

FOR IMMEDIATE RELEASE: November 15, 2024

Comprehensive, First-of-its-Kind Study Finds Nearly One-third of Plant Species Call Islands Home but Warns That Many of These Unique Plant Populations Are Threatened by Habitat Loss, Climate Change, and Invasive Species

NYBG Scientist and International Colleagues Call for Urgent Conservation Measures in Recently Published Paper in the Prestigious Journal *Nature*



Islands are home to about one-third of all plants species, including *Carpoxylon macrospermum* (left), a palm found only in southern Vanuatu that is considered critically endangered. New York Botanical Garden scientists and local partners are working to save the species by growing young palms in nurseries (right) and planting them in their native habitats.

Bronx, NY—A comprehensive study involving nearly all known plant species has found that the world’s islands are home to about one in three of those species, according to a paper by an international team of researchers, including a scientist at The New York Botanical Garden (NYBG), published recently in the prestigious British journal *Nature*. In addition, the researchers discovered that of all plant species classified as threatened, more than half are unique to islands, a disproportionately high percentage that demonstrates the critical importance of focusing on islands as a key component of preserving plant biodiversity.

Islands harbor an astonishingly large segment of all plant life, given that they account for slightly more than five percent of Earth’s landmass, but their limited size and relative isolation make their unique plant populations especially susceptible to habitat loss, climate change, and invasive species.

“Urgent measures, including habitat restoration, invasive species removal and *ex situ* programmes, are needed to protect the world’s island flora,” write the authors, who include Gregory M. Plunkett, Ph.D., Senior Curator in NYBG’s Center for Plants, People, and Culture. They add that their checklist of island plant species “quantifies the uniqueness of island life, provides a basis for future studies of island floras, and highlights the urgent need to take actions for conserving them.”

Ex situ (meaning “off-site”) conservation involves preserving a species away from its natural habitat. In the case of plants, that can mean at botanical gardens or seed banks.

Julian Schrader, Ph.D., a lecturer in the School of Natural Sciences at Macquarie University in Sydney, Australia, led a team of a dozen researchers from Australia, Germany, Spain, the United States, Greece, and Japan in analyzing data about more than 304,103 plants—essentially all species known to science worldwide. They uncovered a treasure trove of island biodiversity.

The team found 94,052 species are native to islands, nearly one-third of all known plants. Of these, 63,280 are endemic—found nowhere else in the world—representing 21 percent of global plant diversity. Their research provides the first comprehensive assessment of vascular plants native and endemic to marine islands worldwide.

Native plants occur naturally on an island while endemic plants are found only on that specific island or group of islands and nowhere else in the world. Vascular plants make up most plants on Earth and include trees, shrubs, herbs, ferns and grasses. They have a circulatory system, unlike non-vascular plants such as mosses and liverworts.

“This is the first time we have had such a complete understanding of which species are where, globally,” Dr. Schrader said. “We can now explore the conservation status of some of our rarest plants and come up with distinct strategies to conserve them, such as identifying botanical gardens that could host rescue populations.”

Rescuing a Palm Tree from the Brink of Extinction

NYBG’s Dr. Gregory M. Plunkett, an expert in the geographical distribution and diversity of plants in the southwestern Pacific, has first-hand experience in working to save an endemic island plant species. He has conducted field research on islands throughout the region and is

currently the co-leader of NYBG's *Plants and People of Vanuatu* project, a multidisciplinary effort to conserve the plant biodiversity and traditional Indigenous knowledge of Vanuatu, a nation of 80 islands in the South Pacific.

As part of the project, Dr. Plunkett and his *Plants and People of Vanuatu* partners launched an effort to conserve *Carpoxyton macrospermum*, a palm that is assessed as critically endangered because its rain forest habitats in southern Vanuatu are being destroyed. They have collaborated with Indigenous residents to conserve the species in its original forests, known as *in-situ* (or on-site) conservation.

So far, the effort to save the palm in its native habitat has been very successful: easy-to-maintain nurseries have produced thousands of seeds, leading to the planting of more than 2,500 young palms across at least 450 acres of native forest.

Globally, however, much remains to be done to conserve island biodiversity. The study found that only six percent of islands supporting endemic species met a United Nations goal to protect 30 percent of land and sea areas by 2030.

Hotbeds of Island Diversity

The study identified several centers of plant endemism—areas with high numbers of species found nowhere else. Nearly all are large, tropical islands with complex topography and a long history of isolation.

Topping the list is Madagascar, home to a staggering 9,318 endemic plant species. This African island nation is followed closely by New Guinea (8,793 endemic species), Borneo (5,765), Cuba (2,679), and New Caledonia (2,493).

Isolation has led to some remarkable examples of plant evolution: in Hawaii, 126 species of lobeliads trace their lineage back to one ancestor species.

However, many plants that have evolved in isolation and developed unique adaptations to their original ecosystems may be poorly equipped to compete with introduced species. Climate change poses an additional threat. Rising sea levels and increased frequency of extreme weather events are potentially devastating for low-lying islands and their unique flora.

The team has created a standardized checklist of all known vascular plants occurring on islands, documenting their geographical distribution, evolutionary relationships, and conservation risk. The dataset also provides a crucial baseline for monitoring changes in

island plant communities over time and could offer a roadmap for prioritizing protection efforts.

“Islands are key for protecting the world’s plant endemism” is available at the following link: <https://www.nature.com/articles/s41586-024-08036-1>

About The New York Botanical Garden

The New York Botanical Garden (NYBG) has been a connective hub among people, plants, and the shared planet since 1891. For more than 130 years, NYBG has been rooted in the cultural fabric of New York City, in the heart of the Bronx, its greenest borough. NYBG has invited millions of visitors to make the Garden a part of their lives, exploring the joy, beauty, and respite of nature. NYBG’s 250 acres are home to renowned exhibitions, immersive botanical experiences, art and music, and events with some of the most influential figures in plant and fungal science, horticulture, and the humanities. NYBG is also a steward of globally significant research collections, from the LuEsther T. Mertz Library collection to the plant and fungal specimens in the William and Lynda Steere Herbarium, the largest such collection in the Western Hemisphere.

The plant people of NYBG—dedicated horticulturists, enthusiastic educators, and scientific adventurers—are committed to helping nature thrive so that humanity can thrive. They believe in their ability to make things better, teaching tens of thousands of kids and families each year about the importance of safeguarding the environment and healthy eating. Expert scientists work across the city, the nation, and the globe to document the plants and fungi of the world—and find actionable, nature-based solutions to the planet’s dual climate and biodiversity crises. With eyes always looking forward, they train the next generation of botanists, gardeners, landscape designers, and environmental stewards, ensuring a green future for all. At NYBG, it’s nature—or nowhere.

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The New York Botanical Garden is located at 2900 Southern Boulevard, Bronx, New York 10458. For more information, visit nybg.org

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Media Contact: Stevenson Swanson at sswanson@nybg.org