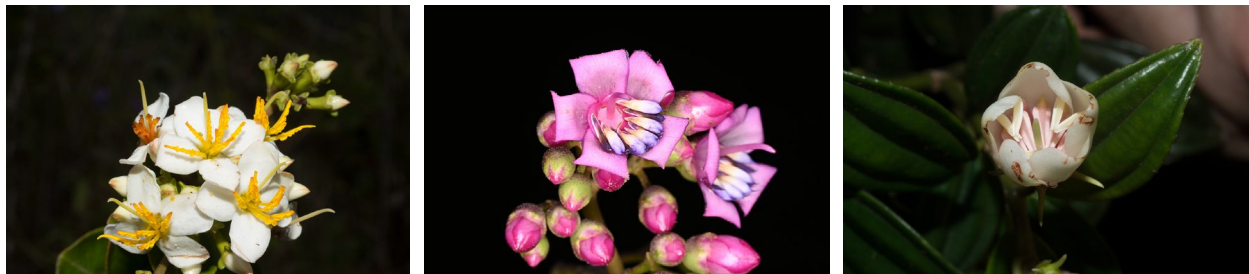


# NYBG

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## **NYBG Scientist and Collaborators Call for Speeding Up the Process of Scientifically Describing New Plant Species to Improve Biodiversity Conservation Efforts after Finding That Naming Tropical Tree Species Takes an Average of 16 Years**

Their Call to Action is Part of *State of the World's Plants and Fungi 2023*, Which Estimates That 45 Percent of the World's Plant Species Are at Risk of Extinction



Flowers of three tree species are shown that were part of a study to determine how long it takes to scientifically describe new tree species in the tropics of the Western Hemisphere. A research team that included an NYBG scientist found the process takes 16 years on average. Left to right: *Huberia sessilifolia*, *Meriania bicentenaria*, and *Meriania albiflora* (Photos by Fabián A. Michelangeli, Ph.D.)

**Bronx, NY**— As part of a comprehensive report that estimates 45 percent of the world's plant species are at risk of extinction, a New York Botanical Garden (NYBG) scientist and his colleagues found that it takes 16 years on average from the time a new tree species is observed in the tropics of the Western Hemisphere to formally naming it as a species new to science. With plant extinction rates rising, the researchers say there is an urgent need to speed up the process of describing new species to improve their chances of conservation.

Released today, *State of the World's Plants and Fungi 2023* is the result of a global scientific collaboration organized by the Royal Botanic Gardens, Kew that lays out the current condition of the world's plants and fungi. Based on the work of 200 international researchers and covering the content of more than 25 cutting-edge scientific papers in its 11 chapters, the new report examines global drivers and patterns of biodiversity as well as critical knowledge gaps and how to address them.

Plants and fungi underpin all life on Earth, supporting livelihoods and providing people with food, medicine, clothing, and raw materials. The natural world is in a state of imbalance, however, driven by the dual crises of climate change and biodiversity loss. In this year's report, the subtitle of which is *Tackling the Nature Emergency: Evidence, gaps and priorities*, scientists take an in-depth look at what is known and not known about the diversity of these fundamental building blocks of ecosystems and the threats they face.

One of the challenges facing researchers and conservationists is documenting Earth's plant life so it can be preserved for future generations. As part of this year's report, Fabián A. Michelangeli, Ph.D., NYBG's Abess Curator of Tropical Botany and Director of its Institute of Systematic Botany, was part of a team of researchers from six institutions in the United States, the United Kingdom, and Mexico who examined how quickly new species were described and named after they were first collected within a group of more than 2,000 tree species in the Neotropics—the tropical belt that stretches from Argentina to Mexico, including the Caribbean.

“On average it takes more than 16 years from when a tree species is first collected to when it is scientifically described, but in some cases it can be as short as less than a year or as long as more than 100 years,” Dr. Michelangeli said. “Access to the field and local taxonomic expertise are two of the main factors affecting this time lag.”

Dr. Michelangeli cited three dramatically different examples from the Melastomataceae family, a large and diverse group of tropical plants that is one of his research specialities. *Huberia sessilifolia*, a species that is known from a single locality in the Brazilian state of Bahia, was described shortly after it was first collected. *Meriania bicentenaria*, which is only found in a small area of a Peruvian national park, was identified as new last year although the park has been studied for the last 30 years. Finally, *Meriania albiflora*, which is found only in undisturbed cloud forests in southeastern Cuba, was described more than 100 years after it was first collected because it was initially misidentified as a Jamaican species.

The Neotropics are particularly diverse, with around 23,000 known tree species alone. Dr. Michelangeli and his co-authors found that the time lag between collection and naming was lower when the same person collected and named a species or when field botanists sent material to scientists based at plant research collections as part of a specific collaborative project. Conditions that extended the time lag included political instability and conflict, which can deter researchers from undertaking fieldwork because of safety concerns.

With plant species going extinct at least 500 times faster than they would in the absence of such factors as climate change and habitat loss—and predictions that this rate could rise to 10,000 times faster—the need to speed up how new species are described and named is urgent. The researchers concluded that enhancing collaboration and training opportunities in Latin American countries, continuing and expanding field visits to collect material, and taking advantage of artificial intelligence and genomics are critical to completing the inventory of Neotropical plant species.

The underlying scientific evidence of the 2023 plant and fungi report is published today in a special collection from the journals *New Phytologist* and *Plants, People, Planet*, titled *Global Plant Diversity and Distribution* and in a review of global fungal diversity and conservation

published by the journal *Annual Review of Environment and Resources*. This year's report is the fifth in a series of Kew's survey of the world's plants since 2016.

### **Three out of Four Undescribed Plant Species Are Under Threat of Extinction**

Among other major findings in *State of the World's Plants and Fungi 2023* is a startling conclusion that three out of four undescribed plant species are threatened with extinction. With some 350,000 species of vascular plants already known to science, researchers are in a race against time to name and assess those still waiting to be described—estimated to be as many as 100,000 species.

Scientists arrived at their conclusion about extinction risk after analysing data from the *World Checklist of Vascular Plants* (WCVP) with the International Union for Conservation of Nature (IUCN) Red List of Threatened Species to examine links between the year a plant species is formally described and its extinction risk.

The researchers found a clear relationship between the year of description and the risk of extinction, with more than 77 percent of species described in 2020 meeting the criteria to be assessed as threatened. Similarly, they found that species described more recently are more likely to meet the criteria for a higher threat category. Over 59 percent of species described in 2020 are likely to meet the criteria for Endangered and 24.2 percent are likely to meet the criteria for Critically Endangered.

Based on these findings, Kew scientists are now calling for all newly described species to be treated as though they have been assessed as threatened unless proven otherwise. Unfortunately, an increasing number of newly described species have narrow ranges (many are described from a single location) and are undergoing population or habitat decline. Scientists believe that prioritizing these species for full assessments on the IUCN Red List will aid their conservation efforts, as these, or other formal extinction risk assessments, greatly aid conservation efforts.

### **Forty-five Percent of All Known Flowering Plants Could be Threatened with Extinction**

To better understand the risks faced by flowering plants already known to science, researchers cross-referenced data from the WCVP with the IUCN Red List of Threatened Species. They extracted a set of 53,512 assessed species as a baseline for making predictions about the 275,004 species that have not been assessed or for which data is deficient. These new estimates of extinction risk, along with an estimate of uncertainty for each prediction, paint a more robust picture of the level of threats facing Earth's plant diversity than any previous attempts.

Worryingly, the estimates indicate that 45 percent of all known flowering plant species could be under threat of extinction. The plant families Orchidaceae (orchids); Piperaceae, which includes black pepper; Bromeliaceae, which includes pineapple; and Araceae, which includes many important crops, are among the most threatened. Scientists are, however, hopeful these new findings can guide policymakers and conservation efforts to save plants on the brink of disappearing forever by fast-tracking species for extinction risk assessments.

## **New Estimate of 2.5 Million Fungi Species Unlocks a Frontier of Discovery**

Very little is known about the diversity of fungi when compared to plants and animals, both of which have received a greater share of scientific interest over the centuries. To date, only 155,000 species of fungi have been formally named, but researchers have long suspected the kingdom of fungi is as diverse, if not more so, than those of plants and animals, with past estimates ranging from 250,000 to 19 million species. Now, thanks to a robust analysis of the science and advancements in DNA technologies, scientists estimate there are about 2.5 million species of fungi globally.

To put that figure into perspective, scientists have to date only described about 10 percent of the world's fungal diversity, meaning that many of the discoveries waiting to be made could supply us with new sources of food, medicine, chemicals, and enzymes with useful properties such as plastic degradation. Scientists warn that the current rate of discovery is wholly inadequate to tackle the scale of the problem. Since the start of 2020, some 10,200 new species of fungi have been formally described as new-to-science; at the current rate of species description, it would take about 750 to 1,000 years to describe them all.

Researchers are hopeful, however, that focusing on DNA sequencing and molecular data could result in 50,000 new species being cataloged each year from environmental samples.

## **More Than 18,800 New Plant and Fungal Species Named New to Science since 2020**

Although disruptive to virtually every aspect of modern life, the COVID-19 pandemic and lockdown gave scientists the time and opportunity to work through a backlog of data and unfinished papers. This yielded many new finds for science, raising the tally of global biodiversity. In total, more than 8,600 species of plant have been named that are new to science since January 2020, including the world's largest giant waterlily, *Victoria boliviana*.

Sadly, many novel plant species are already threatened or extinct by the time they are formally named and recognized as new to science, such as the extinct "orchid of the falls," *Saxicollela deniseae*. This plant, which does not belong to the orchid family but rather a group of plants restricted to waterfalls and shallow, rapid waters, was collected along the Konkouré River in Guinea in 2018. Unfortunately, by the time the species was formally published in May 2022,

satellite imagery dated to November 2021 showed that the falls where it was found had been flooded by the construction of a hydroelectric dam about 20 miles downstream.

Since 2020, scientists have also named more than 10,200 new species of fungi, including the Queen's hedgehog mushroom (*Hydnum reginae*). The species, with its characteristic white quills, was named in honor of Queen Elizabeth II and is found in just one area of Great Britain—ancient beech forests south of London. It had been known as *Hydnum albidum* for more than 130 years, but genetic research found it to be a distinct species. Despite these recent advances, scientists warn there is still an urgent need to speed up the process of finding and naming new fungi.

*State of the World's Plant and Fungi 2023* is available [here](#).

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**The New York Botanical Garden is a museum of plants, an educational institution, and a scientific research organization. Founded in 1891, the Botanical Garden is one of the world's preeminent centers for studying plants at all levels, from the whole organism down to its DNA. Garden scientists conduct fundamental research on plants and fungi globally, as well as on the many relationships between plants and people. A National Historic Landmark, the Garden's 250-acre site is one of the greatest botanical gardens in the world and the largest in any city in the United States, distinguished by the beauty of its diverse landscape and extensive collections and gardens, as well as by the scope and excellence of its programs in horticulture, education, and plant research and conservation. Learn more: [nybg.org](http://nybg.org)**

**The New York Botanical Garden, 2900 Southern Boulevard, Bronx, New York 10458**

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