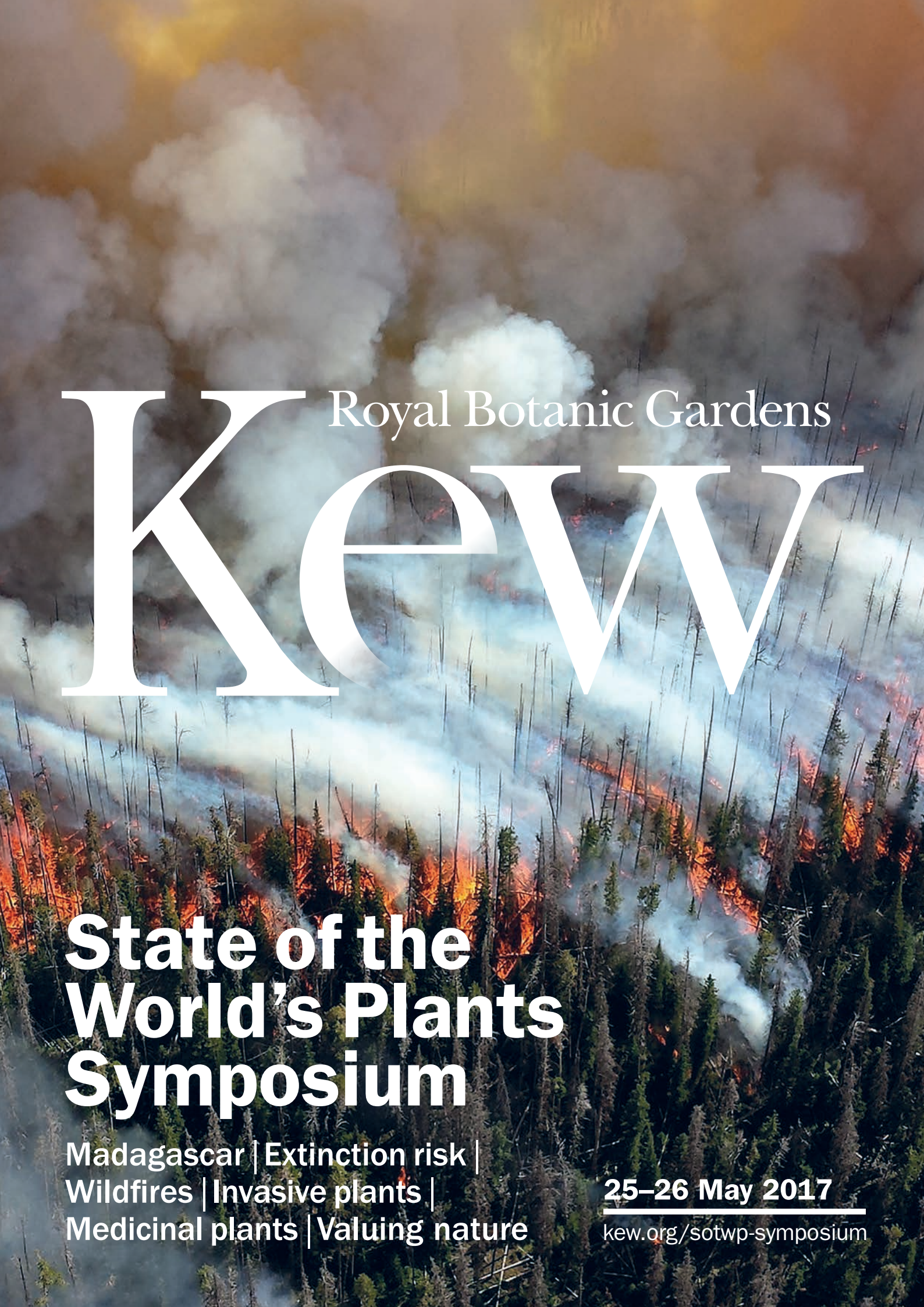

Royal Botanic Gardens

Kew

State of the World's Plants Symposium

Madagascar | Extinction risk |
Wildfires | Invasive plants |
Medicinal plants | Valuing nature

25–26 May 2017

kew.org/sotwp-symposium

State of the World's Plants

Royal Botanic Gardens, Kew

25–26 May 2017

In conjunction with the publication of Kew's cutting-edge annual report, scientists and policymakers are gathering for the second international State of the World's Plants Symposium.

The State of the World's Plants report provides data on major issues affecting plant diversity and abundance, to show us how plants are faring and how this is changing over time. As well as revealing the current status, the report includes horizon scanning to identify important and emerging issues, including research and knowledge gaps. This two-day symposium offers a platform to discuss issues raised in the report and to engage the scientific community, policymakers and public alike.

Please visit the State of the World's Plants interactive website to download a copy of the 2017 report and to explore our data visualisations:

stateoftheworldsplants.com

The staff and trustees of the Royal Botanic Gardens, Kew and the Kew Foundation would like to thank the Sfumato Foundation for generously funding the State of the World's Plants project.

SFUMATO FOUNDATION

We also thank the following sponsors for supporting the symposium:

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Contents

General information

Meeting location

Jodrell Laboratory
Royal Botanic Gardens, Kew
Kew Road
Richmond
Surrey TW9 3DS

All talks and panel discussions will take place in the Jodrell Lecture Theatre inside the Jodrell Laboratory. Refreshment breaks, lunches and the evening poster session and drinks reception will also be held in the Jodrell Laboratory.

To access the building, please enter the Gardens via the Jodrell Gate on Kew Road. A member of staff will be present at the gate between the following times:

Thursday 25 May:	08:30–10:30	18:00–19:45
Friday 26 May:	08:30–09:30	16:00–18:00

If you arrive/depart outside of these hours, please call RBG Kew Constabulary using the telephone in the yellow box on the wall by the gate. You will be connected automatically when you pick up the receiver. Please give Constabulary your name and let them know that you are attending the State of the World's Plants Symposium. They will then remotely release the pedestrian gate.

Exhibition

A trade exhibition will run throughout the symposium in the Jodrell Laboratory. We encourage you to please take the opportunity to visit the exhibition stands and meet our sponsors.

Kew Shop pop-up

Please visit our pop-up shop on the ground floor of the Jodrell Laboratory where you can find a range of exciting books and gifts for sale. We are pleased to offer symposium delegates a 20% discount on selected book titles purchased at the stand.

Poster presentations

Posters will be displayed for viewing throughout the symposium. Please ensure that your poster is mounted by 12:30 on Thursday 25 May and taken down by 17:00 on Friday 26 May.

A designated poster session and drinks reception will take place from 18:00–19:20 on Thursday 25 May. If you are presenting, please ensure that you are by your poster at this time.

Symposium dinner

The symposium dinner will be held on Thursday 25 May in the Orangery restaurant, a Grade I listed historic building designed by Sir William Chambers. Attendence at the dinner is by prior booking only (in advance of the symposium).

Tours

Join us for behind the scenes tours of Kew's Collections and facilities, after the symposium closes on Friday 26 May. Tours depart from the Jodrell Laboratory at 16:15 and 17:00, and last for

approximately 30 minutes. To book a place on a tour, please sign up in advance at the registration desk. Places are limited and will be allocated on a first-come, first-served basis.

Internet access

Free Wi-Fi access is available in all of our buildings including the Jodrell Laboratory. To connect to our Wi-Fi, please select Kew-Visitors from the available networks and accept the terms and conditions.

Twitter

If you are tweeting about the symposium, please use the hashtag #SOTWP.

First aid

First aiders will be in attendance during the symposium. Should you need assistance, please ask at the Jodrell reception desk or speak with a member of staff.

Emergencies

For emergencies, please dial 020 8332 3333 (or extension 333 from a Kew telephone). Please do not dial 999, as emergency calls need to be co-ordinated by on-site Constabulary.

Fire

The signal to evacuate is a loud, two-tone alarm. On hearing the alarm, please proceed directly to the nearest emergency exit. DO NOT use the lifts. The fire assembly point is the GRASS GARDEN at the rear of the Jodrell Laboratory.

Taxis

Kew Cars: 020 8568 6666

Nearby facilities

Kew's Victoria Plaza shop (situated by Victoria Gate) sells a variety of books, gifts and gardening supplies. You can also find a range of shops and restaurants near to Kew Bridge railway station, Kew Gardens station and Kew Green.

Programme

Thursday 25 May 2017

09:00–10:00	**Registration and refreshments**
10:00–10:30	**Welcome and introduction** Professor Kathy Willis – Director of Science, RBG Kew, UK
Session 1	**Madagascar: megadiverse and misunderstood – how can we hope to reverse threats to biodiversity?** Chair: Dr David Goyder – RBG Kew, UK
10:30–10:50	**Dr Maria Vorontsova – RBG Kew, UK** Using grasses to puzzle out ancient Madagascar
10:50–11:10	**Dr Porter P. Lowry II – Missouri Botanical Garden, USA** Using our knowledge of Madagascar's flora to conserve what we can before it's too late
11:10–11:30	**Herizo Andrianandrasana – University of Oxford, UK / Durrell Wildlife Conservation Trust, Madagascar** Evaluating the social and biodiversity impacts of community-based conservation projects in Madagascar
11:30–11:50	**Tianjanahary Randriamboavonjy – Kew Madagascar Conservation Centre (KMCC), Madagascar** The Itremo Massif: a new site for conservation in Madagascar's Protected Area System
11:50–12:10	**Q&A panel discussion**
12:10–13:10	**Lunch**
Session 2	**The immediate risk of extinction: climate change won't matter if everything has already died out…** Chair: Dr Eimear Nic Lughadha – RBG Kew, UK
13:10–13:30	**Dr Ruth Kiew – Forest Research Institute, Malaysia** Causes of plant extinction in Malaysia – anthropogenic, global warming or indifference?
13:30–13:50	**Dr George Schatz – Missouri Botanical Garden, USA** What will be left?

Programme

13:50–14:10 **Dr C. Thomas Philbrick – Western Connecticut State University, USA**
Dams are the most prevalent global threat to Podostemaceae

14:10–14:30 **Dr Noeleen Smyth – RBG Kew, UK**
Consume, Alt, Delete

14:30–14:50 **Q&A panel discussion**

14:50–15:20 **Refreshment break**

Session 3 **Wildfires: a necessary evil?**

Chair: Dr Tom Etherington – RBG Kew, UK

15:20–15:40 **Professor William Bond – South African Environmental Observation Network (SAEON), National Research Foundation (NRF), South Africa**
Problems with wildfires and biodiversity conservation

15:40–16:00 **Dr Juli G. Pausas – Centro de Investigaciones sobre Desertificación (CIDE), Spanish National Research Council (CSIC), Spain**
Fire and plant biodiveristy – a global perspective

16:00–16:20 **Professor Andrew C. Scott – Royal Holloway, University of London, UK**
Fire as an Earth system process

16:20–16:40 **Professor Vigdis Vandvik – University of Bergen, Norway**
A burning issue: climate and land-use controls of ecology, evolution and landscape wildfire risk in coastal landscapes of Norway

16:40–17:00 **Q&A panel discussion**

17:00–18:00 **One-minute poster presentations**

18:00–19:20 **Drinks reception and poster session**

Sponsored by Science/AAAS

19:30–22:30 **Symposium dinner** (pre-booking required, in advance of the symposium)

Programme

Friday 26 May 2017

Session 4 **Invasive plants: born to invade?**

Chair: Dr Colin Clubbe – RBG Kew, UK

09:00–09:20 **Dr Rosemary Newton – RBG Kew, UK**
Are plant traits a good predictor of invasiveness?

09:20–09:40 **Professor Petr Pyšek – Institute of Botany, Academy of Sciences of the Czech Republic**
Biogeography of plant invasions: interaction of native range habitat legacy and species traits

09:40–10:00 **Professor Laura A. Meyerson – University of Rhode Island, USA**
Genome size variation and its implications for the invasive fitness of plants

10:00–10:20 **Professor Christoph Kueffer – University of Applied Sciences (HSR) Rapperswil, Switzerland**
Invasive plants: new solutions for the Anthropocene

10:20–10:40 **Q&A panel discussion**

10:40–11:10 **Refreshment break**

Session 5 **From field to healed: how do we detect the medicinal plants of the future?**

Sponsored by the New Phytologist Trust

Chair: Professor Monique Simmonds – RBG Kew, UK

11:10–11:30 **Her Excellency, Dr Ameenah Gurib-Fakim – President of the Republic of Mauritius**
African herbal pharmacopoeia – potential leads from the Indian Ocean region

11:30–11:50 **Professor Nina Rønsted – Natural History Museum of Denmark**
Phylogenetic exploration of medicinal plant diversity

11:50–12:10 **Dr Christine Leon – RBG Kew, UK**
Beyond species level discovery: insights from Traditional Chinese Medicine

12:10–12:30 **Professor Sarah O'Connor – John Innes Centre, UK**
How do plants make drugs?

12:30–12:50 **Q&A panel discussion**

12:50–13:00 **Group photo**

Programme

13:00–14:10 **Lunch**

Session 6 **Valuing nature: which plant species are most valuable?**

Sponsored by PBL

Chair: Dr Paul Wilkin – RBG Kew, UK

14:10–14:30 **Dr Geoffrey H. Donovan – USDA Forest Service, USA / Centre for Public Health Research, Massey University, New Zealand**
The public-health benefits of plants: direct health benefits and bio-indicators of health risks

14:30–14:50 **Professor Philip C. Stevenson – RBG Kew, UK**
What are the most important plants for pollinators?

14:50–15:10 **Dr Yude Pan – USDA Forest Service, USA / Harvard University, USA**
Global forest carbon sinks and the future perspective

15:10–15:30 **Dr Rodrigo Cámara Leret – RBG Kew, UK**
The provisioning services of tropical American palms

15:30–15:50 **Q&A panel discussion**

15:50–16:00 **Poster awards and closing remarks**

Professor Kathy Willis – Director of Science, RBG Kew, UK

Sponsored by the New Phytologist Trust and Society for Experimental Biology

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16:00–17:45 **Refreshments and optional tours of Kew's Collections**
Please book tours in advance at the registration desk

Speaker abstracts

Session 1: Madagascar: megadiverse and misunderstood – how can we hope to reverse threats to biodiversity?

Using grasses to puzzle out ancient Madagascar

Vorontsova, M.S.[1], Nanjarisoa, O.P.[2,3], Solofondranohatra, L.C. [2,3], Jeannoda, V.[3], Hackel, J.[4], Besnard, G.[4], Linder, H.P.[5] & Lehmann, C.E.R.[6]

[1] Royal Botanic Gardens, Kew, UK
[2] Kew Madagascar Conservation Centre (KMCC), Madagascar
[3] Département de Biologie et Ecologie Végétales, University of Antananarivo, Madagascar
[4] Laboratoire Evolution & Diversité Biologique, CNRS/ENSFEA/IRD/Université Toulouse III, France
[5] Institute of Systematic Botany, Switzerland
[6] School of Geosciences, University of Edinburgh, UK

Anthropogenic destruction has long been blamed for 65% of Madagascar's land area being covered by grassland and savanna, despite the flora of these regions never having been thoroughly investigated. Over the last six years, via new collections of Malagasy grasses and taxonomic work, we have found that an estimated 217 of Madagascar's 541 grass species are endemic, a level of endemicity consistent with other subtropical islands. For example, *Lecomtella madagascariensis*, a monotypic endemic lineage diverged from its sister groups more than 20 million years ago. In total, Madagascar contains 70 endemic grass lineages that colonised Madagascar primarily from Africa, with a mean age of 3.5 million years; 50% of grass dispersals were C_4 lineages pre-adapted to open canopy habitats. Today, the High Plateau, Madagascar's largest area of intact grassland and savanna, is home to a diverse grass flora, where a grass checklist of the Itremo Protected Area alone found 20% of grass species are restricted to the High Plateau. Across these regions, grass community composition suggests Tapia woodlands, historically perceived as degraded forest, are a savanna and that the grass and tree functional traits of this ecosystems diverge strongly from gallery forests. Phylogenetic diversity within grassy ecosystems decreases with strong physical disturbance, such as grazing, indicating ecosystem dynamics typical of natural assemblages. Madagascar is home to an ancient and diverse grass flora, with local species assemblages functioning similarly to savanna ecosystems of Africa, indicating that pre-human Madagascar was home to, likely extensive, tropical grasslands and savannas.

Using our knowledge of Madagascar's flora to conserve what we can before it's too late

Lowry II, P.P.

Missouri Botanical Garden, USA

Botanical exploration in Madagascar has generated more than 400,000 collections (nearly half of these over the last 30 years), providing a robust basis for our continuously expanding knowledge of the island's flora, currently estimated to comprise up to 14,000 native species of vascular plants, nearly 90% of which are endemic (up from 7,900 species and 81% endemism reported in 1959). Hundreds of groups have been treated since the mid-1980s, including many large genera and several key families, and revisions are ongoing for numerous other important groups. Taxonomic studies have significantly increased the number of known species (from 33 to 73 Sarcolaenaceae, 3 to 33 *Canarium*, and 85 to ca. 230 *Diospyros*, etc.), and nearly all newly described taxa are endemic. Reliable, up-to-date information is available on-line for all 1,700 currently recognized genera and 11,635 species through the *Madagascar Catalogue*. The island's native habitats face unprecedented, relentlessly increasing threats resulting from a combination of acute poverty, unsustainable land use practices, rapid human population growth and ineffective governance. It will be nearly impossible to counter these threats and most remaining natural vegetation outside effectively protected areas will be lost in the coming decades. However, massive extinction can be averted by a coordinated effort focusing on sustainable community-based protection of carefully selected sites that collectively contain most of Madagascar's floristic diversity coupled with *ex-situ* conservation of the most acutely threatened species. Our current knowledge of the island's flora is more than sufficient to inform and guide this effort, which is already under way.

Evaluating the social and biodiversity impacts of community-based conservation projects in Madagascar

Andrianandrasana, T.H.[1,2], Long, P.R.[1], Young, R.P.[3] & Willis, K.J.[1,4]

[1] Department of Zoology, University of Oxford, UK
[2] Durrell Wildlife Conservation Trust Madagascar Programme, Madagascar
[3] Durrell Wildlife Conservation Trust, Jersey, UK
[4] Royal Botanic Gardens, Kew, UK

I conducted a retrospective evaluation of the effectiveness of Community-Based Conservation (CBC) interventions carried out by Durrell Wildlife Conservation Trust in 109 villages across five project sites in Madagascar since 1997. One objective of this programme was to conserve some globally threatened species locally endemic to each project site.

The evaluation used a quasi-experimental design to test for changes in a set of biodiversity and human wellbeing outcomes in the intervention villages compared with a further 109 control villages, which were matched on a range of social and environmental attributes. This study used government records, questionnaire surveys, remote sensing and species distribution modeling.

The CBC approach reduced the frequency of fire in intervention villages. Although CBC interventions did not prevent forest loss, the rate of deforestation in CBC villages was lower than in control villages. The CBC programme improved attainment in primary schools. However the intervention did not affect public health or Multidimensional Poverty Index. This is possibly because relatively modest resources were provided to each village by the programme.

One aim of the CBC programme was to increase environmental awareness among local people. People in CBC villages reported greater awareness of changes in the provision of ecosystem services, as measured by an Index of Perceived Provision of Valued Ecosystem Services.

Distribution models showed that there has been a decrease in the area of suitable habitat for the target species within intervention villages.

The Itremo Massif: a new site for conservation in Madagascar's Protected Area System

Randriamboavonjy, T.

Kew Madagascar Conservation Centre (KMCC), Antananarivo, Madagascar

At the World Park's Congress in Durban in 2003, the Malagasy government, led by the President Ravalomanana, pledged to triple the surface of the Madagascar terrestrial parks from 1.6 million to 7 million ha. The Systeme des Aires Protégées de Madagascar (SAPM) was created achieve this goal.

In 1990, 43 protected areas were managed by ANGAP, the forerunner to Madagascar National Parks (MNP), and covered 720,000 ha (1.22% of the land surface). Now there are 127 protected areas in total, covering 6.4 million ha (10.84% of the land surface). The new protected areas are managed in collaboration with local communities and these are reflected in their classification according to the IUCN. There are now 42 Category V protected areas: where the interaction of people and nature over time has produced an area of distinct character with significant, ecological, biological, cultural and scenic value. And there are 18 Category VI protected areas: conserving ecosystems and habitats together with associated cultural values and traditional natural resource management systems. Furthermore, Madagascar has created a further forest management system: GeLoSe (Gestion Locale Securisée) covering community management of forests on state land, often in areas adjacent to protected areas.

As part of SAPM and working with local communities, RBG Kew has established a new protected area on the Itremo Massif, which is IUCN Category V. Lying 350 km southwest of Antananarivo, it is a rugged upland area with savanna, tapia woodland, rocky outcrops and humid gallery forest. We have recorded over 670 plants species, of which 10% are locally endemic and 21% are classified as Endangered applying IUCN criteria. Fauna include the lemur *Verreaux's sifaka* (IUCN Vulnerable) and the amphibian *Mantella cowanii* (IUCN Endangered).

The Itremo Massif Protected Area has habitats that are similar to those covering over 60% of Madagascar. The major threats of fire and mining and other problems around maintaining biodiversity and ecosystem services in a living landscape, provide a research platform for Kew to undertake vital research with far-reaching consequences. As a result we have already seen improved understanding of the evolution and ecology of Madagascar's grasslands through the work with Maria Vorontsova.

Session 2: The immediate risk of extinction: climate change won't matter if everything has already died out…

Causes of plant extinction in Malaysia – anthropogenic, global warming or indifference?

Kiew, R.

Forest Research Institute Malaysia, Malaysia

Proving extinction demands adequate recent distribution data and knowledge of current threats to populations. In Peninsular Malaysia, while proven cases of extinction are very low, a third of the vascular plant flora of 8,500 species is endangered. The major threat to lowland and hill forest is land clearance for agriculture, logging and formerly tin-mining. For the flora of limestone karst hills quarrying and burning are major threats, while highland resort development, telecommunication installations and global warming threaten montane vegetation. Anthropogenic causes can in theory be checked. Malaysia's National Strategy for Plant Conservation aims to do this by, among other things, recommending that 10% of each ecological habitat be conserved, 50% of Important Plant Areas be protected, and that 60% of threatened species be conserved *in situ*. Basic knowledge on Peninsular Malaysia's flora is available, policy and methodology is established, so is it now indifference that is the impediment to halting the drift towards species extinction? Or is it a communication gap between scientists on the one hand and policy makers, resource managers, the general public and the press on the other?

What will be left?

Schatz, G.E.

Missouri Botanical Garden, USA

How many, and what plant species will survive the 6th great extinction event now underway? Protected areas cover over 15% of Earth's terrestrial surface; however, in the absence of a Global Gap Analysis, the number of plant species they shelter is unknown. Even within protected areas, disrupted reproductive biology, invasive species, pests and pathogens, climate change, and ineffective protection threaten the long-term persistence of plant species. Outside of protected areas, vast expanses of desert, grassland, taiga, and tundra may persist, but will harbor a relatively low number of plant species. In disturbed and abandoned landscapes, *r*-selected plant species will dominate and result in depauperate, homogeneous plant communities. Increasingly, the survival of plant species will depend upon active gardening, and as such will rely upon seed banks. Botanical gardens already grow over 105,000 species of plants, but will need to grow many more. Restored landscapes, agricultural landscapes, and urban landscapes can all contribute to the creation of a future biosphere that retains the maximum amount of biodiversity in the Anthropocene.

Dams are the most prevalent global threat to Podostemaceae

Philbrick, C.T.[1] & Philbrick, P.K.B.[2]

[1] Western Connecticut State University, USA
[2] University of Connecticut-Waterbury, USA

Podostemaceae (Riverweeds, ~50 genera, ~300 spp.) are distributed across much of the tropics, with highest diversity in Africa, India, southeast Asia and the Americas. These plants grow attached to rocks in swift currents of river-rapids and waterfalls; environments that are extreme, yet fragile. Local species endemism pervades the family, with near 40% of species in some regions occurring only in a single river. Large dams are the single most significant threat to these plants. Dams convert rivers into reservoirs, which destroy habitat upstream for a distance equal to the length of the reservoir, and downstream to the extent where the natural flood-pulse is disrupted. Loss of habitat from a single dam can span hundreds of kilometers. Placement of dams is biased toward regions of significant altitudinal gradients – areas where habitat for Podostemaceae is most abundant. Economic and political forces driving large dam construction are strong with major efforts underway to expand hydropower capacity. For instance, around 250 dams are planned or under construction in the Amazon basin alone. Other examples from Africa and southeast Asia will be discussed. Effective strategies for conservation of species remain elusive. Conserving *in situ* requires mitigating impacts (e.g., building of dams) and/or modifying dam operation. Transplantation between rivers is a logical alternative, although to date such attempts have met with limited success. Effective methods for *ex situ* cultivation remain to be developed. Conservation plans are essential and will require political, economic and scientific support.

Consume, Alt, Delete

Smyth, N., Dhanda, S. & Simpson, R.

Royal Botanic Gardens, Kew, UK

Global trade and increasing consumption is an immediate risk to species survival. The world's population reached over 7.3 billion in 2015 and people must consume to survive. Some sobering facts highlight that more than one billion people lack reasonable safe drinking water and that over 800 million people are undernourished. Consumption of natural resources is an increasing problem as highlighted through the impact of *i*llegal wildlife trade. However, the legal wildlife trade is also having an impact, Moran & Kanemoto (2017) identified 6,803 globally threatened species and found that the greatest threat to their survival was the legal trade with the USA, the European Union, China and Japan. The number of endangered plant species regulated and monitored under CITES (Convention on International Trade of Endangered Species) has increased to over 31,517 (CITES CoP 17). One timber species which has been consumed to near extinction is Siamese Rosewood (*Dalbergia cochinchinensis*), and it is estimated that only 80,000–100,000 trees now remain in Thailand. Trade had already started to alternate from this species in 2014 to other similar timber species, namely Burmese rosewood (*Dalbergia bariensis*) and Burmese padauk (*Pterocarpus macrocarpus*). Over 8% of the world's flora encompassing our most endangered plant species are now monitored in global trade, but trade regulations alone will not guarantee species survival.

Session 3: Wildfires: a necessary evil?

Problems with wildfires and biodiversity conservation

Bond, W.J.[1, 2]

[1] South African Environmental Observation Network, South Africa
[2] Emeritus Professor, Biological Sciences, University of Cape Town, South Africa

Fire is often seen as a threat to nature and this is true for much closed forest vegetation. However fire is often the most important ecological process maintaining open habitats filled with sun-loving plants. Fire-dependent vegetation includes vast areas of savannas and related grasslands, but also shrublands and woodlands with trees that cast little shade. These open vegetation types include some of the world's major biodiversity hotspots such as cerrado in Brazil, Cape fynbos in South Africa, the kwongan of south-west Australia and the pine savannas and related grasslands of the southern USA. The main threats to open-vegetation plants are conversion of their habitat to crops or plantation forestry, often under the misguided belief that open vegetation is the result of deforestation by people. Losses of sun-loving plants are also caused by fire suppression due directly to management intervention or indirectly as a result of landscape fragmentation. The biggest current threats are to grassy ecosystems where fires can be relatively easily managed. In shrublands and woodlands, where woody plants are the fuel, large, intense fires are becoming common under warmer and drier conditions and it is the closed forests that are threatened. A more nuanced understanding of fire as an ecological process is clearly needed. So too are technological interventions that allow fires to burn where needed and to be extinguished where they are not.

Fire and plant biodiversity – a global perspective

Pausas, J.G.

Centro de Investigaciones sobre Desertificación (CIDE), Spanish National Research Council (CSIC), Spain

Despite the general perception that wildfires are threatening biodiversity, by no means this can be generalised. There is increasing evidence that wildfires can act as an ecological and evolutionary pressure shaping landscapes and biodiversity at different scales. Wildfires has occurred since the land colonization by plants, and since then, fire activity has been going up and down in different regions and depending on different drivers (e.g., oxygen concentration, climate, megaherbivores). Consequently many plants have acquired a set of traits for survival and reproduction in fire-prone environments. In this talk I review the main fire-related traits in plants, and the micro- and macro-evolutionary evidence suggesting that fire has acted as a selection pressure for these traits. These evidences suggest that fire has contributed through time to shape plants, and thus it explains a proportion of the variability of our current global plant biodiversity.

Fire as an Earth system process

Scott, A.C.

Department of Earth Sciences, Royal Holloway University of London, UK

Evidence of wildfire comes from the occurrence of charcoal in sedimentary rocks since the late ~Silurian (420 million years ago). From the early Carboniferous (350 mya) fire is widespread and had an impact on a range of ecosystems. Fire is not only controlled by vegetation (fuel), moisture (climate and weather) and landscape (topography) but also there is a significant feedback between fire and the atmosphere. During periods of high oxygen in deep time, fires may have been more widespread. The high-fire world of the Cretaceous (140–65 mya) was a period of elevated oxygen when many plant groups evolved and developed mechanisms to cope with or exploit fire. Fire has, and continues to play an important role in the maintenance of many biomes and the new science of phytogeography has been developed to integrate fire into ecological and Earth system models.

A burning issue: climate and land-use controls of ecology, evolution and landscape wildfire risk in coastal landscapes of Norway

Vandvik, V.[1], Bargmann, T.[1], Daws, M.I.[2], Grimsrud, K.[3], Lee, H.[4], Måren, I.E.[1], Skrivervik, S.[1], Thorvaldsen, P.[5], Töpper J.P.[1] & Velle, L.G.[6]

[1] Department of Biology, University of Bergen (UiB), Norway
[2] Belfast, UK
[3] Statistics Norway (SSB), Norway
[4] Uni Research Climate (BCCR), Norway
[5] Norwegian Institute for Bioeconomics (NIBIO), Norway
[6] Møreforskning, Norway

It is uncontroversial that humans have strong, and often negative, impacts on natural ecosystems. However, the debate is often polarized into a 'people vs. nature' dichotomy, and fails to acknowledge that aspects of nature that we value are also partly shaped by human imprints. The coastal heathlands of north-west Europe is one example of landscapes that have emerged under, and are shaped by, strong anthropogenic forcing. These heathlands have been continuously managed by traditional burning and grazing regimes for up to 6000 years, and support characteristic ecosystems and biodiversity.

Understanding the ecology and evolutionary biology of the heathlands requires understanding how the interplay between natural and anthropogenic forcing has shaped heathland ecosystems and their flora and fauna. We combine palaeoecological reconstructions, landscape ecology, and germination ecosphysiology to explore the roles of climate and land-use in shaping heathland ecosystem functioning, ecology, and evolutionary biology. In contrast to the 'biotic homogenization' paradigm, we find that heathlands after fire do not support widespread generalist taxa but a characteristic subset of the local and regional native flora. The past human manipulation of coastal heathland fire-regimes have also triggered evolution of smoke-responsive seed germination in the keystone species *Calluna vulgaris*. Today, heathland management plays an important role in regulating carbon storage, and in controlling fuel loads and thus landscape wildfire risk. Such ecological, evolutionary, and ecosystem functioning imprints of (pre)historic anthropogenic impacts are severely under-studied, and research is urgently needed to inform decision-making in conservation science and ecosystem management.

Session 4: Invasive plants: born to invade?

Are plant traits a good predictor of invasiveness?

Newton, R.J., Wyse, S.V., Dickie, J.B. & Clubbe, C.P.

Royal Botanic Gardens, Kew, UK

Invasive alien species are widely acknowledged as one of the most important drivers of biodiversity loss globally. Understanding biological invasions due to human activity in a changing world is becoming increasingly important, particularly as the spread of non-native plant species shows no sign of slowing. Plants comprise the largest documented group of non-native species; however, not all non-native plants become invasive. Numerous studies have attempted to define the functional traits that promote invasiveness, with the aim of recognising potential future invasives early enough to prevent their arrival in a region or eradicate them whilst it is still economically feasible.

In addition to functional traits, factors such as biogeography, residence time and phylogeny should be considered to identify meaningful correlates of invasion success. Furthermore, the traits promoting progression along the naturalisation-invasion continuum will differ depending on the invasion stage. Nevertheless, some studies have shown that faster growth rate, increased specific leaf area and longer flowering period, for example, are more prevalent in invasive species. Yet different plant life forms can behave quite differently and thus a single “one size fits all” model is unlikely to be appropriate for predicting future plant invasions.

Our ongoing research on invasive species at the Royal Botanic Gardens, Kew, is helping inform management practice and conservation strategy. These research activities include documenting and mapping invasives in the UK Overseas Territories and work to further our understanding of the role of plant traits in invasion success across several habitat types.

Biogeography of plant invasions: interaction of native range habitat legacy and species traits

Pyšek, P.[1, 2]

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[2] Department of Ecology, Faculty of Science, Charles University, Czech Republic

In the last decade, habitat-oriented studies of plant invasions have focused on quantifying the representation of alien species in vegetation, identifying factors underlying invasions, and exploring the pools of species available for invasion into particular habitats. For central European temperate communities it has been shown that habitat identity is a more important determinant of the level of invasion than propagule pressure or variation in climate. Recent studies yielded a good knowledge of which habitats tend to be highly invaded and which resistant to invasion, and interpreted this variation in terms of habitat-specific resource dynamics and disturbance regimes. However, studies looking at how habitats interact with other determinants of invasion are rather rare. If tested in the same model with other factors known to affect the outcome of invasion, such as residence time, propagule pressure and species biological traits, habitat legacy from the native was one of the most important determinants of whether central European plant species successfully naturalized in North America. Interestingly, the effects of biological traits on invasion was indirect via their effect on the number of native range habitats occupied and cultivation in the native range, and the importance of the biological traits was nearly an order of magnitude less than that of the larger scale drivers, such as habitat legacy. This suggests that in future research, a failure to consider characteristics of the native range may seriously overestimate the role of biological traits, which, in turn, may result in spurious predictions of plant invasiveness.

Genome size variation and its implications for the invasive fitness of plants

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Nuclear genome size and ploidy level can influence plant traits including growth rate, photosynthetic rate, minimum generation time, and pollen and seed size and both karyological traits have been related to plant invasion success. According to the large genome constraint hypothesis, small genome plants thrive in a range of diverse conditions, but large-genome plants are excluded from the most extreme environments because they are more strongly influenced by abiotic factors. Extreme conditions under global environmental change, including drought, changes in temperature and salinity levels, and increased atmospheric CO_2 concentrations are becoming more frquent in some regions. These conditions may favor small-genome plants over those with larger genome sizes. We use the model plant species *Phragmites australis* (common reed) to examine how genome size interacts with the environment to influence invasion and plant fitness and how these interactions vary across wide geographic ranges with diverse environmental conditions in both its native and introduced ranges. *Phragmites australis* is an appropriate model organism because it has multiple phylogeographic groups that sympatrically inhabit wetland environments in Europe and North America and it exhibits high genetic variation, true intraspecific genome size variability and ploidy level variation. We found that ploidy level and genome size influence different plant traits and that monoploid genome size was the only significant variable that clearly separated the North American native groups from the groups of European origin indicating that the European populations successfully invaded North America because they had a smaller genome that manifested via plant traits favouring invasiveness.

Invasive plants: new solutions for the Anthropocene

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The main paradigm of invasive species management says that prevention is better than cure. A prerequisite for the prevention of potentially invasive species is the ability to predict which alien species might become invasive and which ones not. Such risk assessment systems are mostly built on statistical analyses of traits characteristic of known invaders. In the Anthropocene, such an approach might often not work anymore for a number of reasons. Ever more new species (with novel traits) are introduced to the international plant trade, and therefore for many of them no experience with their behaviour in alien regions exists yet. And, environmental conditions, land use patterns, and plant uses fundamentally change, all of which can lead to invasive behaviour of plants with characteristics that differ from those of the invaders of the past (ghost of invasion past). I will discuss research and management strategies for dealing with the emerging challenges of predicting invasive species in the Anthropocene including monitoring of plant trade (e.g. e-commerce), risk assessments that are specific to particular introduction pathways of new plants, and establishing closer, more continuous and reciprocal relationships and knowledge exchange between practice and research (problem orientation).

Session 5: From field to healed: how do we detect the medicinal plants of the future?

African herbal pharmacopoeia – potential leads from the Indian Ocean region

Gurib-Fakim, A.

President of the Republic of Mauritius

The Indian Ocean islands [the Mascarenes – Mauritius, Rodrigues and La Reunion (Fr.)] including Madagascar constitute one of the world's biodiversity hotspot. These islands, which are characterized by a high level of endemicity in their flora, are also endowed with unique traditional knowledge associated with these plants. Unfortunately, as it is the case for many other tropical islands, this biodiversity is threatened with extinction. There is thus an unrestrained race against time not only to protect and preserve this unique biodiversity but also to document the associated traditional knowledge, which remain the mainstay for future discovery for the pharma, cosmetic and nutrition sectors amongst others.

This presentation will focus on the industrial potential of some of the indigenous medicinal plant species and why it is important to validate the traditional knowledge against diseases and conditions, especially in the light of global antibiotic resistance.

Phylogenetic exploration of medicinal plant diversity

Rønsted, N.

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The use of plants for medicine is closely associated with human culture and has provided both local healthcare and new leads. Through evolution plants have developed sophisticated chemical defenses, which may explain their bioactivity in humans. Intuitively, the evolutionary history of plants may enable predictive approaches allowing systematic evaluation of current and potential medicinal value as well as help guide safety, conservation policies and agriculture. A series of case studies have highlighted that medicinal use, plant defensive compounds and bioactivity are correlated with phylogeny to some extent and suggested methods for identifying the potentially most useful species. Developing new systematic and integrative approaches and tools to synthesize and take advantage of systematics, phylogeny, bioinformatics, ethnobotany, natural products, chemistry and bioactivity studies could supplement traditional selection approaches with the ultimate aim of providing better healthcare. Museum and botanical garden collections provide access to expertise and biodiversity for improving selection and focusing drug lead discovery efforts and avoid destructive collection of rare and threatened species. At the same time, engaging in addressing societal challenges provides added value and great potential for increasing public awareness and appreciation of the collections. This presentation will summarize recent studies, current efforts, and future directions as well as introducing the work of the MedPlant International Training Network (www.MedPlant.eu) educating 15 young scientists in phylogenetic exploration of medicinal plant diversity.

Beyond species level discovery: insights from Traditional Chinese Medicine

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The quest for medicinal plants of the future, whether using an ethnopharmacological or high-throughput approach, usually focuses on the species level. In Traditional Chinese Medicine (TCM) the selection or breeding of infra-specific plant populations with clinically preferred traits have resulted in many medicinal cultivars as well as so-called *Dao Di* herbal drugs sourced from specific localities and grown under particular management regimes. One example of the latter is the production of *Dao Di*-quality *Panax notoginseng* from the Wenshan district of Yunnan, south-west China; active principles in the rootstocks are reported to be 20–70% higher than those sourced from neighbouring districts. Such *Dao Di* herbal drugs usually command higher prices than their non-*Dao Di* counterparts being highly sought after by TCM practitioners who value their reputedly increased efficacy. TCM post-harvest processing methods (collectively called *Pao Zhi*) also play an important role in enhancing efficacy and/or reducing toxicity of certain herbal drugs (e.g. roots of *Rehmannia glutinosa* (Di Huang)). A complex trade nomenclature has developed in China over the centuries to reflect these many medicinal traits and qualities and this continues to evolve in line with TCM's own dynamically evolving medical practices.

The role of current herbal medical systems such as TCM in the discovery of medicinal plants of the future clearly deserve further investigation. Aided by herbal drug authentication techniques and nomenclatural databases, this is best done by taking into account not only the species identity of a medicinal plant, but its infra-specific entities and post-harvest processing techniques too.

How do plants make drugs?

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Department of Biological Chemistry, John Innes Centre, UK

Plants, which make thousands of complex natural products or specialized metabolites, are outstanding chemists. Through the concerted action of enzymes that are assembled into metabolic pathways, nature creates incredible chemical complexity from simple starting materials. This lecture will highlight how the genes that encode these metabolic pathways are discovered, as well as highlight some of the unusual enzymatic transformations that plants use to make complex, bioactive natural products. We will also discuss methods by which these pathways can be harnessed for metabolic engineering. We will focus on the biosynthesis of the monoterpenes called iridoids, and the alkaloids derived from iridoids, known as the monoterpene indole alkaloids. These natural products have potent biological activities and are produced across hundreds of plant families. Overall, this lecture will describe the discovery, functional characterization and mechanistic study of genes involved in the biosynthesis of important compounds derived from several medicinal plant species.

Session 6: Valuing nature: which plant species are most valuable?

The public-health benefits of plants: direct health benefits and bio-indicators of health risks

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The emerald ash borer (EAB) is an invasive tree pest that first detected in the United States in Detroit, Michigan in 2002. It has since spread to 29 states killing hundreds of millions of ash trees. The spread of EAB offers a unique opportunity to study the public-health impact of a major change in the natural environment. We found that between 2002 and 2007, EAB infestation was associated with an additional 15,000 deaths from cardiovascular disease and 6,000 deaths from lower-respiratory disease. Results held even after controlling for demographic differences between counties. Our results suggest that invasive trees pests may pose a significant public-health threat, and exposure to trees may be protect against cardiovascular and lower-respiratory disease.

The natural environment not only provides direct health benefits, it can also help detect threats to our health. We used 347 moss samples taken from urban trees to map atmospheric heavy-metal pollution in Portland, Oregon. We found that two stained-glass manufacturers were releasing levels of cadmium and arsenic that posed an immediate public-health risk. Neither facility were known to environmental regulators. Our findings led to a major overhaul of environmental regulations in Oregon and showed that bio-indicators can be a cost-effective complement to traditional instrumental monitoring.

What are the most important plants for pollinators?

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Plants and pollinators need each other. Around 90% of plant species require pollinators for their survival, and pollinators rely on flowering plants as food resources. In essence, the state of the world's plants is dependent on the state of the world's pollinators and vice versa.

Pollinator populations have been declining in diversity and abundance across the world in recent decades, threatening pollination services in agriculture and natural ecosystems. Efficient strategies to halt and reverse this decline have to consider the central role of plants for pollinators. However, could certain plant species be more important for supporting pollinator populations than others? What traits might make them more important?

The quantity and nutritional quality of the floral rewards (i.e., nectar and pollen) by different plant species can determine their value for pollinators. A recent study in the UK reported that 3 plant species, *Trifolium repens*, *Cirsium palustre* and *Calluna vulgaris* contribute 50% of all nectar provision, so in general terms these plants are arguably the most important in the UK. However, whether they support a sufficient diversity of pollinator species is questionable. Many pollinators are specialized to varying extents to different plant species, and so are unlikely to benefit from these plants.

New insights into the nutritive and non-nutritive value of nectar and pollen are needed to fully understand how to measure the importance of floral resources to pollinators. For example, secondary metabolites in some nectars and pollens may provide disease-ameliorating benefits while some pollinating species may require a more varied food supply to acquire an appropriate balance of nutrients.

Global forest carbon sinks and the future perspective

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Forests cover approximately 30% of global land area and provide invaluable ecosystem goods and services to humanity. A service provided to us is in the form of carbon sink: forests remove 2.4–2.8 billion tons of carbon (Pg C yr^{-1}) each year from the atmosphere to alleviate the buildup of carbon dioxide (CO_2), offsetting about 30% of global CO_2 emissions from fossil fuel use. Tropical intact forests dominate the sink, which is more than a billion tons per year, equivalent to the C sinks in temperate and boreal forests put together. However, the tropical sink is mostly cancelled out by C emissions from tropical deforestation and land-use change, and further threatened by increasing drought, fire and forest degradation. If we should reduce tropical deforestation, enhance global afforestation and improve existing forest management, roughly 4.0–6.2 Pg C yr^{-1}, potentially the maximum limit, could be realized by global forests for mitigating CO_2-induced climate effects. From a viewpoint of tree species, not all trees are equal in their capacity for absorbing C and storing C in their woody biomass. Generally, fast growing trees (e.g. *Populus deltoides*) have low wood density and short lifespans, while some long-lived trees in old-growth forests (e.g. *Sequoia sempervirens*) can sequester huge amounts of C and keep it in stocks over centuries. Our recent study shows that tree growth is also benefiting from high CO_2 because of "fertilization" effect. Forests with lower foliage such as boreal forest and dry forest appear to be more profited by the effect. That said, our future forest C sinks and landscapes are likely very uncertain as for under many changing and novel environmental conditions.

The provisioning services of tropical American palms

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The livelihoods of tropical forest inhabitants are inextricably linked to the goods and services delivered by their ecosystems, but it is not well understood which traits underpin different human needs. Palms (Arecaceae) are an excellent model group to explore this question, because palms are one of the most useful and economically important plant families in the tropics, and because palm species exhibit great variation in usefulness and traits. The largest palm ethnobotanical documentation effort in the world was integrated with a species-level phylogeny and a dataset of four traits (leaf length, stem volume, fruit volume, geographic range size) to test for relations between palm traits and perceived value of 208 tropical American palm species. After accounting for phylogenetic autocorrelation and trait multicollinearity, we show that different combinations of species' traits drive which benefits people obtain from biodiversity. Thus, plant size and geographic range size are stronger predictors of realization of services related to basic human needs than less-basic needs (for example, ritual). This indicates that the traditional importance of plant size and availability may have prevented our complete understanding of wild-plant services because ecologically rare yet functionally important (for example, chemically) clades may have been overlooked, even by local communities with great knowledge about biodiversity. Our novel trait- and phylogeny-based approach to ethnobotany sheds new light on the linkages between ecosystem services, human needs and species' traits, and underscores the importance of large-scale, cross-cultural ethnobotanical efforts documenting how cultural heritage is linked to biodiversity.

Poster numbers

Climate change

P01	Thalukanyo Nevhulaudzi	The interactive effect of *Bacillus subtilis* and elevated temperature on seed germination of three cowpea genotypes

Extinction risk

P02	Don Drake	The state of Hawaii's plants
P03	Kazi Md. Abu Sayeed	Conservation of *Corypha taliera* a species of palm, native to Bangladesh region of South Asia: we start before extinction
P04	Gustavo Martinelli	Challenges and perspectives for plant conservation in Brazil
P05	Karen Bacon	What makes this time different? Comparing modern plant extinction risk with plant responses to mass extinctions in the fossil record
P06	Porter P. Lowry II	The Plant Red List initiative in New Caledonia, a hotspot in the south-west Pacific
P07	Carly Cowell	Are existing herbarium and survey data useful in predicting extinctions in South African National Parks?
P08	Christopher Cockel	Using preliminary conservation assessments to estimate threats to crop wild relatives
P09	Sven Buerki	Gymnosperms on the EDGE
P10	Lauren Gardiner	Orchids of Colombia: can analysis of traits help us predict extinction risk, and conserve the extraordinary diversity in the face of emerging threats?
P11	Rashad Salimov	Multidisciplinary approach studying populations of rare and threatened plant species in Azerbaijan

Global land-cover change

P12	Louise Hill	Preparing for the loss of ash: how to maintain ash-associated ecosystem properties after widespread ash death in Great Britain
P13	Gail Stride	Rainforest fragmentation: contrasting impacts on seedling versus sapling diversity

Important plant areas

P14	Mohd Norfaizal Ghazalli	Conservation of Crop Wild Relatives (CWR) in Malaysia: an update
P15	Catherine Waite	A view from above: using an Unmanned Aerial Vehicle (UAV) to investigate scale and patterns of liana infestation in tropical forests in Malaysia

Invasive species

P16	Moustapha Itani	Assessing the impact of *Carpobrotus edulis* and *Lantana camara* on three Lebanese coastal endemic plant species
P17	Nigar Mursal Qizi	Distribution of invasive species in Azerbaijan flora
P18	Kate Pollard	Controlling invasive non-native plant species using classical biological control – past successes and future potential
P19	Fiona Corke	The *Brachypodium distachyon* species-complex as a model for dissecting the role of allopolyploidy in plant adaptation
P20	Nicola Wakefield	CABI's Compendia: knowledge resources for invasive plants, plant pests, crops and forest trees

Madagascan plants

P21	Harison Andriambelo	Landscape scale consequences of dispersal traits of trees in a fragmented forest ecosystem: a case study of a tropical humid forest of Madagascar
P22	Victoria Price	Exploring an emerging threat to the endangered Madagascan endemic, *Adansonia grandidieri* (Malvaceae)
P23	Matthew Smith	Monitoring internet trade to inform species conservation actions

Naming and counting the world's plants

P24	Richard Corlett	State of 1% of the world's plants: towards zero extinction in Xishuangbanna
P25	Heather Lindon	Women's contribution to plant species discovery: a different use for historic botanical nomenclature data
P26	Emily Beech	Cataloguing the world's 60,065 tree species – GlobalTreeSearch
P27	Jacek Wajer	Typification of plant names published by Philip Miller in *Gardeners Dictionary* (1731–1768)
P28	Quentin Groom	The new era of the digital herbarium @ BR (Botanic Garden Meise)
P29	Mark Carine	Does a Linnean shortfall explain the Azores diversity enigma?

Natural capital

P30	David Benz	NaturEtrade: creating a marketplace for ecosystem services in Europe
P31	Peter Long	The Local Ecological Footprinting Tool (LEFT)
P32	John Doonan	Extracting value from Floras all the way through to genotype-phenotype approaches

Plant evolutionary relationships and plant genomes

P33	William Baker	Completing the Plant & Fungal Trees of Life
P34	Jan Hackel	Phylogenomics of the core Panicoideae (Poaceae) reveal an unexpected tropical C3 grass lineage

Plant health

P35	Paul Twigg	Enhancing plant health and productivity through improved plant-soil microbe interactions
P36	Noelle Anglin Barkley	sRSA: a novel strategy to overcome the bottleneck of virus detection in germplasm collections
P37	Lucy Carson-Taylor	Protecting plant health in the UK requires a multi-disciplinary approach
P38	Charles Lane	The International Plant Sentinel Network: early warning of new threats to plant health
P39	Christopher Dennis	Unpacking the plant biosecurity continuum; reducing pest spread and maintaining food security
P40	Julian Smith	Efficacy of a campaign to control Coconut Lethal Yellowing syndrome in Mozambique

Policy

P41	Fred Rumsey	The role of historic herbarium collections for species status assessment
P42	Dawn Sanders	Beyond plant blindness: seeing the importance of plants for a sustainable world
P43	Irene Sørensen	Nature conservation in a transboundary context: implementation and practice of the EU Habitat and Bird-protection Directives

Useful plants

P44	Naiba Mehdiyeva	Pharmaceutical potential of Azerbaijan flora
P45	Marshet Gijan	Ethnobotanical study of medicinal plants in Arsi Nagelle district, West Arsi zone of Oromia, Ethiopia
P46	Ranee Prakash	Samuel Brown – digitising a seventeenth-century collection of Indian medicinal plants in the Natural History Museum, London
P47	Peter Giovannini	Medicinal plants used to manage diabetes in Central America: a review
P48	Sandra Knapp	Untangling the taxonomy of African supervegetables (*Solanum* L., Solanaceae)
P49	Mamy Tiana Rajaonah	Conserving Madagascar's yams through cultivation for livelihoods and food security
P50	Daniela Beltrame	Eat it or lose it! – The nutritional value of plants in promoting sustainable diets and conservation

P51	Denise Dostatny	The occurrence and importance of Crop Wild Relative plants in Poland and in the world
P52	Victoria Grape	Postpartum phytomedicine and its future in maternal healthcare in Prey Lang, Cambodia
P53	Tom Prescott	Searching for a clinically effective plant medicine to treat the tropical ulcer in Papua New Guinea

Poster abstracts

P01 The interactive effect of *Bacillus subtilis* and elevated temperature on seed germination of three cowpea genotypes

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Bacillus subtilis, a ubiquitous microorganism, and temperature have been reported to stimulate seed germination in some plants. The aim of this study was to investigate the interactive effect of *Bacillus subtilis* and elevated temperature on seed germination percentages and plumule lengths of three cowpea genotypes (Asetanapa, Soronko and Nyira). The experimental treatments included the following: 1) seeds treated with *B. subtilis* and; 2) seeds not treated with *B. subtilis.* Each treatment was incubated at six different temperature regimes (10˚C, 25˚C, 30˚C, 35˚C, 40˚C and 45˚C) for seven days. A complete randomized design seed-germination experiment (two replicates of 30 seeds per genotype per treatment) was carried out under sterile conditions using 9 cm plastic Petri dishes and Whatman No. 1 filter paper discs. The filter paper discs were all kept moistened with sterile distilled water throughout the experiment. The interaction of *B. subtilis* and temperature significantly influenced seed germination percentage and plumule length of cowpea seedlings and the differences in genotype response were significant. The highest seed germination percentage was for Nyira (98.6%) compared with Soronko (84.8%) seeds inoculated with and without *B. subtilis* (respectively) and both incubated at 35˚C. Temperature significantly affected seed germination percentage as all genotypes incubated at 10˚C had the lowest seed germination percentages compared to those incubated at 35˚C. Soronko seeds inoculated with *B. subtilis* and incubated at 35˚C for seven days had the longest plumule (2.06 cm) compared to other genotype seeds under similar conditions.

P02 The state of Hawaii's plants

Drake, D.[1,2], Caraway, V.[1,3], Keir, M.[1], Kennedy, R.[1,4], Sporck-Koehler, M.[1,4], Sugii, N.[1,5], Weisenberger, L.[1,3], Wichman, C.[1,6] & Yoshioka, J.[1,7]

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[5] Lyon Arboretum, USA
[6] National Tropical Botanical Garden, Lawai, USA
[7] Plant Extinction Prevention Program of Hawai'i, USA

The Hawaiian Islands are widely renowned for their extraordinary plant diversity and textbook cases of adaptive radiation. The archipelago hosts 1371 native taxa of vascular plants: 1191 angiosperms (89% endemic) and 180 pteridophytes (74% endemic). Sadly, Hawai'i has also become known for its extraordinary levels of endangerment and extinction. During the past two centuries, 113 plant taxa have gone extinct; of those that remain, 478 are considered relatively secure, and 780 are of conservation concern, including 440 federally endangered taxa (42% of the US total). Many endangered taxa are extremely rare, and 239 are represented by < 50 individuals in the wild. Ongoing threats include habitat loss, altered disturbance regimes (e.g., fire), climate change, the loss of reproductive mutualists such as pollinators and seed dispersers, and impacts of invasive alien plants, animals, and diseases. Challenges facing the islands' conservationists include limited resources, limited scientific knowledge for most taxa, and the sheer physical inaccessibility of many rare plants. Nevertheless, Hawai'i's botanical community is developing innovative strategies and partnerships to conserve island plants. Noteworthy recent initiatives include: the Plant Extinction Prevention Program (for taxa represented by < 50 individuals), the Hawai'i Strategy for Plant Conservation (paralleling the Global Strategy for Plant Conservation), the Lyon Arboretum's Hawaiian Rare Plant Program's *ex situ* conservation facilities, the Hawai'i Seed Bank Partnership (working to develop ties with Kew's Millennium Seed Bank Partnership), and Laukahi: The Hawai'i Plant Conservation Network. These and other efforts have combined to halt extinction and are now promoting recovery of rare plants.

P03 Conservation of *Corypha taliera* a species of palm, native to Bangladesh region of South Asia: we start before extinction

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Corypha taliera is a very significant rare plant species which is now close to extinction. Due to having huge medicinal importance, it should capture organized and effective attention. This was the last plant of its own kind administratively protected and grown up in scrub jungle on the Dhaka University campus, Bangladesh. In Bangladesh it is known as Tali Palm which flowers and bears fruit only once in its life and then dies. Although the palm is the last known *Corypha taliera* growing in the wild, IUCN has already classified the plant on its Red List, as being "extinct in the wild". Therefore, one would assume this palm would tolerate some cold conditions. Being close to freezing temperatures can kill this palm. But this palm tolerates a constantly mild climate with little temperature difference between day & night, and summer & winter. The paper discusses and explores the socio-economic and medicinal importance, climatic and demographic limitations and opportunities of this red listed and threatened Tali Palm of Bangladesh. This account further advocates for a well-planned initiative to effectively complete the Red List of threatened Tali Palm species of the country by considering appropriate, established, updated assessment methods following collaborative approach and capitalizing on the progress made so far. Such steps may contribute to the species diversity conservation endeavours in Bangladesh National Parliament, The President House, Prime Minister Office, National Martyrs' monument, National Parks, various institutes and subsequently will help spread countrywide at the disposal of Arboriculture Division of Bangladesh.

P04 Challenges and perspectives for plant conservation in Brazil

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Brazil has the largest flora in the world with more than 35, 000 described native species. However, our knowledge on the actual number of existing species and the geographical distribution and evolutionary/ecological relationships among them is still poor. The situation is becoming more complex given that more than 2000 species are currently threatened with extinction and this ever-increasing figure will likely double by 2020. In Brazil, plants are threatened by a number of different large-scale human-induced pressures. One of the first challenges that we face for strategic plant conservation (e.g. recovery plans, national map for priority areas, ex situ conservation) is related to the acquisition and organization of all essential data for supporting action and policy making. The poster will show how we are dealing with these challenges and our progress towards achieving the Global Strategy for Plants Conservation (GSPC) targets. We use the experience of the National Centre for Flora Conservation – CNCFlora, as a case study for discussing the reasons for success in pursuing some targets and some perceived failures during this process. We also offer information that could assist other countries in their plant conservation process and aid decision and policymakers to address the difficulties and move towards achieving GSPC's targets.

P05 What makes this time different? Comparing modern plant extinction risk with plant responses to mass extinctions in the fossil record

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Recent research suggesting that 1 in 5 of the worlds plants are at risk of extinction in the near future and over 10% are highly susceptible to climate change lies far outside the common conception within palaeobiology that plants do not suffer major extinction events. Although 20% extinction would not reach the 75% level required by most definitions for a large-scale plant extinction to be a component of a larger "Anthropocene mass extinction", it is still far outside the usual recording of a handful of species becoming locally or regionally extinct that is more commonly found across previous mass extinction events in the geological past. This raises numerous interesting issues including questioning the fidelity of the plant fossil record for accurately recording plant responses to major climatic upheavals and whether the current extinction risk is far above even the most severe in Earth history. An initial analysis of plant functional group and extinction risk versus likelihood of preservation in the plant fossil record based on growth form, habitat and plant traits will be presented. A full understanding of what the plant fossil record can reveal about plant responses to past major upheavals to the Earth system is required in order to utilise the fossil record to its full effect for determining future responses of the world's plants to modern climate change.

P06 The Plant Red List initiative in New Caledonia, a hotspot in the south-west Pacific

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[2] Muséum National d'Histoire Naturelle, France
[3] New Caledonia Plant Red List Authority, New Caledonia

New Caledonia, a biodiversity hotspot located in the south-western Pacific, is well known for its unique flora. Of the 3,371 native species of vascular plants, 76% are considered endemic (Munzinger & al., 2016). A Red List Authority (RLA) established in 2014 has brought together local and international members working on the New Caledonian flora with expertise in various fields that relate to red listing. To date, 48 botanists have participated in 22 days of RLA workshops, which assess the risk of extinction of species in compliance with IUCN criteria using data that are carefully compiled and verified. To date, 833 species have been treated, 41% of which were assessed as threatened: 78 as Critically Endangered, including 9 that are potentially extinct; 147 as Endangered and 119 as Vulnerable. Low and mid-altitude dense humid forests host the majority of threatened species (193 taxa) while dry forests have the highest level of threatened taxa (72%). The principal threats are uncontrolled bushfires (impacting 59% of the threatened species), nickel mining activities (39%), and vegetation degradation caused by Rusa deer (29%). An additional 8% of the species could be threatened by future mining activities in areas that are currently unimpacted. The protected area network includes subpopulations of only 38% of threatened species, while a tiny 4% are effectively conserved outside their natural habitat. An additional 12% of the species were assessed as Data Deficient due to taxonomic uncertainty. An integrated approach is urgently needed locally in order to ensure the long-term protection of this unique floristic heritage and to enhance our knowledge of the island's plant species, a significant portion of which still requires additional field documentation and taxonomic study.

P07 Are existing herbarium and survey data useful in predicting extinctions in South African National Parks?

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Facing extreme environmental impacts, protected areas globally are under pressure to prevent species extinctions within their borders. We use the Table Mountain National Park (Cape Town, South Africa), in the Cape Floral Kingdom biodiversity hotspot as a case study to test the usefulness of herbarium and botanical survey data in predicting plant species extinction. Prioritisation of species for monitoring to detect species extinction risk is urgently needed. We undertook a desktop quantitative assessment of herbarium data, survey data and a combined dataset. Using the Solow 1993 extinction probability equation to identify the mean survival probability for four of the main fynbos families (Ericaceae, Fabaceae, Proteaceae and Restionaceae), we tested against Red List status categories. We found that the herbarium data was inadequate when tested alone. Survey data was biased towards easily detected species and Red List species. Our results showed little in the way of a meaningful relationship between IUCN status and mean survival probability of species within TMNP. Species listed as Least Concern had the lowest mean survival probability, which seems counterintuitive, but could possibly be explained by the fact that some of these species are not actively sought out or recorded by field botanists and collections of the more 'common' species are not kept by herbaria. There is a need to collect herbarium specimens of all species regardless of status and consolidate survey data from research and botanical assessments within a central database in order for extinction probability equations to be beneficial to protected area managers.

P08 Using preliminary conservation assessments to estimate threats to crop wild relatives

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Crop Wild Relatives are threatened to the same extent as other plants, but occur in some of the world's most vulnerable locations, such as the Middle East. Threats to CWRs include: climate change, agriculture/livestock grazing, conflict, invasive plants, land use/habitat change (development, deforestation), shortage of material in genebanks, insufficient data (IUCN conservation assessments), and a lack of institutional capacity, especially in countries where CWRs are most under threat.

As part of the Adapting Agriculture to Climate Change (CWR) Project at the Royal Botanic Gardens, Kew, preliminary conservation assessments were carried out on 485 CWR species. Of these, 18 percent were classified as threatened with extinction, according to IUCN criteria. This figure is comparable with results of Kew's Sampled Red List Index Project, which calculated that 20 percent of all plants are threatened with extinction, but is higher than the 12 percent figure cited by other researchers.

This poster will reference published papers, IUCN data and expert opinion to illustrate the multiple threats faced by CWRs. Species case studies will illustrate two taxa subject to preliminary assessments as part of the project to highlight the plight of CWRs around the world.

As well as raising awareness of the multiple threats to CWRs, this poster will also emphasize the urgent need to increase the output of conservation assessments, and to raise the profile of CWRs for conservation in genebanks. This is particularly urgent, given that 23 percent of the 485 CWR species subject to preliminary assessment were classified as Data Deficient.

P09 Gymnosperms on the EDGE

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Gymnosperms are an assemblage of ancient cosmopolitan lineages of seed plants comprising ginkgo, conifers, cycads, and the gnetophytes. With 40% of the species at high risk of extinction, about twice as many as the most recent estimates for all plants, gymnosperms are one of the most threatened groups of living organisms on the planet. This high proportion of species facing extinction highlights the urgent action required to secure their future through effective conservation planning and the importance of this action being guided by an objective prioritization approach. Such an approach, the Evolutionary Distinct and Globally Endangered (EDGE) method, is applied here to gymnosperms, a first for plants. The EDGE approach combines phylogenetic information with probabilities of extinction to rank species rapidly according to their evolutionary distinctiveness and risk of extinction. We show that gymnosperms have a wider distribution of EDGE values, including several distinct outliers, compared to animal groups previously investigated. Sixteen of the 20 top EDGE species belong to the four conifer families (Araucariaceae, Cupressaceae, Podocarpaceae, and Taxaceae), while *Ginkgo biloba* is identified as the highest scoring species on this list. New Caledonia and South-Central and Southeast China clearly stand out as home to the largest number of top ranked EDGE species of gymnosperms. Complimenting existing EDGE lists generated for other groups, this information will provide conservationists and governments with much needed tools and the increased visibility necessary to protect these amazing plants.

P10 Orchids of Colombia: can analysis of traits help us predict extinction risk, and conserve the extraordinary diversity in the face of emerging threats?

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The Colombian flora includes 3593 currently accepted orchid species in 220 genera, approximately 12% of all known orchids - the largest orchid species diversity for a single country. Nearly half are known only from Colombia and many are very narrow endemics. With the Colombian peace process opening up many areas of the country for the first time in decades, there is a greatly increased risk of human-induced threats (e.g. road-building, urban development, agriculture, mining, hydroelectric power production) causing the decline of many unique and rare species.

Assessments of extinction risk (e.g. those published on the IUCN Red List), allow the prioritisation of conservation efforts to focus resources on the most immediately threatened species. Currently just 51 of Colombia's orchid species (1.4%) are globally assessed on the IUCN Red List, although more are covered by regional assessments. Can we increase the number of species assessed? Can we collect more and better data on species' true distributions to contribute to these assessments?

With so many species and so many competing conservation needs, in the absence of full assessments, can we use species' traits and knowledge of threats to predict which taxa are likely to be more at risk than others? Are particular trait-threat combinations indicative of heightened risk and more pressing conservation need for some species? Do certain life histories or vegetative structures make some species more vulnerable? May phylogenetic patterns allow us to predict the extinction risk of species for which full assessments are not yet available?

P11 Multidisciplinary approach studying populations of rare and threatened plant species in Azerbaijan

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Climate change, one of the main drivers of biodiversity loss is defined as species extinction, degradation of ecosystems and loss of genetic diversity, as well as the key problems of global change. Predicting the response of biodiversity to climate change has become an extremely active field of many studies in recent years.Azerbaijan is a valuable floristic center in the Caucasus region, one of the Biodiversity Hotspots of the world.Not less than 10% of species are regarded as rare or endangered of which 6% were listed in the Red Book. The purpose of this study is to describe the experience of prediction of the risks of extinction of threatened rare plant species included in Red Book.A population-ontogenetic method via application of mathematical and computer modeling was used during development of a dynamic integrated database for rare species.The concept of discrete description of ontogeny was used for the identification of the ontogenetic state. The GIS-technologies are used to generalize the heterogeneous information concerning the spatial and age structure of populations. As a result of comprehensive study of ontogenetic structure of coenopopulations a dynamic database was created for rare plant species.Integrated database with models makes it possible to predict the further development of the populations on the basis of its current state for more than 10 years.It will give the chance to elaborate scenarios of their further dynamic development and also strategy of conserving a variety of rare, endemic and endangered species of plants including phytocenosis.

P12 Preparing for the loss of ash: how to maintain ash-associated ecosystem properties after widespread ash death in Great Britain

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Pests and diseases are increasingly impacting tree populations around the world, causing widespread ecological impacts. In Britain, ash dieback (*Hymenoscyphus fraxineus* Baral *et al.*) and emerald ash borer (*Agrilus planipennis* Fairmaire) have the potential to severely affect common ash (*Fraxinus excelsior* L.), causing significant changes to the character and functioning of many ecosystems.

We present a method to locate areas most vulnerable to loss of a major tree species (ash), and identify the resultant loss of distinctive ecosystem properties. Our results indicate that in some areas of Britain provision of ash-associated ecosystem properties could be reduced by over 50% if all ash is lost. Some woodland types and trees outside woodlands may be especially vulnerable to ash loss. However, compensatory growth by other species could halve this impact. We make recommendations to reduce ecosystem vulnerability to ash loss, and present these in a format for direct use by woodland managers.

P13 Rainforest fragmentation: contrasting impacts on seedling versus sapling diversity

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Rainforest fragmentation has been shown to reduce the diversity of mature trees, but the impacts on tree seedling diversity are rarely considered. We examined fragmentation effects on seedlings, saplings, and trees at 14 study sites on Borneo, spanning a fragmentation gradient of 45 – 120,000 ha, plus 5 sites in continuous forest. We assumed that trees are representative of pre-fragmentation communities, whilst saplings and seedlings were produced post-fragmentation (~ 20 years ago). Species richness of seedlings was 32.2% lower in forest fragments compared with sites in continuous forest, and we found as few as 4.2 seedling species (± 0.97) per 2 by 2 m sub-plot in the smallest fragment (40 ha), compared with 12.8 seedling species (± 2.28) per sub-plot in undisturbed continuous forest. However, we found no effects of fragmentation on the species richness of trees or saplings. We conclude that the lack of fragmentation impacts on trees is evidence of extinction debts post fragmentation. We also conclude that fragmentation has a detrimental impact on tree reproduction, reducing the species richness of seedlings. However, our results for saplings, which unexpectedly showed no impacts of fragmentation, implies that other biological processes may be acting to compensate for seedling losses in fragments.

P14 Conservation of Crop Wild Relatives (CWR) in Malaysia: an update

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Malaysia holds a rich diversity of tropical species due to suitable climate condition and geographic location. However, some of the valuable species are currently being threatened by many factors such as land development and climate change. Therefore, *ex situ* conservation for these species is becoming more important. One of the valuable genetic resources that are endangered are the crop wild relatives (CWR). Since 2015, intensive surveys and collections of CWR from the genus of *Oryza, Musa* and *Ipomoea* were conducted in Peninsular Malaysia. To date, four populations of *Oryza officinalis* were successfully collected. While, 64 samples from different taxa of wild bananas consisting of *Musa acuminata* ssp. *truncata, M. violascens, M. acuminata* ssp. *acuminata, M. acuminata* ssp. *microcarpa*, *M. balbisana* ssp. *balbisana, M. acuminata* ssp*. flava, M. acuminata* ssp. *malaccensis* and *M. gracilis* were collected from several areas such as in Selangor, Perak and Pahang. In 2016, a total of 34 samples of various wild banana species – *M. acuminata* ssp. *truncata, M. acuminata* ssp*. microcarpa, M. acuminata* ssp*. flava, M. violascens* and *M. gracilis* that were found to possess seeds were collected. The seeds are kept *ex situ* at the national genebank for conservation and one set of each samples were sent to Millennium Seed Bank, Kew, London. Collection activities of *Ipomoea* species in Peninsular Malaysia were carried out in the states of Kedah, Kelantan, Terengganu, Selangor and Johor. In view of the future plan for utilization and genetic enhancement, CWR species are unique, especially wild bananas that showed great diversity, variation and characteristics.

Acknowledgement: The team would like to acknowledge the fund given from the Crop Trust (GCDT) and MARDI (Internal Fund) for the implementation of the project.

P15 A view from above: using an Unmanned Aerial Vehicle (UAV) to investigate scale and patterns of liana infestation in tropical forests in Malaysia

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Tropical forests are a major global carbon sink, storing ~30% of terrestrial carbon. However, recent increases in liana abundance are pervasively altering forest structure; reducing carbon accumulation and long-term storage by enhancing tree mortality and reducing growth by up to 84%. Relying on trees for support, lianas allocate a higher proportion of biomass to foliage production over carbon-dense stems, reducing net above-ground carbon uptake by as much as 76%/year. Despite this, lianas are chronically understudied. Ground-based censuses are extremely time-consuming and, while mapping and monitoring studies utilising satellite and airborne images have occurred, they are limited by relatively coarse spatial and temporal resolutions, cloud obscuration, and high costs. UAV imaging may provide an affordable and accessible tool to overcome these limitations. Combining UAV and ground-based canopy censuses in two areas of Malaysian forest, this research will investigate whether canopy cover of lianas can be accurately distinguished using UAV imagery. It aims to assess the viability of UAVs for mapping and monitoring lianas in tropical forests while providing information on the extent and spatial patterning of liana infestation. This is crucial for analysing and quantifying lianas' effect on forest function, while helping uncover mechanisms behind their proliferation, as a continued increase may further reduce tropical forest carbon storage and sequestration, thus endangering the future of the tropical carbon sink. Preliminary results (r values = 0.68 to 0.83, n = 890, p values = <0.001) indicate a strong, positive correlation between UAV-derived and ground-derived %liana canopy cover on individual-tree and plot-based levels.

P16 Assessing the impact of *Carpobrotus edulis* and *Lantana camara* on three Lebanese coastal endemic plant species

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Lantana camara L. (Caprifoliaceae) and *Carpobrotus edulis* (L.) N.E. Br. (Aizoaceae) are ornamental plants known for their aggressive invasive behavior in Mediterranean ecosystems worldwide. During 2016 we conducted field surveys along the coast of Lebanon to document the distribution of these two species and their impact on local coastal endemics, namely *Matthiola crassifolia* Boiss. & Gaill. (Brassicaceae), *Limonium mouterdei* Domina, Erben & Raimondo and *Limonium postii* Domina, Erben & Raimondo (Plumbaginaceae). Quadrat sampling was performed in every site in which either of the potential invasive species occurred with any of the coastal endemics. Data analysis through Twinspan was then used to assess the impact of these alien species on the three species of conservation interest. The results revealed that *Lantana camara* was negatively associated with *M. crassifolia*, while *C. edulis* was positively associated with *M. crassifolia*. No associations were detected with the two *Limonium* species because they never co-occurred with *L. camara* and *C. edulis*. Our findings suggest reconsidering conservation strategies of species in extremely peculiar habitats subject to heavy anthropogenic disturbance: within coastal urban green spaces in highly urbanized regions, some potentially invasive species may play unexpected, yet beneficial, roles in the conservation of native plants. This is certainly the case of *C. edulis* in Beirut, commonly used as perennial cover along the Lebanese coast, because of its high drought- and salt-tolerance, this invasive species seems to indirectly contribute to the protection of the co-occurring and endangered *M. crassifolia* from trampling.

P17 Distribution of invasive species in Azerbaijan flora

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In recent decades, most indicators of the state of biodiversity showed declines, whereas indicators of pressures on biodiversity including invasive alien species and climate change impacts showed increases. Climate change and biological invasions, two major components of global environmental change, significantly affect the economic value, biodiversity and function of invaded ecosystems, as well as the quality of life for humans. In response to climate change the ranges of invasive species are expected to shift to new habitats where they will encounter different communities and could affect biotic interactions as well as expansion dynamics. A special study on plant invasive species is limited in Azerbaijan yet. But there are records during integrated researches of flora in some local areas. A phytocoenotic as well as population-ontogenetic methods via random sampling were used. The features and level of invasions, ontogenetic spectrum and number of individuals in the population, fertility and mortality of invasive species are analyzed. Invasive flora of Azerbaijan includes 117 species of flowering plants. Many of them were lately introduced into local ecosystems, naturalized and continue to settle over long distances. Part of them (*Robinia pseudoacacia*, *Xanthium strumarium*, *X. spinosum* etc.) are medicinal, edible and ornamental plants. Main share of invasive species belongs to the family Asteraceae Dumort. and Poaceae Barnhart. Interacting effects through rising atmospheric CO_2 concentrations, warmer temperatures, greater nitrogen deposition, altered disturbance regimes and increased habitat fragmentation may facilitate further invasions.

P18 Controlling invasive non-native plant species using classical biological control – past successes and future potential

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CABI, UK

Non-native invasive species pose a major threat to the natural environment and have the potential to destroy habitats, decrease biodiversity and impact on agricultural production. Typically, the control of invasive plants is based upon mechanical and chemical methods; both are labour intensive and expensive, usually requiring repeated applications in order to be effective. Classical biological control (CBC) using coevolved host-specific natural enemies (arthropods and/or pathogens) from the centre of origin of a non-native invasive provides an economic and self-sustainable approach which can be incorporated into an integrated weed management strategy. CABI has been supporting countries to implement CBC since the 1920s and has been instrumental in numerous successful programmes. In the 1940s the use of three insect agents from Trinidad against black sage, *Cordia curassavica*, resulted in complete control of the weed in Mauritius and prevented its establishment in Malaysia and Sri Lanka. More recently the release of the rust fungus *Maravalia cryptostegiae* in Australia in 1994 led to successful control of rubber vine, *Cryptostegia grandiflora*, in Australia with total economic benefits ranging between AS$295 – 528 million, a figure which does not include any resulting environmental and social benefits.

Currently CABI is leading the research into CBC for four target weeds in the UK – *Fallopia japonica, Impatiens glandulifera, Hydrocotyle ranunculoides* and *Crassula helmsii* – as part of the country's obligation to fulfil the requirements for good chemical and ecological status in inland and coastal waters stipulated by the EU Water Framework Directive.

P19 The *Brachypodium distachyon* species-complex as a model for dissecting the role of allopolyploidy in plant adaptation

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Interspecific hybridization can lead to increased aggressiveness in the hybrid forms relative to the parental species and this is often associated with invasiveness in new environments. European annual grasses from the *Brachypodium* genus illustrate this phenomenon very well, with extensive post Columbian invasion of Mediterranean areas in the New World. The original *B. distachyon* morphotype has been resolved into three distinct species: two diploids, *B. distachyon* and *B. stacei*, and a derived allotetraploid species, *B. hybridum* (Catalan et al., 2012). The *B. distachyon* complex is an ideal model to study numerous aspects of adaptation, including invasiveness. The *B. distachyon* complex is a well developed model that cycles rapidly and can be grown cheaply and at scale (Opanowicz *et al*., 2008). High quality annotated genomes from parental and hybrid species are available and large collections of well defined natural accessions have been made from across its native range. We are developing high throughput phenotyping and reverse genetic approaches to measure traits that contribute to reproductive success with the aim of mapping allelic variants in both diploid and polyploid species. These traits range from the level of chromosome pairing in diploids and polyploids to seed set, seed number and the response to environmental variables such as heat and water stress. We will discuss the different approaches and the future prospects for developing this species-complex as a tractable model for studying the role of interspecies hybridization in natural ecosystems using state of the art genomics, phenomics and cell biology.

P20 CABI's Compendia: knowledge resources for invasive plants, plant pests, crops and forest trees

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CABI, UK

Information on over 25,000 plant species is made available in the Compendia published by CABI in the form of datasheets, images, maps, abstracts and full text records, and relevant websites. Detailed, fully-referenced datasheets on the most important species have been specially commissioned from experts, edited by CABI and peer reviewed. Sections on identification, distribution, biology and impacts are common to all Compendia. The open-access Invasive Species Compendium (ISC) currently includes detailed datasheets on 1000 invasive plants with additional sections on invasiveness, habitats, pathways, natural enemies, threatened species (many of which are plants), and management. Considering other threats to plants, the Crop Protection Compendium (CPC) covers almost 3000 detailed pest datasheets of crops and provides the host range (including wild plants), symptoms, diagnosis, natural enemies and methods of control. With their broad species coverage and global scope, both Compendia are useful resources for pest risk assessment and horizon scanning. Compendia also cover productive plants. In the recently launched Horticulture Compendium (HC), the propagation, cultivation, harvesting, breeding and protection of 200 major fruits and vegetables is supported by key topics of general horticultural interest, while 590 crops are covered in detail in the CPC although the main focus is on the pests that attack those crops and their control. The Forestry Compendium (FC) includes detailed datasheets on 1500 tree species with information on silviculture, uses and damaging forest pests. CABI continues to add updates, new datasheets, bibliographic records and website features. Further information can be found at http://www.cabi.org/publishing-products/compendia/

P21 Landscape scale consequences of dispersal traits of trees in a fragmented forest ecosystem: a case study of a tropical humid forest of Madagascar

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Tropical deforestation continues to be the major driver of forest fragmentation which affects the ability of tree species to persist by disrupting key biological processes such as seed dispersal.

In this study, I tested the effects of forest configuration and dispersal traits on the realized dispersal of tree species in a humid forest of Madagascar. I used remote sensing tools to characterize temporal changes in vegetation cover and configuration based on Landsat images. Forest configuration was characterized in terms of patch size, distance to neighboring patch, distance to the edge and perimeter area ratio. 160 forest plots of 20m x 20m were established and stratified with respect to forest configuration. Trees in plots were identified to species and placed into approximate age classes. Dispersal traits were collected in the field and from herbarium specimens. I analyzed plot data based on species occurrence, on the difference in prevalence of mature and immature species and used them as response variables. I used landscape configuration and dispersal traits as covariates and ran ANOVA and GLMs on R.

Vegetation configuration and dispersal traits influenced realized dispersal of 21 tree species. Species associated to larger patches and forest interior showed passive dispersion mode which implies some limitation in seed dispersion across the forest landscape. Smaller patches and forest edges support tree species with lower seed size and low seed longevity but bird dispersed seeds. Bird and lemur dispersed tree species are not sensitive to patch size and edge distance.

P22 Exploring an emerging threat to the endangered Madagascan endemic, *Adansonia grandidieri* (Malvaceae)

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Madagascar's endemic baobabs are iconic symbols of the island's unique diversity, especially the famed *Adansonia grandidieri,* which despite being a flagship species for the nation, is also an Endangered species. Since 2008, the Global Trees Campaign and our partner Madagasikara Voakajy have been conserving the species in situ, supporting communities to gain management rights for key areas of baobab habitat and promoting protection of populations in western Madagascar. However, *A. grandidieri* faces an emerging threat from a rising trade in baobab fruits, driven by new markets for the product since they were declared a 'superfood'. In 2016, *A. grandidieri* were listed onto Appendix II of CITES, as a precautionary measure in response to a growing interest from potential exporters. However, national demand for the fruit also has the potential to threaten the species; very little is known about the extent of fruit harvesting or whether it is sustainable. To understand the impacts of fruit harvesting on baobab populations, we carried out research into flower and fruit production of >700 trees. We estimated the entire population produced approximately 900 tonnes of fruit in 2015, however no new regeneration was observed during monitoring. In addition, we conducted 217 household surveys and found that 98% of households adjacent to baobab forests collect *A. grandidieri* fruits, and 45% sell fruits for profit. The data also revealed people typically collect more fruit than they can use. This poster explores what these results mean for the conservation of *A. grandidieri* and related baobabs in Madagascar.

P23 Monitoring internet trade to inform species conservation actions

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Internet trade in specimens, parts and products of threatened species could threaten the survival of some wild populations if inadequately regulated. We outline two methods to monitor internet sales of threatened species to assess potential threats and inform conservation actions: manual systematic monitoring and predictive modelling. We used these methods to monitor internet trade in five genera of succulent plant species endemic to Madagascar, for which some have recently been listed for trade regulation under the Convention on International Trade in Endangered Species (CITES). This revealed potential threats to wild populations: for instance, almost all species recorded were of high conservation concern yet most offers for live plants were of apparently wild collected specimens (85%). Moreover, no records of international trade in the official CITES database were from the countries featured in our survey. Our model predicted with 89% accuracy whether the live plants were classified as propagated or wild collected by an expert, although accuracy dropped for data collected in the following summer due to a change in the patterns of sales. Our results highlight potential threats by internet trade to the survival of some CITES and non-CITES listed plant species from Madagascar. These should be addressed by further conservation actions and policy. More generally, our results reveal how standardised internet surveys can provide information on levels of trade in wild collected threatened species that could impact on natural populations and can provide data that can be incorporated into models to facilitate future monitoring and enforcement.

P24 State of 1% of the world's plants: towards zero extinction in Xishuangbanna

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Xishuangbanna Tropical Botanic Garden, Chinese Academy of Sciences, China

Most flowering plant species, most unknown species, most data deficient species, and most threatened species are in the humid tropics. Tropical floras, however, are under-collected, under-described, and under-represented in both *in situ* protected areas and *ex situ* seed banks and living collections. We assessed the conservation status of the entire native angiosperm flora of Xishuangbanna, a well-studied 20,000 km^2 area in tropical SW China, bordering Laos and Myanmar, which has undergone rapid land-use change in recent decades. We started with a desk-top multi-expert assessment for every species and then used this to target field and herbarium surveys at taxa identified as data deficient or threatened, and at understudied groups. After the initial desktop survey, our checklist included 4092 taxa, of which 11.7% were considered Data Deficient. Three years later we have 4042 taxa, of which <2% are Data Deficient. Many species were removed from the checklist because they were not reliably recorded from the wild, while >150 new species were added from field and herbarium surveys, and at least 11 species found that are new to Science. Currently, 2 species are considered regionally Extinct, 153 Critically Endangered, 193 Endangered, and 700 Vulnerable. We are now trying to protect these both *in* and *ex situ*. The assessment approach used is being applied (as the '*Full-cover Conservation Plan of Native Plant Species in China*') in other areas through the Chinese Union of Botanical Gardens. The target is a bottom-up assessment for all species in China: c. 10% of the world's flora.

P25 Women's contribution to plant species discovery: a different use for historic botanical nomenclature data

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How has women's contribution to science developed over multiple generations? We present the first quantitative analysis of the role played by women in publishing botanical species names, and the first complete analysis of women's contribution to any field of science with a timeframe of more than 260 years. The 2013 data from the International Plant Names Index and The Plant List were used to analyze the contribution of female authors to the publication of land plant species names. Female authors make up 12% of the total number of authors, and authored 3% of plant names. Female contribution has accounted for more than 1% of new species names per decade since 1900, and stood at 12% in the first half of this decade. Female authors are now 80% as productive as their male counterparts. We determined that Elizabeth Blackwell was the first woman to publish a plant name, *Amomum verum* Blackw. in the 1750s. The most prolific female plant author was Harriet Margaret Louisa Bolus and one of the top 10 most prolific women, Dr. Charlotte M. Taylor, is still working today. Studies such as this illustrates the great strides women have made in science over the past 260 years and hopefully will inspire the current generation of taxonomists to narrow the gender gap.

P26 Cataloguing the world's 60,065 tree species – GlobalTreeSearch

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GlobalTreeSearch, an online database launched in April 2017, is the most comprehensive list of the world's tree species and their country level distributions. The GlobalTreeSearch database, compiled by Botanic Gardens Conservation International (BGCI) tells us the world is home to 60,065 known tree species. The GlobalTreeSearch database collates data from 500 sources, contains over 375,000 lines of data and is the result of over two years of work. The most tree diverse countries are Brazil, Colombia and Indonesia, all with over 5,000 tree species. Brazil also has the most endemic species with 4,333 tree species, followed by Madagascar (2,991 tree species) and Australia (2,584 tree species). Nearly 58% of tree species are single country endemics. As well as delivering interesting statistics about trees, GlobalTreeSearch also provides the backbone for the Global Tree Assessment, an initiative to assess the conservation status of all of the world's tree species by 2020. This project is led by BGCI and the IUCN/SSC Global Tree Specialist Group. Preliminary comparisons between BGCI's ThreatSearch database, containing all known plant conservation assessments, and GlobalTreeSearch have indicated that 40,000 tree species are without a conservation assessment. Work is ongoing to extend our global collaborative partnership in order to achieve the 2020 target. With threats such as land use change and overexploitation on the increase, prioritisation of conservation action through red listing is vital to prevent the extinction of any of the 60,065 tree species.

P27 Typification of plant names published by Philip Miller in *Gardeners Dictionary* (1731–1768)

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Philip Miller (1691–1771) was the most influential gardener of the eighteenth century, under whose leadership of the Chelsea Physic Garden the number of plants cultivated in England doubled between 1722 and 1770. Miller's most celebrated work, which catapulted him into international stardom, was the *Gardeners Dictionary*, a practical guide to horticulture published in eight editions between 1731 and 1768. The *Dictionary* was, however, more than just a manual on the methods of plant growing, as within it Miller also described nearly 1,500 new species of plants, mainly from South Africa, North America and the West Indies. The eight edition of the *Dictionary*, published on 14 April 1768, validated many of Miller's newly described plant names, as within it the author had adopted the Linnaean system of binominal nomenclature. Typically for a botanical publication of his era, Miller did not indicate type specimens on which he based his new species, although almost 250 years later, lectotypes for many of his names have been selected by subsequent botanists. The aim of the present study is to review the types already designated, and to lectotypify Miller's names for which types have never been selected. The sources of the original material for Millerian names are his own herbarium, the collection of Sir Hans Sloane, and the specimens grown in Chelsea Physic Garden presented to the Royal Society, all of which are now housed at the Natural History Museum. These sources and their differences are discussed, focusing on the legumes (*Fabaceae*).

P28 The new era of the digital herbarium @ BR (Botanic Garden Meise)

De Smedt, S., Bogaerts, A., Stoffelen, P., Engledow, H. & Groom, Q.J.

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The Botanic Garden Meise (BR) has been conducting an ambitious program of digitization. Currently, we have more than 1.2 million herbarium specimens imaged and we have upgraded our photographic equipment to support faster and improved photography. All of these images and their associated metadata will be made available on a newly designed digital gateway to our collections. This new portal will provide additional functionality, including stable URIs to the specimens and machine readable versions of the data. Users will have much more ability to browse and query the data than before.

Nevertheless, with such a large proportion of our collections digitized we have had to adapt our procedures. For example, new specimens can no longer be reinserted into the collections until they are photographed. Also, because stable URIs provide a permanent reference to a specimen we are now responsible for their persistence, uniqueness and reliability.

Digitization is a marvellous opportunity to improve access to our collections and to improve the scope and quality of research done with it. However, it has forced us to reassess how we manage the herbarium and we expect it to have profound consequences for how research is conducted and reported.

P29 Does a Linnean shortfall explain the Azores diversity enigma?

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In a letter to Hooker, dated Christmas Day, 1844, Darwin reflected on a recently published account of the flora of the Azores and commented '…don't you think it odd, the fewness of peculiar species?'. More recently, the distinctivenss of the flora was highlighted by its poor fit to the ATT2 model derived from the General Dynamic Model of Oceanic Island Biogeography, an otherwise powerful model for explaining diversity patterns of oceanic archipelagos. The Azores flora is unusual in the paucity of single island endemics, in the paucity of lineages that have speciated in situ and in the limited extent of diversification in those lineages that have diversified. The term 'Azores Diversity Enigma' (ADE) was coined to refer to this suite of features that distinguished the flora from those of the other north Atlantic archipelagos. Several explanations have been offered to explain the ADE, including island size and age, limited habitat heterogeneity, palaeo-environmental conditions and a 'Linnean shortfall' – inadequate knowledge of the diversity of the flora. This poster explores the latter. Molecular data indicate that there is indeed a Linnean shortfall in the flora, with previously undescribed single island endemic lineages revealed in a number of taxa. In some cases, morphological data support the recognition of these as new taxa. These cases are reviewed. As a consequence of such recent taxonomic work, the Azores flora now seems less unusual. Nevertheless, the distinctivess of the flora cannot be explained by a 'Linnean shortfall' alone.

P30 NaturEtrade: creating a marketplace for ecosystem services in Europe

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NaturEtrade is a project aiming to prevent the loss of ecologically-rich land in Europe by establishing a marketplace for supporting ecosystem services. Despite their importance in sustaining human well-being, ecosystem services have not commonly been an object of private-market transactions. Where ecosystem services are recompensed, it is almost exclusively via government incentives or charitable donation. NaturEtrade proposes a payment-for-services model in which the economic value of nature is negotiated between landowners, who control the natural capital on their land, and beneficiaries of the ecosystem services associated with that natural capital. An easy-to-use online mapping tool allows landowners to measure their land's provision of five key services: pollination, soil erosion prevention, carbon sequestration, water flow regulation, and recreational amenity. Beneficiaries of ecosystem services, such as local governments, businesses, or conservation-minded individuals, will be able to contract with landowners to avoid degrading their land, thus ensuring a continuation of service provision. NaturEtrade is a LIFE+ project funded by the European Union.

P31 The Local Ecological Footprinting Tool (LEFT)

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LEFT (www.left.ox.ac.uk) is a web-based decision support tool developed to aid in evaluating the pattern of relative ecological value across a landscape to inform planning of land use in order to minimize the environmental impacts. A user defines an area of interest anywhere globally using a web-based map and the tool then automatically processes a series of high-quality datasets using standard published algorithms to produce maps at 30m resolution of land cover class, numbers of globally threatened terrestrial vertebrate and plant species, beta-diversity of terrestrial vertebrates and plants, habitat intactness, habitat connectivity and vegetation resilience. These results are aggregated to produce a single map of relative ecological value. The tool then generates a customised pdf report and a zip file of GIS data for the area requested. Results are delivered to users by email within a few minutes of job submission. This tool has been designed to be highly intuitive to use, requiring no specialised software or user expertise.

P32 Extracting value from Floras all the way through to genotype-phenotype approaches

Mols Sierra, S.[1], Borges, P.A.V.[2], Doonan, J.H.[3], Gkoutos G.[3], Groom, Q.[4], Hoehndorf, R.[5], Kattge, J.[6], Sandovar, A.[1], Stadler, C.[7] & Weiland, C.[8]

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Facilitating a richer understanding of the molecular (i.e. genetic and epigenetic) basis of plant biodiversity data, and their interaction with the environment will be particularly important for tackling grand societal challenges. For example, in issues such as the sustainable management of biodiversity as a natural resource, the control of invasive species and the mitigation of climate change. A rich understanding will also help industry to strengthen its knowledge base and technological know-how by providing innovative resources for industrial applications in bio-medicine, pharmacy and agricultural technology including plant breeding.

Plant biodiversity data can only be used to their fullest potential when they are discoverable, effectively mobilised, referenceable, transparently cross-linked and employable for different purposes. Traits define morphological, biochemical, physiological and phenological features of individuals and their component organs and tissues. A big advantage of trait data from Floras is its excellent taxonomic quality, being produced by taxon experts in many cases directly connected with voucher material in natural history collections. To fully exploit the plant data in digital media such as Floras, morphological and molecular trait databases, and occurrence databases, one needs to overcome challenges related to data access, data integration, and collaboration.

An approach to overcome those challenges includes adopting technologies used in related domains, such as biomedicine; improving different technologies for automatically extracting trait data and linking these data, ontologies and vocabularies; and applying them to the representation and integration of plant traits.

P33 Completing the Plant & Fungal Trees of Life

Baker, W.J., Barker, A., Botigué, L., Dodsworth, S., Eiserhardt, W.L.T., Epitawalage, N., Gaya, E., Kim, J., Maurin, O., Parker, J., Pokorny, L. & Forest, F.

Royal Botanic Gardens, Kew, UK

Evolutionary trees are powerful tools for prediction, species discovery, monitoring and conservation. Through comparative analysis of DNA sequence data, the backbones of the plant and fungal trees of life are relatively well understood, and many subcomponents have been studied in great detail. However, DNA data are still lacking for numerous genera and the vast majority of species of plants and fungi, preventing their accurate placement within this evolutionary framework and hindering downstream science. To better understand how the world's plants and fungi are related to each other and how they have evolved, we have initiated a project at the Royal Botanic Gardens, Kew to complete the Plant and Fungal Trees of Life (PAFTOL). We will utilise our collections and work with our collaborative networks to produce extensive new DNA sequence data (whole plastid genomes, 100s of nuclear loci) for a representative species from each genus of plant and fungus using high-throughput sequencing technologies. This comprehensive investigation of phylogenetic relationships will be a rich resource enabling the discovery and study of evolutionary patterns in the plant and fungal kingdoms, and will provide a unifying framework for comparative research. The project is an essential step towards the compilation of genomic data for all known species.

P34 Phylogenomics of the core Panicoideae (Poaceae) reveal an unexpected tropical C3 grass lineage

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The "core Panicoideae" lineage of grasses contains some very diverse tribes of mainly tropical species, namely Andropogoneae (including maize and sugarcane), Arundinelleae, Paniceae, and Paspaleae. Aside these large clades, there are some tropical C3 grasses that appear to be isolated in the phylogeny. We used full chloroplast genomes and nuclear genes to resolve relationships and estimate divergence times in the core Panicoideae, focusing on these enigmatic taxa. *Gynerium sagittatum* from tropical America is confirmed as the earliest-branching lineage in the group, followed by *Lecomtella madagascariensis*, a local endemic from Madagascar that appears to be older than previously estimated. Two C3 genera from Asia, *Jansenella* and *Chandrasekharania*, form a well-supported clade sister to the large C4 clade Andropogoneae–Arundinelleae. With only three known species, two from single localities in the state of Kerala, India, this lineage now appears to be rare, but may have been more widespread before the global rise of C4 grasslands. This newly discovered clade may help understand the origins of C4 photosynthesis in the Andropogoneae, now one of the dominant and most diverse groups in tropical grasslands and of considerable economic importance.

P35 Enhancing plant health and productivity through improved plant-soil microbe interactions

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Current predictions are that the world's population will reach 9 billion people by 2050. Feeding all of these people would currently require much more than we currently produce. This problem is also made worse by the specter of climate change robbing us of arable land. There are many obvious approaches to attacking this issue, but some such as changing what and how we eat are very difficult to achieve on a sustainable worldwide scale. Nebraska, in the plains of the USA, is an important agricultural state growing a large amount of corn, soybeans, and many other crops. To try to improve our productivity in the face of the same challenges as above, the University of Nebraska has established the Center for Root and Rhizome Innovation. Our goal is to analyze the interactions of plant roots and soil microbes and to find a way to understand and improve upon them. To accomplish this, our group of plant and soil scientists is currently analyzing many lines of corn and its ancestors and relatives. We're analyzing plant growth through a continuous phenotyping facility and soil interactions through next generation sequencing and other techniques. With this poster, we wish to share our current results and future plans. This work is funded by grant OIA-155741: RII Track 1-Center for Root and Rhizome Innovation from the National Science Foundation (NE EPSCoR), a grant from the NU foundation, and by the UNK Summer Student Research Program.

P36 sRSA: a novel strategy to overcome the bottleneck of virus detection in germplasm collections

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The International Potato Center (CIP) has a large in vitro genebank of potato, sweetpotato, and nine Andean roots and tuber crops (ARTCs) and distributes this plant material worldwide for research, training, and breeding. The genebank contains 11,491 in vitro accessions; however, of these, only 6,552 accessions (52%) are currently certified as virus free, and thus are available for international distribution. The current phytosanitary program to detect and clean viruses from the in vitro plants takes approximately one and half years with a capacity of ~450 accessions per annum. Therefore, ten more years are required to clear the backlog. Ten and eleven viruses are routinely targeted for detection in potato and sweetpotato, respectively utilizing serological, molecular, and host range testing. In the ARTCs, however, little research has been performed to determine the significant viruses which infect these crops and no standardized testing for detection has been developed. In order to develop an operational and rapid method for virus detection in the ARTC germplasm collections, small RNA sequencing and assembly (sRSA) is being evaluated for its efficacy in virus detection. Small RNA was extracted from ulluco (*Ullucus tuberosus*) followed by library preparation and Illumina sequencing. VirusDetect version 1.6 was employed to align the small RNA sequences to deposited, characterized viruses. Ten viruses belonging to six genera were detected in ulluco. Viromes were assembled from two viruses (PVX and AVB) and primers will be designed to fill in the gaps. sRSA is proving to be effective and a faster method for viral detection.

P37 Protecting plant health in the UK requires a multi-disciplinary approach

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Plant pests and diseases can have a significant impact on the environment, economy and social well-being. Evidence shows that worldwide this biological threat accounts for loss of entire plant species from areas, 40 % loss in global food production and numerous human health issues.

Part of the reason of the spread of trans-boundary plant pest and disease is due to globalisation, trade and climate change. The UK alone has seen unprecedented increase in the monitoring for and assessment of plant pest and disease over recent years. For example, three years since publication of the plant health risk register, over 200 additional species have been added.

Some significant pests and pathogens that threaten the UK's plant species and have been shown to have international impact include, Ramorum dieback (*Phytophthora ramorum*), Asian long-horned beetle (*Anoplophora glabripennis*), Ash dieback (*Hymenoscypus fraxineus),* Emerald ash-borer (*Agrillus planipennis*) and *Xylella fastidiosa*

The UK's Plant Health and Seeds Inspectorate (PHSI) are on the front line to spot and take action on any plant health incursions at point of entry or within the country. Using the latest research and technological advances helps the PHSI to identify new threats rapidly. This, alongside a programme of engagement and awareness raising and effective biosecurity practices implemented by industry, significantly reduces the risk and impact of plant pest and disease.

This poster highlights some of the current threats to the UK and work government is doing to mitigate the risk.

P38 The International Plant Sentinel Network: early warning of new threats to plant health

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Invasive pests and diseases are arguably one of the greatest threats to the world's flora. These organisms can cause irreparable damage to plants, associated biodiversity and landscapes. Dutch elm disease (UK), the emerald ash borer (U.S.) and the red palm weevil, currently decimating palms across the Mediterranean, are just three examples of the impact that these invasive species can have. The occurrence of outbreaks has increased in recent years, largely due to the increase in international trade and (ever-increasingly) the changing climate which creates favourable conditions for such pests. As a result, outbreaks of damaging organisms are forecast to rise. Management of such invasives relies heavily upon early detection and pre-border prevention.

The International Plant Sentinel Network (IPSN) has been developed as an early warning system for new and emerging plant health risks. The network consists of botanic gardens, plant health researchers and government organisations who work collaboratively, and globally, to safeguard plant health. Coordinated by BGCI, the IPSN provides research into potential threats and collects information for use in Pest Risk Analyses (PRAs). The IPSN shares information and best practise on plant health issues and biosecurity by providing resources (guides, posters, protocols) which support and upskill garden staff. The network also facilitates contact in-country between plant health institutes and garden staff to establish a culture of recording and reporting prominent issues.

The network's aim is to identify those pests and diseases which pose the next big threat, to enable government organisations and agencies to better protect their plant species.

P39 Unpacking the plant biosecurity continuum; reducing pest spread and maintaining food security

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As the global population rises, there is increasing pressure to produce higher yielding crops to cope with the demand for food. The plant traits that result in increased yield often conflict with those that enable resilience to threats, including pests and diseases. This leaves high yielding food crops vulnerable to these dangers. The role of plant biosecurity is therefore becoming more important, especially as rising levels of global trade and human travel increase the pathways through which pests and diseases can enter and spread. Climate change exacerbates both this risk of entry and the likely impact posed by new pests and diseases. Concerns are highest for developing countries, where the increase in population is likely to be greatest, with a heavy reliance on a small number of major food crops and where levels of plant biosecurity are typically limited. Given the back drop of a rapidly changing political landscape that will impact on both future climate change and global trade agreements, we discuss the impact of phytosanitary actions along the whole of the plant biosecurity continuum in restricting the spread of pests and diseases. With a focus on developing nations we give particular attention to the role of pre-border interventions to increase biosecurity capacity and capability and the impact this can have on ensuring global food security.

P40 Efficacy of a campaign to control Coconut Lethal Yellowing syndrome in Mozambique

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Coconut Lethal Yellowing syndrome is a combination of Coconut Lethal Yellowing Disease (CLYD), a vascular wilt caused by the insect-vectored phytoplasma '*Candidatus* Phytoplasma palmicola', and feeding by the adult Rhinoceros beetle (*Oryctes monoceros*) causing defoliation and apical growth damage. In Mozambique vast areas of coconut have been decimated by these pests, with the beetle larvae developing within the trunk of palm killed by CLYD. Coconut is a critical crop for smallholders and the commercial sector. To reverse the decline of coconut in Mozambique, a major programme of 'felling' and 'burning' of CLYD-infected palm was implemented, focused in Zambezi province.

The programme of control ran from 2010–2013 (4yrs) and a reported 600,000 palms were felled and burned. Using a quasi-experimental design we assessed the efficacy of the campaign (felling and burning) by visual observation of coconut stand health using remotely sensed (plane and satellite) imagery (from 2008–2014) and a ground survey (in 2014), supported by diagnostic assessment of asymptomatic CLYD infection levels. Over 400 images, 1600 palms and 200 palm trunk samples were studied.

Felling and burning was shown to have slowed, but not stopped or reversed, the decline of coconut. In areas of high devastation, an 'end-state' of predominantly beetle damage was evident. Critically, visual diagnosis of CLYD overlooked high numbers of asymptomatic palm and the burning of trunks was not effectively implemented. These factors undermined the control strategy. Future efforts should focus on breeding for tolerance to CLYD and economic uses for dead palm, or progress a different coconut system, with palms having a shorter life expectancy.

P41 The role of historic herbarium collections for species status assessment

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Natural History Museum, UK

Prioritisation of scarce conservation resources has generally been focussed on native, or long-established (archaeophyte) rare and threatened species. However, in the absence of palaeo-botanical information and reliable early literature resources, the status of many taxa, particularly the critical and cryptic, is contentious. Historic (pre-linnean) collections provide an under-used resource validating species presence at early dates, which used in conjunction with other data can support native status. Examples are given of two pteridophyte taxa: *Cystopteris diaphana* (Cystopteridaceae) and *Equisetum ramosissimum* (Equisetaceae) for which the discovery of 17th century material in the Sloane Herbarium (BM) allowed the revision of their accepted status in the British Isles. This led to red-listing of the former (as VU:D_2) and has supported the retention of the legal protection of the latter under Schedule 8 of the Wildlife and Countryside Act, 1981.

P42 Beyond plant blindness: seeing the importance of plants for a sustainable world

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In recent years an interdisciplinary nexus has been generated around what it means to experience life as a plant. From the science of plant behaviours, plant language and meaning-making to plant-based philosophy, plant enquiries are crossing disciplinary and conceptual boundaries. The everyday life of a plant can appear to be static and silent to human perception. And yet, as modern science narratives tell their stories, we are realising that plants live in complex, and often social worlds. Removing plants from the human view makes it easier for us to exploit them and appears accordingly to reduce our ability to see into their worlds. In this research study we ask how, by taking a different view through an interdisciplinary lens, might we improve our understanding and sensitivity to the lives of plants? Thus, our research contributes to policy contexts in which society cannot afford its citizens to be plant blind to contemporary conservation issues.

P43 Nature conservation in a transboundary context: implementation and practice of the EU Habitat and Bird-protection Directives

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European legislation for protecting the common European natural heritage has since the beginning of the 1990s advanced with the publishing of the Habitats Directive. One of the main aims of the Directive is to form a greater network of nature areas with the intention of overlooking the borders of Member States.

By analyzing a case of two designated sites geographically considered as being an undivided nature area, this study compares the procedures in each member state from policy implementation to practical management. The study site is a former peat bog located on the border between Denmark and Germany. The study has been conducted as a literature review of European Union treaties and directives, national nature protection legislation and the processing of these into practical management by governmentally and privately involved managers.

Conclusions propose a national preference for implementation of the Directive based on the subsidiary principle stated in the founding Treaty of the European Union, along with the possibility of developing methods with nationally determined standards and consideration of species, and different priority making in regards to national species distribution.

Based on this analysis it is recommended that the assessment of species distribution is regarded on a regional scale rather than on a national and thus advocates for a stronger cooperation between administrations if the aims of the Directive should not be evaded.

Nonetheless, this case study should be compared to the management of other border-crossing nature areas in order to put forward a general statement about the issue raised.

P44 Pharmaceutical potential of Azerbaijan flora

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The Azerbaijan flora is represented by 4745 species of vascular plants of which 1550 are medicinal plants belonging to 178 families and 741 genera. The medicinal plants are dominated by representatives of the Magnoliophyta (1467 species) and least in the Equisetophyta (6), Gnetophyta (3), Bryophyta and Lycopodiophyta (2 each). Some genera with a high number of medicinal species (10–21) are *Euphorbia, Chenopodium, Erysimum, Salvia, Viola, Centaurea, Galium, Stachys, Allium, Artemisia, Potentilla, Rumex,* and *Orchis*. Among the medicinal plants of Azerbaijan, 77 species are endemic to the Caucasus, 6 endemic to Azerbaijan, 44 relict and 112 rare and endangered and listed in the Red Data Book. The greatest number of plants have long been used by the people for the treatment of diseases of the stomach and intestines (396 species), liver and gallbladder (198), kidney and bladder (153), spleen (69), female urogenital diseases (183), as well as common skin disorders (386), cardiovascular disease (213), eye disorders (118), rheumatism (275), tuberculosis (172), tumors, (153), malaria (116), burns (97) and diabetes (81). 274 species of Azerbaijan medicinal plants are accepted as an officinal and were included in the Pharmacopoeias of different countries. Therefore, for detection of the medicinal plants of the future and the development of new pharmaceuticals, it is very important to expand scientific ethnomedicinal research on medicinal plants used in ethnopharmacy. In this aspect investigation of biologically active compounds and identification of their structure, as well as the development of biotechnological approaches to the evaluation of modern pharmaceuticals is carried out.

P45 Ethnobotanical study of medicinal plants in Arsi Nagelle district, West Arsi zone of Oromia, Ethiopia

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The study was conducted with the objective of identifying and documenting medicinal plants and the associated ethnobotanical knowledge of the local communities in Arsi Nagelle District, West Arsi Zone in Oromia Regional State, Ethiopia. Semi-structured interviews, group discussions, field observations and market survey methods were used for data collection. A total of 90 informants were interviewed. Qualitative and quantitative statistical methods, priority ranking, paired comparison, direct matrix ranking, informant consensus and percentage distribution were used for data analysis. A total of 102 medicinal plants belonging to 85 genera and 55 families were collected and identified. Seven species were used for treatment of livestock diseases, 65 were used for treatment of human diseases, and the remaining 30 species were used for treating both human and livestock diseases. *Acokanthera schimperi, Afrocarpus falcatus, Agave sisalina* and *Clerodendrum myricoides* were perceived as medicinal plants for treating cancer. Besides, 2 species were used for treating blood pressure, 15 for treating malaria, 2 for diabetes, 6 for haemorrhoids and 2 for prostate problems. Most important multipurpose medicinal plants were *Syzgium guineense, Allophylus abyssinicus,* and *Celtis africana.* Local communities perceived that medicinal plants in Arsi Nagelle District have been under serious threat due to agricultural expansion, forest degradation and over harvesting for different purposes including firewood collections. Therefore, urgent conservation measures that include both *in-situ* and *ex-situ* (field gene banks), management of the natural forest with full and effective participation of local communities and other relevant institutions is recommended as a result of this study.

P46 Samuel Brown – digitising a seventeenth-century collection of Indian medicinal plants in the Natural History Museum, London

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In 1697 the English physician Samuel Brown (Browne) sent to London a collection of several hundred pressed and dried plant specimens that were prepared in India in the region of Fort St George (Chennai). These were incorporated as bound books (two volumes) into the collections of Sir Hans Sloane and are now held in the herbarium of the Natural History Museum, London. Along with his original handwritten notes mentioning the medicinal and other uses of the plants, Browne also recorded their vernacular (native names). The collection is one of very few such collections of medicinal plants surviving from the late 17th century. Current work at the Museum in the digitisation of this collection has encountered considerable challenges, as the bound herbarium cannot be opened more than 30 degrees. The challenges and opportunities that arise from the digitisation of historical collections of useful plants are discussed, along with an analysis of the plants collected by Browne near Chennai in relation to today's uses.

P47 Medicinal plants used to manage diabetes in Central America: a review

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Globally more than 400 million people currently have diabetes and worldwide this accounts for about 12% of the global total health care expenditure. As of 2012, its total prevalence in Central America was 8.5%. The population of this region widely use herbal medicine. Therefore the medicinal plants used to manage diabetes and its sequelae, including renal, dermatological and cardiovascular diseases, in seven Central American countries were reviewed. We found 535 species used to manage diabetes and its sequelae, with 104 of these used to manage diabetes specifically. We also found *in vitro* and *in vivo* preclinical experimental evidence of hypoglycaemic effects for 85% of the 20 species reported by at least two sources, whilst there was a lack of randomised controlled clinical trials for most of the species. Considering the cost of diabetes and that for many in Latin American countries, full access to the formal healthcare system may be limited, and that risk of type2 diabetes is associated with low socio-economic position, the current use of medicinal plants provides a health care option that is available, accessible and culturally appropriate. However, more rigorous clinical studies are urgently needed to assess the efficacy and safety of these medicinal plants.

P48 Untangling the taxonomy of African supervegetables (*Solanum* L., Solanaceae)

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Solanum L. (Solanaceae) is a mega-diverse genus of more than 1200 species with worldwide distribution and is comprised of 13 major clades. One of these, the Morelloid clade (the Black Nightshades), has a worldwide distribution with diversity centred in the Old World, where in Africa, many species are important local crops that are experiencing a resurgence in popularity and interest. The taxonomy of the Morelloid clade has long been confused, in part due to polyploidy, but also due to the great variation in morphology due to human selection of genotypes for cultivation, particularly in Africa. There, these species were often collected by early 20th century botanists as "weeds of cultivation", and not recognised as cultivated plants. Of the ca. 75 species in the clade, the majority are distributed in the New World, but 19 are found in the Old World, 10 of which are native to Africa and Madagascar. All of the African species are polyploid and share parental species; they are all members of a monophyletic group within the larger Morelloid clade, with a recent origin. Five species of Morelloids are cultivated in Africa for their fruits and/or their leaves, which are used as spinach and are high in protein and iron. *Solanum scabrum* Mill. is the most commonly cultivated across Africa, and wild populations have consistently been confused with the North African and European species *Solanum nigrum* L. Here we present the newly revised taxonomy of the African species, with discussion of their potential for the future.

P49 Conserving Madagascar's yams through cultivation for livelihoods and food security

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This project engages farmers in the conservation of Madagascan yam diversity while at the same time improving their livelihoods. It works in two regions, endemic-rich Antsiranana province and the COFAV (Fandriana-Vondrozo Corridor) region in Fianarantsoa Province, where winged yams are popular cultivated plants. We are working with 3000 households managed by KMCC (Kew Madagascar Conservation Center). It has currently run for two of three years. The idea is to cultivate at the household level both the wild yam species of the regions and winged yam varieties to minimise extraction from the forest and provide food sufficient for the family. We are collecting seeds of wild yams to be stored at MSB and SNGF and implementing germplasm collections of yams at the community, regional and national levels.

Of the 21 species of yams used in this project, 19 are endemic to Madagascar. To date, 54 seed lots have been harvested, conserving 6 species threatened with extinction; *Dioscorea buckleyana, D. irodensis, D. sambiranensis subsp. bardotiae, D. sambiranensis subsp. sambiranensis, D. orangeana* and *D. pteropoda*.

Preliminary analysis of nutritional values of the tubers of 7 northern species was carried out and suggested a high protein content. We have already made a significant positive impact on conservation and livelihoods in Madagascar and we are developing a national strategy to promote nationwide yam cultivation.

P50 Eat it or lose it! – The nutritional value of plants in promoting sustainable diets and conservation

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Why have our food systems come to rely on such a narrow range of plants of limited nutritional value? Today three plants (rice, maize and wheat) account for more than 50% of calories consumed, while we continue to neglect the huge diversity of nutrient-rich food plants utilized by humanity at one time or another and face diet simplification and increasing levels of malnutrition. The reasons for this are complex and challenging and require innovative approaches to ensure more food diversity on our plates. The "Biodiversity for Food and Nutrition" (BFN) project is working to increase knowledge, appreciation and awareness about the value of underutilized, nutrient-rich biodiversity through strategic research partnerships, lobbying and advocacy to promote their conservation and sustainable use in Brazil, Turkey, Sri Lanka and Kenya. Food composition data revealed the high nutrient content of plants such as: peach palm (*Bactris gasipaes*), buriti (*Mauritia flexuosa*) and camu-camu (*Myrciaria dubia*) from Brazil; golden thistle (*Scolymus hispanicus*), foxtail lily (*Eremurus spectabilis*) and einkorn (*Triticum monococcum*) from Turkey; finger millet (*Eleusine coracana*) and bambara nut (*Vigna subterranea*) from Kenya and centella (*Centella asiatica*) and woodapple (*Limonia acidissima*) from Sri Lanka. We suggest that if we are to reverse this diet simplification it is essential to develop markets and increase demand for food biodiversity, by influencing public policies, recording, developing and spreading methods for cultivation/collection and recipes, linking producers directly to consumers and food procurement, and promoting events such as food fairs. Only then might we see more food diversity on our plates and in our fields.

P51 The occurrence and importance of Crop Wild Relative plants in Poland and in the world

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Crop Wild Relatives (CWR) are wild plants, genetically close to cultivated plants, which have not been domesticated. CWR can be found growing in natural or semi-natural ecosystems, mainly in disturbed habitats as field margins, edges, roadsides, meadows but also in traditionally cultivated agricultural land. Apart from being used in cultivation, the wild relatives are also used in their wild state. Nowadays, few plants from this group are directly used as wild species of edible and medicinal plants, although they provide useful raw materials, for example for the pharmaceutical industry. CWR are used for creating new varieties, as they are perfectly adapted to local conditions and thus constitute a reservoir of valuable genes (resistance to diseases, climate unfavorable conditions, etc.). Worldwide, from among a few thousand wild vascular plants which people used as food, only about 200 species have been domesticated, while the diet most favorable to our health should be the most varied one. Therefore, extinction of a species is a great loss. Many such species are endangered with extinction. We are preparing the Polish Checklist of CWR. It was inventoried with about 1500 CWR species with more or less economic value. Some of them are common to different countries e.g. in Poland and in Madagascar we can find edible CWR as *Potamogeton pectinatus* whether *Samolus valerandi*. Bearing in mind the fast rate of plant extinction in the world nowadays, we are obliged to protect crop wild relatives (*in situ* and *ex situ*) – especially their local forms, varieties and ecotypes – in all parts of our globe.

P52 Postpartum phytomedicine and its future in maternal healthcare in Prey Lang, Cambodia

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Cambodia has reduced maternal mortality rates by modernizing provincial health centres and referral hospitals as well as by banning traditional birthing attendants (TBAs) from practicing. The implications this will have on ethnobotanical knowledge and the local culture are unknown. Because postpartum mortality is a dire reality in Cambodia, this study aimed to document knowledge on traditional phytomedicine for the prevention and treatment of postpartum complications.

Sixty-eight plant species belonging to 33 families were recorded, the most prevalent being Rubiaceae (n=10), Lauraceae (n=4), Leguminosae (n=4) and Smilacaceae (n=3). The most common uses were appetite stimulation (34.2%), improving blood circulation (25.7%) and stimulating milk production (22.8%).

Mothers from two villages in northern Prey Lang, Cambodia, recognized 50–60% of postpartum plants collected by TBAs and there was no significant correlation between plant recognition and the mother's age, nor with the number of pregnancies had. A shift from home births with TBAs towards hospital births in the villages of Chamraeun and Spong was observed. There are similarities and differences in the diversity of Cambodian postpartum plants and their uses compared to neighbouring Laos and Thailand.

We suggest an integrative approach to maternity services is needed in which traditional medicine supplements modern postpartum healthcare, while preserving bio-cultural heritage and potential pharmacological discoveries

P53 Searching for a clinically effective plant medicine to treat the tropical ulcer in Papua New Guinea

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The tropical ulcer is a painful and debilitating bacterial infection of the lower leg that is common in rural Papua New Guinea. Deploying healthcare infrastructure to remote and inaccessible rainforest locations is not practical, therefore local plants may be the only viable treatment option. With this in mind ethnobotanical surveys were conducted in two communities in the remote central mountains of New Britain to identify plant medicines that are applied to tropical ulcers. Samples of plants were tested in disc diffusion assays with *Staphylococcus aureus* and *Fusobacterium ulcerans* and for their ability to stimulate human dermal fibroblast proliferation and inhibit matrix metalloproteinase-9. Two species displayed promising activity. *Homalium foetidum* Benth. inhibited *S. aureus* in a disc diffusion assay, inhibited matrix metalloproteinase-9 and at lower concentrations stimulated human dermal fibroblast proliferation. The exudate of *Ficus botryocarpa* Miq. exhibited greater activity in a *S. aureus* disc diffusion assay than the clinically used antiseptic 0.2% chlorhexidine gluconate. Field observations revealed that when *F. botryocarpa* exudate is applied to a tropical ulcer it dries to form a flexible adhesive covering that actively deters the flies that are known to act as a vector for the disease. Activity-guided fractionation of *F. botryocarpa* exudate yielded an antibacterial compound which was subsequently identified with NMR to be the alkaloid ficuseptine. Future work will include a randomised clinical trial to determine the efficacy of *F. botryocarpa* exudate for treating early stage tropical ulcers.

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