Kew botanists discover more than 250 new plant species in 250th anniversary year

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Giant rainforest trees, rare and beautiful orchids, spectacular palms, minute fungi, wild coffees and an ancient aquatic plant are among more than 250 new plant and fungi species discovered and described by botanists from the Royal Botanic Gardens, Kew in this, the botanical organisation's 250th anniversary year. The new species come from a wide-range of fascinating locations including Brazil, Cameroon, East Africa, Madagascar, Borneo and New Guinea. Nearly a third are believed to be in danger of extinction.

Following in the footsteps of their famous botanical predecessors such as Sir Joseph Banks, Sir Joseph Hooker, and Charles Darwin, taxonomic botanists at the Royal Botanic Gardens, Kew continue to explore and study the world's plant and fungal diversity, making astonishing discoveries every year. Their work involves a combination of fieldwork in remote and exotic parts of the world, and research in the Royal Botanic Gardens, Kew's Herbarium, a vast scientific collection of over seven million dried plants specimens, perhaps the largest of its kind in the world. This work has never been more relevant and pressing than in the current era of global climate change and unprecedented loss of biodiversity - especially as we count down to the International Year of Biodiversity in 2010.

Professor Stephen Hopper, Director of the Royal Botanic Gardens, Kew, says, "It is not widely known that 2,000 new plant species are discovered worldwide each year. Kew's botanists make a very significant contribution to this total.

"These new discoveries highlight the fact that there is so much of the plant world yet to be discovered and documented. Without knowing what's out there and where it occurs, we have no scientific basis for effective conservation. It is vital that these areas of botanical science are adequately funded and supported.

"As part of our Breathing Planet Programme we are committed to accelerating the discovery and classification of plant diversity, and finding solutions for their conservation."

Professor David Mabberley, Keeper of the Herbarium, Library, Art and Archives adds, "Achievements like this year's bumper crop of new species discoveries are only possible because of Kew's international collaborative network. Successful research in the field and Herbarium depends on our in-country partnerships. We are currently working with 100 countries throughout the world."

The full list of over 290 new discoveries can be found on www.kew.org/new-discoveries, together with profiles of selected species, an interactive map and a link to a specially created Google Earth layer.

Examples of the new discoveries include:

Canopy Giants from the rainforests of Cameroon - Among the most gigantic of the new species discoveries are three towering rainforest trees discovered by Xander van der Burgt, and colleagues in the Korup National Park in Cameroon. Talbotiella velutina and Lecomtedoxa plumosa both reach more than 30m into the forest canopy, but Berlinia korupensis, named by Dr Barbara Mackinder, tops these at more than 42m in height with a buttressed trunk almost 1m wide. The Berlinia is a member of the pea family (Leguminosae). It bears beautiful white flowers from which enormous pods some 30cm in length develop. The

pods explode when ripe, propelling the seeds ballistically away from the mother tree. Surveys of the Korup National Park revealed that this tree is extremely rare. "We found just 17 trees in our surveys," says van der Burgt. "Even though Korup is protected, Berlinia korupensis is critically endangered due to human pressures on the park." The Royal Botanic Gardens, Kew and in-country collaborators have discovered and described more than 100 new plant species from Cameroon since 1995, although Dr Martin Cheek, leader of the programme in Cameroon, comments that "species discovery is accelerating [with] more than 50 of these new species described since 2005".

From the tallest to the smallest - The smallest species on this year's new species list are wood-rotting fungi, which are less than a millimeter thick and cover their hosts like a lick of paint. With a Swedish colleague, Dr Brian Spooner and Dr Peter Roberts, the Royal Botanic Gardens, Kew's experts on fungal taxonomy, have just described five of these minute fungi. "They are small, but they perform a vital role in decomposition of plant material and recycling of nutrients," says Dr Spooner. These new fungi were among many specimens collected during a joint Anglo-Australian expedition to the Kimberley Region of Western Australia in 1988 and which are still under study. Other miniature discoveries in this year's list include two new species of Gymnosiphon; bizarre little flowering plants less than 10cm tall that derive their energy not from the sun but from underground fungi. Marie Briggs, the Royal Botanic Gardens, Kew botanist, who discovered one of these plants in Madagascar in 2007, seems to have a penchant for discovering small plants. While on an expedition to western Madagascar in 2009 she found specimens of a new genus of succulent belonging to the coffee family (Rubiaceae), and which is less than 3cm tall.

Mountains of orchids - With just over 25,000 species, the orchids are probably the world's largest flowering plant family. The Royal Botanic Gardens, Kew's orchid experts Dr Jeff Wood and Dr Phil Cribb have

added 38 new species to the total this year alone. Wood has been studying the orchids of Mount Kinabalu, the highest mountain in Borneo (4095m), for more than a decade and yet continues to discover species new to science. "Kinabalu is unbelievably rich," says Dr Wood. "In an area of just 1,200 square kilometres 866 different orchids occur, including 13 new species described this year alone". But there is trouble in paradise; Borneo's forests are being devastated by widespread logging for timber and oil palm plantations. Dr Wood has named a further 15 new species this year, all of which have been discovered in logging areas in Borneo. Orchids face a further threat - illegal collection for the horticultural trade. Wood's research is essential - put simply, by placing these spectacular plants on the map, he is throwing them a lifeline.

Two dozen new palms - An astounding 24 new species of palm feature on the list. Some are enormous forest canopy trees, such as the 25m tall Cyrtostachys bakeri, discovered by Royal Botanic Gardens, Kew palm expert Dr Bill Baker in Papua New Guinea, but most are slender, elegant palms from the rainforest undergrowth. Twenty of the new palms come from Madagascar, which is home to 188 palm species. "After 20 years of research, we're still finding new species in Madagascar," says Dr Baker. "A half of all known Madagascar palms have been discovered by Kew botanists." Less than 10% of Madagascar's original vegetation remains and a further 200,000-300,000 hectares of forest are destroyed every year. As a result, 90% of Madagascar's palms, including all of the 20 new species, are threatened with extinction because of habitat loss and destruction of palms for the numerous useful products that they provide, such as food and construction materials. Some are incredibly rare; for example, fewer than 10 individuals of one of the new species, Dypsis humilis, were found in a single forest patch used heavily by local people for timber. Innovative conservation strategies involving local communities are needed to save these species. This approach has been effectively employed for the conservation of the 'suicide palm', Tahina spectabilis, discovered in Madagascar by a collaborative team led from

the Royal Botanic Gardens, Kew in 2007.

The coffee species that could save your daily cup from climate change - Seven wild coffee species, mostly native to the mountains of northern Madagascar, feature on the list. This takes the total number of new coffee species discovered by the Royal Botanic Gardens, Kew and its partners over the past ten years to nearly 30, including some weird and wonderful species. Coffea labatii and Coffea pterocarpa have winged fruits, while Coffea namorokensis and Coffea bissetiae are distinctly hairy, and Coffea ambongensis and Coffea boinensis have the largest seeds of any coffee species: their 'coffee beans' are more than twice the size of those of Coffea arabica (Arabica coffee), the main species used in the commercial production of coffee.

"We're still finding new species of coffee, including those directly related to crop plants," says the Royal Botanic Gardens, Kew's coffee expert Dr Aaron Davis. "Coffee is the world's second most traded commodity, after oil, with at least 25 million farming families dependent on its production for their livelihoods, yet we still have much to learn about its wild relatives. We estimate that 70% of wild coffee species are in danger of extinction due to habitat loss and climate change.

"Conserving the genetic diversity within this genus has implications for the sustainability of our daily cup, particularly as coffee plantations are highly susceptible to climate change. Those involved in the coffee trade could help to future-proof the industry by working with Kew and its partners to create reserves to conserve coffee genetic resources."

Ancient aquatic plant on the rocks - Isoetes eludens, a species of an ancient group of spore-plants known as quillworts, and so named because it eluded its discoverers for seven years, was found in a mountain-top rock pool in a remote corner of Namaqualand, South Africa by the Royal Botanic Gardens, Kew's Director, Professor Stephen

Hopper. Botanists are concerned that these exposed temporary rock pools - known by the local Nama people as !gau - are vulnerable to climate change which could mean the 5cm high plant's days are numbered. Urgent collection of spores and long-term storage in seed banks is an important next step to secure the conservation of this intriguing species. Quillworts date from fossils aged more than 150 million years old in an era before the evolution of flowering plants.

"To discover a completely new species in a small pool just 2m in diameter and 15cm deep was an unexpected delight. It highlights how much more work is needed to reveal the full diversity of the Cape's world-famous flora," says Professor Hopper.

Critically endangered 'cancer cure' yam - Dioscorea strydomiana is a critically endangered species from South Africa with only two populations of about 200 plants known in the wild. It does not look like a typical yam - it is shrub-like in appearance with a huge, slow growing, lumpy wooden tuber above the ground measuring up to 1m in height and diameter. The tuber sprouts multiple shoots each spring. The species is regarded as a cancer cure in the region where it grows and as a result is under threat from over-collection by medicinal plant collectors who cut pieces off the tubers. The Royal Botanic Gardens, Kew's yam expert, Dr Paul Wilkin, describes this species as "the most unique and unusual yam I have come across, and probably the most threatened".

Indigos and relatives - Fourteen species of the blue dye indigo producing genus Indigofera have been described as new to science in 2009. Few natural by-products have played as prominent a role in history and in international trade as indigo. It has been a valued dye from the earliest human civilizations because of its compatibility with all types of natural fibres and its ability to be combined with other natural dyes to create a range of colours not possible to produce with synthetic substitutes. The Royal Botanic Gardens, Kew has had a long-standing interest in the

research of this genus and these discoveries arose during ongoing research in southern tropical Africa. Of the 14 new species described, 11 are highly localised and are threatened with extinction.

Indigofera has more than 750 species and occurs throughout the tropical regions of the world. It is member of Leguminosae (pea family).

Discovered in a glasshouse - Most of this year's discoveries come direct from the wild, but in one case, a new species was found closer to home - in Kew Gardens' Princess of Wales conservatory. Dr Iain Darbyshire, an expert on African botany, stumbled across Isoglossa variegata during a lunchtime wander in the glasshouse, where it was used for tropical bedding. Dr Darbyshire, who has contributed 36 new species from the Acanthus family (Acanthaceae) alone to this year's list, later found specimens in the Herbarium. It was first collected nearly 100 years ago but on another specimen from the 1950s there is a note stating "NAME URGENTLY DESIRED". Fifty years on, the job is now done, the delay reflecting the overwhelming task of charting the world's plants. Isoglossa variegata is one of more than 100 new species from East Africa and southern tropical Africa and is part of a major commitment by the Royal Botanic Gardens, Kew, initiated some 50 years ago, to document the flora from this area in two major projects, the Flora of Tropical East Africa and Flora Zambesiaca. These great works, which document around 12,500 and 10,000 species respectively, are now nearing completion.

Brazilian passion - Passiflora cristalina is among the 20 new Brazilian species discovered by the Royal Botanic Gardens, Kew this year. It is a striking red passionflower with edible egg-shaped fruits and is thought to be pollinated by hummingbirds. Dr Daniela Zappi discovered it during an expedition to the Amazon rainforest in Mato Grosso, Brazil. The plants in this part of the Amazon are poorly known and threatened by deforestation from cattle farming. "We are almost certainly losing

species from this region before they are known to science, and our work is a race against time." says Dr Zappi. "The survey work we have carried out so far is a major step forward in scientific knowledge and is being used by local government agencies to develop a much-needed plan to protect this area."

Also on the list is a new legume genus, Tabaroa catingicola, discovered by Brian Stannard from the Royal Botanic Gardens, Kew and his Brazilian colleagues, on the lower slopes of the Rio de Contas mountain range in southwestern Bahia. The legume family is of great research significance because so many species are used throughout the world as sources of food and medicine. Great potential exists to utilise more species, which is why continued taxonomic research into this family is essential.

Knee-high eucalyptus discovered in SW Australia - To many British gardeners the eucalyptus is a fast growing monster; casting shade and debris… usually in the neighbour's garden. In Australia, however, the over 900 species of eucalypts are integral to the landscape and culture and come in all shapes and sizes. It seems fitting, therefore, that the Royal Botanic Gardens, Kew's Director, Professor Stephen Hopper, an Australian himself, has recently described two fantastic new species in southwest Australia. "You might expect that the plants of Australia are already well-known," says Professor Hopper, "but these kinds of finds are far from unusual, especially in the southwest." Professor Hopper discovered Eucalyptus sweedmaniana with his colleague Luke Sweedman, after whom he named the plant. It is a dwarf in comparison to most eucalyptus species, forming a low-growing mallee (shrub) around 1m high. It survives the bush fires that are common in the area by dying back to a woody underground rootstock, known as a lignotuber, from which it can resprout later. The second new species (*Eucalyptus brandiana*), although larger than sweedmaniana, isn't so lucky; it lacks a lignotuber and is killed by fire. Both species are known from just a few

hundred plants each and are in need of conservation. However, both have potential as ornamentals in Australia (and perhaps elsewhere), which could provide a welcome backup plan to secure their futures.

Provided by Royal Botanic Gardens Kew