several boxes of huge *Anoectochilus chapaensis* (syn. *brevilabris*) being picked up from a local collector in Vietnam by a Chinese dealer.

Clearly no species can sustain such levels of collection! I expect this practice to stop when the plant colonies are truly extinct, then hunting in different countries such as India will start. We saw this when Myanmar (Burma) began to open and massive outflows of *Dendrobium* and jewel orchids started nearly immediately. Artificially propagated plants, provided that they are not accidentally hybridized, will be the only thing that remains of the many species of jewel orchids.

Jewel Orchids of Thailand and Their Herbal Powers

By Peeraya Inpanich, Bangkok, Thailand

In Thailand, jewel orchids are immensely popular as ornamental plants. They are unique orchids that stand out, especially because of the leaves that have strange and beautiful glowing patterns. Therefore, they have earned the nickname 'Jewel Orchid'. There are many species that originate in Thailand. They can be found in the eastern and southern regions of Thailand, but only by streams or near rainforests and mountains.

In the Thai marketplace, because they are popular as ornamental plants, jewel orchids sell well. They are also 'toxin-reducing' plants that can decorate the office or home. The beautiful and distinctive nature of the leaves makes this type of orchid more in demand in the ornamental flower market.

The jewel orchid is a plant that needs dappled light and cool temperatures. It must be planted in the shade,

Left: *Ludisia discolor* growing in the wild; Right: *Ludisia discolor* 'White Marking' in cultivation

such as in a courtyard outdoors, or indoors with light exposure. To grow jewel orchids well in Thailand, where the weather is usually hot, they are grown in glass jars with sphagnum moss, or in a cabinet that controls the humidity. If they are placed in an air-conditioned room, the sphagnum moss will dry slowly, and the plant will need to be watered less often. They should be fertilized one to two times a month.

Normally, this type of orchid is propagated in nature by the dispersal of seeds, which have a relatively low germination rate, making reproduction terribly slow. The introduction of tissue culture technology to propagate them under sterile conditions, while controlling various factors in growth, has proven to be very successful.

Young jewel orchid plants grown in sphagnum

Top and above: propagation of jewel orchids in sterile jars

However, there are other properties less known about these endearing plants. There are also important substances found in these orchids such as alkaloids that are used in traditional medicine. While eating a lot of this orchid can cause side effects like vomiting, its medicinal properties are many if taken at lower amounts in the appropriate dosage. It can be used for an upset stomach and relief of colic distension. It can also help expel air in the intestine, be used as an expectorant remedy and relieve asthma symptoms. Because of its usefulness, there is a lot of demand for it in the local Thai market.

It is no surprise that there is a worldwide market for jewel orchids for their outstanding beauty as well as their medicinal properties. For example, in India they are used for a variety of ailments. The plant can be chewed or eaten for cold and sore throat relief. It can be prepared as a laxative. All parts of the jewel orchid are 'fragrant'. The essential oils can be extracted and used for inhalation medicine. It can be made into tea or boiled with chicken soup. It can help relieve seizures in traditional medicine. In China, jewel orchids are in demand as a herbal medicine, increasing the sale of these orchids under the 'food' category. Permission under CITES must be requested for international export in this case.

Who knew that jewel orchids are both ornamental and medicinal at the same time? (Editor's Note: Please see **Notes on the Use of Jewel Orchids for Traditional Herbal Medicine** on page 2 at the beginning of Introduction to Jewels of the World.)

Jewel orchids and other tropical plants for sale at a marketplace in Thailand

Breeding of Jewel Orchids in Taiwan

By Charlot Teng, Taipei, Taiwan

Many people have seen Charlot Teng's beautiful jewel species and hybrids on social media. They are indeed stunning and in high demand. Due to limited germination and low seed production, they are rarely available.

The following interview with Charlot Teng, jewel breeder extraordinaire, was conducted through email for this issue. (Editor's Note: The original answers were revised for clarity.)

Tell us about your journey breeding jewel orchids and your favourite hybrids.

Even though I have kept jewel orchids since my teens there are still many limitations for me, especially the hot summers and the low humidity inside the house. These difficulties often stopped me from growing them. It was only after I started to collect many *Begonia* species that I thought, "Why don't I care for jewel orchids the exact same way I care for *Begonias*?" It was then that I started to be successful.

Clockwise from top: *Anoectochilus* hybrid × *Ludisia* discolor; *Anoectochilus* spp. 'Creamy Center'; different variations of the *Anoectochilus* species in Charlot's collection

Although in Taiwan, there is the famous *Anoectochilus formosanus*, I didn't have much interest in this plant since I found it did not live long in the city. It is a cool climate plant, native to the high cloud forests. It does not last long in the lowlands once collected from the wild; it had not yet been protected by law at that time. Instead, I used *Ludisia discolor* that was introduced to the horticulture market from Hong Kong, which was an easy grower but not as beautiful as the Taiwan species.

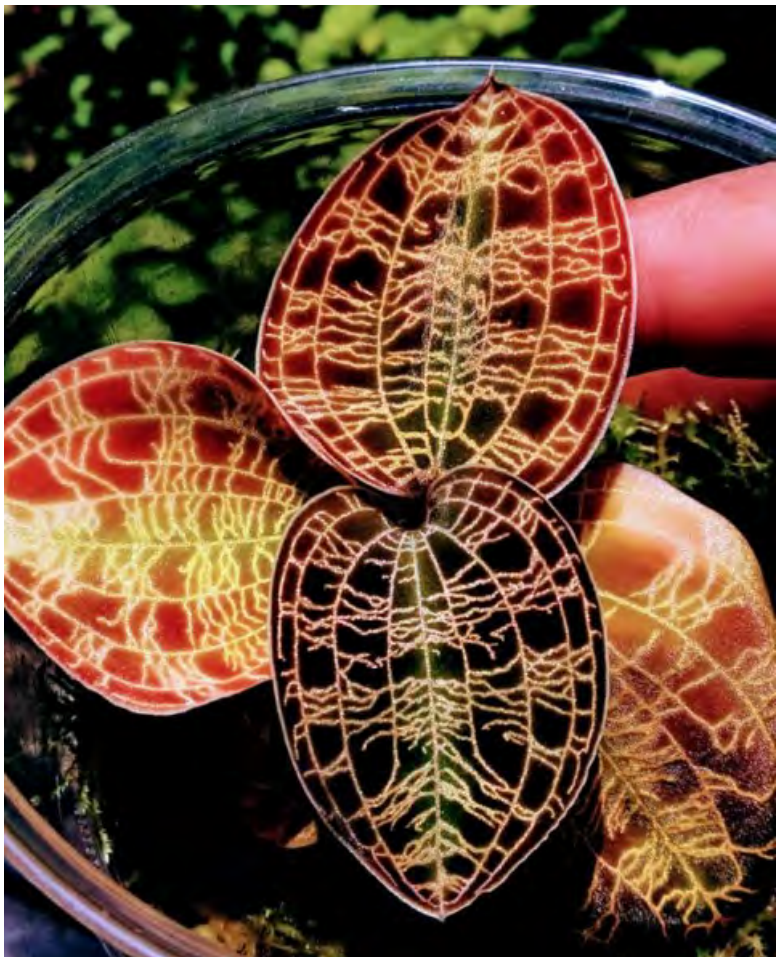
I then started to hybridize jewel orchids with *Anoectochilus siamensis* (syn. *albolineatus)* from the market. It is a nice species with shining colors on its midveins. Then I was lucky that I met a Ukrainian grower who kept many stunning jewel orchids and we exchanged some plants. I got several nice Eastern European *Anoectochilus* cultivars, similar to some nice Russian *Anoectochilus* I saw at the Tokyo Dome Orchid Show. I started to cross them with my *Anoectochilus siamensis.* Later I visited the famous US orchid nursery website, Hoosier Orchid Company, and learned that these orchids could be crossed with other closely related genera. This is when I started to create the jewel intergeneric hybrids that everyone sees today.

How do you grow your jewel orchids?

They are grown in small grow pots and then placed inside taller clear plastic cups. I keep them separated from other orchids to protect them from fungal infections. All of them are in terraria but some like *Ludisia* or a few stronger hybrids are kept outdoors all year round at low temperatures. Plants like *Anoectochilus* can be kept in an air-conditioned room in the summer, but in winter they are put outdoors in Taiwan. However, *Dossinia* are warm growers and it is best to keep them in a heated room for the winter.

Left: *Anoectochilus* Ukrainian hybrid × *Anoectochilus siamensis*; Right: *Anoectochilus* hybrids in 2020

Goodyera usturata × *Macodes sanderiana*



Above: ***Dossinia marmorata* × *Macodes limii*;**
Right: ***Macodes sanderiana* × *Macodes limii***

What water do you use?

I use tap water directly to water my jewel orchids. Our water in Taipei has low TDS (total dissolved solids) with a pH between 7 and 7.2.

What do you use to treat fungal infections such as Fusarium oxysporum?

I spray them with *Bacillus amyloliquefaciens.* (Editor's note: This is present in some biological products such as microbial inoculants that may not be available in Canada. Much like probiotic cultures help protect and promote human intestinal health, microbial inoculants can help fight fungal and bacterial infections in plants.)

Do you flask yourself? If so, what media do you use?

I have no time for this. I send seed pods to an orchid flasking laboratory to do it for me.

How do you grow from flask? Do you pot into sphagnum or soil mix in a dome?

I keep the seedlings in sphagnum moss with some perlite pot mix. They are kept in as small a growing pot as possible and then put into a taller clear plastic cup. They are separated once they are larger.

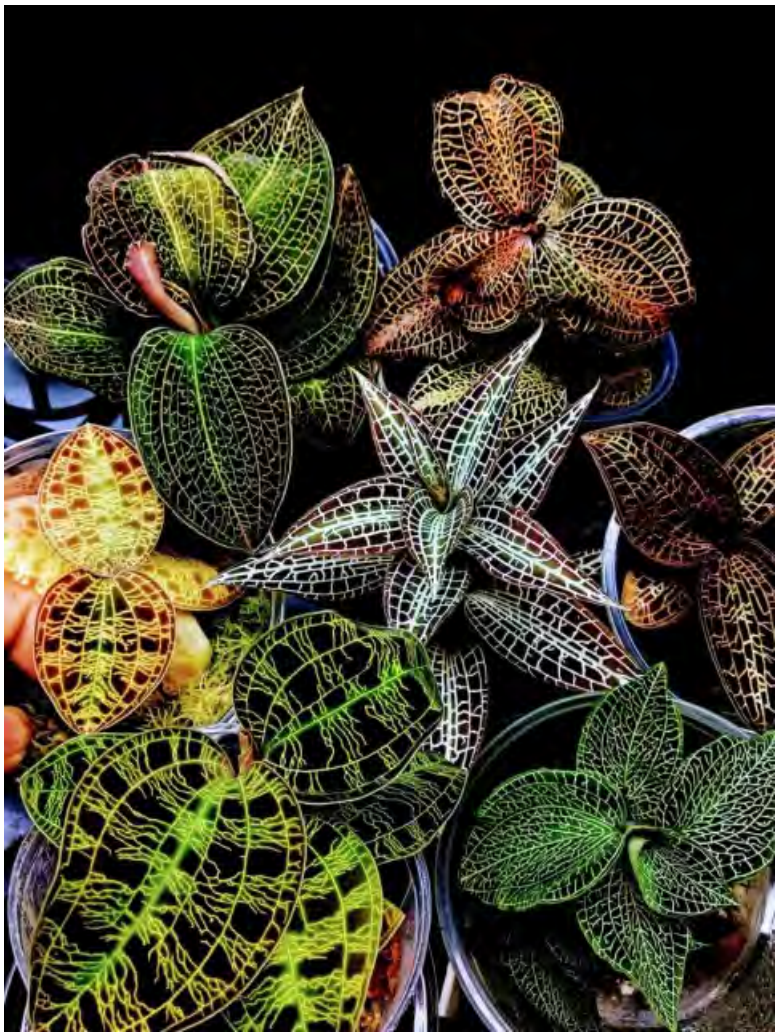
How long does it take to grow to adult and flower from flask?

This is not a simple question. I create a wide range of hybrids including intergeneric ones. All of them bloom at different maturities. Some of them can bloom when they are very small, but this uses up energy so these plants will need a longer time to grow to a mature size. This situation often occurs with intergeneric hybrids.

Do you have new hybrids coming out? If so, can you give an example?

I have made several hybrids of jewel orchids. A lot of time is spent waiting for the laboratory to send me back the flasks. Not all the crosses are successful even though the plants produce seed pods. Less than half germinate in the flasks at the final stage. I had one cross, *Anoectochilus* x *Ludisia*, where one seed pod produced only two seedlings in a single flask! My newest breeding is a cross of *Macodes sanderiana* with an unknown *Anoectochilus sp.* from Laos.

Variations of the gold veins in different jewel orchid hybrids



Various species and hybrids by Charlot:
***Goodyera pusilla* (centre);**
***Macodes limii* (top right);**
***Anoectochilus roxburghii* 'Green' (bottom right);**
***Macodes petola* (bottom left);**
the rest are hybrids or intergeneric hybrids

Culture Tips

Here are some of Charlot's secret tips for the care of jewel orchids:

- Air humidity should be high and remain stable.
- Keep temperatures cool with the night temperature under 22°C in the summer.
- Watch for mites and be very wary of *Fusarium oxysporum*. Treat with biological agents.
- Jewels do not like to be overwatered, preferring a mix that retains moisture that dries slowly without being damp (too long). Water as they approach dryness.

Section 2
A List of Jewels in Cultivation

The Mystery of the Red Devil Jewel

By Dr. Leslie Ee, N.D.

Jewel orchids are some of the most beautiful orchids in the world with their glittering, colourful and velvety foliage. The many species and hybrids in different genera offer a specific pattern for everyone. The one that drew me compulsively into the world of jewels was the mysterious one labeled as 'red' *Ludisia discolor* from Southern Thailand. The stunning black foliage of this beautiful cultivar is lined with contrasting blood red veins on the outer edges and a large central orange-red stripe with dendritic side branches that look like little lightning bolts. I unofficially called them 'Red Devils'

They had apparently been discovered in the deep forests and their coordinates were kept secret. Appearing in Thai markets about two years ago, cuttings sold at a very high price of around $100 USD. Since then, they have been propagated locally and sold overseas.

There is a shroud of mystery about this jewel orchid. There are several horticultural varieties of *Ludisia discolor* that look similar to the 'Red Devils'. A horticultural variety 'Salmon Sandstone' was coined by Leon Glicenstein many years ago that has the same pattern. This variety has four colour forms: alba, red, dark and yellow. As a result, the possibility that the 'Red Devils' may be a sib cross of these different varieties or even an intergeneric hybrid has been rumored. No one knows.

With so much confusion, it is critically important that plants are labeled and tagged correctly. With the ever changing world of taxonomy, based on new DNA evidence and the review of old literature, many jewel orchids have been reclassified and renamed. Today's name may be different tomorrow. The compendium that follows has been updated to the date of this publication.

It is just as critical to conserve the habitat of these precious plants in the wild. Protection of all orchids by local governments and international CITES can only work if end consumers, like ourselves, ethically source orchids that are not wild collected.

A Compendium of Jewel Orchids

By Andrew Geimar, Toronto, Ontario, Canada

Welcome to the family of jewels! Most are classed in the subfamily *Spiranthoideae*, under the subtribe *Goodyerinae,* with as many as 30 genera and over 500 species. However, the term 'Jewel Orchids' is often used to describe a family of plants that are not necessarily related to each other.

This section will introduce the budding grower to the more commonly seen jewel orchids along with a brief description of the species and their cultural requirement needs. Photos of the various species will be included in the gallery section. (Editor's note: Taxonomy is an ever-changing science, therefore some of the species listed here are currently synonyms of each other.)

Anoectochilus roxburghii

Aspidogyne argentea

Anoectochilus

This jewel requires more care than most. *Anoectochilus* has a thin rhizome and is therefore more sensitive to drought. It is best grown in a terrarium with preferred intermediate temperatures and stable ambient humidity conditions. Commonly found species from this genus include *Anoectochilus albolineatus, Anct. burmannicus, Anct. geniculatus, Anct. longicalcaratus, Anct. reinwardtii, Anct. roxburghii* and *Anct. siamensis* (syn. *albolineatus*).

Aspidogyne

This jewel is found in South America. Some plants in the genus *Aspidogyne* have a beautiful silver/glitter effect on their leaves. They are considered easy to grow. They grow well in high humidity. Some are cool growers. Most commonly found species from this genus include *Aspidogyne argentea, Apg. commelinoides, Apg. fimbrillaris, Apg. foliosa, Apg. mystacina, Apg. peteriana, Apg. querceticola* and *Apg. tribouillieri.*

Cheirostylis

Found in New Guinea, Southeast Asia and the islands of the Western Pacific, these jewels are smaller in size, have velvety leaves and are warm growers. The most commonly found species from this genus include *Cheirostylis flabellata, Cs. griffithii, Cs. montana* and *Cs. ovata.*

Corybas

Corybas is from another group of terrestrial orchids, not related to the usual group of jewel orchids. Its leaves and flowers are beautiful. The velvet-like leaves have pink veining and these plants are typically warm growers that prefer high humidity. They have a tuber-forming growth habit. The most commonly found species from this genus include *Corybas circinatus, Cbs. diemenicus, Cbs. geminigibbus, Cbs. himalaicus, Cbs. incurvus, Cbs. pictus* and *Cbs. serpentinus.*

Cyclopogon

This genus often grows in the branches of trees, or mossy clumps. They are easy to grow. They like small pots and prefer to be root-bound due to their epiphytic nature. Some are cool growers. The most commonly found species from this genus include *Cyclopogon chloroleucus, Cycl. cranichoides, Cycl. elatus, Cycl. lindleyanus* and *Cycl. peruvianus.*

Cystorchis

Cystorchis is another jewel orchid with velvety leaves. It remains small in size throughout maturity. These are typically warm growers that prefer high humidity. The most commonly found species from this genus include *Cystorchis aberrans, Cyor. celebica, Cyor. javanica, Cyor. stenoglossa* and *Cyor. variegata.*

Cyclopogon sp.

Cystorchis stenoglossa

Dossinia

This genus has some of the most beautiful leaves of the jewel orchids. *Dossinia* is found in Sarawak and its surrounding regions. It is susceptible to rot and its potting mix must be allowed to completely dry out before watering. It likes a lot of air movement and is an intermediate to warm grower. The only species in this genus is *Dossinia marmorata.*

Goodyera

With an upright growth habit, jewels in the genus *Goodyera* produce rosette forming leaves, similar to orchids in the genus *Spiranthes*. They are native to Europe, Mozambique, North and Central America and Australia. They can be cool to warm growers depending on their origin and habitat. The most commonly found species in cultivation from this genus include *Goodyera biflora, G. daibuzanensis, G. hachijoensis, G. hispida, G. pusilla, G. rostellata* and *G. viridiflora.*

Ludisia

Ludisia is one of the most popular genera of jewel orchids because it is easy to grow due to the thickness of its rhizomes. It can stand being grown at a lower humidity than most jewel orchids. While only one species is included in this genus, *Ludisia* does come in various colour cultivars and varieties including *alba, nigrescens,* 'Ambrosia', 'White Center' aka 'Sandstone' and many other unidentified types.

Clockwise from top: *Goodyera daibuzanensis; Ludisia discolor* var. *alba; Dossinia marmorata*

Kuhlhasseltia

This jewel is rare in collections. A warm grower, *Kuhlhasseltia* is native to China, Southeast Asia and New Guinea. The most commonly found species from this genus include *Kuhlhasseltia javanica, Kuh. papuana* and *Kuh. rajana.* (Editor's note: As of this printing the genus *Kuhlhasseltia* has been changed to *Odontochilus (Odt.).*)

Macodes

Macodes is one of the most commonly grown genera. It has been in cultivation for a long period of time and is a warm grower that prefers stable conditions and is sensitive to humidity changes. It produces colonies after flowering. The most commonly found species from this genus include *Macodes cominsii, Mac. dendrophila, Mac. limii, Mac. petola* and *Mac. sanderiana.*

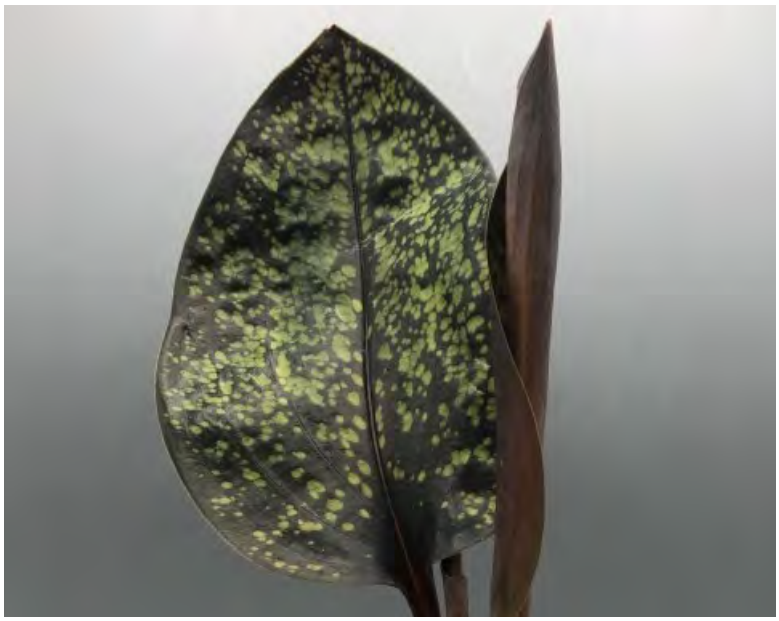
Malaxis

Another genus of orchids, somewhat related to jewels is *Malaxis.* Its culture is similar to that of jewel orchids and is quite popular. This species is a warm grower, but often has a dormant rest period in winter when watering needs to be limited. The most commonly found species from this genus include *Malaxis bayardii, Mal. calophylla, Mal. latifolia, Mal. metallica* and *Mal. uniflora*. (Editor's note: Some *Malaxis* species such as *Mal. calophylla* and *Mal. metallica* have undergone a name change to the genus *Crepidium* as of this printing. In addition, *Malaxis latifolia* is now *Liparis latifolia*.)

Nephelaphyllum

Found in Southern China, the Himalayas, Indochina, Indonesia, Malaysia and the Philippines, *Nephelaphyllum* are mostly warm growers and have a climbing habit. They can tolerate high moisture levels in soil and ambient air temperatures. The most commonly found species from this genus include *Nephelaphyllum pulchrum* and *Nep. tenuiflorum.*

Top: *Macodes petola* 'Kalimantan';
Right: *Malaxis calophylla*



Nervilia

Known as shield orchids due to the oval shape of their leaves, *Nervilia* are found in the Pacific and Indian Ocean islands, Australia, the Southern Himalayas and sub-Saharan Africa. This genus has normal shaped flowers. The most commonly found species from this genus include *Nervilia aragoana* (syn. *concolor*), *Ner. crociformis* (syn. *simplex), Ner. plicata* and *Ner. punctata.*

Pelexia

This genus is found in Latin America, the West Indies and Florida. *Pelexia laxa* produces large leaves similar to aroid leaves. It grows well in soil. When in flower, it produces long spikes with green flowers. The most commonly found species from this genus include *Pelexia adnata* and *Pel. laxa.*

Vrydagzynea

Native to India, Taiwan and Southeast Asia, *Vrydagzynea* is warm growing and prefers a terrestrial soil mix. It has a rosette type growth habit. The most commonly found species from this genus include *Vrydagzynea albida, Vry. elata, Vry. purpurea, Vry. tristriata,* and *Vry. weberi.*

Zeuxine

Very little is known about this genus. A cool to warm grower found in Laos, Vietnam, Nepal, India and China, this genus is primarily composed of terrestrial, perennial and deciduous sympodial types with a fleshy, creeping rhizome. The most commonly found species from this genus include *Zeuxine formosana* (syn. *nervosa*), *Zeu. hengchuanense* (syn. *nervosa*) and *Zeu. nervosa.*

From top: *Nephelaphyllum sp.* (possibly *pulchrum); Pelexia laxa; Vrydagznea tristriata*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1. *Anoectochilus roxburghii* 'Vietnam' (Peeraya Inpanich)
2. *Anoectochilus siamensis* 'White Center' var. green form (syn. *albolineatus*) (Andrew Geimar)
3. *Anoectochilus* sp. (Peeraya Inpanich)
4. *Anoectochilus siamensis* 'White Center' var. pink-gold form (syn. *albolineatus*) (Andrew Geimar)
5. *Anoectochilus geniculatus* × *Ludisia discolor* var. *alba* (Andrew Geimar)
6. *Anoectochilus roxburghii* 'White Gold' (Andrew Geimar)
7. *Anoectochilus* sp. 'Vietnam' × 'Red Veins' (Andrew Geimar)
8. *Anoectochilus* sp. 'Vietnam' × 'Red Veins' (Andrew Geimar)
9. *Aspidogyne argentea* (Andrew Geimar)


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1. *Cyclopogon lindleyanus* (Aaron Coleman)
2. *Cyclopogon lindleyanus* (Aaron Coleman)
3. *Cystorchis stenoglossa* (Leslie Ee)
4. *Dossinia marmorata* 'Dark' (Andrew Geimar)
5. *Dossinia marmorata* 'Titan' (Andrew Geimar)
6. *Goodyera pusilla* 'Galaxy' (Leslie Ee)
7. *Goodyera daibuzanensis* (Andrew Geimar)
8. *Goodyera hispida* (Andrew Geimar)
9. *Goodyera hispida* (Leslie Ee)


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1. *Ludisia discolor* var. *alba* (Andrew Geimar)
2. *Ludisia discolor* 'Marble' (Andrew Geimar)
3. *Ludisia discolor* 'Variegated' (Peeraya Inpanich)
4. *Ludisia discolor* 'Red Devil' (Leslie Ee)
5. *Macodes petola* 'Prime' (Andrew Geimar)
6. *Macodes petola* 'Java' (Andrew Geimar)
7. *Macodes petola* 'Java' (Andrew Geimar)
8. *Macodes sanderiana* (Andrew Geimar)


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4.

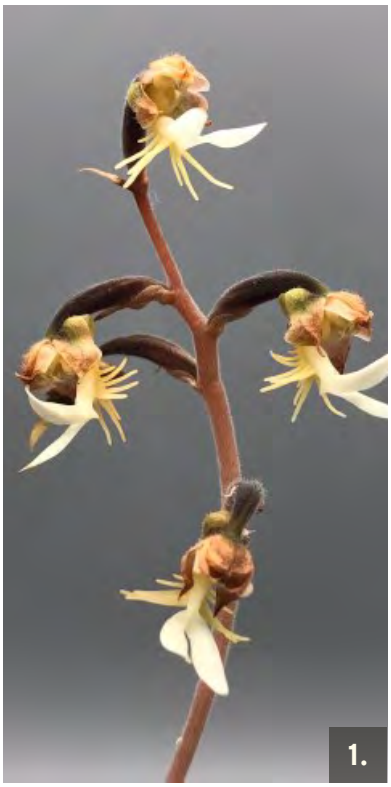

5.

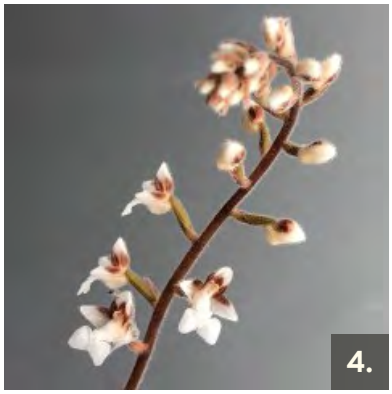

6.

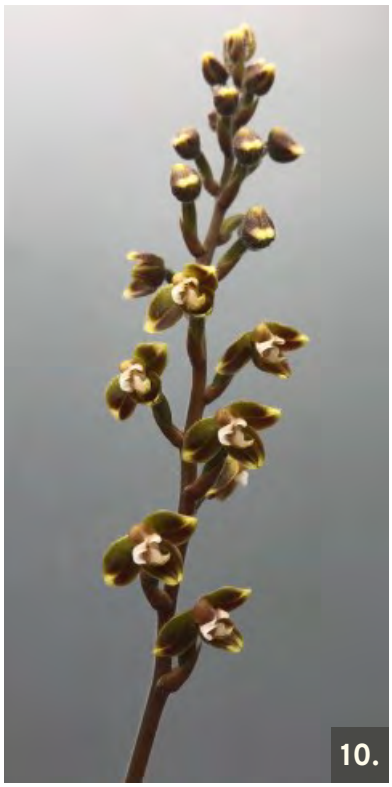

7.


8.

1. *Malaxis metallica* var. *purpurea* (syn. *Crepidium metallicum*) (Leslie Ee)
2. *Malaxis calophylla* (syn. *Crepidium calophyllum*) (Leslie Ee)
3. *Malaxis calophylla* (Andrew Geimar; photo Heidi Chung)
4. *Nephelaphyllum* sp. (*tenuiflorum*?) (Nick Rust)
5. *Odontochilus elwesii* with *Selaginella* in situ (Udai C. Pradhan)
6. *Odontochilus grandiflorus* in situ (Udai C. Pradhan)
7. *Pelexia laxa* (Aaron Coleman)
8. *Pelexia olivacea* (Aaron Coleman)
9. Pelexia olivacea (Aaron Coleman)







1. *Anoectochilus* sp. (Andrew Geimar)
2. *Cyclopogon* sp. (Andrew Geimar)
3. *Cyclopogon* sp. (Andrew Geimar)
4. *Dossinia marmorata* (Andrew Geimar)
5. *Malaxis calophylla* (syn. *Crepidium calophyllum*) (A.Geimar, photo Heidi Chung)
6. *Ludisia discolor* 'Spider-Man' (Andrew Geimar)
7. *Nephelaphyllum* sp. (possibly *pulchrum*) (Andrew Geimar)
8. *Pelexia olivacea* (Aaron Coleman)
9. *Malaxis metallica* var. *purpurea* (syn. *Crepidium metallicum*) (Leslie Ee)
10. *Macodes petola* 'Kalimantan' (Andrew Geimar)

Section 3
A Guide to Jewel Culture

Warning on the Use of Chemicals: Insecticides, Miticides, Fungicides and Bactericides

We are grateful to our professional international authors for sharing their work. However, in several articles, chemicals that are banned or restricted in Canada and possibly other countries are suggested for use. As this issue is intended for a Canadian audience of mainly home growers (and some commercial growers), we include the following information.

Be safe; don't be sorry

In Canada, you must have certified training to use commercial and restricted chemicals. Training requirements are designated by province. You risk harming yourself, your family and others, pets and the environment via air or groundwater by their use, storage and/or disposal. Some of these chemicals are dangerous neurotoxins and some are neonicotinoids harmful to beneficial insect pollinators (especially bees). Even if you are using a chemical approved for home use, follow instructions carefully.

Check before you buy

Don't make online purchases of insecticides, miticides or fungicides or bring them across the border without checking to see whether they are legal for use in Canada or the country in which you reside. The benefit of the chemical in balance with its efficacy has been vetted by Health Canada. What you need to know before importing unregistered pesticides for personal use - Recalls and safety alerts (healthycanadians.gc.ca) You can search for both the chemical and the class of chemical (which determines the restrictions on use) here. Pesticide Label Search - Health Canada (hc-sc.gc.ca) Each province and territory may have additional restrictions.

Caution with DIY recipes

Do not try a homemade recipe for pesticides that involves more than soap and water or edible products. Read this online reference first. The risks of homemade pesticides - Canada.ca

If you are convinced that you must use drastic measures to save a precious plant, consult a trained professional, perhaps through your society, and ask them to treat it for you safely for a fee or favour.

General Culture of Jewel Orchids

By Andrew Geimar, Toronto, Ontario, Canada

Jewel orchids are unlike any orchids we typically see grown in homes; they are prized for their beautiful foliage rather than their flowers. The extravagant patterning on the leaves acts primarily as camouflage. On the forest floor, their ornate leaves help them blend into the forest undergrowth, making them hard to spot. However, when planted in a terrarium or a pot in our homes, they draw the attention of any viewer, casting their magical spell. They defy the traditional growing methods practiced on most orchids and are all terrestrial (rarely lithophytic or growing on rocks).

Habitat

Jewels are forest floor growers. They prefer low light conditions and can be found growing on patches of moss, leaf litter debris and in humus-rich soil. These orchids have two distinctly different growth habits. The first is to grow upright, then spread onward onto the next spot, travelling horizontally like a vine. The second is to grow sideways and produce basal rosettes after flowering, forming clumps or colonies of plants. The plants provide new root tips from each node and the leaves may die back after flowering. In the basal growth habit, this is followed by an explosion of new growths.

Right: Two examples of the characteristic growth habits of jewel orchids, with *Vrydagznea tristriata* (top) showing the creeping, vine-like growth habit, and *Macodes petola* 'Baron's Prime' (bottom) displaying basal rosettes

Growth Cycle

You might notice that certain jewel species grow more during certain periods of the year. Growth spurts are seen in the spring, summer and fall (their natural growth cycle). They produce flower spikes in the winter. Generally, the flowers are not particularly showy, but some species do have unique flowers. Most flowers are not fragrant, however there are exceptions such as *Ludisia discolor* var. *ambrosia.*

Light

Jewels prefer low light conditions. Depending on the species most jewels prefer around 150–350 foot-candles (under artificial lights, this is approximately 18–36 inches distance from the leaves, depending on the wattage of the lights). In natural light, they prefer bright shade conditions. Some varieties, like *Ludisia discolor* can take short periods of direct sun. There is some evidence that jewel orchids may benefit from supplementary light (especially blue) at night between 6:00 p.m. and 2:00 a.m. (1). A study by Wang et al. has found greater yield in *Anoectochilus roxbhurghii* leaf, stem, root and overall plant weight when exposed to a supplementary light source.

Temperature

The majority like an intermediate to warm growing temperature of 15°C–25°C. There are some jewels, such as *Goodyera oblongifolia,* that are known to tolerate temperatures down to 0°C. Many jewel orchids come

***Ludisia discolor* 'Spider-Man'**

Anoectochilus roxburghii

from jungles, mountains and evergreen forests between 100 m to 1000 m elevation levels in Borneo, Java, Malaysia, Sumatra, India, Bhutan, Laos, Vietnam and the Philippines. Typically, a temperature change occurs during a 24-hour period. This can be a result of high elevations, changes in temperature during the day/night cycle and natural phenomena such as fog or mist.

There are cooler growing species found in South America and in more temperate areas such as North America (USA and Canada), Northern China and the Himalayas; amazingly, some are found growing near the Arctic Circle. Therefore, the more temperate species must be grown in a cooler setup.

Humidity

Even though the ideal humidity is 70%–80% RH (relative humidity), jewels can be grown with less humidity, but they will lack vigor. It is possible to grow jewels in house plant conditions if you practice good watering habits.

In a low humidity environment, keep the center of the pot/root zone always slightly moist, and water when approaching dryness. However, be aware that this setup can increase the chance of rotting jewel orchids because it is difficult to maintain an ideal root zone moisture and can be challenging if you are growing jewels for the first time. Checking the potting medium before watering is helpful.

In a high humidity environment, keep the center of the pot/root zone on the drier side. It is beneficial to use a fan to encourage air movement. This setup results in a higher success rate for growers, and with minimal maintenance.

Jewel orchids growing inside a humidity chamber

The humidity chamber with the lid removed

Water

The key to watering jewel orchids is to provide just the right amount of water, and this depends on the type of media they are potted in (to be discussed below). Allow the potting medium to approach dryness. Since jewels are prone to rotting from being overwatered, letting them dry out is perfectly fine if ambient humidity is kept high. Use reverse osmosis or rainwater only, as these plants are sensitive to minerals, fertilizers and other impurities in the water. Water should be corrected to between pH 6 and 7, as this closely duplicates some of their natural habitat.

Fertilizer

There really is no need to fertilize until the plant is of a substantial size since jewels require little nutrients and prefer to extract them directly from the potting medium. Jewels are sensitive to minerals and fertilizer on their leaves. A common sign of this is when the leaves turn red and curl, signaling stress or die back. Foliar feeding can be practiced but is considered an advanced feeding technique due to the sensitivity of the leaves to topical fertilizer application.

An organic substrate fertilizer applied directly to the root zone would be a preferred alternative. Root zone feeding can be accomplished by mixing organic additives into the potting media at a rate of 1 teaspoon per litre. Earthworm castings and cricket frass are great natural fertilizer additives. Jewels can also be fed with organic fertilizers like kelp, fish emulsion or other organic fertilizer brands at a very low dose (one-eighth strength).

Dossinia marmorata* and *Macodes petola

***Ludisia discolor* 'Lightning'**

Media

Ingredients for preferred potting media mixes:

- Loose tree fern fiber
- Peat moss (fine or chunky)
- Perlite
- Sphagnum moss
- Horticultural charcoal

Mix 1: loose tree fern fiber (60%), perlite (20%) and horticultural charcoal (20%)

This is a super porous and airy mix that retains less moisture. It helps reduce rot caused from overwatering. This mix works well in high ambient humidity environments (60%+ RH in a terrarium, vivarium, cup method, etc.).

A layer of clay pellets (LECA) at the bottom of the media creates humid air pockets for roots

Jewel orchid grown using the cup method

While the mixes below work for high humidity environments, ensure there is ample air circulation and that soil moisture levels are monitored carefully to avoid rot.

Mix 2: peat moss (40%), perlite (40%) and horticultural charcoal (20%)

The peat moss and perlite is a common mix, such as 'Pro-Mix HP Mycorrhizae', to which one must add horticultural charcoal. This mix works well for low ambient humidity environments from 40%–50% RH, such as in the home, but is also an option for high ambient humidity environments.

Mix 3: sphagnum moss (60%), perlite (20%), and horticultural charcoal (20%)

If the orchid is received from a large green house, it will typically come in a pure sphagnum moss mix. The key with this mix is to ensure the pot size is small, so that the jewel does not stay wet for a long period of time.

Did you know?

The benefits of adding charcoal to soil have been observed by the ancient Mayans, who added charcoal to their fields over 2000 years ago to increase yield. Furthermore, a recent study by Cornell University (2) demonstrated similar findings. They even concluded that yields at times increased by 600%. The charcoal gives a place for the beneficial bacteria to live in the soil, increasing the biological profile and adding additional air pockets to make the soil airy. Moreover, it is also used to soak up toxins and clean the soil. The University of Saskatchewan (3) also demonstrated increased plant growth with the addition of charcoal in poor or contaminated soils.

1. Peat moss; 2. perlite; 3. charcoal; 4. tree fern

Different pot types for jewel orchids

Pot types

It is preferred to pick the smallest pot size possible, so as to allow the media to dry out somewhat quickly because extended moisture to the root zone can lead to rot.

Clay is great for keeping the root zone cooler and allows for greater airflow and drying. This is ideal if you find your potted jewels are staying too wet for too long.

Plastic is great for keeping the root zone moist for longer. The soil's moisture level is more easily assessed with a transparent plastic pot versus a clay pot.

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3. Foster, K. (2012, July 11). *U of S Team Helping Decontaminate Soil in Canada's North*. Retrieved from: https://news.usask.ca/articles/research/2012/u-of-s-team-helping-decontaminate-soil-in-canadas-north-2.php

An Adventure Into the World of Jewel Orchids

By Nicholas Rust, Lawrenceville, Georgia, USA

Several species and hybrids of jewel orchids in Nicholas's DIY jewel orchid growing container

I purchased my first set of jewel orchids about five years ago. As with many, the beautiful patterns and colours of the foliage lured me into trying them despite my minimal knowledge on their culture. I was ecstatic to see the electric venation and stellar sparkle of the foliage, but my lack of cultural knowledge would force me to watch these incredible plants die. Determined to grow them well, I dug deeply into the world of jewel orchids and set out on a mission to start a collection.

My first successful experience growing jewel orchids occurred when I built a vivarium for my old college. The microenvironment in the vivarium was 99% humidity with no air movement which provided constantly damp soil. To many, this may sound like a chamber for growing mold, but it led to my first breakthrough regarding jewel culture. They not only grew in this tank—they thrived. I spent the next few years solidifying their culture and learning the subtle discrepancies between different species or genera.

Although *Ludisia discolor* is the immediate thought when most people picture a jewel orchid, there are many more genera that are much more vibrant and beautiful than this widespread species. While many of the following genera have simple cultural requirements, they all have their own preferences that make them unique and interesting to grow.

The second most common jewel orchid is a member of a genus called *Macodes*. The two most common species in this genus are *Macodes petola* and *Macodes sanderiana*. Their culture is nearly identical to *Ludisia*, requiring decent humidity, a well-draining soil mix and a fair amount of water. They do tend to be slightly less tolerant of inadequate conditions than *Ludisia*, but they are much more forgiving than many other jewels and are a great starter plant for people who wish to expand their jewel orchid collection.

Other similar genera include *Odontochilus* and *Anoectochilus*, two closely related and ever-expanding genera. These two are sometimes considered the same genus, *Anoectochilus*, and have a large list of diverse species such as *Anoectochilus reinwardtii*, *Anoectochilus chapaenensis* and *Anoectochilus formosanus.*

Clockwise from top:
***Anoectochilus reinwardtii* (photo Jeffrey Tyler);**
Odontochilus lanceolatus;
Anoectochilus formosanus

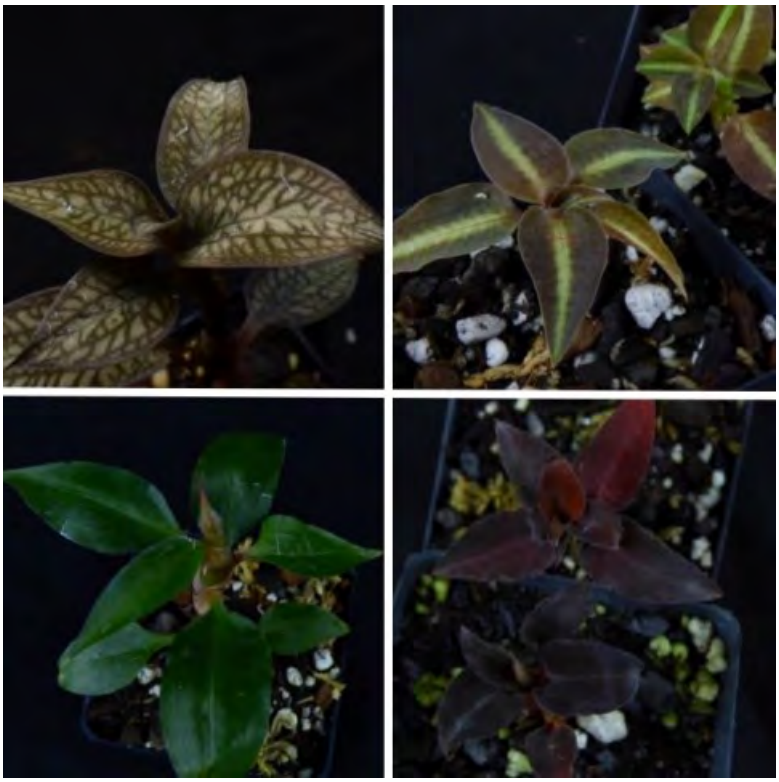
Top: *Macodes sanderiana*;
Bottom: *Macodes petola*

Left: *Anoectochilus chapaensis*;
Right: both *Anoectochilus* species

For *Odontochilus,* there are *Odontochilus lanceolatus* and *Odontochilus elwesii*. They have similar culture to *Ludisia* but require much closer consideration of the humidity, especially as young seedlings. The one downside to these genera is the taxonomy. There are likely more unidentified species or hybrids or misidentified plants than there are properly identified ones. For example, '*Anoectochilus roxburghii*' is often easy to find for sale, yet some may notice that the plants among different vendors rarely ever look the same. This is because many unidentified *Anoectochilus* are often given this incorrect name just to give them an identification.

Dossinia is very similar to *Anoectochilus* but differs in a few ways, one being the larger size of the plant's foliage compared to many other jewels, hence earning it the royal name, 'the Queen of the Jewels'. Unfortunately, species like *Dossinia marmorata*, the most common in trade, tend to be much pickier with their culture and will quickly rot or burn if too much water or light is given, respectively.

Another genus, and one of my personal favorites, is *Cheirostylis*. This genus has leaves that are very different from many other jewel orchids, offering a completely distinctive look to a collection. They also have fascinating yet small flowers that are quite beautiful compared to many other jewels. Their culture is nearly identical to *Anoectochilus*, but they have a distinct winter rest that sets them apart from other genera. During this rest, watering should be restricted to the point that the medium completely dries out. At this time, the foliage will die back, and the plant will flower if mature.



Clockwise from top left: *Cheirostylis* aff. *montana*; *Cheirostylis flabellata*; *Cheirostylis tortilacinia*; *Cheirostylis griffithii*

Flowers of jewel orchids, clockwise from top left: *Oeceoclades maculata*; *Macodes petola*; *Goodyera pubescens* in situ; *Cheirostylis tortilacinia*

Temperate *Goodyera* in situ,
Left: *Goodyera pubescens*;
Right: *Goodyera oblongifolia*

Tropical *Goodyera*
Top: *Goodyera daibuzanensis* (photo Jeffrey Tyler);
Bottom: *Goodyera malipoensis*

The next genus, *Goodyera*, is admittedly my black sheep. They are different from the previous genera in the sense that there are cold growing temperate species that are native to North America, as well as cool-to-hot growing tropical species, mostly from Asia. The temperate species are extremely difficult to keep in cultivation for an extended time due to their strict rest period. However, they can be grown outside in shade gardens in areas that drop below freezing in the winter.

Some tropical species include *Goodyera malipoensis*, *Goodyera daibuzanensis* and *Goodyera viridiflora*. These benefit from high humidity and a very well-draining medium but will rapidly rot if their stem is buried too deeply.

Yet another genus that stands out from the rest is *Malaxis.* Several species in this genus are now

Top: *Malaxis metallica* (photo Jeffrey Tyler);
Bottom: *Malaxis calophylla*

considered part of another genus, *Crepidium,* which was previously classified as a section of *Malaxis*. The single most cultivated member of this genus, *Malaxis calophylla* (syn. *Crepidium calophyllum*), is relatively easy to care for and will grow well in a greenhouse. The thin, papery leaves are very susceptible to fungal infections, so misting the leaves should be avoided. Several species are deciduous geophytes or semi-deciduous, dropping their leaves if water is restricted during the colder months. Although the genus is large, only a tiny handful exist in culture such as *Malaxis metallica* (syn. *Crepidium metallicum*), *Malaxis calophylla* and a few others that are still relatively difficult to find for sale.

One final and truly fascinating genus to discuss is *Vrydagzynea*. This genus is challenging to keep alive in culture, partially due to the fact that several species of *Vrydagzynea* are epiphytes as opposed to terrestrials. As a result, they require good air movement and an airy medium such as an equal part mix of sphagnum moss and perlite. *Vrydagzynea* are very seldom sold, so any opportunity to try and grow these species should be taken advantage of.

Many more genera of jewel orchids or painted leaf orchids exist than most people realize. Some genera such as *Sarcoglottis*, *Cyclopogon* and *Mesadenella* create brilliant displays with decently large foliage that loosely resembles that of a hosta. A closely related genera, *Pelexia*, offers brilliantly patterned foliage, some of which is nearly glossy black in color. Another wonderful genus is *Microchilus* which offers the incredible colors, patterns and mesmerizing contrast seen in some jewels but is

Left: *Vrydagzynea tristriata;*
Right: *Vrydagzynea albida*

Clockwise from top:
Oeceoclades maculata;
Oeceoclades spathulifera;
***Oeceoclades monophylla* (syn. *maculata*)**

often much more difficult to grow. *Aspidogyne* is a truly extraordinary genus found mainly in South America, but few species exist in culture. *Oeceoclades* is another strange genus that is found in Africa and Madagascar and displays some of the most bizarre foliage of all painted leaf orchids. Many species and hybrids are cultured that mostly have light to dark brown, gray and black patterned leaves. Many, many more genera exist such as *Zeuxine*, *Herpysma* and *Nervilia,* but it would be impossible to cover every fantastic genus in one article.

Nervilia plicata **(photo: Sarah Hurdel)**

Nicholas's Method for Creating an Easy DIY Jewel Orchid Growing Container

Over time, I ran into the issue of not having enough space to keep all my jewels. A vivarium was the best setup, but it was unrealistic from a spatial and monetary standpoint to keep adding more vivaria into my collection. In response, I created a low-cost, effective growing container that I still use today. This vessel is just an overturned (or upside down) storage container. It may not be as visually appealing as a thriving vivarium, but it is easy to make and get supplies for. It replicates an appropriate environment for jewel orchids and can be placed under a table or in a closet to maximize one's growing space.

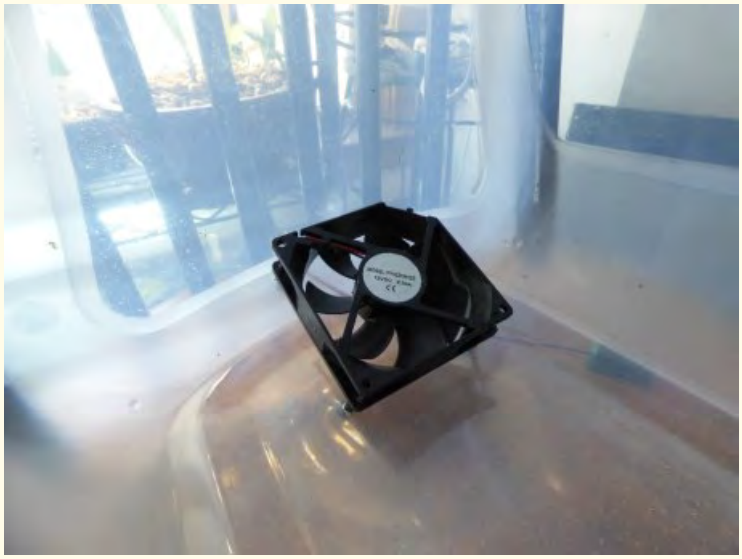
There are only five items needed to make the jewel orchid growing container.

- a clear storage container
- a small computer fan
- a voltage adaptor
- four screws
- an LED light

The voltage adaptor should be set between 7 and 12 volts depending on the size of the container. For lighting, any decent white LED often works well for growing jewel orchids. It does not need to be a specialized full-spectrum grow light since most jewels require lower levels of light. If a grow light is used, one such as the 13 watt Gro LED (easily purchased online) is more than sufficient. With any new light, the plants should be monitored to ensure the leaves do not display any yellowing or reddening, indicating too much light.

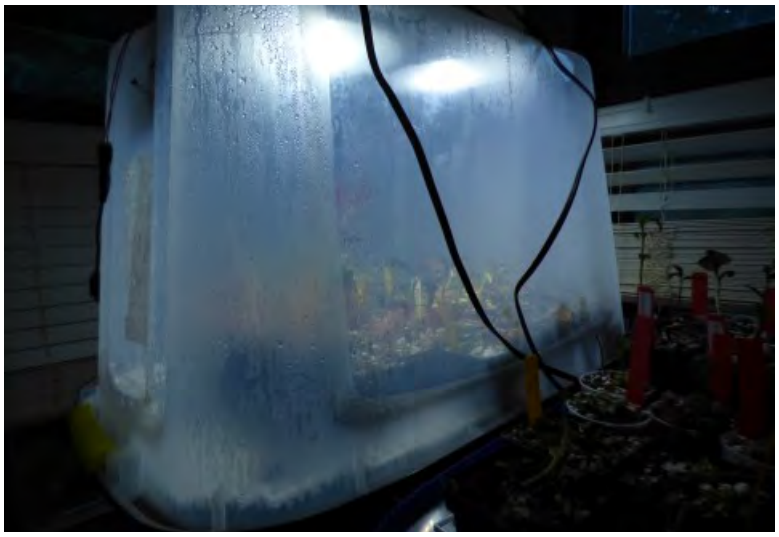
To begin building the growing container, first choose a storage bin that is about 40 cm tall so that the light can be positioned appropriately far above the leaves and the jewels are given ample room to spike if desired. Next, take the fan and mark where to drill holes in the container to align with the holes on the fan. Use the screws to mount the fan in the corner on the inside of the container so that it is positioned away from the side to adequately recirculate air.

Finally, drill a small hole in the container to push the fan's wires outside and connect it to the voltage adaptor. To help keep humidity constant while keeping the orchids out of standing water, an egg crate louver can be cut to size and placed on the bottom where the jewels will sit. This is especially useful for deciduous species that will decline if they stay wet in the winter but still benefit from higher humidity. The orchids can now be placed on the lid and the upside-down container positioned on top, so that the LED light can be easily placed on top of the container to allow adequate lighting for the jewels.



The fan mounted in the corner of the grow container. The fan itself is suspended off the sides using 2 inch (5 cm) screws. A small hole is drilled in the side to allow the wires to pass to the exterior of the container.

Connection between the fan and the adaptor. The positive (red) and negative (black) wires are easily inserted into the adaptor and tightened down with a small Phillips head screwdriver.



The DIY jewel orchid growing container as a propagation chamber for jewel orchid seedlings

Using the growing container, providing an appropriate environment for jewel orchids is easy. Most jewels benefit greatly from the high humidity and decent air movement that this container provides. The LED placed on top of the container will provide sufficient light, especially if the container is placed near a window that allows it to also receive low levels of sunlight (while making sure the sunlight doesn't heat up the container). The light should be left on for 8–10 hours a day and can be hooked up to a timer to relieve the burden of remembering to turn the lights on and off.

Jewel orchids thrive in a well-draining soil that holds more water than the typical epiphytic medium. A mix of one part each of perlite, fine pine bark, fine charcoal, chopped New Zealand sphagnum moss and a peat-based soil mixture will suffice. If needed, pure New Zealand sphagnum moss mixed with an equal part of perlite is a decent substitute. As seedlings, jewels require more water and are much less tolerant of drying out. Most mature plants can usually survive a day or two in dry medium and lower humidity. It is also important not to let the medium remain soaking wet, so a decent misting of the soil two to three times a week in the growing container is often enough. I use filtered, dechlorinated water with an approximately neutral pH of around 7 and a TDS reading of approximately 50 ppm.

Freshly deflasked seedlings can be potted into a 1.5–2 inch (3.8–5 cm) pot. Mature plants will grow well in a pot that gives them room to sprawl out, especially for leggy species such as *Ludisia discolor* or many of its hybrids. I prefer potting plants separately, but many jewels come from tissue culture and are genetically identical, and therefore may be potted in a single pot. If desired, many different species may be potted in the same pot, but it is important to keep in mind how large or leggy one mature species may be over the others. If the previously described medium is used and the pots have appropriate drainage holes, nothing extra needs to be added to the bottom to further increase drainage.

The phrase, "if you are comfortable, your orchids are comfortable," works for most common jewel orchids. They will do well in any temperature between 16°C and 27°C. If temperatures drop below 15°C in the winter wherever one grows their jewel orchids, most plants will benefit from remaining slightly on the drier side since the orchids will reduce their metabolic activity in response to the lower temperatures. If the growing container is kept in a greenhouse or even in one's living quarters, the interior temperature will remain equal to or slightly higher than the ambient temperature of the air.

Fertilizing should occur every three to four weeks using a mixture of KelpMax and Superthrive, or similar organic fertilizers mixed as recommended on the bottle. In my experience, many jewels benefit greatly from foliar fertilizing in which the above products should be mixed at half-strength to use every two to three weeks. During the cooler months, foliar fertilizing or misting should be halted and general fertilization should also be reduced.

The DIY container on top of an indoor orchid shelf

Treating jewel orchids with insecticides or fungicides can be a tricky topic since some species are so sensitive. Most small pests such as spider mites are not often a problem since the high humidity deters them from establishing themselves. If one does find themselves with a pest infestation, a light application of one-quarter to half-strength neem oil at night (to deter any sun damage caused by the oil) is often sufficient. To treat any fungal infections, Southern Ag's Thiomyl (thiophanate-methyl) is a must have because it is very effective, works systemically and does not often affect even the most sensitive plants such as the leafless ghost orchid *Dendrophylax*. Another gentle fungicide that works well for thin-leaf plants is Garden Tech's Daconil Fungicide (chlorothalonil). The light white coating seen in many of the pictures in this article is residual Thiomyl that was applied prophylactically. (Editor's Note: Please see the **Warning Paragraph on Use of Chemicals** on page 40 at the beginning of A Guide to Jewel Culture.)

Horticulture of Jewel Orchids: A Technical Approach

By Xavier Loubresse, Zuidbroek, The Netherlands

Goodyera ustulata **grown in Xavier's recommended rockwool potting mix**

Part A: Keeping Jewel Orchids Healthy and Robust

Jewel orchids are great plants for beginners to grow. Although some have specific needs, they require similar conditions including the colourful mottled leaf species such as *Malaxis calophylla* (syn. *Crepidium calophyllum*).

The growth habits of different jewel orchids have evolved to suit their natural habitat and can give us hints on suitable culture. Usually the jewels grow on the forest floor, most of them in moss and leaf debris. Some species, such as *Anoectochilus chapaensis* (syn. *brevilabris*) however, grow on degraded limestone, often nearby *Paphiopedilum gratrixianum*, *Cymbidium sinense* and *Colocasia*. This hints that they are not light feeders and need good nutrition.

The leaf litter and debris tend to accumulate over time, and jewel orchids need to grow taller or they would remain buried under this debris. In contrast, *Cymbidium* can have new growths emerging from way below the ground, and then make leaves several centimetres above. *Ludisia discolor* and a couple of other species have creeping rhizomes with a lot of new shoots coming from below the ground. It is the key reason why they have been cultivated and propagated for decades. The plants are always able to form a lot of underground shoots that make roots and feed the plant, even if the main top shoots do not.

On the other hand, most *Macodes*, *Anoectochilus* and *Cheirostylis* have upright growths. There is a simple reason why there is a root node at every leaf base when

they grow upwards: unfortunately, it appears that the older root system is not able to properly feed the new emerging growths, so the plants must be constantly rooting from those new nodes. However, because in culture there is no leaf litter to continuously cover these upward-climbing growths, the new rooting nodes are left above the level of the media and, as a result, the root node will stop growing and plants will slowly perish. This is the fatal error that makes the difference between growing jewel orchids well or killing them slowly. This constant root growth from the nodes is particularly important when a plant has expended energy during blooming and the subsequent production of side shoots. High humidity will help to keep the plants alive, as they will not dehydrate. However, it is only a palliative solution for troubled plants. The plant expects to be able to reroot from those newer nodes, and if not allowed to do so, some strong stem species, such as *Macodes petola* or *Anoectochilus formosanus*, can still grow a bit but with various deficiencies in the leaves. However, most of the thin-stemmed or fragile looking species will perish and never realize their full potential.

What then, is the solution? The only way to grow them fast is to repot them frequently, or even to remove some bottom leaves and bury back the stems on a single growth. On a plant that has bloomed, wait for the new shoots to have two to three leaves and bury the entire old growth so the new shoots just emerge from the top of the potting mix. They will root on their own. Surprisingly, the old, buried shoot will emit a few side shoots that will emerge a couple of weeks or months later.

To sum up, the key is to reroot the plants frequently. In the wild, this happens with the leaf debris, and explains the elongated stems. In fact, to get compact growth, it is important to bury the stems regularly, otherwise the stems between the nodes will become progressively longer, producing a spindly plant.

Left: A plant with many growths ready for repotting; Right: stages of repotting in Grodan cubes (1. note the arrow pointing at the root node and 3. the depth at which the stem is buried in the new pot)

Part B: Jewel Orchid Potting Mixes

The soil in which jewels grow is usually quite moist, which is something most people replicate by using sphagnum moss. Sphagnum moss has a very low pH and a high metallic content, especially zinc. Some people have luck with it, usually when they use some hard water from time to time, which will raise the pH to a proper range. Unfortunately, people forget to feed the plants most of the time in sphagnum. Quite frequent repotting will help to prevent some deficiencies, but the plants do not perform well at all in sphagnum and are slow growing.

The pH is often overlooked. A pH range of 5.5 to 6.2 is the most suitable for them. Sometimes we see pH problems as a reddening of the leaves and an unhealthy colour. Sphagnum with Dolokal (dolomitic limestone) at about 100–300 g (grams) Dolokal per kg (kilogram) of dry sphagnum can give good results. The use of hard water periodically to water plants potted in sphagnum helps, but there are other options.

Throughout my life, I have used several mixes for jewel orchids. They are similar to what I use for *Paphiopedilum*.

- **Mix of sphagnum and Dolokal**
  Decompress 1 kg of dry sphagnum by adding water until it is fully loosened but not soaking wet, then add 300 g of Dolokal by mixing it slowly with the sphagnum.
- **Mix of pine bark, peat, polyurethane foam and perlite in a a 5:3:2:1 ratio**
  Use smaller 1 cm pine bark, combined with peat (not cocopeat), 1 cm polyurethane soft foam and perlite in the given ratio, then add 3 g of Dolokal per litre of mixture.
- **Rockwool cubes (1 cm size)**
  This is the best as of now because it is a single stable ingredient and can be used directly. When repotting in rockwool cubes, it is essential to soak them in water first, then a heavy flush is required to wash off the wetting agent that is present in the rockwool. Finally, repot with the soaking wet cubes, never with dry cubes. Furthermore, the older versions of Grodan Grow Cubes (prior to 2017) were manufactured with a high content of calcium hydroxide as a residual by-product of production and needed pH buffering before use. The newer versions do not have this pH problem.

Plant freshly repotted into rockwool cubes

- **Mix of coconut coir with bark and polyurethane foam in a 3:1:1 ratio**

  This mix can give great or poor results depending on the coir batch. Many supplies of coir, despite their certifications or brand, have problems with cation stability and release unknown compounds over time, eventually resulting in a chlorotic plant. Nearly all the coir types, except some processed using steam and calcium nitrate under positive pressure, are at high risk of capturing some cations over time making the plant deficient at first. When the coir gets older, it suddenly releases those ions at the very same time, creating an acute toxicity. It can be commonly seen as a whitening or chlorosis of the plants after a while. Because it is unpredictable, I do not recommend this mix at all unless you do specific analysis and testing each time you buy it. One of its main uses is in hydroponics where it undergoes periodic flushing and replacement of the nutrient solution. This alleviates the problems of ionic stability as well as limiting the growth inhibitor compounds released.

A group of jewels (photo: Andrew Geimar)

Other media that I have not used personally include the following. Recently, some ingredients became more available such as tree fern, fern roots and cork chips. They each have a very specific behaviour.

- **Tree fern and fern roots**

  Tree fern tends to become extremely acidic over time and its decomposition products release a lot of metallic ions. This is something that is very well known in Brazil, where they need to either remount plants frequently or use heavy fungicides to cope with the problem. An easier solution is to add Dolokal on top periodically. Whilst its structure is stable for a long time, its chemical properties need to be controlled. Fern roots have the same issues as tree fern.

- **Cork chips**

  Cork chips are a great mystery. I have seen a few growers using them successfully nearly pure for *Phalaenopsis*. I have seen other growers that used them and they turned into an acid sludge over a few months (even under industrial conditions) with the same feeding scheme. I would not use cork products at the present time.

- **Seramis and pumice**

  Seramis and other kinds of pumice are interesting. I have used them in the past. After a while, in my way of growing plants, Seramis becomes too heavy for the roots. Pumice is good, but one must be careful to get certified pumice or heat-treated pumice. Some outbreaks of nematodes have occurred with pumice from contaminated areas, so I tend to stay away. I always prefer to use soft potting mixes where the roots and shoots can push through and arrange their structure to their wishes.

- **Red lava rock**

  The red lava rock on the other hand is very heavy and tends to trap small media particles resulting in an anoxic (low oxygen) potting mix. It releases a lot of aluminium too. If the pH of the potting mix is low, aluminium toxicity will appear. It is very difficult to correct, if not impossible, once the plant has been exposed.

Part C: Humidity

Humidity does not matter as much as some may think. As said before, the 'humidity requirement' is related to the fact that the plants are poorly rooted. If you repot and reroot them periodically, and if proper growth and rooting on the new nodes occurs with a wet enough potting mix, the humidity can go as low as 40% without any damage at all. The roots prefer to be in a moist environment, neither too wet nor too dry, like *Paphiopedilum*.

***Dossinia marmorata* from Miri, Sarawak, Borneo**

***Dossinia marmorata* from Sabah, Sarawak, Borneo**

Part D: Nutrition, Watering and pH

(Editor's Note: EC (electrical conductivity) units can be converted to TDS in ppm using an online converter such as this one. There may be regional conversion differences.)

In general, most people starve their orchids and there is a misconception that tiny species, such as *Dendrobium cuthbertsonii* or the smallest *Cheirostylis*, require very little fertilizer as they are "tiny plants". It is wrong! When testing a new fertilizer, or determining what the plants do need, it is important to do a foliar analysis, to see if the assumptions are correct and if there are progressive toxicities or deficiencies that appear. (Editor's note: Foliar analysis is done for important agricultural crops and scientific studies.)

A phosphorus deficiency, for example, will initially produce very dark green plants. Potassium deficiency will produce very long leaves that are lacking strength. Calcium toxicity will appear after a while with a general yellowing of the older leaves, producing high calcium and low potassium content in leaf mineral analysis. As of now, I use my own fertilizer that is sometimes

adjusted based on foliar analysis. This goes for huge *Dimorphorchis*, hard leaf C*ymbidiums*, *Phalaenopsis*, *Disa*, *Dendrobium cuthbertsonii* and jewel orchids.

One effect of underfeeding orchids is slower growth. "Slow growth" is something quite relative. As an example, for long term culture with proper feeding, a *Phalaenopsis* plant should make one new leaf every four weeks. If much less fertilizer is given, it will produce one smaller leaf every two to three months. The plant will still look acceptable, but it will not be optimum and will take a much longer time to reach specimen size. One way to optimize culture is to provide boosts of boric acid at 2 mg/L of water here and there. This is the key ingredient of a fertilizer composition sold in the USA that gives "amazing results" and along with molybdenum, it is required in large amounts when plants are grown with nitrates. These additions are very useful, but they need to be made in a controlled way. This means testing and analysing leaf samples of the plant collection. Although this is not commonly done in the commercial orchid world, I suspect that some Taiwan nurseries use it to optimize their feeding.

- **Light and nutrition**

Light is a sensitive topic, related to nutrition. I have 14 hours of light, either sunlight or 2 kW HPS (high pressure sodium) bulbs. Succulents and *Euphorbia* grow well in the same conditions because the key is the feeding. However, at such light levels, feeding requires a custom fertilizer because the plants grow much faster and stronger and are virtually disease free. The current EC (electrical conductivity using an EC meter) of the fertilizing solution I use is 2.400 mS (millisiemens) equivalent to a TDS (total dissolved solids) of 1500 ppm! The composition of the fertilizer needs to be adjusted precisely for those growing at different light levels. With standard good light, I suggest an EC of 1.200 mS (approximately 770 ppm) in general. In low light one can safely go down to 0.600 mS (approx. 380 ppm) with good results, though not optimal. Anything below 0.500 mS (approx. 320 ppm) will induce deficiency and slow growth.

- **The problem with nitrate-based fertilizers**

Jewel orchids are nitrate-inefficient; nitrate is a poor source of nitrogen for them. Nitrate can increase the calcium and zinc levels in the tissues which, in turn, prevent potassium, manganese and copper from being absorbed by the plants (based on mineral analysis). This explains a lot of "burnt" leaves or plants with dull and reddish leaves. It is not a symptom of excess salts, but a calcium toxicity that expresses as a potassium deficiency. A lot of "salt burns" reported in the literature are in fact not an excess of fertilizer or salts by themselves. They are the expression of some severe deficiencies or, more rarely, toxicities. To know this, one needs to do a lot of leaf analyses, be willing to pay for them and know how to read them with referential values. One commonly advised solution to the problem is, "give much less light" which will slow down the metabolism and allow the plant to partially catch up with the deficiencies, but never completely. Another solution is to "flush heavily" which will indeed remove some of the nitrate remaining in the media, slow down the growth and metabolism, and again, allow the plant to partially catch up with the deficiency problems.

This is the reason why using nitrate fertilizers with added calcium will eventually result in a critical deficiency of potassium in the plants. At first, plants will use the potassium in the potting mix, then they will redistribute the potassium inside the plant. There

are not many symptoms at this stage. If the plant is repotted frequently, with a fresh potting mix that has potassium, the problems can be delayed by a couple of months or even years. Then, all of a sudden, the plants will start to have serious problems. At first, symptoms will be a lower flower count and leaf loss when the plant blooms. Usually, the lower leaves will be more affected, but depending on the plant, sometimes the intermediate leaves are as well. In some species these symptoms can be confused with a kind of bacterial rot. The rot progresses rapidly on either side of the leaves or from the tip which appears as soft, water-soaked tissue. In our lab, when we see the "leaf tip fertilizer burn", foliar analysis frequently indicates a heavy potassium deficiency. Afterwards, the plants are weak. They do not grow to their full glory and suddenly perish, as they become susceptible to diseases within the environment. The process is very perverse in that there is no warning. The exact potassium level at which this happens is within a very narrow range, depending on the genera. A little bit over, and the plant is slightly yellowish with fewer flowers but still does not look too bad. Just below that level, the plant collapses very quickly, with little chance of recovery. This final stage manifests as white leaves on *Paphiopedilum* and red or purple leaves that look 'dry' on jewel orchids.

- Urea-based fertilizers

As jewel orchids are terrestrial orchids, the best fertilizer to use is one that is high in urea, not nitrates. Ones such as 30-10-10 (nitrogen, phosphorus, potassium) or 28-14-14 in powdered form diluted to 1 g/L, alternating with a high

***Macodes petola* 'Kalimantan' (photo: Andrew Geimar)**

potassium fertilizer can be added to the watering solution for the plants. Occasionally, calcium nitrate can be given as well at 1 g/L with magnesium sulfate at the same rate every other month. Calcium deficiencies do exist, but they are not as common as one might think because, again, if no foliar analysis is done, it is just a guess. For those who cannot make their own fertilizers, a good general fertilizer is urea-based Peters Hi-Nitro (30-10-10) with an EC of 1.1–1.2 mS (approx. 700-770 ppm) at pH 5.7. Another is urea-based PlantPro (28-14-14) with similar values.

- **Additional nutrient and watering issues**

a. **Repotting**

"Repot frequently" is another piece of advice that may remedy perceived deficiency problems. In the past, repotting was recommended because hard water would accumulate and raise the pH over optimal levels. Today, many people only look at the EC of a potting material by collecting and testing the run-off to see if it is poor in minerals or very rich, but it is much more complicated than that. Over time some media does release nutrients, such as bark releasing manganese and sphagnum releasing zinc and potassium (sometimes in quite high levels!). Coir will release very high levels of sodium and potassium if not carefully pre-processed with calcium nitrate. Therefore, the initial EC reading has no meaning as to what nutrition a potting mix may provide. For that, there are two other analyses: the 'barium sulfate ion exchange analysis' to find cations that are bound, and the 'total destructive analysis with acid' ("burn, dissolution and analysis"). Although these will provide specific information about the nutrients in the media and their release, they are also very expensive and few use them. In almost all cases, the increase in plant growth speed following repotting can be attributed to deficiencies and pH of the media being corrected.

b. **The interaction of nitrogen fertilizer with RO water on pH**

It is to be noted that different plant genera will have completely different reactions to the nitrate/ammonium/urea ratio of the fertilizer in terms of residual pH. Today, most growers use pure RO (reverse osmosis) water or rainwater. RO water gives scientific control over the feeding, but unfortunately there are no ideal referential values for orchids except for mass potted plant production. The form of nitrogen present in the fertilizer will have a residual effect in the whole pot, but also a local effect at the root tips and along the roots depending on how the plant uses the nutrients provided. For example, a nitrate-based fertilizer in RO water with a pH of 5.5 can give a final pH in the pot close to 7.0 over a couple of waterings, which I do not recommend. A very high ammonium fertilizer at pH 6.8 can give a final pH in the pot in the 5.0 to 5.2 range. The safe range for jewel orchids is a pH from 5.2 to 6.0. Therefore, one must be careful to monitor the pH of any fertilizer solution when using RO water. (Editor's note: RO water and tap water react differently with nitrogen fertilizers.)

***Macodes petola* 'Java' (photo: Andrew Geimar)**

The best feeding regimes are custom solutions of chemical salts to get absolutely optimal results. However, they are difficult to prepare, and need to be adjusted according to pH and foliar analysis from time to time.

Therefore I recommend a simple feeding regime in RO water + 10% tap water (to buffer the pH) as follows. The pH is adjusted to around 5.7, never more than 6.2 to 6.4, in these conditions. (Editor's note: Tap water is variable, but in most cases can act as a buffer because of the mineral content.)

Possible formulations include the following:

- 28-14-14 or 30-10-10 at 0.8 g/L plus calcium nitrate at 0.2 g/L
- 28-14-14 or 30-10-10 at 1 g/L
- 28-14-14 or 30-10-10 at 0.8 g/L plus magnesium sulfate at 0.2 g/L
- 8-16-32 or similar 1-2-3 high potassium fertilizer at 1 g/L

I fertilize at every watering. It is best to wet the potting mix with the fertilizer, and then water a second time an hour later. I never flush with pure water; sometimes I heavily flush twice over two hours using the fertilizer solution, every month or so. Based on my experience and research, flushing with pure or RO water is a bad practice. Pure water flushing induces heavy stress on the plant, as the osmotic pressure and the EC will be drastically changed for a few days. In addition, most of the nitrogen will be flushed which will starve the plants. Unlike the other orchid myths, nitrogen deficiency in orchids is quite common, but as they have some sort of storage, they can survive without nitrogen for a while.

Advanced RO Water pH Culture Tip

A side note about sphagnum: when a sphagnum-based potting mix is kept wet, green algae/cyanobacteria will frequently form on the surface. While they look ugly, they do provide the plants with a lot of amino acids and contribute to excellent growth! However, one important practice is to monitor the potting mix pH often, as these amino acids tend to change the potting mix pH dramatically. If it goes up, add ammonium nitrate to the feed at 0.1 g/L, and reduce the tap water from 10 to 5%. If it goes down, increase the tap water and use more calcium nitrate in the feed.
Adjust over some weeks until you find the optimal solution to keep the pH at an acceptable level between 5.2 to 6.0 in the pots.

***Anoectochilus roxburghii* 'White Gold' (photo: Peeraya Inpanich)**

Part E: Propagating Jewel Orchids

Propagation is quite easy. If the plants are repotted to bury the new root points, they will clump by themselves readily. Otherwise, it is possible to take top cuttings. Use a new growth with one active root and some rooting nodes, repot that part and let the old rhizome form new shoots. This method works for all species. I do divide the plants in single nodes as well, especially the stronger species, and just repot each node individually. They grow into strong plants within a few months.

The seeds can be germinated on any sterile agar media, preferably with a low sugar concentration, around 8–12 g/L. This is the same process as for any other orchid seeds.

Tissue culture does not pose any problem and is as easy as the other propagation methods. Take single nodes that are not in contact with the potting mix and remove the adjacent leaf. Then clean the nodes and place them in agar plates. If the light is kept low enough, plants will form and etiolate (Editor's Note: Etiolation is the formation of plant tissue that elongates under low light conditions). The stem tips and lower nodes are replated on agar individually no matter whether they have roots or not. When exposed to more light, they make strong individual plants. If kept in low light, they will etiolate again to make more plants. The process is quite simple and extremely safe as hormones are not required.

Part F. Jewel Pests and Diseases

If these plants are well fed, they are very robust growers and immune to diseases in general. However, in some instances, there can be disease problems. I will give a little advice here and suggest some chemicals that can be used to treat diseases, although everyone must check the legality of their use in a specific country. (Editor's Note: Please see the **Warning Paragraph on Use of Chemicals** on page 40 at the beginning of A Guide to Jewel Culture.)

One-node stem cuttings for propagation

Stem tips can also be propagated

Propagation of *Macodes petola* in plastic flask

***Macodes petola* removed from the plastic flask**

Oomycetes are very common fungus-like micro-organisms. They will induce what is usually described in orchid books as 'bacterial' rot, characterized by watery soft areas on the growth and fast root collapse. I use Mefenoxam (metalaxyl) as a preventative, though it works as a curative as well, with 10–20 mg/L of active ingredient (check the percentage) as a drench. I do this every time I repot. It can be used every four to six months as a preventative.

Fusarium is a fungal problem often found on mass propagated *Macodes* and *Ludisia*. One or two blackish sunken areas will appear which will kill the plants. The stems and the leaves turn purplish or pinkish depending on the species. It is always related to a pH problem. To stop it, drench with azoxytrobin at 50 mg/L active ingredient. It is important to repot and check the feeding (or lack of it).

Thrips will produce distorted new leaves with some dots and spots. These can occur in different time periods in some areas where thrips are present outside. They can be controlled with neonicotinoids. It is important to drench the pot, as thrip larvae hatch and form in the potting mix.

Mites will produce identical damage to thrips and can be difficult to detect. Often, there will not be more than 10–20 mites per pot. A drench with Vertimec at 1 mL/10 L may solve the problem. Washing the plant carefully and dipping it for half an hour in Vertimec will usually solve the problem with a small part of the collection. If they become resistant, an organophosphate (designed for *Brevipalpus* or *Tetranychus*) will be required.

Mealybugs and other insects such as aphids can be controlled with neonicotinoids such as imidacloprid, as well as organophosphates and carbamates. However, recently many strains of mealybugs have become multi-resistant to pesticides. The addition of a wetting agent is usually required, with a thorough spraying of the whole plant even when using a systemic insecticide. Mealybugs are a plague in a greenhouse, because the instar (young) and adults will rest somewhere far from

the plants and then come back much later. Thus they are very difficult to control permanently, and outbreaks are to be expected.

Sciara (gnat) larvae must be controlled, as they will chew the stems of most of the jewel orchids with a preference for *Goodyera* and thin stemmed *Anoectochilus*. This will result in rot and collapsed stems after a few days. They also eat the root tips, resulting in a stunted plant. Gnatrol pesticide and similar natural biological larvicides provide some control, but imidacloprid, pirimifos-methyl or carbofuran are the best to eradicate them when used as a drench. Yellow stick cards will reduce the population of adults progressively.

A new pest exists in Europe: flies called *Lyprauta*. They are quite similar to the *Sciara* in their behaviour, but much stronger and nearly impossible to fully eradicate on a commercial scale even with the strongest insecticides. The larvae in the potting mix are bigger and they feed even more. They can completely stunt the growth of a *Phalaenopsis.* A single larva eating non-stop will finish off all the root tips then move to the next plant in no time. They release an extremely acidic slime that will further damage the roots.

A lot of wild plants are also affected by the boring larvae of several insect families, with beetles being the most common one.

Live biological controls have been designed mostly for a reduction of pests in commercial greenhouses. They are not designed for a full eradication. In some cases, on a small-scale infestation, they can eliminate some pests, but it is not guaranteed. For example, Gnatrol is usually effective for *Sciara*, but not always. *Lecanicillium,* an entomophathogenic fungus, is quite effective for spider mites though slow acting (four to six weeks). Mites such as *Macrocheles robustus* are efficient for thrips but need to be reapplied frequently. However, they are not compatible if used with *Lecanicillium* which will kill them. When using biological pest controls, one should be careful not to introduce multiple species or populations that will compete against each other, or use chemicals that will be harmful to them.

Above: A group of various *Anoectochilus, Goodyera* and *Macodes* spp. (photos: Andrew Geimar)

Jewel Doctor: First Aid for Jewel Orchids

By Andrew Geimar, Toronto, Ontario, Canada

Here are some of the most common problems encountered in jewel orchid culture.

Pests	Treatment
Mites	Apply soap solution weekly or Safer's insecticidal soap once a week and repeat for three to four weeks as their life cycles are variable. Make sure you spray the top and underside of leaves. Pressure spray the leaves with cold (15°C–18°C) tap water to keep mite populations down. Avoid run-off into the root zone.
Mealybugs	Mechanically remove with Q-tips and treat with Safer's insecticidal soap.
Slugs and snails	Hydrogen peroxide 3% kills all eggs without harming the roots. Repotting the entire plant helps with controlling/stopping infections. Submerge the pot for twelve hours; all hitch-hikers will crawl to the surface, and you can easily pick them off. Diatomaceous earth works well when spread over the pot/media. Iron phosphate and metaldehyde are also highly effective. You can use beer traps and/or lettuce bait as green alternatives.

Mealybug damage on jewel orchid leaf

White mold

Pathogens	Treatment
White mold	Remove rot by slicing off the affected part. Spray with 3% hydrogen peroxide. Place the remainder of plant horizontally on soil or sphagnum moss. If there are any available nodes, the plant may produce roots and new growth. Increase air circulation in the growing area to prevent further infection.
Black rot	Assess watering habits and ensure the growth media is not too wet. Do not be hesitant to allow the media to dry out before watering if you find this is the issue but make sure you do not dehydrate the plant and water heavily after, as this can invite rot issues. You will need to remove rot by cutting it out with a sharp sterile blade, spray with 3% hydrogen peroxide and repot if necessary.
Red leaves/spotting	Treat with 70% isopropyl alcohol, and then remove the area by slicing off the affected part. Avoid spraying the roots.

Above and top: The symptoms of a pathogen

Above and top: The symptoms of black rot

Light level issues	Treatment
Leggy plant	This is typically a result of too little light. Some species like to 'crawl' and have a wandering habit of roaming the forest floor in their natural environment. Pay attention to the growth habit of the plant and, if the stem appears thin, increase light levels. Ideal levels are 150–300 foot-candles (1615–3230 lux) for most jewels. Invest in a light meter to measure levels.
Red leaves	These can be a result of too much light. Measure light levels. Ideal levels are 150–300 foot-candles (1615–3230 lux) for most jewels. Certain species like Ludisia discolor can handle higher levels.

Sun damage on a jewel orchid leaf

Leggy plants

Where to buy jewel orchids in Canada:

Crystal Star Nursery (West Gwillimbury, Ontario) – www.crystalstarnursery.com

Harpers Garden Center (Hamilton, Ontario) (seasonal) – https://harpersgardencentre.ca

Hawaiian Botanicals (Richmond, British Colombia) (seasonal) – http://www.hawaiianbotanicals.com

Kim's Nature (Markham, Ontario) – www.kimsnature.ca

Roehampton Orchids, specializing in Jewel Orchids (Toronto, Ontario) – www.roehamptonorchids.ca

The Hidden Path (Toronto, Ontario) (seasonal) – https://thehiddenpath.ca

This Side of Paradise (Burlington, Ontario) – https://this-side-of-paradise.square.site

Tropical Gardens Orchids (Richmond, British Colombia) – www.tgorchids.com

Vandermeer Nursery (Ajax, Ontario) (seasonal) – http://www.vandermeernursery.com/

Additional online resources to consult:

https://www.facebook.com/groups/canadianorchidgrowers

https://www.facebook.com/groups/470248953825713

https://www.facebook.com/groups/jewelorchids

https://www.reddit.com/r/jewelorchids

Jewel Species Highlight: *Ludisia discolor*

By Michel Tremblay, Montreal, Canada

Ludisia discolor is one species of a group of orchids called jewel orchids. This terrestrial orchid grows commonly in India, China, Malaysia and Indonesia. It delights orchid enthusiasts primarily because of its attractive foliage and rarely for its flowers, although a mature plant can be very showy. Cuttings were selling as no-name house plants for less than a dollar at local nurseries when I was a teenager. Even today, people love their attractive foliage and ease of growth.

Ludisia discolor is probably the most grown of all monotypic jewel orchids. The wild form has dark green velvety leaves veined with silvery white. Three horticultural varieties have appeared over the years: *Ludisia discolor* var. *dawsoniana* with red-green veins darker than the typical form; var. *nigrescens* with very dark green and almost black leaves with a silver stripe in the middle of the leaf; var. *alba* with lighter green leaves with white silver veins. The latter two varieties are smaller plants.

Ludisia discolor

Ludisia discolor* var. *dawsoniana

Ludisia discolor* var. *nigrescens

Ludisia discolor* var. *alba

***Ludochilus* Tsiku Taiwan**

The long-lasting flowers of all varieties are similar, with white segments and a dark yellow anther cap. They appear in winter at the end of a 20–25 cm inflorescence.

Ludisia discolor can be hybridized with other jewel orchid genera such as *Dossinia, Anoectochilus*, *Macode*s or *Goodyera*.

Ludochilus Tsiku Taiwan *(Anoectochilus formosanus* × *Ludisia discolor)* is an exciting cross and is very easy to grow. The leaves are a mix of both species. The flowers look like those of *Anoectochilus formosanus*.

Growing *Ludisia discolor* and its hybrids is very easy. Pot it in a plastic pot relative to the size of the plant, in sphagnum moss alone or in a well-draining medium. Provide diffused light and a temperature between 19°C and 20°C. Fertilize weekly with a balanced fertilizer at one-quarter of the recommended strength. The orchid needs no rest period.

The Hidden World of *Ludisia discolor* by Xavier Garreau de Loubresse

Ludisia is a very robust stemmed species and tends to make horizontal shoots and underground shoots. The plants keep rooting, feeding and hydrating the whole plant through only those underground roots. Most of the other jewel orchids are not able to do this.

The secret is to repot them very frequently and to bury back the emerging roots. In that case they grow more like they do in their natural environment where most of the jewel orchids will be covered with dead leaf litter periodically, resume intense rooting and get new shoots forming below the ground. These shoots will further root and produce new leaves. It is possible to bury the entire plant in moist potting mix and wait for the new shoots to emerge.

The Jewel Orchid *Ludisia discolor*: A Grower's Perspective

By Joe and Sheila Csabai, LaSalle, Ontario, Canada

Ludisia is a genus of orchids that was thought to contain just one species, *Ludisia discolor*, commonly referred to as a jewel orchid. A second species, *Ludisia ravanii*, from the Philippines was described in 2013. *Ludisia discolor* is native to Southern China, Northeast India, Thailand, Vietnam, the Philippines, Malaysia, Indonesia and Myanmar and often cultivated. Our jewel was acquired six years ago as a cutting from a fellow society member. It is easy to grow and thrives under our conditions, as follows.

Temperature: 16°C–22°C. Our jewel in winter can be found on the cool side of our greenhouse grown at about 22°C–23°C daytime temperature, with about a 6°C decrease in temperature overnight. It is outside in the summer.

Water: We water once a week. It likes to be thoroughly watered then well-drained and kept moist, but not sitting in water. There is no need to dry out or change any routine for a rest period

Medium: It grows in 75% potting soil, 25% sphagnum moss – now in a 10 inch pot.

Fertilizer: We use 1 teaspoon of Miracle Grow Slow Release 30-30-30 every four months.

Light: It prefers indirect sunlight, and in the summer it is under our plant shelter for a degree of shade.

This plant has grown very quickly. We have taken cuttings and planted them directly in soil to have new plants to give away or trade with interested orchid growers. This jewel is a rewarding addition to any collection.

Joe and Sheila's *Ludisia* blooming profusely

From Jewels to Gems: Culture of *Corybas geminigibbus*

By Thomas Fraleigh, Toronto, Ontario, Canada

Corybas is a terrestrial orchid genus with species found in Australia, New Zealand, New Guinea, Southeast Asia, the Himalayas, southern China, many Pacific islands and a few sub-Antarctic islands (1). Using their creeping stolons to deposit distal clone tubers, *Corybas* can establish colonies on sloping surfaces, moss banks and even epiphytically in pockets of humus inside logs and trees. They are pollinated by small gnats, and some *Corybas* are believed to mimic mushrooms upon which these insects may lay their eggs (2).

Corybas geminigibbus (Figure 1) is a Malaysian and Indonesian species with an observation also made in Thailand (3). The plant bulbs range in size from a grain of rice to a chickpea. The bulbs are rootless with a hairy

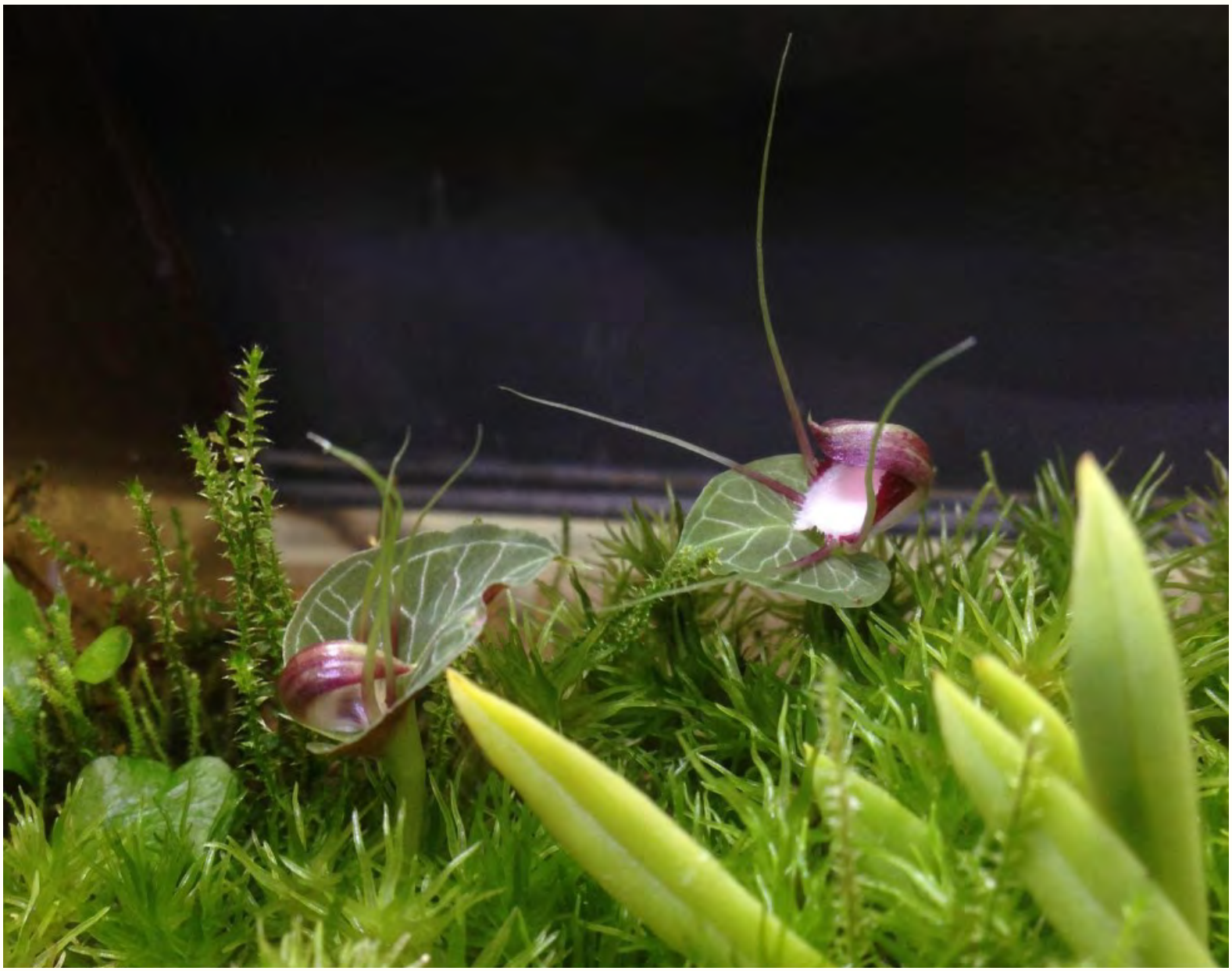


Figure 1: Two of the author's *Corybas geminigibbus*

texture that seems to afford them some grip on the surrounding substrate (Figure 2). These plants clone themselves prolifically both by budding new bulbs off existing ones and by sending out long, creeping stolons that form a new clone tuber at the terminus (Figure 3). Each tuber clones itself two to three times per year.

In indoor culture in Southern Ontario, these miniature plants emerge from dormant underground tubers in the late winter to early spring with a single leaf and flower (Figure 4 and Figure 5).

The flower can last for up to two weeks. With their diminutive stature and white veining, the leaves are beautiful even of their own accord. In the fall the leaves will begin to yellow and die, and the tubers will go dormant (Figure 6).

Figure 2: *Corybas geminigibbus* tuber with new growth emerging from tip (note the hairy texture of the tuber)

Figure 3: Clonal propagation via new tubers formed at the end of the creeping stolons

Figure 4: A plant emerging from dormancy

Figure 5: Plants emerge from dormancy en masse in late winter to early spring

Figure 6: In the fall the leaves begin to die back as the plants approach dormancy

These plants require conditions that are humid, moist and well-drained. They should never be allowed to go bone dry or they will quite literally disappear. The author grows a colony in a clump of living moss and *Microgramma heterophylla* (Figure 7 and Figure 8). The enclosure is a humid terrarium with 3–5 watt LED lights at a colour temperature of 5000–6000 K, placed approximately 5 cm above the plants. Growing these plants in a 'living substrate' appears beneficial. A living mound of moss such as sphagnum is a perfect home. If a clump of moss can survive in the cultural conditions, then *Corybas geminigibbus* will stand a good chance of growing there as well. If moss culture is challenging, whether from stagnation, rot or lack of humidity,

Figure 7: The author's culture setup

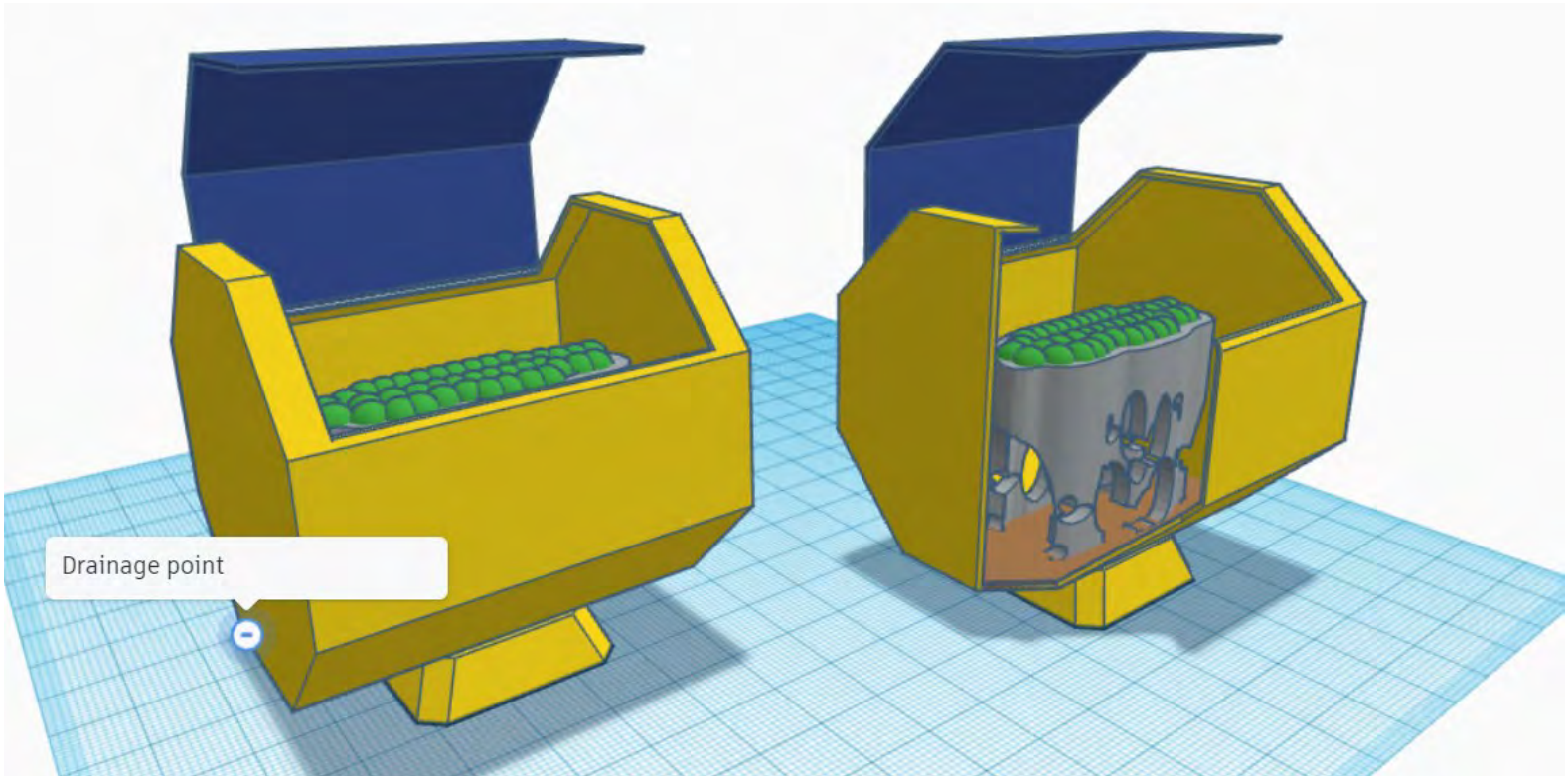


Figure 8: CAD (computer aided design) diagram of the author's enclosure (left) and partial cutaway (right). A framework of rocks (grey) bonded together with epoxy resin creates a cradle to hold the clump of living moss media off the bottom substrate. The bottom substrate is inert and consists of sand and turface media bonded to a layer of epoxy resin. The configuration allows for fresh water to flow over the living moss and carry dissolved substances to the base layer where they may accumulate without touching the media. A drainage point at the back allows for periodic flooding a few times a year to rinse these materials away.

then this orchid species might also be difficult. A clump of tropical *Selaginella* would also be a good candidate. Remember that water low in dissolved substances should regularly flow over the media and out of some drainage point to carry away accumulated minerals and salts.

During the active growth period, plants are fertilized à la 'weakly, weekly' with a diluted 20-20-20 mix with some added micronutrients. During dormancy, the watering schedule is kept largely the same to maintain the humid habitat. Fertilizer is reduced to micronutrients and an occasional, dilute, high phosphorous and low nitrogen mix.

The proximity of the LED lights to the enclosure warms the environment a few degrees above room temperature during the daytime. It receives cooler nighttime temperatures in winter. If its other cultural requirements are met, this species does not appear to be very temperature sensitive.

No matter how deep they find themselves, these plants have a remarkable ability to wind their way through the substratum to find light (Figure 9). Plants will have a more pleasing compact appearance if grown under medium light levels. They will tolerate lower levels if required though they may appear stretched and leggy. High light will result in bleaching. Plants are best transplanted when tubers are dormant.

Figure 9: These clonal tubers were deposited by stolons deep in the media. Undaunted, they are capable of winding quite a distance through the media to find the light as their wild counterparts would through the detritus of the forest floor.

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About the Authors

John Alexander

John has been photographing his surroundings since his teens. Originally from Fredericton, New Brunswick, John moved to Toronto in 1978 to study photography at Ryerson. Along with work on corporate brochures and reports, John has exhibited at Sunbury Shores Arts and Nature Centre in St. Andrews, New Brunswick, and during the CONTACT Festival in Toronto.

In addition to local art and craft shows, John has presented his photos in Toronto bars, restaurants, and museums. In March of 2015, John was awarded First prize for his photograph of an Ontario Orchid at the Royal Botanical Gardens Orchid Society Show.

He is currently the Co-Chair of the Conservation Committee of both the Southern Ontario Orchid Society and the Canadian Orchid Congress.

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Dr. Leslie Ee, N.D.

Born in Borneo, not far from the home of *Paphiopedilum sanderianum*, Leslie was raised around orchids his entire life by his grandmother and mother, both of whom treasured local orchids. They taught Leslie how to grow and flower them at a young age, and he has never looked back. Since then, Leslie has grown many varieties over 30 years, but his favourites are *Cattleya* species, *Paphiopedilum* species, novelty *Phalaenopsis* and miniatures with a few botanical varieties thrown in. At present Leslie has over 500 plants, a majority of them selected and heirloom *Cattleya* species, and three orchid tanks including a cool tank with *Dendrobium cuthbersonii*. Dr. Ee has travelled the world to attend orchid shows and nurseries in Japan, Ecuador, Colombia, US, Thailand, Singapore and Malaysia. Leslie is an AOS Associate Judge with the Toronto Judging Centre as well as President of the Canadian Orchid Congress. He is committed to the sharing of orchid knowledge and conservation efforts of local orchids around the world.

Thomas Fraleigh

Thomas is a life science professional and entrepreneur. He is the founder of an analytical chemistry and microbiology testing lab called Vivariant Laboratories.

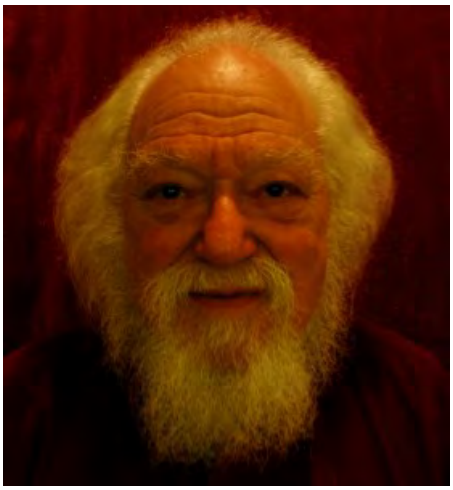
He runs a small hobby business selling orchid seedling flasks, plants and raw materials. Thomas has been growing orchids and peculiar plants since he was a teenager. He specializes in miniature species.

Xavier Garreau de Loubresse

Xavier has been growing orchids over 30 years. Apart from running a large-scale laboratory for the potted-plant industry, he owns Select Orchids Nursery, growing and selecting various species with a special focus on *Paphiopedilum* and other odd genera including jewel orchids. He has a special interest in tissue culture and horticultural optimization through scientific understanding.

Andrew Geimar

Growing up in South Africa, Andrew has always been around orchids from a very young age. Taking hikes to Drakensburg mountains, he often stumbled across various *Disa* genus with no clue what they were but loved the colorful flowers. Today, he has grown orchids indoors for over five years, starting with jewels early on. He prides himself in his ability to reimagine how he grows his orchids. “Don’t be afraid to try new growing techniques, or be afraid of failure; it’s how you learn”. Andrew and his partner Felix are co-owners of Roehampton Orchids, a tropical plant nursery located in the heart of Toronto specializing in many jewel orchids.



Leon Glicenstein, Ph.D.

Leon Glicenstein has been growing orchids for over 60 years, is an international lecturer who speaks, in person, to orchid and plant societies. He is also breeder of novel orchid hybrids in the *Gongorinae, Zygopetalinae, Pleurothallidae*, Angraecoids, Jewel and Painted leaf orchids, and *Habenaria*, as well as a few other genera. Leon also writes educational orchid articles for various orchid journals.

Peeraya Inpanich

Peeraya Inpanich (Mam) and husband Wattanakorn Inpanich own Joe & Mam Orchids. With their great love of orchids, they opened an orchid shop at Bangkok’s famous Chatuchak Market and have been there for about 20 years. They travel to orchid shows abroad and are orchid judges in Taiwan and Japan. They also vendor at foreign orchid events like Brunei, Singapore and Japan. Sharing their passion for orchids, they love making good friends in the orchid world.

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Udai C. Pradhan

Udai Chandra Pradhan graduated with a Gold Medal from Allahabad Agricultural Institute in 1971 and received further postgraduate training on orchids and the techniques of propagation by seeds at the Royal Botanic Gardens, Kew, England during 1971-72. He learnt the techniques of meristem tissue culture of orchids from Professor Georges Morel at the Agronomical Research Station at Versailles, France and underwent six months of practical training at the orchid firm of H. Wichmann Orchideen at Celle, Germany where he learnt the commercial aspects of orchid production and sales. Udai has been actively breeding and registering new orchid hybrids over 50 years now and has a keen interest in the biology, conservation and cultivation of jewel orchids. He chaired the Indian Subcontinent Regional Orchid Specialist Group from its inception in 1999 until 2012 and has been a nominated member of the Orchid Specialist Group of the World Conservation Union (IUCN), Species Survival Commission since its inception in 1984.

Udai authored *Indian Orchids Guide to Identification and Culture* in two volumes which set the trend on orchid research and cultivation in India. He also co-authored *100 Beautiful Himalayan Orchids and How to Grow Them* and *Himalayan Jewel Orchids and How to Grow Them* with his son Satyam. He has also written over 100 articles in orchid magazines around the world. He was honoured by the Orchid Society of India for his pioneering work on orchids with the Society's Lifetime Achievement Award in 2006, an Honorary Fellowship of the Indian Society of Ornamental Horticulture in 2009 and, very recently, an orchid species *Liparis udaii* has been described in his honour. He was elected to the Life Membership of the American Orchid Society in 1972 and The Orchid Digest, California, U.S.A. in 1976. He judged and exhibited at two World Orchid Conferences: Frakfurt Germany in 1975 and Florida, USA in 1984. He also exhibited at the 18th WOC in Dijon, France. Today Udai along with his wife Tej continue to enthuse and inspire young people to take up orchid studies and commercial production in India and elsewhere.

Nicholas Rust

Nicholas is an up-and-coming hybridizer in the orchid community, seriously growing and studying orchids for about 7 years. His orchid passion arose during the end of high school when a mini-*phalaenopsis* was gifted to him. Like a flame to gasoline, this gift quickly pulled him into the diverse world of orchids. Shortly after his interests were formed, he began exploring the culture of several unique genera of terrestrial orchids. He now specializes in jewel orchids, *Bulbophyllum*, *Habenaria* and other related genera.

Through studying biochemistry and molecular biology throughout college, Nicholas approached his orchids with the same scientific perspective he used while working in a research lab. This led to an interest in the entire growth cycle of orchids and the start of his own hybridization program which focuses on terrestrial orchids, especially *Habenaria*. His aim is to use rarely cultivated species and distinct variations of common species to create truly exceptional shapes and colors that will pave new directions for unique hybrids.

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Charlot Teng

Charlot Teng grew up in Taiwan and has loved jewel orchids since his teens. At age 16, he saw photos of *Macodes petola* and *Dossinia marmorata* in a Japanese orchid book which ignited his interest with their attractive foliage. He was trapped by their spell when he saw magazine photos of the many *Anoectochilus* cultivars from Russia at the 1992 Japan Grand Prix International Orchid and Flower Show. Besides jewel orchids, Charlot also grows a variety of other orchids like *Paphiopedilum* as well as ornamental houseplants.

Michel Tremblay

Michel Tremblay has been a Canadian amateur orchid grower for over 35 years, cultivating his orchid collection in his basement under artificial light. His main interest is hybridizing *Phalaenopsis*, both species and hybrids.

He is an accredited AOS judge in the Montreal Judging Center (Quebec region) since 1995 and a member of Les Orchidophiles de Montréal since 1984.

Joe and Sheila Csabai

Joe and Sheila are members of both the Essex County and Windsor Orchid Societies, as well as the LaSalle Horticultural Club and the Ojibway Nature Centre. They became interested in growing orchids 12 years ago. Their greenhouse is full of diverse species and hybrids, but their favourite is always the one that's presently in bloom! Recently they have spent time pursuing species and hybrids of the jewel orchids for their growing collection. They have traveled multiple times to Cuba and Mexico in pursuit of orchids and enjoy the history of each one. Joe spends his free time in the garden and greenhouse. Sheila takes time for orchid shows, travel and charity activities and also volunteers as the Treasurer for the Canadian Orchid Congress. Both are very thankful to have met so many wonderful friends and orchid enthusiasts along the way.

Glossary

aff. ---------- a taxonomy term that means 'closely related to' a species or a group
AM ---------- Award of Merit (AOS award)
AOS ---------- American Orchid Society
coir ---------- fibre used in potting mix made from outer coconut husks
cricket frass ---- insect droppings from crickets used as manure
distal --------- -- furthest distance from the body or anatomical reference point
DIY ---------- 'do it yourself'
Dolokal ---------- dolomite lime powder
EC ---------- electrical conductivity used to measure solutions using EC meters
Grodan cubes --- cubes made from rockwool
in situ/ex situ --- in situ means in their original natural wild habitat whereas ex situ means outside of the habitat
mS ---------- microsiemens, or units used to measure electrical conductivity
nothogenus ----- a hybrid between two different genera
ppm ---------- parts per million, or units used to measure TDS
pumice ---------- light weight volcanic rock
RHS ---------- Royal Horticultural Society
rockwool -------- fine fibres spun from molten rocks
Seramis --------- small granules of expanded clay
sp. and spp. ----- taxonomic terms meaning species (sp.) or several species (spp.)
stolon ---------- a horizontal branch that produces new plants
TDS ---------- total dissolved solids usually expressed in ppm
turface ---------- a high fired clay used in mixes
var. ---------- a variety of a species or hybrid, usually denoting a colour form e.g. *alba*

Jewel Orchids

The Canadian Orchid Congress would like to thank the contributors as well as our volunteers for sharing their expertise and talent for this issue.
Let's work together to ensure our jewels survive at home and in the wild!