The top ten plant and fungi species named new to science in 2022

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Hydnum reginae, also known as the Queen's hedgehog due to the soft white spines under its cap was named in honor of Queen Elizabeth II. Rare in Europe, the species is only known in Britain from its type locality in the ancient beech forest of White Down, Surrey. Credit: Geoffrey Kibby

Scientists from the Royal Botanic Gardens, Kew, and partners across the globe present their pick of the top 10 plant and fungal species named new to science at Kew in 2022.

From a record-breaking giant waterlily in the wetlands of Bolivia to a waterfall-dwelling plant deemed extinct before it was named and a Ukrainian-discovered Turkish 'winter daffodil' with non-opening flowers; RBG Kew's annual list sheds light on the wonders, complexities and rarities of the natural world. This year's showstoppers are particularly poignant as they pay tribute to those who laid their lives down for the sake of protecting the planet's biodiversity.

Approximately 90 plants and 24 fungi have been named this year by RBG Kew and partners alone, with new species hailing from the rainforests of central Africa, the Atlantic Forest of Brazil, and even the caves of SE Asia. Many of these discoveries represent extremely rare species already threatened with extinction, some of which only exist in single locations and at least one is considered already globally extinct.

By heading out into the field with their international partners to discover, characterize, and name new species to science of plants and fungi, scientists at Kew are aiding worldwide efforts to halt and reverse the global biodiversity crisis, with two in five plants estimated to be at risk of extinction.

Dr. Martin Cheek, Senior Research Leader in RBG Kew's Africa Team, says, "It's easy to think we have a picture-perfect understanding of the natural world and all its plants and fungi, but as these annual lists show us time and time again, we've only really scratched the surface of discovery.

"Unfortunately, many of the species described this year have already been assessed as either Vulnerable or Critically Endangered with

extinction, or are even already Extinct, highlighting the need to accelerate the rate at which we make new discoveries. We cannot put a stop to the biodiversity crisis unless we know exactly what it is we are saving and where."

The global effort to name new plants and fungi yields on average 2,000 new species in each of these two kingdoms every year, revealing new potential sources of food, medicines, and solutions to the biggest challenges we face. The collected data also serves to strengthen our understanding of the natural world, how various species relate to one another, and where they fit in the tree of life.

Dr. Tuula Niskanen, Research Leader in RBG Kew's Fungal Diversity and Systematics team, says, "It has been estimated that more than 2 million fungal species, or more than 90% of all fungi, remain to be described. Surprisingly, this figure does not only represent rare species but also many common ones, including those occurring in Britain.

"Fungi have remained such a mystery to us, compared to plants and many animals, because their cryptic lives mainly unfold hidden from our eyes and have been challenging to study with traditional techniques. Only in the last few decades, thanks to the arrival of DNA-based methods, have we started to understand the true diversity of this kingdom."

Here are the top ten weird and wonderful species named and discovered this year:

1. The rare Queen's hedgehog named after Britain's beloved monarch

Named in honor of Her Majesty the Queen, Elizabeth II, Queen's hedgehog (Hydnum reginae) is a conspicuous white mushroom measuring up to 15 cm wide. The common name "hedgehog" comes

from the soft white spines that are found under the cap in place of gills, whereas the species epithet "reginae" means "queen's."

Queen's hedgehog is a rare European species known in Britain only from the type locality, from the ancient beech forest of White Down, Surrey. The species was previously known as Hydnum albidum, a name originating from North America. However, recent DNA analysis of the North American fungus has revealed the European one to be a different species altogether.

A collaboration between British field mycologists and RBG Kew mycologists led to the description of the European species as new to science. It was named after the late Queen, whose example has inspired generations across the globe, not just in the U.K.

2. Rainforest tree honoring assassinated Honduran environmentalist

Carpotroche caceresiae, a tree from the Caribbean rainforests of Nicaragua and Honduras, was named in memory and recognition of the bravery of Berta Isabel Cáceres Flores (1971–2016). Berta Cáceres was one of 123 environmental activists assassinated between 2009 and 2016 for their opposition to the destruction of natural habitats and loss of indigenous land in Honduras.

In 2015, thanks to her unwavering commitment to the cause, Berta Cáceres was awarded the Goldman Environmental Prize. Tragically, she was murdered just a year later due to her opposition to the Agua Zarcas hydroelectric project on the Gualcarque river in northwest Honduras.

The C. caceresiae grows up to 15 m tall, with white, star-like flowers 20 mm wide on the main stems. These are followed by lime green, five

winged fruits with numerous protuberances between the wings. It has been assessed as Near Threatened.

3. The world's biggest giant waterlily

The newest member of the Victoria genus of waterlilies, named after Queen Victoria, is the giant Bolivian waterlily (Victoria boliviana). With impressive leaves reaching up to 3.3 m across, it is the biggest of the three known Victoria species and features a number of differences in its shape, size, and distribution of features such as flowers, spines, and seeds.

The Victoria boliviana is the third and largest member of giant waterlilies in the genus Victoria, found in the wild in the wetlands of Bolivia. Credit: Royal

Confined to the wetlands of Amazonian Bolivia, the species has been assessed as Vulnerable to extinction. Observations by Carlos Magdalena, Kew botanical horticulturist, and Lucy Smith, a freelance botanical artist at RBG Kew, confirmed by Kew scientists Natalia Przelomska and Oscar A. Pérez-Escobar through DNA analysis, led to the naming of this incredible species as new to science in 2022, in partnership with 16 European and Bolivian botanists.

Two previously known species, Victoria amazonica and Victoria cruziana, were both named in the early 19th century and have long been a source of great public interest and inspiration at RBG Kew and other botanic gardens, particularly for their massive, spiny, floating leaves, which are sometimes photographed supporting small children. Unbeknownst to Kew's researchers, a dried specimen of V. boliviana had been kept in Kew's Herbarium for more than 170 years before being revealed as a new species. All three species can be seen at the Princess of Wales Conservatory at Kew Gardens in West London.

4. 'Garland of nails' threatened by pigeon droppings

Gomphostemma phetchaburiense, a new species in the genus Gomphostemma (meaning "garland of nails") is a leafy herb measuring 30–50 cm tall with pink-purple flowers. It is considered Critically Endangered in the wild because its global population counts less than 50 plants, all at a single site at the mouth of a limestone cave. The plants are considered to be threatened by the droppings of a nearby colony of rock pigeons.

The newly-named Gomphostemma phetchaburiense exists in a small, global population of less than 50 plants and is already considered Critically Endangered. The population, which is found at the foot of a cave, is threatened by the droppings of a nearby colony of pigeons. Credit: Preecha Karaket

Gomphostemma species occur from India to China and south to Malaysia and are known to have multiple medicinal uses, for example, for the treatment of malaria, tuberculosis, and insect bites, as well as alleviating fatigue and combating abscesses. Although most species of Gomphostemma occur in forests, only this species is from a dry, open habitat.

This year's revision of the genus includes three new species of Gomphostemma, two of which are extremely rare and known from a

single herbarium collection each, both collected in Myanmar about 100 years ago. The most recent species, the yellow-flowered G. longipetalum Bongch, was collected in the mountains of northern Myanmar by Frank Kingdom-Ward, famous British botanist, plant collector and explorer who introduced many new plants to English gardens from Asia, especially China.

5. Extinct before it was named, Denise's 'orchid of the falls' from Guinea

"Orchids of the falls" are a family of herbs restricted and highly adapted to living in aerated, white water, with many species only found on one or a few waterfalls. But despite their name they are not orchids but are related to Hypericums.

Their adaption to living in fast-moving waters that are typically too harsh for most other plants, means "orchids of the falls" have had little competition for the tens of millions of years in which they evolved. This has changed in recent decades due to the growing demand for hydroelectricity as a "green" source of renewable energy. Hydroelectric projects require dams to be situated on solid foundations of rock where there is a drop in water: waterfalls. The resulting disruption in seasonal water flow, and destruction of habitats, has already caused the global extinction of several species of "orchids of the falls" in Africa and scientists fear many more will follow.

Perhaps the most recent is Saxicolella denisea, a species found on a set of falls on the Konkouré River of Guinea in West Africa. First collected in 2018, it was found to be new to science and named in honor of Denise Molmou who collected it. Unfortunately, it became globally extinct, most likely in 2021, after a dam was constructed 30 km downstream, producing a reservoir that swamped the surviving falls on the lower

reaches of the Konkouré and its tributaries.

6. Turkish 'winter daffodil' with non-opening flowers

Despite only recently being named new to science, the discovery of Sternbergia mishustinii can be traced back to 1997 and Ukrainian nature explorer Ruslan Mishustin of Kherson State University, who at the time collected the seed of an unknown bulbous plant near Mersin in southern Turkey. Nearly four years later, the seedlings flowered in cultivation and were revealed to be a species of the "winter daffodil" genus (Sternbergia).

This new species of 'winter daffodil' (Sternbergia mishustinii) - was named after Ruslan Mishustin, who came across the species in Turkey, near Mersin. Credit:

Ruslan Mishustin

The genus is related to daffodils, amaryllis, snowdrops, and agapanthus. Species occur from the western Mediterranean to central Asia, and generally have yellow flowers that appear before the leaves. Ruslan's species, however, matched none of the eight species known to science, and it was only after years of researching the structure of its leaves and seeds that it it was described as new to science and named in honor of Ruslan.

S. mishustinii features bright, sulfur-yellow flowers that emerge from the ground from October-November. Since they are cryptic flowering (their flowers don't open) and only 2 cm long, they might not become very popular with gardeners. However, less than 300 individuals are known globally, occurring at a single, secret site, and the species has been assessed as Critically Endangered.

Plants in the Sternbergia genus are known to contain anti-inflammatory and antioxidant compounds, making this new species a potentially untapped source of medicine.

7. Bruising ink bolete discovered in Israel and Sardinia

Researchers from RBG Kew and the University of Cagliari together with a citizen scientist from Reggio Emilia (Italy) have described a new species of Mediterranean bolete. Officially named Cyanoboletus mediterraneensis, the fungus was found in Northern Israel and Sardinia, Italy.

This species was first found by researchers in 2012, growing with the Palestine oak (Quercus calliprinos) in Israel, and based on its morphology was identified as the ink stain bolete (Cyanoboletus pulverulentus), which is common in Temperate Europe. However, additional collections and DNA studies have found the Israeli mushrooms represent a whole new species, with further specimens found from rockrose (Halimium halimifolium) shrubland in Sardinia. This is a small to medium-sized bolete with a felty, hazel brown surface on the cap and a lemon-yellow stipe and pores. Many parts of the mushroom turn intense dark blue when handled or damaged.

Because the Mediterranean is among the most prominent hotspots for climate change, many of the species growing there are of particular interest to conservationists, highlighting the need for additional studies of the distribution of this rare and interesting fungus. It is a potential candidate for the Global Fungal Red List and its habitats should be protected.

8. Busy lizzie pays tribute to 'defenders of Ebo' forest

Measuring anywhere from 10 to 60 cm tall, this threatened busy lizzie has brightly bicoloured flowers of magenta pink and white. The species is named after the Banen—defenders of Cameroon's Ebo Forest and wildlife reserve.

Impatiens banen is known only from granite domes inside of Ebo Forest, which is still threatened with deforestation despite the suspension of a logging concession in the area in August 2020 following protests. The protests, led by local communities and especially the Banen, were thrust into the spotlight thanks to the support of international campaigners, including actor Leonardo DiCaprio.

Ebo Forest is among the biggest intact rainforests of Cameroon and

boasts and incredible array of biodiversity. However, it has remained largely unstudied by scientists and is now the focus of studies between RBG Kew and partners at the National Herbarium of Cameroon, San Diego Zoo Wildlife Alliance, and local communities.

9. Sweet potato relative is a new species of morning glory

Hailing from the tropics, the sweet potato (Ipomoea batata) is a major food crop originating in tropical America, providing millions of people with food every single day. It has long been known to be a hexaploid (organism with cells made up of six sets of chromosomes), but its parent species have remained a mystery. Ipomoea trifida was identified in recent years as the closest diploid (organism carrying two complete sets of chromosomes) relative, but only now has a tetraploid species (with four sets of chromosomes and therefore a putative progenitor), been found—Ipomoea aequatoriensis.

While conducting research on morning glories, the attention of Robert Scotland's team at the University of Oxford was drawn to an anomalous and previously unrecognized provenance from Ecuador. Using material collected in earlier years, scientists were able to show this new species, I. aequatoriensis, to be a putative progenitor of the sweet potato.

Further field work conducted in 2022 has revealed the new species to be a common weedy plant with flowers in coastal Ecuador. The discovery is of considerable scientific interest as knowledge of the closest relative of sweet potato may lead to the breeding of improved strains beneficial for humanity.

10. Only three left in the wild—the last survivors of Brazil's Mata Atlântica

Confined to one of the last surviving fragments of Brazil's Mata Atlântica rainforest, Eugenia paranapanemensis grows in the province of São Paulo where it reaches heights of up to 27 m. Also known as the pitanga amerala, the species and its native forests (of which only 7% remains), are under intense threat from cattle farming and the production of corn, soybeans, cotton, and cereals.

The tree produces bright yellow-orange fruits that taste of sour cherries with a slight hint of eucalyptus. These are similar to the purple and widely popular fruit of the Brazilian fruit tree pitanga (Eugenia uniflora). Both species belong to the myrtle family, which makes up a considerable proportion of South America's forests.

The team of scientists that discovered this species considered it to be Critically Endangered. It is currently known to be restricted to a forest patch near its namesake, the town of Paranapanema. Only three mature trees have been found so far.

Additional runners-up in 2022:

Betula buggsii—With unique characteristics of its bark, leaves, and catkins, evolutionary biologist Nian Wang named this Chinese species after his former Ph.D. supervisor Richard Buggs, Professor of Evolutionary Genomics at Queen Mary's College, London and RBG Kew.

Mauritiella disticha—2–7 m tall, spiny trunked fan palm restricted to just five sites in the Amazon basin.

Lophopetalum tanahgambut—A Critically Endangered, 40 m giant swamp forest spindle tree from Sumatera, Indonesia.

Staurogyne yamokmehong—A medicinal herb and hormone regulator used by the Shan Ni people of Myanmar that measures 20–35 cm tall.

Provided by Royal Botanic Gardens, Kew