

ORCHID CONSERVATION NEWS

The Newsletter of the Orchid Specialist Group of the IUCN Species Survival Commission

Issue 1

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ORCHID CONSERVATION CLIMATE ALTERATIONS

Editorial

We live in a period of rapid change and unpredictable happenings. Change is happening everywhere we study orchids but we might consider what is happening to the community of plants, animals, and soil microorganisms sharing the same niche. Orchid populations may have the capacity to adapt genetically with seeds that extend their range to habitats not yet subject to rapid change (Bateman, 2020; Kaur *et al*, 2021; Sramkó *et al*, 2019). See The Food for Thought column on Page 5 for links.

With climate change and the consequences flowing from that, the question of habitat climate type comparison, projections, and future trends is being addressed. Having awareness of climate types, where are these situated, and what projections there are to future trends for temperature and precipitation is well worth reading (Peel *et al*. 2007; Beck *et al*. 2018).

In this issue, we have a second inspiring article about student conservation initiatives by Larry Zettler. The south Florida population of the Ghost Orchid (*Dendrophylax lindenii*) faces challenges that extended study could elucidate (Mújica *et al*, 2021).

Jasmine Janes provides a comprehensive insight to climate change impacts on orchids, Page 3.

The American Orchid Society Conservation grants and awards, Page 5. See Wilson (2021) Conservation Committee Report, Food for Thought column.

Marilyn H.S. Light, Editor

How a College Student Overcame Political Interference to Conserve the Ghost Orchid (*Dendrophylax lindenii*) in Florida at a Critical Time.

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His name is Adam Robert Herdman. He is a young man in his 20s who grew up outside of Chicago in the suburbs where busy roads and shopping malls abound. When he entered college as an undergraduate student almost a decade ago, he had no idea he would soon be sidestepping alligators and venomous snakes in south Florida's swamps studying the enigmatic Ghost Orchid, *Dendrophylax lindenii*, which is now a candidate for U.S. Federal protection as an endangered species. Although he is a newcomer to orchid conservation, the story of Adam Herdman and the Ghost Orchid needs to be told, because it exemplifies how one young man can have a profound and positive impact in a world where orchids and other life forms are quickly vanishing.

Pictured on the right is *Dendrophylax lindenii* photographed in flower in the Florida Panther National Wildlife Refuge, courtesy of Emily Massey.





Adam Herdman (left) pictured with Connor Melton (middle) and Dr. Ernesto Mújica (right) in the Florida Panther National Wildlife Refuge in July 2017. Photo courtesy of Mark Danaher.

Typical of today's youth, Adam entered college armed with a cell phone and laptop computer and limited perspective of the incredible natural beauty begging to be studied outdoors. Wildflowers, insects, slime molds, songbirds, and other creatures great and small are no match for handheld electronic gadgets with flat screens. Unless this pattern changes quickly, the next generation will never get to know and appreciate all of the life forms that need our help in this age of extinction. As long as nature remains rooted in our DNA, however, there is hope. Students just need opportunities to be led outdoors and immersed in a setting devoid of technology. Habitats rich in orchids are a logical starting point.

In Adam's case, 'immersed' had added meaning after he agreed to travel from Illinois into the swamps of the Florida Panther National Wildlife Refuge during his first summer internship, graciously funded by the Naples Orchid Society. The purpose of his trip was to collect survey data on the well-known Ghost Orchid, the subject of Susan Orlean's best-selling novel, *The Orchid Thief* that led to the Hollywood movie, *Adaptation*. Found as a leafless epiphyte on trees rooted in stagnant water filled with reptiles, collecting data on this species posed a formidable physical and emotional challenge. He was joined by another college student, Jack Waggoner, and both were led into the wilderness by Cuba's Ghost Orchid expert, Dr. Ernesto Mújica, who spearheaded the effort to survey the species in Florida.

The team's goal was to collect at least five continuous years of data on Ghost Orchids in the Panther Refuge to determine mathematically if the populations were stable, rising, or in decline. A minimum of five years of data were needed, and Adam arrived in July of Year 2.

Off they went each morning into the humid air visiting different Ghost Orchid sites, swatting hordes of mosquitoes while dripping with sweat. Although they sported snake boots to protect their feet and ankles from the fangs of venomous snakes, the boots offered little protection from the jaws of large alligators that roamed the tea-colored water beneath the orchids. More than once, the team was forced to climb a tree when an unusually large alligator ventured too close for comfort only to disappear beneath the water uninterested. Despite the daily hardships and foreboding conditions, Adam, Jack, and Dr. Mújica secured much needed data from Year 2, nearing the mid-point of the important survey. In Year 3, Adam rejoined Dr. Mújica along with another college student, Connor Melton, and everything went according to plan. Then politics reared its ugly head.

As Year 4 was being planned, relations between the United States and Cuba began to sour led by a change in administration eager to reverse Obama-era gains. This was soon followed by a mysterious illness – "Havana Syndrome" – that led to the sudden closing of the U.S. Embassy in the Cuban capital. But the timing of the embassy's closing was much more than an inconvenience for Cuban citizens seeking visas to enter the United States, for it was a potential death nail in the coffin of the ongoing Ghost Orchid survey. Simply stated, Dr. Mújica could no longer visit the Panther Refuge to supervise the surveys using his reliable time-tested methods. Without more data, it was anybody's guess whether or not orchid populations were stable or in flux making it less likely that the Ghost Orchid would eventually receive Federal legal protection.

Despite the souring of relations and the closing of the embassy, e-mail communication between the U.S. and Cuba remained free of political interference. And although Adam had endured a number of hardships while surveying Ghost Orchids in the Panther Refuge, he was bitten by a creature far more powerful and influential than he had ever imagined - Mother Nature. Not only did Adam desire to continue the surveys, he longed for the natural beauty he experienced the years prior and agreed

to press on without his Cuban mentor. Through frequent e-mail communication with Dr. Mújica who remained in Cuba, Adam quickly re-learned the methods used to survey the Ghost Orchids in Florida giving him the confidence to collect valuable data. In July of Year 4, and after securing additional support from the Naples Orchid Society, Adam Herdman's boots were on the ground and back in murky water once again.

The ending of Adam's story is a happy one, otherwise it would not be written here in this newsletter. Despite ongoing political interference that lingers to this day, all necessary yearly survey data were eventually collected in the field by Adam and analyzed afar by Dr. Mújica. The results were indeed grim, but at least now a clearer picture has emerged concerning the fate of the Ghost Orchid in south Florida. Of over 400 individual orchids counted and monitored in the Panther Refuge from 2015-2020, *D. lindenii* numbers will experience a gradual (20%) decline during the next decade in the absence of adverse external factors (e.g., severe hurricanes). Moreover, seedling recruitment is not expected to keep pace with this decline as only one of seven sites harbored spontaneous seedlings. Thus, the Ghost Orchid is on a path to extinction unless immediate steps are taken to save it. What is equally troubling is that politics nearly ended the survey at the worst possible time.

The research that Adam Herdman piecemealed together led to his co-authorship on a peer-reviewed scientific paper that was published in the July 2021 issue of *Plants* – an honor he most certainly deserved. This paper also filled a void at a time when the U.S. Fish & Wildlife Service was considering a petition aimed at granting *D. lindenii* Federal protection. Although it remains to be determined if the highly coveted Ghost Orchid will be granted this lofty legal status, Adam Herdman's role during the process is commendable and rather remarkable for someone his age. He also exemplifies how one young person can contribute to orchid conservation in a meaningful way while, at the same time, learning to appreciate and protect the natural beauty that remains in our world.

Adam R. Herdman is currently completing the requirements for his Master's degree at Southern Illinois University-Edwardsville under the supervision of Dr.

Elizabeth Esselman. He aspires to enter a Ph.D. program in the coming year that will allow him to study *D. lindenii* and other native epiphytic orchids in Florida and the Caribbean.

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Reference:

Mújica, E, A. Herdman, M. Danaher, E. González, and LW Zettler. 2021. The projected status of the Ghost Orchid (*Dendrophylax lindenii*) in Florida during the next decade based on temporal dynamic studies spanning six years.

Plants 10, 1579. <https://doi.org/10.3390/plants10081579>

Orchids and climate change: It's not just pretty flowers that we stand to lose.

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Imagine, you've waited about seven months for your terrestrial orchids to break their dormancy and initiate aboveground tissues. You monitor these leaves religiously for the next two months, waiting for signs of an inflorescence to develop. Finally, you prepare your team and equipment. Cameras monitor the plants 24/7 to ensure that you can capture evidence of insect visitors to the flowers as they open over the flowering season. Your planning and hard work seem to be paying off; your team is excited to see what results can be gleaned. Then, quite unexpectedly, the flowering season is cut short by unseasonably high temperatures and several months without rain. This scenario played out for us last summer as we tried to identify the floral visitors and nectar microbiome of several orchid species on Vancouver Island, Canada.

Experiences like these are becoming increasingly common for researchers around the world as we begin to feel the effects of global climate change. We have been warned of increasingly unpredictable and extreme weather conditions for several years – rising temperatures, more severe storms, less predictability in where and when rain will fall. Obviously, many organisms will be at risk as such dramatic changes occur. We already know that alpine and high latitude areas are effectively shrinking, some plants and their

pollinators are no longer in sync in terms of their flowering and active periods, and many species simply cannot adapt to such (evolutionarily speaking) rapid changes. But what does it mean for orchids exactly, and should we care?

Terrestrial orchids are considered to be sensitive species, even if they aren't formally recognized as at-risk species, because of their intricate relationships with other species. Typically, orchids require a fungus for germination, and often they rely on animals, particularly insects, for pollination. Now, anyone who has tried growing an orchid at home knows that these plants are quite fussy anyway. They need the right light, temperature, humidity, pH, and growing media to thrive. Now add in the relatively unknown preferences of the fungi and insects and you can begin to appreciate why terrestrial orchids are often considered sensitive, ecosystem indicators.

I've worked with terrestrial orchids for the past 15 years but my experience last summer really made me think deeply about what may be happening in these communities as the climate continues to change. It's not just pretty flowers that we stand to lose. Below are some thoughts on what else may be at risk:

Temperature and rainfall changes may limit orchid reproduction: With less rainfall, and increased evapotranspiration from higher temperatures, it is likely that orchids will face an allocation paradox. Should they invest more in maintaining themselves rather than producing numerous flowers and costly nectar, or should they invest in reproduction over longer-term survival. Either strategy carries risk in increasingly unpredictable environments. Hopefully, enough diversity exists that we will see both strategies enacted as a means of safe-guarding populations.

Climate-induced changes to nectar: Rewarding orchids produce nectar for the pollinators. Each rewarding orchid species produces a nectar tailored to the pollinator(s) it attracts. For example, the various amino acids, sugar concentration, and type of sugar offered have been selected for over time to suit that particular orchid-pollinator relationship. Increasing temperatures and lowered rainfall may result in limited production of nectar and/or altered chemical composition of the nectar. Lowered production is

likely to reduce reproductive success for the orchid as less food for pollinators translates to less visits. Altered chemical composition may reduce visits from pollinators, or potentially attract different floral visitors that may or may not be able to perform a pollination service. I'm sure a similar impact could be considered for deceptive orchid species also.

Initially, nectar is believed to be sterile until the flowers open. As floral visitors arrive and collect nectar they alter the composition of this nectar, adding new microbes to the mix. The temperature influences these microbial communities also. Effectively, different flowers on a single inflorescence could support unique microbial communities. These communities can increase or decrease the attractiveness of the flowers over time, further influencing the floral visitors, and ultimately determining the relative success of fertilization and seed production.

In line with the above, as the microbial community changes it may render some sources of nectar unsuitable as a food source for pollinators and other floral visitors. Our knowledge of the floral visitors and pollinators for many orchid species is very limited, particularly for orchid species pollinated by nocturnal insects. A reduction in suitable nectar is likely to negatively impact pollinator populations, many of which may also be considered rare species.

Orchid-pollinator asynchrony: Offsets between plant flowering dates and pollinator activity have largely been studied in alpine and high latitude environments. While these areas are typically low in orchid diversity, they do represent habitats in which some of our already rare species are present. To my knowledge, few orchids have been considered in studies addressing the effects of climate change on phenology. Any disruptions to the relationship between orchid and pollinator are likely to result in population reductions for the orchid given that pollination rates are typically low for insect-pollinated species. Orchid population reductions may have knock-on effects that reduce pollinator populations if alternative food sources aren't available.

Unknown impacts on mycorrhizal associations: Our knowledge of mycorrhizae and their ecology is improving. However, the impacts of climate change on mycorrhizae may be difficult to predict with any certainty. We don't know the full range of fungal

species that couple with orchids, and we often don't know how specific these relationships are. The geographic range, growing conditions, and environmental tolerance of many mycorrhizal species remains unknown also. Generalizations, such as range contractions and expansions for some species, can be assumed but the specifics pertaining to impacts on orchid germination and what this might mean for orchid distributions moving forward are relatively unknown. Will some mycorrhizal species become increasingly rare as soils become hotter and drier? It's possible that orchids with species-specific mycorrhizal relationships (i.e., one orchid, one fungus) will face extinction, opening up niches to more generalist orchids and their mycorrhizae.

So, next time you are admiring an orchid flower, consider the complex eco-evolutionary relationships that species is a part of. Orchids aren't just flagship species. They are an integral component of ecosystems, linking various groups of species together. It's certainly not just the orchids at risk, it's also the associated pollinators, mycorrhizae, and microbes too. Jasmine Janes

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AMERICAN ORCHID SOCIETY CONSERVATION AWARDS AND GRANTS

The American Orchid Society (AOS) provides two different conservation recognition awards (cash type awards to the recipients in recognition of their work - to individuals, groups or Affiliated Societies). Do you know someone who should be recognized for their orchid conservation work? Deadline for submission each year is 1 September. Photos are desirable as an article in the *Orchids* journal is intended about each recipient. Details on how to nominate individuals, groups or AOS affiliated societies are

available at:
<https://www.aos.org/about-us/orchid-research/conservation-awards.aspx>

American Orchid Society Orchid Conservation Grants

The AOS also offers grants for orchid conservation each year. Deadline for submissions is 1 February. Details are available as well as the grant application form at:
<https://www.aos.org/about-us/orchid-conservation/grant-application.aspx>

AOS Education and Research Grants

The AOS also offers grants in orchid education and orchid research each year with the same 1 Feb deadline for submissions. Details are available at:
<https://www.aos.org/about-us/orchid-research.aspx>

Food for Thought

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Mark your Calendar

MONOCOTS – 7th International Conference on Comparative Biology of Monocotyledons.

San José, Costa Rica, March 6–10, 2023

IOCC VIII, Perth, Australia, September 2023 or 2024

Details to follow.

Changes to contact information?

To maintain effective communication, we need to know of any changes in contact information.

Please inform the OSG Chair, Mike Fay. (M.Fay@kew.org)

Call for conservation news

Members are invited to provide news of their recent conservation activities for publication in the OSG Conservation News.

Please submit material in Microsoft Word, and illustrations, if any, as separate jpeg files. If applicable, please include suggested captions and photographic credits. Send news to Marilyn Light, Editor, (milight@distributed.net)