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Nearly half of the species of *Heliconia* are threatened with extinction

A new analysis from researchers at the Smithsonian's National Museum of Natural History reveals that nearly half of the genus *Heliconia*, a group of tropical plants popular for their bright, beakshaped flowers, are threatened with extinction. The findings, published in the journal *Plants, People, Planet* (https://doi.org/10.1002/ppp3.70000), reveal that many of these imperiled plants are not found within protected areas or botanical gardens, making additional conservation action crucial to saving these charismatic, horticulturally important and ecologically significant floras.

The new work places *Heliconia* among a select group of plants to undergo a detailed, comprehensive conservation assessment. Traditionally such an effort requires countless hours of demanding fieldwork. Instead, the new project relied on previous field work conducted by research botanists like W. John Kress, an emeritus curator at the museum and one of the authors of the new study, who spent decades collecting *Heliconia* plants in the tropics. These efforts yielded thousands of dried specimens and data-rich labels that are housed in herbaria around the world, including the museum's United States National Herbarium.

"The data that is stored in the herbarium is a scientific treasure that makes a project like this feasible," said conservation biologist Gary Krupnick, who heads the museum's Plant Conservation Unit and is one of Kress' coauthors on the new study. "We built upon the valuable time and resources that past researchers have spent going out into the field and counting plant populations."

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> **"When you realize that whole evolutionary lineages of life with multiple species may be similarly threatened with extinction, it makes you stand up and notice that something is really happening here."**
>
> *W. John Kress, Smithsonian Botanist*

Profile

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The genus *Heliconia* contains 187 species of tropical plants related to bananas. While a handful of *Heliconia* species are native to western Pacific islands, the majority live in rainforests throughout tropical Central and South America. Here, the plants are important ecological resources for a variety of creatures, including bats in the Pacific tropics and hummingbirds in the New World tropics, which are the primary pollinators for many *Heliconia* species. The plants produce nectar to entice the flying animals, who then spread pollen to other flowers as they flutter about.

Heliconia plants are famed for their flowers, which come in a variety of vivid hues, including intense yellows, fiery oranges and rosy reds. Their reproductive structures are composed of waxy, elongated leaves called bracts. Many *Heliconia* flowers resemble the striking plumage of birds-of-paradise. Others evoke lobster claws or toucan beaks.

Gardeners have cultivated *Heliconia* species for centuries as striking ornamental plants. This popularity has put some species at risk of overexploitation and poaching. In addition, *Heliconia* plants are threatened by habitat loss and fragmentation, invasive species, and climate change.

Until now, little was known about *Heliconia* populations in the wild. Only a few *Heliconia* plants have undergone conservation assessments, and just 21 species of the charismatic flora are currently listed on the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species.

During the pandemic, Krupnick spent time sifting through herbarium sheets on the museum's online collection database. While in-person access to the herbarium itself was limited, all *Heliconia* specimens in the museum's collection had been fully digitized and were available online.

Krupnick became interested in exploring how *Heliconia* populations were faring in the wild and collaborated with Kress. At the time, Kress, who first encountered these plants in 1972 and became fascinated by their vibrant flowers during field work in Peru, was working with a group of scientists to publish a detailed description of *Heliconia*'s evolutionary history.

Kress and Krupnick used the dataset from this prior study and analyzed nearly 10,000 *Heliconia* specimens. Many of these dried plants, which Kress collected, were housed in the museum's herbarium and mounted on large sheets of paper alongside labels that contain key information on when and where each plant was collected.

"As a conservation biologist, I'm most interested in the data on the label, which tells us the what, where, when and why," Krupnick said. "This helps us track how

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On the cover: *Heliconia sclerotricha* in Ecuador. *Heliconia* plants are famed for their flowers, which come in a variety of vivid hues, including intense yellows, fiery oranges and rosy reds. (photo by W. John Kress)

This new work places *Heliconia* among a select group of plants to undergo a detailed, comprehensive conservation assessment. Traditionally such an effort requires countless hours of demanding fieldwork. Instead, the new project relied on previous field work conducted by research botanists like W. John Kress who spent decades collecting *Heliconia* plants in the tropics. These efforts yielded thousands of dried specimens and data-rich labels that are housed in herbaria around the world. *Heliconia atratensis* is known from 16 specimens collected from 11 populations found in the understory of the Chocó-Darién moist forests of Colombia. The species is assessed as near threatened due to its narrow distribution, known populations all outside of Colombia's protected-areas network, and no known individuals preserved in botanical gardens. This species may be difficult to grow in greenhouse conditions because of its unique soil, drainage and moisture requirements. (photo of living plant by W.J. Kress; image of herbarium specimen from the U.S. National Herbarium)

W. John Kress, now an emeritus curator at the Smithsonian's National Museum of Natural History and one of the authors of the new study, discovering a new species of *Heliconia* in Venezuela. "Now that we know the conservation status of every one of the 187 species of *Heliconia*, we can construct a coherent plan of how to protect them," Kress said. "That does give me a tidbit of hope." (photo by W.J. Kress)

populations change over time."

The team used a spatial software tool called GeoCAT (Geospatial Conservation Assessment Tool) to calculate factors like range size and the abundance of plants occupying certain areas. The team then examined how human activities in these areas have impacted forest coverage using resources like satellite imagery. They also pinpointed which *Heliconia* populations occur in protected areas and which species exist in botanical gardens and could potentially be reintroduced into the wild.

The team revealed that 87 *Heliconia* species (47% of the genus) are threatened with extinction, nearly half of the entire group. Alarmingly, all but one of these threatened species are found in only a few protected areas in the wild. And a relatively small number of these imperiled species exist outside their native ranges. The team discovered that the majority of *Heliconia* specimens growing in botanical gardens represent species of least conservation concern on their list of assessed species.

The work also found that certain lineages within the *Heliconia* genus are particularly endangered. According to Kress, more work is needed to determine what makes these subsets of related species so vulnerable. But the overarching takeaway is clear.

"When you realize that whole evolutionary lineages of life with multiple species may be similarly threatened with extinction, it makes you stand up and notice that something is really happening here," Kress said.

The researchers list 45 *Heliconia* species that they consider top priorities for additional protection. These include species that reside outside of protected areas and are not well represented in botanical gardens. It also highlights species that are adapted to thrive in fragile environments, such as high-altitude cloud forests that are particularly susceptible to change.

"This study provides a blueprint for how to save this group of plants, starting with this list of priority species," Krupnick said.

At the end of March, Kress and Krupnick attended the Heliconia Society International (HSI) conference in Hawaii, a gathering of *Heliconia* scientists and commercial growers. They hosted a workshop to initiate a new, concerted effort by members of HSI to extend and expand the efforts of botanical gardens and private living collections to conserve in *ex situ* collections of the most endangered species of *Heliconia*, focusing on the 45 priority species for conservation highlighted in the new study.

The researchers also hope this project will inspire similar efforts to study other botanical groups. To date, less than 20% of all plant species have undergone conservation assessments. And without understanding the threatened statuses of certain groups, it remains difficult to chart a path forward.

"Now that we know the conservation status of every one of the 187 species of *Heliconia*, we can construct a coherent plan of how to protect them," Kress said. "That does give me a tidbit of hope."

In addition to Krupnick and Kress, Tomáš Fér of Charles University in Prague and Mónica Carlsen of the Missouri Botanical Garden were coauthors on the study.

***Heliconias* planted as ornamentals in a garden in Panama. Gardeners have cultivated *Heliconia* species for centuries as striking ornamental plants. This popularity has put some species at risk of overexploitation and poaching. In addition, *Heliconia* plants are threatened by habitat loss and fragmentation, invasive species and climate change. (photo by W.J.Kress)**

Delayed ocean acidification confirmed in Gulf of Maine

-Adapted from The Pinnacle Gazette

Recent research indicates a delayed onset of ocean acidification in the Gulf of Maine due to complex water mass interactions and temperature variations. The Gulf of Maine, significant for its ecological and economic value, particularly for fisheries, has become the focus of increasing scrutiny due to concerns about rising atmospheric CO_2 levels affecting marine life.

The study reveals a surprising trend: seawater pH levels were low (~7.9) for much of the last century but increased by +0.2 pH units over the past 40 years, contradicting the rising levels of atmospheric CO_2. This unexpected increase raises questions about the factors influencing coastal water chemistry and the potential impacts on marine species.

Conducted by researchers including J.A. Stewart (University of Bristol), **Walter Adey** (Smithsonian's National Museum of Natural History), and others, the study spans pH records from 1920 to 2018 CE, primarily focusing on changes noted from 1980 to 2000 CE. The researchers employed boron isotope measurements from long-lived coralline algae to create proxy records indicating seawater pH trends.

Significantly, the researchers highlight the remarkable interplay between different water masses within the Gulf of Maine. The influx of warmer, higher alkalinity waters derived from the Gulf Stream contributed to the increased pH, acting as a buffer against ocean acidification's effects.

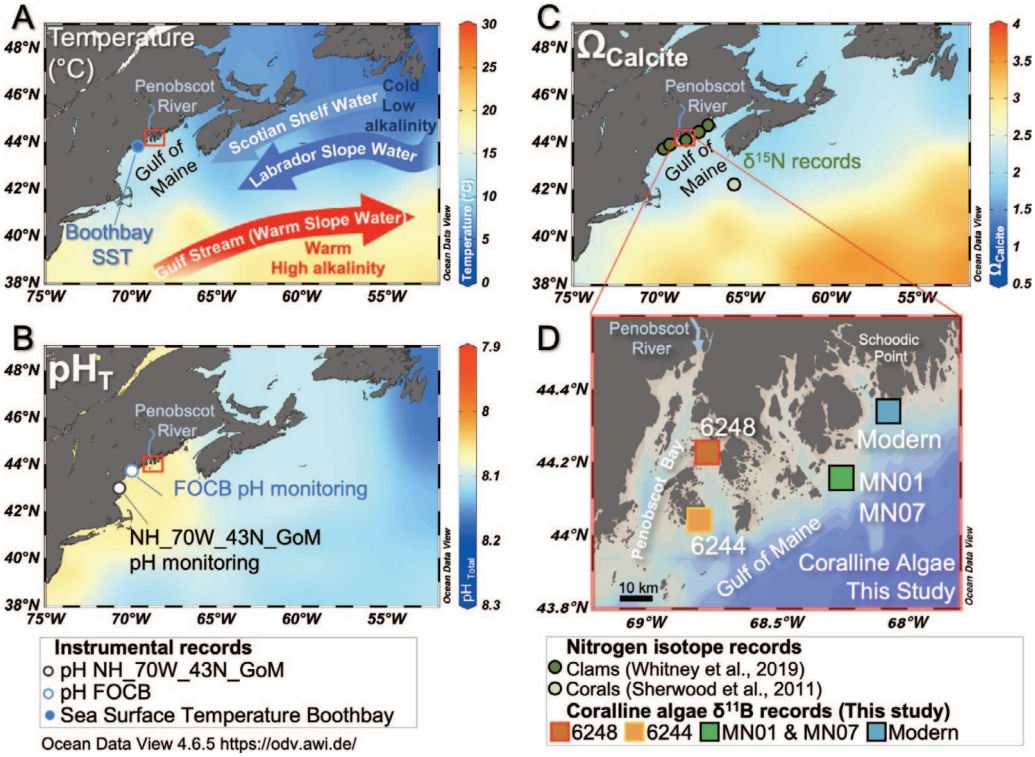
"Once ocean circulation-driven buffering effects reach their limit, seawater pH decline may occur swiftly," the researchers warn. This statement underlines the precarious balance of the Gulf's delicate marine ecosystem, which includes commercially significant species like oysters and clams.

The findings, published in the journal *Scientific Reports* (https://doi.org/10.1038/s41598-024-84537-3), stress the need for careful monitoring of oceanic conditions as the Gulf of Maine approaches its buffering capacity. The unique oceanographic conditions suggest the Gulf may be at risk for rapid shifts to more acidic conditions if prevailing influences change. If the inflow of low alkalinity waters from the north increases or if extreme runoff events happen more frequently, coastal ecosystems could face dire consequences.

"This delayed onset of ocean acidification is cause for concern," said the researchers, emphasizing the potential impacts on marine calcifiers and the wider ecosystem. The study addresses the challenge of predicting the future of ocean chemistry and the ramifications for ecosystems dependent on stable pH levels.

While the recent trends may suggest some resilience, the increasing pressure on marine species from climate change emphasizes the necessity of proactive management and policy measures. "Our records suggest the recent direct influence of anthropogenic CO_2 invasion on seawater pH has been primarily buffered by changes in water mass mixing," the authors conclude, highlighting the complex, interrelated nature of climate impacts on oceanic systems.

Continued research and monitoring efforts will be key to fully understand and mitigate the effects of acidification across the Gulf of Maine and beyond, safeguarding its fragile marine ecosystems and the economic lifelines they provide.



Location of crustose coralline algae samples in the *Scientific Reports* study and modern hydrographic context of the Gulf of Maine. Sea surface temperature (A), pH (B), and calcite saturation state data (C). Ω calculated from bottle measurements of alkalinity and dissolved inorganic carbon. Detailed sample locations of the *Clathromorphum compactum* coralline algae specimens used in this study are shown in panel (D). (image from *Scientific Reports*, https://doi.org/10.1038/s41598-024-84537-3)

Climate change is altering plant and pollinator relationships

-Adapted from Pollinator Partnership

An international team of scientists from Mexico, the United States, and Costa Rica recently published a literature review that compiles the research from 340 scientific articles on how climate change is disrupting plant reproduction. The paper titled, "Untangling the complexity of climate change effects on plant reproductive traits and pollinators: a systematic global synthesis," was published in the journal *Global Change Biology* (31: e70081, https://doi.org/10.1111/gcb.70081).

The basic findings of this study show that climate change is reshaping how plants and animals interact. Disruptions in these relationships may occur when plants and pollinators no longer co-exist in space or time, or when floral characteristics no longer match the needs and behaviors of their animal pollinators. Climate variations may impact floral attraction and reward traits, affecting the health, reproduction, and survival of plants and pollinators.

The study, led by Silvana Martén Rodríguez of the Universidad Nacional Autónoma de México (UNAM), included a team from UNAM, as well as authors affiliated with Instituto de Ecología, A.C., Universidad Autónoma de Guerrero, Universidad Autónoma de Yucatán, Universidad Michoacana de San Nicolás de Hidalgo, Universidad de Costa Rica, Smithsonian's National Museum of Natural History, and University of Kansas.

Co-author **Gary Krupnick** of the Smithsonian's National Museum of Natural History points out that "This paper shows how climate change is increasing the risk of temporal mismatches between plants and pollinators worldwide, which can have serious negative impacts on biodiversity and ecosystem health."

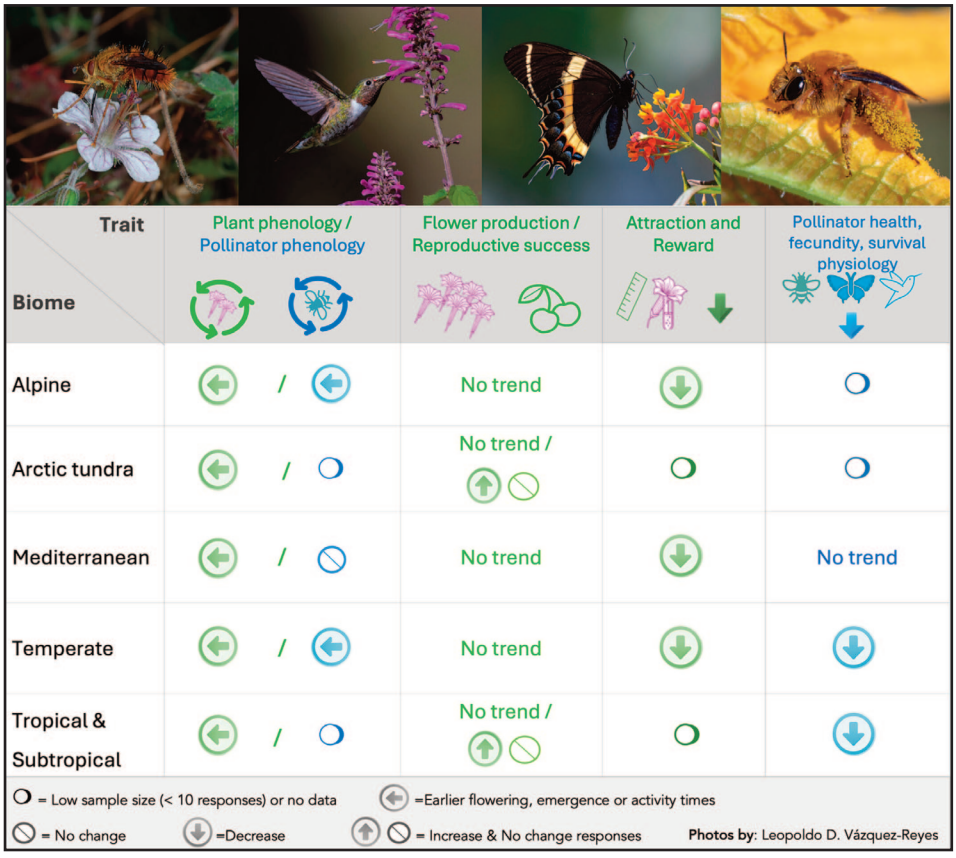
The effects on flower production, plant reproductive success, and pollinator abundance vary depending on geographic location, temperature, and water availability. Most pollinators experience negative impacts on their health and life cycles due to rising temperatures. Drought, extreme weather, and land-use changes further worsen these effects, posing even greater challenges for the conservation of plants and pollinators. The study also highlights how research on climate change's impact on plants and pollinators is imbalanced throughout the world, and many plant and pollinator groups remain highly understudied. Even for the most well-studied ecosystems, information on most plant and animal species is still limited.

"The report underscores the need for broader global research, especially in tropical, arid, and icy regions and in underrepresented plant and pollinator species worldwide," says Martén Rodríguez.

The rhythms of life, shaped by millions of years of evolution, are being altered by our rapidly changing climate. The relationship between plants and their pollinators is particularly vulnerable, and the survival of nearly all terrestrial ecosystems hangs in the balance. Our planet's future will be defined by how well we understand and safeguard these vital connections.

Luckily, individuals everywhere have the opportunity to support the globe's pollinators and native plants. To learn more about this publication and to see how you can help fight climate change while supporting biodiversity, visit the North American Pollinator Protection Campaign (NAPPC) at www.nappc.org.

For over 23 years, NAPPC has brought together stakeholders from all sectors of the pollinator issue in a collaborative partnership to support pollinator health across the North American continent. More than any other single organization, the collective effort of these 180 plus organizations has made pollinator health a feature in conservation landscape management. From its many Task Forces, NAPPC affects change and moves solid science into real progress on the ground. The recent *Global Change Biology* publication is just one of many outputs produced by NAPPC Task Forces. The National Museum of Natural History has been a proud partner of NAPPC since its inception.



Summary of climate change effects on plant (green) and animal (blue) phenologies, plant reproductive traits, and pollinator traits documented in the literature review across the most studied world biomes. Main trends in response direction (> 50% of responses in one category) are indicated with arrows. (image from *Global Change Biology*, https://doi.org/10.1111/gcb.70081)

New spatial mechanism for the coexistence of tree species: Hidden patterns in tree distribution stabilize biodiversity in forests

-Adapted from Helmholtz Centre for Environmental Research - UFZ

The reason why so many tree species can coexist in species-rich forests has long been a subject of debate in ecology. This question is key to understanding the mechanisms governing the dynamics and stability of forests. An international team of scientists, including **W. John Kress** of the Smithsonian's Department of Botany and **Stuart Davies** of Smithsonian's Forest Global Earth Observatory (ForestGEO), has now discovered unexpected patterns in the spatial distribution of tree species, as reported in the scientific journal *Nature* (https://doi.org/10.1038/s41586-025-08604-z). Their results suggest that tree species in tropical and temperate forests manifest contrasting coexistence strategies as a result of differences in the patterns of tree clustering and the abundances of tree species.

The data sets are very large with more than 75 permanent forest dynamics plots in 29 countries worldwide. The ForestGEO network of the Smithsonian Tropical Research Institute (STRI) provides excellent forest inventories for investigating the dynamics of forest ecosystems and better understanding the processes that drive the structure and function of forests. On these 20-to-50-hectare plots, every single tree with a diameter not much larger than a pencil has been identified, measured and mapped every five years, often totaling more than 200,000 trees.

The international team took a closer look at 21 of these forest megaplots, which cover a gradient from the tropical to the subtropical and temperate zones. The team then used the ForestGEO data to analyze the distribution of tree species in the forests and which processes are responsible for their spatial patterns. "The search for simple principles underlying the spatial structure and dynamics of plant communities is a long-standing challenge in theoretical ecology," says first author Thorsten Wiegand of the Helmholtz Centre for Environmental Research - UFZ, describing their research question.

The highly complex spatial distribution of tree species in species-rich tropical forests. Shown is the spatial position, species identity (color), and size of individual trees in a 500 m × 1000 m study plot on Barro Colorado Island, Panama, which was analyzed in the study. (photo courtesy of UFZ)

For their analyses, the research team examined all individual trees with a diameter at breast height of at least 10 centimeters as found in the forests. "The closer the forest plot was located to the equator, the less likely it was that trees of rare species had a tree of the same species nearby," says Andreas Huth (Helmholtz Centre for Environmental Research – UFZ). In temperate forests, in contrast, they found only slight differences between common and rare species. This results in unexpected and systematic changes in the spatial patterns from the tropics over the subtropics to the temperate latitudes. This intriguing finding immediately raised two questions: What consequences do these changes have for the coexistence of tree species and which processes cause them?

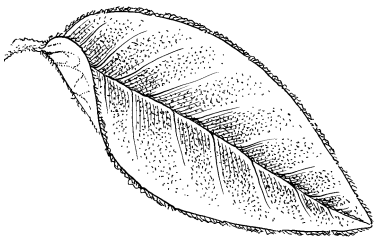
To find answers to these questions, the researchers used information on the dispersal mechanisms of the different species. "Roughly 70 to 80 percent of tree species in the tropics are dispersed by animals, but much less in temperate forests," says Wiegand. Another important factor is mycorrhizal fungi. This network of fungi forms a symbiotic relationship with the fine roots of the trees to benefit both organisms: The fungi supply the trees with nutrients and water, receiving glucose in return.

"In temperate forests, mycorrhiza usually protect the roots of young trees in the neighborhood of large conspecifics from pathogens or insect pests," explains UFZ researcher Samuel M. Fischer, who was also involved in the study. In tropical forests, on the other hand, this is mostly not the case. "That's why seeds in the tropics have to ensure that they are dispersed away from their parent trees, a job mostly done by animals," he says. The conclusion: "In tropical forests, mechanisms such as seed dispersal by animals lead to the observed patterns, while in temperate forests, the patterns are shaped by mycorrhizal fungi" says Wiegand.

In order to better understand the consequences of the observed spatial patterns for species coexistence, the team used spatially explicit simulations and a novel mathematical theory. "We wanted to know under what circumstances tree species would be able to coexist," says Huth. Stable coexistence generally requires that species

that have become rare can increase in abundance again. Based on mathematical models of forest dynamics, the researchers have developed a novel formula to describe the population growth rate at low abundances.

A key element of their formula is a risk factor that combines several influencing factors. The result: the more common the species currently is and the more neighbors of the same species it has, the smaller the risk factor and the higher the probability that the species can coexist. Species in temperate forests generally have a low risk factor. However, the risk factors are often greater in tropical forests, but the formula includes additional factors that compensate for this disadvantage, such as the specific spatial patterns generated by animal seed dispersal. "Overall, it turned out that species in tropical and temperate forests exhibit optimal - but contrasting - spatial structures that each promote coexistence," concludes Wiegand.



The 2024 *JSE* Outstanding Papers Awards given to Smithsonian botanists

Three papers co-written by Smithsonian botanists were recently recognized in the 2024 *JSE* Outstanding Papers Awards. The *Journal of Systematics and Evolution* (*JSE*) established the award to recognize the important, high-impact papers published in *JSE* in the previous two years.

The journal's award review committee conducted a comprehensive evaluation of articles published in 2022 based on five criteria: importance of the topic, innovative content, scientific rigor of research, practical applicability of findings, and readability of the articles, ultimately selecting 10 outstanding papers.

The winners of the *JSE* Outstanding Papers Awards receive a certificate and a monetary prize.

Among the 10 award-wining papers, in first place is Soreng, et al. (2022), which presents an updated worldwide phylogenetic classification of Poaceae with 11,783 species in 12 subfamilies, 7 supertribes, 54 tribes, 5 super subtribes, 109 subtribes, and 789 accepted genera.

Robert J. Soreng, **Paul M. Peterson**, Fernando O. Zuloaga, **Konstantin Romaschenko**, Lynn G. Clark, Jordan K. Teisher, Lynn J. Gillespie, Patricia Barberá, Cassiano A. D. Welker, Elizabeth A. Kellogg, De-Zhu Li, and Gerrit Davidse. 2022. A worldwide phylogenetic classification of the Poaceae (Gramineae) III: An update. *J. Syst. Evol.* 60 (3): 476-521. https://doi.org/10.1111/jse.12847

In third place is Gallaher, et al. (2022), which uses DNA sequence data, whole plastomes and chloroplast sequences, to reappraise the grass family's origins, timing, and geographic spread and the factors that have promoted diversification.

Timothy J. Gallaher, **Paul M. Peterson**, **Robert J. Soreng**, Fernando O. Zuloaga, De-Zhu Li, Lynn G. Clark, Christopher D. Tyrrell, Cassiano A.D. Welker, Elizabeth A. Kellogg, and Jordan K. Teisher. 2022. Grasses through space and time: An overview of the biogeographical and macroevolutionary history of Poaceae. *J. Syst. Evol.* 60 (3): 522-569. https://doi.org/10.1111/jse.12857

In fourth place is Dong, et al. (2022), which uses phylogenomic data from genome skimming to resolve relationships within *Olea* and to identify molecular markers for species identification.

Wen-Pan Dong, Jia-Hui Sun, Yan-Lei Liu, Chao Xu, Yi-Heng Wang, Zhi-Li Suo, Shi-Liang Zhou, Zhi-Xiang Zhang, and **Jun Wen**. 2022. Phylogenomic relationships and species identification of the olive genus Olea (Oleaceae). *J. Syst. Evol.* 60(6): 1263-1280. https://doi.org/10.1111/jse.12802

W. Carl Taylor (1946-2025)

William Carl Taylor, of Arlington, Virginia and The Villages, Florida, passed away on March 3, 2025, in Ocala, Florida.

Taylor was born in St. Louis, Missouri to Ruth and William A. Taylor on April 4, 1946. He attended Bayless School in Afton, Missouri. He got his B.A. from the University of Missouri in Columbia and his M.A. and Ph.D. in Botany from Southern Illinois University in Carbondale.

From 1970-1971 he served in the US Army. He was a sergeant in the infantry in Vietnam, where he won a purple heart and a bronze star.

He married his wife, Jerry, on June 12, 1971, in Warrenton, Missouri.

His career began at the Milwaukee Public Museum of Natural History where he became the head of the Botany Department. After 30 years, he briefly moved to Old Dominion University in Norfolk, Virginia, and then became a Program Officer at the National Science Foundation in Arlington, Virginia.

He was well known for his studies on the taxonomy of a group of spore-bearing plants in the genus *Isoetes*. He mentored many graduate students and was honored with a Colloquium in 2018 at the Botanical Society of America annual meeting. He taught courses in botany at the University of Wisconsin in Milwaukee, Old Dominion University, Eagle Hill Research Institute in Steuben, Maine, and the Organization for Tropical Studies in Costa Rica. He

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W. Carl Taylor: A keystone species in the botanical community

There are lots of flowery (and punny) metaphors that have been made about botany professors being the nurturing mentors in a garden of life. And for all these poetic analogies, Carl completely personified and transcended them. Carl had an infectious sense of positivity that made everyone around him really excited about plants. This is probably why he had so many productive collaborations with fellow botanists around the world and here in the Department of Botany. His seemingly magical ability to make anything super-exciting is probably why all the graduate students he advised were so focused and dedicated and went on to have such successful careers. There is no doubt that all field botany classes at the local universities, field trips with Natural History Research Experiences (NHRE) interns, and Q?rius high-school botany workshops were made ten-fold more enriching by Carl's involvement.

Carl's humble, down-to-earth demeanor often shrouded the erudite polylingual scholar that he was. As a Research Associate here at the U.S. National Herbarium, his work was multifaceted, integrating all dimensions of life science research. He brought to our lab his nuclear gene cloning and cytology methods where he worked at the lab bench side-by-side with his students, even on weekends. His work on allopolyploid speciation was cutting-edge and provided important data for critically endangered species and the understudied floras of the American southeast. He was a true organismal biologist growing specimens from spores in axenic lab culture as well as in his incredibly diverse home greenhouse and garden. During field excursions, he taught the next generation of botanists proper hand-lens techniques and specimen pressing with symmetry as perfect as the neatness and accuracy of his field notebooks.

In an age of uncertainty and scientific demoralization, Carl's unwavering optimism, kind personable demeanor, and stoic wisdom were a panacea. He gave so selflessly and brought energy and life to everyone around him. Like Shel Silverstein's *Giving Tree*, he provided all he could to support his students and colleagues without complaint or hesitation. Although Carl may no longer be with us, he surely knew that he would live on for many generations through the community of the brilliant scientists he had nurtured.

- Gabe Johnson

Liz Zimmer and Carl Taylor standing next to a display of *Isoetes* at the National Museum of Natural History. (image by Smithsonian Institution)

Taylor

Continued from page 8

was a Research Associate at the National Museum of Natural History in Washington, DC. He retired in 2011.

He loved plants! With his wife, he enjoyed growing plants in his greenhouse and planting all native plants in his yards in Wisconsin, Virginia, and The Villages.

He is survived by his wife.

Carl and Jerry Taylor (bottom center) with several Smithsonian botanists, fellows, and interns on July 13, 2023, at Plummers Island, Maryland. (photo by Leopoldo Angulo Crespo)

"Grass Bunch" visits US

In 1930, J.B.S. Norton wrote *Maryland Grasses,* a monograph of the University of Maryland Agricultural Experiment Station, which clearly prioritized grasses of economic importance. According to Norton, the "chief interest" of the Panic Grasses is "furnishing puzzles for botanists."

Almost a century later, some things have changed – most of the Panic Grasses have been reclassified as *Dichanthelium* – but the puzzles remain the same. A group of members from the Virginia Native Plant Society (VNPS) visited the Smithsonian's Department of Botany twice this winter, on January 30 and March 6, to try to solve a few of these puzzles.

The VNPS Grass Bunch is a group dedicated to identifying and documenting the native grasses, sedges, and rushes of Northern Virginia. Over the winter, the group worked with the herbarium of Huntley Meadows Park in Fairfax County, Virginia, to identify a backlog of pressed plant specimens. This resulted in a number of identification challenges.

To work on those confusing species, Grass Bunch members Margaret Chatham, Alan Ford, David Gorsline, Karla Jamir, Jenny Meyer, and Cheryl Roesel (former staff member of the Botany Department) visited the US National Herbarium to examine the *Dichanthelium* specimens in its collection—in particular, the extensively curated and annotated collection from the old DC Herbarium, including many specimens collected by Agnes Chase.

The group focused on distinguishing *D. sphaerocarpon* from *D. polyanthes* and worked on distinguishing the three variants of *D. acuminatum* using specimens collected in the greater D.C. region. They also reviewed specimens of *D. columbianum,* which was once considered a variety of *acuminatum.*

They were assisted by **Rod Simmons**, Smithsonian Research Associate and longtime mentor to the Grass Bunch, and Department of Botany grass experts **Robert Soreng** and **Paul Peterson**.

"The Grass Bunch", members from the Virginia Native Plant Society (VNPS), visiting the United States National Herbarium, on January 30, 2025. (photo by Rob Soreng)

NEW FACES

Yeison Londoño-Echeverri, a MSc. student at the University of Antioquia in Medellín, Colombia, visited the U.S. National Herbarium on February 18 to March 20, 2025, as a José Cuatrecasas Travel Award recipient under the supervision of **Pedro Acevedo-Rodríguez**. The main objective of his visit was to enhance his understanding of species limits in the plant family Rutaceae in Neotropics. He considered the visit to be one of the most important milestones in his master's research project. He examined about 330 type specimens and conducted a rapid review of about 5,300 specimens of Neotropical Rutaceae. He documented and photographed relevant features for the taxonomy of the family, including indumentum types, degree of petals union, number of stamens and staminodes, types of fruits, and more. He also updated the identification of some specimens from Rutaceae and other plant families of his interest. He found specimens of some species potentially new to science and of two new genera currently under study by experts in the family. Academic discussions with Acevedo about the systematics of Sapindaceae, a strongly related family, highly enriched his interpretation of Rutaceae and ideas for further projects.

Ana Gabriela Martínez Becerril, a Mexican botanist, recently joined the **Eric Schuettpelz** lab as a Peter Buck Postdoctoral Fellow. She earned her Ph.D. with honors in 2023 from the National Autonomous University of Mexico (UNAM) in collaboration with the Botanical Research Institute of Texas (BRIT). In 2024, she was awarded a postdoctoral fellowship to conduct research in the Plant Anatomy and Evolution Laboratory at UNAM's Institute of Biology under the supervision of Marcelo Pace, a former member of the NMNH community. Her research focuses on the diversity and evolution of ferns in the American tropics, with a special emphasis on Mexican species. Her work integrates traditional taxonomy, molecular systematics, herbarium curation, and fieldwork. Throughout her career, she has taken on various academic and professional roles, including laboratory and herbarium assistant, high school biology teacher, and instructor for courses on fern systematics and diversity. During her time at NMNH, she will investigate the anatomical traits of fern rhizomes associated with growth form transitions in the megadiverse genus *Elaphoglossum*. Using a phylogenetic approach and next-generation sequencing data, she aims to understand the evolutionary processes underlying these transitions.

Continued on page 11

Yeison Londoño-Echeverri

Ana Gabriela Martínez Becerril

New Faces

Continued from page 10

Atiles Reis, a Ph.D. student at the National Museum at Federal University of Rio de Janeiro, Brazil, visited the U.S. National Herbarium for four weeks, November 11 to December 6, 2024, as a José Cuatrecasas Travel Award recipient. Reis is currently working on the treatment of a large but poorly understood genus of ferns, *Diplazium* (Athyriaceae), which is closely related to the Lady Fern genus, *Athyrium*. Two lineages of neotropical *Diplazium* have recently been circumscribed as two sections: *Diplazium* sect. *Diplazium* and *Diplazium* sect. *Trichoneura*. Reis' focus is to develop a monograph for the *Diplazium* sect. *Diplazium*, exploring morphological, geographical and molecular datasets, trying to explain the boundaries among the species and how this lineage evolved and occupied several different neotropical areas such as the Central America formations, the Caribbean islands, and the Andean, Amazonian, and Atlantic forests in South America. Reis estimates that more than 30 species can be placed in this group. He is also interested in the occurrence of trophopods (reduced leaves that act as primary or secondary starch reserves) in those plants. Although the last part involves a model cultivated in the Brazilian greenhouses, both studies were only possible by the expressive force of the herbaria. During his visit to the Smithsonian, he examined the *Diplazium* collection, which contains 5,000 specimens from species around the world, of which 2,700 records are from the Neotropics. Reis' visit to the Smithsonian, under the supervision of **Eric Schuettpelz**, was valuable in expanding his knowledge of *Diplazium*.

Ana María Trujillo López, a MSc. student at University of Antioquia in Medellín, Colombia, visited the U.S. National Herbarium from February 18 to March 20, 2025. She is currently developing a taxonomic synopsis of *Macrolobium* (Fabaceae) in Colombia as part of her master's dissertation. Her research aims to shed light on the morphological boundaries between species of *Macrolobium*, as well as between the genus and nearby genera. Her research will also contribute to the general knowledge of biological diversity in Colombia, it will improve the curation of herbaria, and it will allow advances in the knowledge and publication of new species found in Colombia and neighboring countries. During her visit to the herbarium, she examined nearly 70 type specimens and 1,600 specimens of the genus *Macrolobium*. She updated the identification of specimens that required new identifications. She reviewed the indetermined Fabaceae and contributed to the identification of some of them. Within these collections, she found nearly 10 new species belonging to *Macrolobium* that are in the process of being described.

Atiles Reis

Ana María Trujillo López

DEPARTURES

Leslie Brothers documenting the greenhouse living plant collection in 2000. (image by Smithsonian Institution)

At the close of 2024, we bid a fond farewell, though not entirely, to **Leslie Brothers**, a now retired member of the Botany Department. Her journey to the halls of the Department began at the University of Maryland, where she completed a B.S. in Zoology with a side interest in computer programming. Her broad interest in ecology, evolution, and the behavioral aspects of natural history eventually led her to explore various roles within the field.

Brothers' path to the Smithsonian began in an unexpected way. While working at a bike shop in Maryland, colleagues tipped her off about jobs at the National Museum of Natural History and in September 1985 she landed a temporary job in the Entomology Department. Computers were just beginning to be used in research and collection inventories, and she was introduced to a variety of early generations of software like SELGEM (a computer system for collection management) and WordPerfect. It was there she also learned about general museum practices, biological systematics (particularly typification), collection inventories, and becoming the WordPerfect guru for the older staff members. Her compatibility with computers became an asset later in her career.

During those early years she also volunteered her Saturdays at the Invertebrate Exhibit at the National Zoo, finding great satisfaction working with living collections and feeding the curious animals on display to the delight of the watching public.

After three years, she transitioned in early 1989 to a permanent position in the Botany Department working for **Laurence Skog** as a Museum Technician, using her databasing and report creation skills in dBase and Microsoft Access to support Skog's work. She also began photographing the many mounted specimens coming through his office as well as his live specimens in the Botany Research Greenhouse, which was located where the museum's East Court is now. One of her other tasks was caring for Skog's living material in the greenhouse.

In 1995, Brothers took on the role of helping to manage the greenhouse, now at the Smithsonian's Museum Support Center (MSC) campus in Suitland, Maryland. Over the next two decades, she thrived in this "jack-of-all-trades" role, coordinating with Greenhouse Manager Mike Bordelon on plant care and greenhouse maintenance, as well as managing the collections data and the safety program. Brothers became the computer support person for the greenhouse and managed the greenhouse collections database in Axiell/KEmu. She also continued her passion for botanical photography and created the popular "Plant of the Week" feature on Botany's public website, hand coding its earliest iterations in HTML. Her photography extended to documenting the greenhouse collections and being the photographer at Department events such as the Smithsonian Botanical Symposiums.

In 2017, Brothers shifted roles again joining the Core Collections Management team in Botany. Here, she took on a variety of tasks including tracking loans, which she humorously referred to as "botanical accounting." One of her significant side projects involved organizing and relocating the extensive diatom collection at MSC. Researching legacy materials, whether loans or old collections, provided much satisfaction, and she says she is deeply grateful to the many colleagues who came before her and took the time to document the status of the collections, helping her manage their movement and preservation.

Though retired now, Brothers continues to volunteer in Botany cataloging her vast collection of plant images and contributing in various ways. Ending her career in a field she loves as a volunteer, much like her early volunteer days at the Smithsonian, is a wonderful way to close the chapter on such a long and impactful career. It's clear that her contributions to the Smithsonian, both in terms of practical work and knowledge sharing, have been invaluable.

TRAVEL

Alberto Coello and **Angélica Gallego-Narbón** traveled to St. Louis, Missouri (2/3 – 2/6) to work at the herbarium of the Missouri Botanical Garden, where Coello sampled species of Vitaceae and Gallego-Narbón sampled species of Araliaceae for their postdoctoral research projects.

Stuart Davies traveled to Manaus, Brazil (1/19 – 1/26) to meet with the PIs of the ForestGEO Manaus Forest Dynamics Plot, as well as host donors at BDFFP (Biological Dynamics of Forest Fragments Project) research center and meet with INPA (Instituto Nacional de Pesquisas da Amazônia) directors; to Paris, France (2/2 – 2/8) with **David Kenfack** to attend a GEO-TREES conference, "Reliable Carbon Quantification in Tropical Africa," with other GEO-TREES network members; and throughout Singapore and Malaysia (3/14 – 3/26) to meet with GEO-TREES partners, FRIM (Forest Research Institute Malaysia) colleagues, and the PIs and field team of the Bukit Timah Forest Dynamics Plot.

David Kenfack traveled to Brussels, Belgium (2/8 – 2/12) to collaborate on ForestGEO research with a colleague at the Université Libre de Bruxelles; and to Kenya (2/21 – 3/10) to visit with the PIs and field teams of the Mpala Forest Dynamics Plot; and to meet with the Chancellor of Karatina University about the upcoming ForestGEO workshop being co-hosted there.

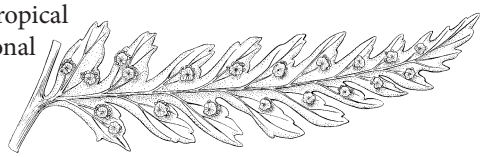
Gary Krupnick traveled to Honolulu, Hawaii (3/22 – 3/26) to co-present a workshop on the conservation of *Heliconia* with **W. John Kress** at the XXII Conference of the Heliconia Society International at the University of Hawaii at Manoa, and where Kress virtually presented the keynote lecture.

Eugénie Mas traveled to Sevilla, Spain (3/18 – 3/20) to present her talk, "Understanding how soil moisture regulates forest composition in Southeast Asia's tropical forest," at the 6th Xylem International Meeting.

Ian Medeiros traveled to Durham, North Carolina (2/16 – 2/21) to meet with colleagues at Duke University.

Laurence and **Judith Skog** traveled to Sarasota, Florida (1/2 – 1/12) where Larry worked on joint projects on Gesneriaceae with John L. Clark (Botany Research Associate) at Marie Selby Botanical Gardens and Judy volunteered some of her time in the herbarium; and both stopped enroute to visit Carl and Jerry Taylor (Carl was a Botany Research Associate and Jerry worked in the NMNH Fossil Lab).

Rob Soreng traveled to Corvallis, Oregon (12/23/2024 & 2/26/2025) to annotate collections of *Poa bulbosa* L. and *P. iconia* Azn. at the Oregon State University herbarium for the Oregon Flora Project updates and the forthcoming Field Guide to Grasses of Oregon & Washington (ed. 2).



VISITORS

Yali Li, South China Botanical Garden; *Firmiana* (Malvaceae) (9/10/2024-9/3/2025).

Ting Wang, South China Botanical Garden; *Angiopteris* (Marattiaceae) (9/10/2024-9/3/2025).

Iván Díez De la Pava, Georgetown University; Latin American environmental history (1/10).

John Mitchell, New York Botanical Garden; Anacardiaceae (2/3-2/7).

Rodolfo Ferreira-Alves, Universidade Federal do Parana, Brazil, **Fabian Michelangeli**, New York Botanical Garden, and **Jhon Steven Murillo-Serna**, Universidad de Antioquia, Colombia; Melastomataceae (2/10-2/14).

Guy Nesom, Academy of Natural Sciences; Asteraceae (2/18-2/20).

Yeison Londono, University of Antioquia, Colombia; Rutaceae (2/18-3/20).

Ana María Trujillo López, Universidad de Antioquia, Colombia; *Macrolobium* (Fabaceae) (2/18-3/17).

Israel Lopes da Cunha Neto, New York University; Paullinieae (Sapindaceae) (2/19-2/21).

Carolyn Ferguson and **Mark Mayfield**, Kansas State University; *Phlox* (Polemoniaceae) and *Euphorbia* (Euphorbiaceae) (2/21).

Ana Gabriela Martínez-Becerril, Universidad Nacional Autónoma de México; Ferns (2/21-3/21).

Emily Magnaghi, California Academy of Sciences; Herbarium/APG tour (2/25-2/26).

Milagros Anzuinelli, Universidad de Buenos Aires, Argentina; *Porophyllum* (Compositae) (3/3-4/11).

Mark Watson, Royal Botanic Garden Edinburgh, United Kingdom; World Flora Online (3/5).

Margaret Chatham, **Alan Ford**, **David Gorsline**, **Karla Jamir**, **Jennifer Meyer**, and **Cheryl Roesel**, Virginia Native Plant Society Potowmack Chapter; Grasses, sedges, and rushes of Northern Virginia (3/6).

Nelson DeBarros, Fairfax County Park Authority, Virginia; *Pycnanthemum torreyi* (Lamiaceae) and *Carex* sect. *Acrocystis* (Cyperaceae) (3/6).

Freya Cornewll-Davison, Royal Botanic Gardens Kew, United Kingdom; Angiosperms from the British Virgin Islands and Puerto Rico (3/10-3/14).

Channing Buckmaster, University of Alaska Fairbanks; Independent research (3/19).

Sylvie Martin-Eberhardt, Michigan State University; Extrafloral nectary bearing species, including *Alchornea*, *Catalpa*, *Gossypium*, *Passiflora*, *Populus*, *Sesamum*, *Erythrina* (3/31-4/4).

Aurora Prehn, Royal Botanic Garden Kew, United Kingdom; *Camellia sinensis* (Theaceae) (3/31-4/1).

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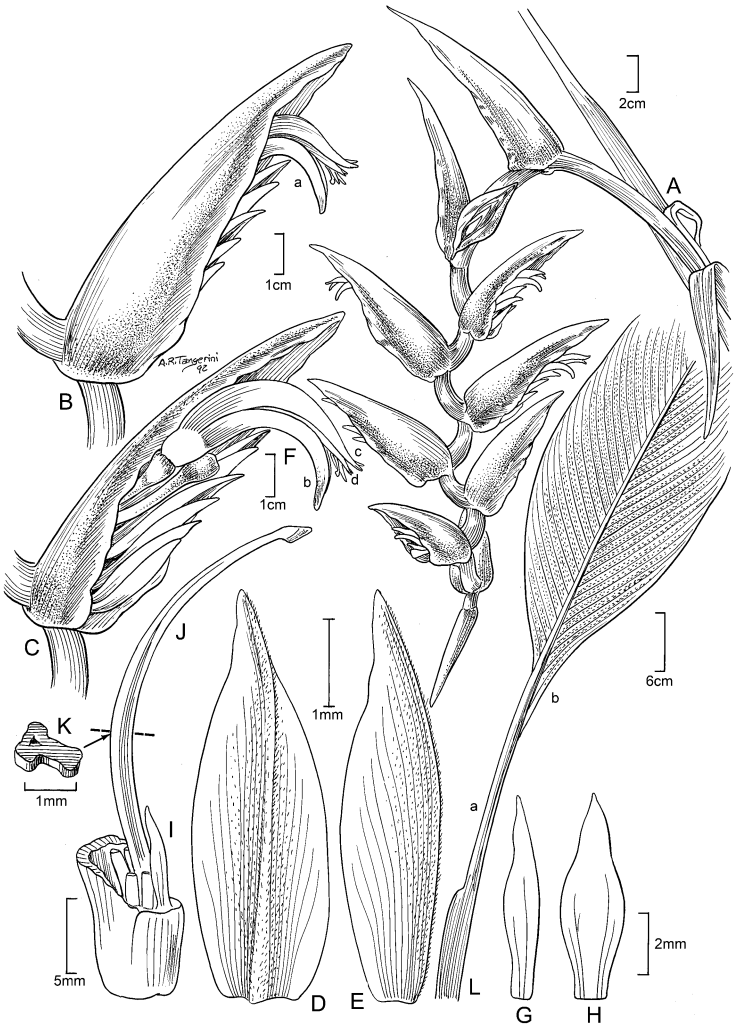
ART BY ALICE TANGERINI

Heliconia donstonea W.J.Kress & Betancur

Heliconia donstonea (Heliconiaceae) is a terrestrial herb with a restricted geographic range in the northwestern Andean montane forests. It is known from only four specimens collected from two populations—one population in Colombia and one in Ecuador. *Heliconia donstonea* was recently assessed as Endangered due to its narrow distribution, two unprotected populations, and no known individuals preserved in botanical gardens. This species is in a priority list of 45 species of *Heliconia* for protection, included in a new paper in *Plants, People, Planet* by W. John Kress, Tomáš Fér, Mónica M. Carlsen, and Gary A. Krupnick (2025). Alice Tangerini's illustration of this species was drawn from unmounted pressed specimens collected by Kress and his team (including former research assistant, Cheryl Roesel) on an expedition to Nariño, Colombia in 1990. The drawing was completed in 1992 in pen and ink on drafting film. Dissections of the flower showed cutaway views inside the spathe and details of the ovary and pistil.



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