



Singapore Journal of
Scientific Research

ISSN: 2010-006x

science
alert

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Weird and Wonderful Plant and Fungal Discoveries of 2010

As the UN's International Year of Biodiversity draws to a close, scientists at the Royal Botanic Gardens, Kew are celebrating the diversity of the planet's plant and fungal life by highlighting some of the weird, wonderful and stunning discoveries they've made this year from the rainforests of Cameroon to the UK's North Pennines. But it's not just about the new -- in some cases species long thought to be extinct in the wild have been rediscovered.

Professor Stephen Hopper, Director of the Royal Botanic Gardens, Kew says, "Each year, botanists at the Royal Botanic Gardens, Kew, working in collaboration with local partners and scientists, continue to explore, document and study the world's plant and fungal diversity, making astonishing new discoveries from microscopic fungi to canopy giants".

"This work has never been more relevant and pressing than in the current era of global climate change and unprecedented loss of biodiversity. Without a name, plants and fungi go unrecognised, their uses unexplored, their wonders unknown".

"On average, 2,000 new plant species are discovered each year, and Kew botanists, using our vast collection of over 8 million plant and fungal specimens, contribute to the description of approximately 10 percent of these new discoveries. Despite more than 250 years of naming living plants, applying each with a unique descriptive scientific name, we are still some decades away from finishing the task of a global inventory of plants, and even more so for fungi".

"Plants are at risk and extinction is a reality. However stories of discovery and rediscovery give us hope that species can cling on and their recovery is a very real possibility. Continuing support for botanical science is essential if plant based solutions to human challenges, such as climate change, are to be realised."

This year's new showstoppers include;

From Africa with Love -- Wild Mozambican Mistletoe ...

This parasitic, tropical mistletoe was named in 2010, and was first discovered near the summit of Mount Mabu in northern Mozambique, a region which hit the headlines in

2008 when a Kew-led expedition uncovered this lost world bursting with biodiversity. Since then, the team at Kew have worked tirelessly sorting through the hundreds of specimens they collected, and they have described this new wild mistletoe (*Helixanthera schizocalyx*) just in time for Christmas!

It was spotted by the expedition's East African butterfly specialist, Colin Congdon, while the team were trekking up the mountain, on a path that took them from the moist montane forest up to where the broad granite peaks break through the dense foliage. Colin quickly realised this species was different from anything he had seen on the mountains in neighbouring Malawi and Tanzania, and on closer inspection back at Kew it was confirmed a new species.

Tropical mistletoes, from the family Loranthaceae, are a great example of biodiversity and the symbiotic relationship between plants and animals. Birds play a vital role in both pollinating these mistletoes, and also distributing the seeds. As birds eat the small fleshy white sweet fruits, the seeds are then wiped on a branch to which they adhere. Once germinated the root grows into the living tissue of the tree to obtain the new plant's nutrients. Tropical mistletoes are also popular with butterflies and in particular the blue group Lycaenidae. These strong links between the plants, their host trees, and various birds and butterflies, shows the interconnected nature of forest species, and the need to conserve all elements in order to preserve the environment.

A Lustrous Vietnamese Orchid...

From one of the world's biodiversity hotspots, Vietnam, comes a strikingly beautiful orchid, *Dendrobium daklakense*, with glossy white-and-bright-orange flowers. The orchid was first collected in 2009 by a local plant hunter, who said

he found it in a remote area in the Dak Lak province of southern Vietnam. It was brought to the attention of Vietnamese orchid expert Nguyen Thien Tich, who being unable to identify it, passed photographs and drawings on to Kew orchid specialist André Schuiteman and his colleague Jaap Vermeulen from the NCB Naturalis in The Netherlands.

As soon as they saw these images they suspected that it was an unknown species of *Dendrobium* (1), which was confirmed after further research. Working in partnership, the three botanists teamed up to produce a formal publication. André Schuiteman comments, "Although undescribed orchids are still discovered regularly in the tropics, it is remarkable that such a distinct and showy species could have escaped detection until recently. The next step is to determine its exact location so that we can assess its conservation status, though I suspect that it is endangered."

Cameroon Canopy Giant...

A gigantic tree, *Magnistipula multinervia*, described excitedly by Kew's well seasoned plant hunter, Xander van der Burgt, as "the rarest tree I have ever found," has been discovered in the lush green rainforests of Cameroon.

Towering above the canopy at 41 metres high this critically endangered tree was discovered in the lowland rainforests of the Korup National Park -- a hot-bed for new discoveries in the South-West Province of Cameroon. Due to its height, rarity (with only four trees known) and the fact that the flowers hardly ever fall to the ground, it proved difficult to identify and collect in flower. After numerous visits to the four known trees over a period of several years to check if they were flowering and fruiting, the team were successful and using alpine climbing equipment, they managed to scale the dizzy heights, and make their collection, and identify it as new.

Steely Blue and Spiky Dragon Palms...

The palm flora of Madagascar is exceptionally rich, varied and yet also threatened. Kew experts have been studying the palms of this extraordinary island since the 1980s. Having added a local palm expert, Joro Rakotoarinivo, to the team the rate of palm discovery has continued to accelerate.

This year Rakotoarinivo, along with Kew collaborator John Dransfield, described a further 14 species new to science, all of which are threatened in the wild, with seven rated as

critically endangered. This brings the total number of Madagascar palm species discovered by Kew scientists to 101(2), which is 54% of the total Madagascar palm flora.

Among the dramatic new species described this year are *Dypsis metallica*, so-named because of its thick, steely-blue leaves; and *Dypsis dracaenoides*, which resembles a spiky dragon tree (*Dracaena* species), and *Dypsis gronophyllum* with leaves that look as if they have been chewed off by insects.

A Medicinal Wild Aubergine from East Africa...

Commonly known as 'Osigawai' in the local Masai language, *Solanum phoxocarpum* was discovered by Maria Vorontsova(3) on an expedition to Kenya's Aberdare mountainous cloud forests. Having researched specimens of wild African aubergines in RBG, Kew's vast Herbarium collections of dried plant specimens, Vorontsova, who was based at the Natural History Museum, London at the time, discovered some unusual unnamed specimens(4), some of which were unlike any she had seen before. Eager to discover more, Maria set out on an expedition with botanists and seed hunters from Kenya's 'Seeds for Life' project team, partners in Kew's Millennium Seed Bank Partnership.

Many of the old collection locations they visited had been stripped of native vegetation, but after four weeks, the team was successful. They spotted a wild aubergine shrub with distinctive unusual long, yellow, pointed fruits and deep mauve flowers that was indeed a new species. They collected its fruits and set out slicing them open to collect seed for banking. While spreading the fruit's yellow sludge onto paper, so the seeds could dry for long term storage in Kew's Millennium Seed Bank, one of the team noticed that the fruits began to emit a pungent odour and later that day they became ill. It is now believed that this species may be poisonous, and having consulted Kew's historic specimens, it also proves to be used medicinally by local people.

3 New Bolivian Beauties -- Wild Irises from the Andes...

This year three new Bolivian species from the genus *Mastigostyla* (Iris family/Iridaceae) were described from the dry mountains and valleys on the eastern edge of the Andes of Bolivia, an area rich in biodiversity. The team, comprising of Bolivian botanist Hibert Huaylla, Kew Research Associate John Wood (from the University of Oxford) and Kew botanist Paul Wilkin collected and named these three stunning irises.

For a short period at the end of the rainy season in March the rocky Torotoro National Park is a carpet of blue as one of its unique botanical jewels, *Mastigostyla torotoroensis*, opens its eye-catching flowers toward the sky. The second species, *Mastigostyla woodii*, is known from just two localities and has horizontally-facing bluish-purple flowers. It was named in honour of John Wood by Huaylla and Wilkin in recognition of his role in training young Bolivian botanists and his own important studies of the vast plant biodiversity of Bolivia. The third newly discovered member of the iris family, *Mastigostyla chuquisacensis*, can be found in dense colonies in sandy hollows between rocks on sandstone mountain ridges near Sucre and has attractively marked light blue flowers. Of the three new discoveries it has perhaps the greatest potential as an ornamental garden plant.

Species back from the brink include;

Ascension Island Parsley Fern...

On the tiny UK overseas territory of Ascension Island in the South Atlantic, a fern long thought to be extinct was rediscovered and saved in a mammoth rescue effort. During a routine plant survey, a team from the Island's Conservation Department (5) decided to explore the intimidating knife-edge ridge running down the wild southern slopes of Green Mountain, Ascension's dominant volcano.

By chance botanist Dr. Phil Lambdon (6) with local Conservation Officer, Stedson Stroud, noticed a tiny fern leaf poking out from an almost bare rock face. They instantly recognized it as the long-lost Ascension Island parsley fern, *Anogramma ascensionis*, which was once prevalent on the mountain, recorded by Sir Joseph Hooker in 1876, but had since been declared extinct. A detailed search soon revealed four minute plants, with delicate, yellow-green leaves, which resembled miniature sprigs of parsley clinging to a precarious existence in spite of harsh, dry conditions.

After their early elation, it was clear that the conservation team had to mount a last-ditch effort to save the unstable population. So Stedson and his colleague Olivia Renshaw pampered the plants twice a week, scrambling down the ridge with a safety rope to water and weed the patch. As Stedson says, "Finding it was difficult. Carrying water and hanging onto the safety rope was even harder. However, we will do whatever it takes to keep these ferns alive." Thanks to this loving care, two of the original four plants

survived long enough to produce spores which were sent to Kew's Conservation Biotechnology Unit for propagation.

Batty Brazilian Bromeliad back from the dead...

Alcantarea hatschbachii, a handsome green-flowered member of the Bromeliaceae (pineapple family), was first described in 1975 from the highlands of Minas Gerais, the state with the largest plant diversity of Brazil. Collected only once in the 1970s, despite the persistent efforts of botanists and amateurs to find out more about this species over subsequent years, it was never seen again and was believed to be extinct.

During recent fieldwork as part of Kew's ongoing Toucan Cipó conservation project, this curious bromeliad, possibly pollinated by bats, was found growing amongst rocks beside a stream. This exciting discovery was made at the furthest point of a strenuous 10 km hike over the mountains, whilst mapping and describing the vegetation types of the area for conservation management.

Daniela Zappi says, "According to a recent study by Kew, one in 10 of Brazil's plants are under threat (7). It is a race against time to document and conserve the country's rich diversity, and it is thrilling to have rediscovered this species, just in time. Plans are now under way to revisit the site, and make collections of living plants for conservation at the Fundação Zoobotânica de Belo Horizonte."

Smut and moon carrots -- the rediscovery of extinct British fungi...

The long-lost British fungus, bird's-eye primrose smut (*Urocystis primulicola*), recognised as a species of "principal importance for the conservation of biological diversity" (BAP review 2007) had not been seen for 106 years until it was rediscovered by Kew and Natural England mycologist, Martyn Ainsworth(8), during a two hour 'ovary squeezing' session.

Smuts are species of inconspicuous, microscopic fungi that are found inside living host plants, in this case the red-listed wild pink flowered bird's-eye primrose (*Primula farinosa*) found in the North Pennines. The bird's-eye primrose smut has co-evolved with the plant and hijacks its ovaries, replacing its seeds with a black powdery mass of smut spores. Concealed in the ovaries, it is only when the bird's-eye primrose seed-pods are squeezed in the late summer, when the seeds are ripe, that this rare smut can be found.

In a similar story, the moon carrot rust (*Puccinia libanotidis*) was rediscovered in England after it was believed lost for 63 years. Rust fungi are so called because their spores are often produced in brownish orange powdery masses on the leaves and stems of host plants. The moon carrot (*Seseli libanotis*), the plant that hosts this rust, is a red-listed wild plant confined in Britain to the chalky soils of the Chilterns, Gog Magog Hills and the South Downs.

Martyn Ainsworth, Senior Researcher in Fungal Conservation says, "It is always exciting to rediscover species thought to be extinct but to find one that has been lost for over 100 years, while carrying out a quick survey in a likely spot during a journey between England and Scotland, was an exhilarating 'Eureka' moment. To wipe these rare British fungi off the extinct list is a joy and we hope that with further field surveying we can now provide a clearer picture of these species' current British distribution".

"Both these fungal species have been re-discovered on rare British plants, and therefore their conservation is dependent on that of their host plants and their habitats. I'd encourage all field naturalists to get out and start looking for so-called extinct fungi and find out about their relationships with other fungi, plants and animals so we can

understand their habitat and conservation requirements better. There are so few of us doing this Study, we need all the help we can get."

And finally the biggest new discovery of them all...

The biggest genome in a living species -bigger than Big Ben!

Scientists in Kew's Jodrell Laboratory, as part of their ongoing research into the causes and consequences of genome size diversity in plants, discovered the largest genome of all living species so far--found in *Paris japonica*, a subalpine plant endemic to Honshu, Japan.

With a genome size of 152.23 picograms(9), its genome is 50 times the size of the human genome, and 15% larger than any other found so far -- it's so large that when stretched out it would be taller than the tower of Big Ben! However, having such a large genome may have direct biological consequences, as plants with large genomes may be more sensitive to habitat disturbances and environmental changes and be at greater risk of extinction.

Story Source: The above story is reprinted from materials provided by Royal Botanic Gardens Kew, via EurekAlert!, a service of AAAS.