10TH FLORA MALESIANA

SYMPOSIUM PROGRAMME

11 to 15 July 2016

Royal Botanic Garden Edinburgh

CLASSIFY CULTIVATE CONSERVE

FLORA MALESIANA

Royal Botanic Garden Edinburgh

WELCOME MESSAGE

On behalf of the organising committee it is my great pleasure to welcome you to Edinburgh, the Royal Botanic Garden Edinburgh and the 10th International Flora Malesiana Symposium.

This year's symposium brings together taxonomists, horticulturists and conservationists from across the world to discuss their research and conservation activities on the plant diversity of the Malesian region.

The theme of this year's symposium is 'Classify, Cultivate, Conserve'. At the heart of the symposium is the taxonomic research which underpins all biodiversity research, in particular publications that document and help us better understand the massive diversity of the region. In this symposium we also want to highlight and celebrate the role that horticulture has had in helping us understand this diversity and how it contributes to conservation actions.

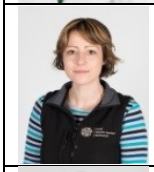
We hope that by bringing taxonomists, horticulturists and conservationists together in a single symposium, we will better understand the needs of each other and how to be more efficient and effective in helping describe and protect the plant diversity of the region.

The symposium is about bringing people together who are passionate about Malesian plants, and about inspiring them to go forward to develop and deliver new and exciting research and conservation projects. It is also about meeting old friends and making new ones. We hope that the scientific and social programme we have put together will encourage you to do both.

Finally I would like to thank the Directors of the Royal Botanic Garden for supporting the symposium, the organising committee for their hard work over the past 6 months for making the symposium possible and all delegates for submitting a great range of talks and posters, which we are sure will make for a fantastic symposium.

Dr Peter Wilkie
Chairperson of the 10th International Flora Malesiana Symposium
Royal Botanic Garden Edinburgh

ORGANISING COMMITTEE

		Peter Wilkie (Chairperson)	
	George Argent		Mark Hughes
	Hannah Atkins		Vlasta Jamnicky
	Sadie Barber		Mark Newman
	Robyn Drinkwater		Carmen Puglisi
	Liz Leith		Duncan Reddish
	Louise Galloway		Lesley Scott
	Shauna Hay		Helen Yeats

FINANCIAL SUPPORT

In addition to the Royal Botanic Garden Edinburgh, we would like to thank the following for financial and logistical support of the conference:

SIBBALD TRUST · EDINBURGH BOTANIC GARDEN

FLORA MALESIANA

Supported by the Friends of Royal Botanic Garden Edinburgh

TURKISH AIRLINES

The M.L. MacIntyre BEGONIA TRUST

CONVENTION EDINBURGH

VENUE INFORMATION

The symposium will take place in the science and education buildings of the Royal Botanic Garden Edinburgh. The entrance is at 20a Inverleith Row (postcode EH3 5LR), about 5 minutes' walk past the public East Gate entrance to the Garden on Inverleith Row. See the map on page 6 for directions.

Registration Desk
The main point of contact for all enquiries regarding the symposium will be the Flora Malesiana Registration Desk to the left of the main reception desk. There will be someone at the desk each day from 08:00 to 18:00.

All venues are within a couple of minutes' walk of the Registration Desk and are accessible to those with impaired mobility.

Main venues
Presentations will take place in the Lecture Theatre or the Conference Room next door. Workshops will take place upstairs in the Teaching Laboratory or in Lecture Room 1. All venues will be clearly signposted; maps of the venue are on pages 7–9.

Delegate Message Board
Delegates can leave messages to contact each other on the Delegate Message Board next to the Flora Malesiana Registration Desk. Delegates are also encouraged to use the symposium social media sites: Facebook (Flora Malesiana 10), twitter (@fmalesiana10) and Instagram (#floramalesiana10).

Smoking
Please note that it is against the law to smoke in any indoor venues in Scotland. There is a designated smoking area between the exit to the Garden from the conference room and the Fletcher Building.

Security
All delegates must wear their symposium badge for the duration of the meeting for security reasons and to give you access to food and drink. If you have lost your badge please go to the reception desk for a replacement.

On the first and last day of the symposium the Board Room will be allocated to store luggage. This will be locked and delegates will have to show the ticket issued to them when depositing their bags in order to retrieve them.

Wi-Fi
WI-FI is available in all areas of the symposium. Delegates should click 'Botanics Visitor', and there is no password required. If a password is required for some areas, signs will be clearly visible supplying the required password.

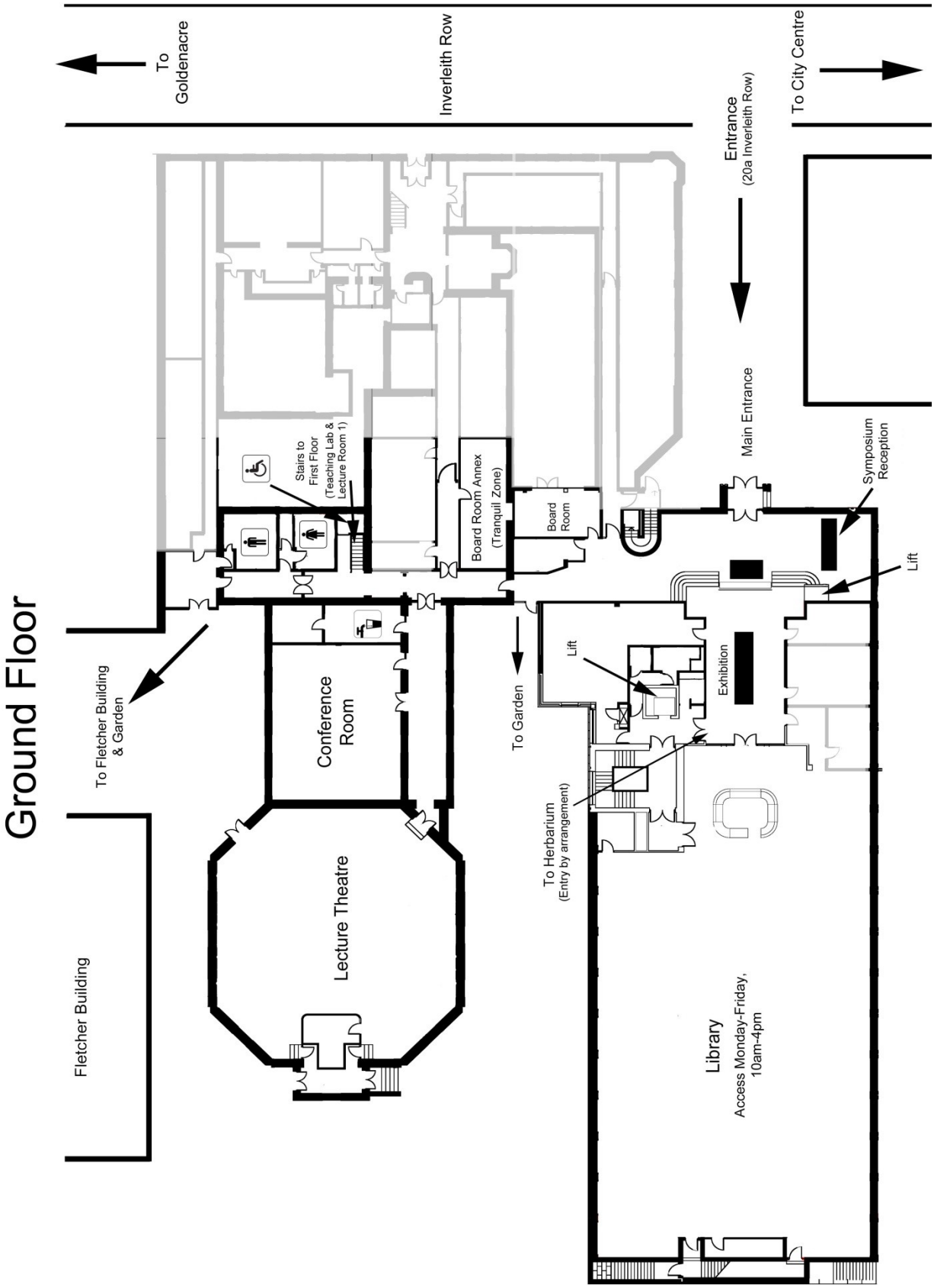
Tranquil Zone
The designated 'Tranquil Zone' is in the Board Room Annex on the ground floor of the Balfour Building. This area is for delegates to relax, catch up on emails and write up notes etc. It is open from 09:00 to 17:00 every day.

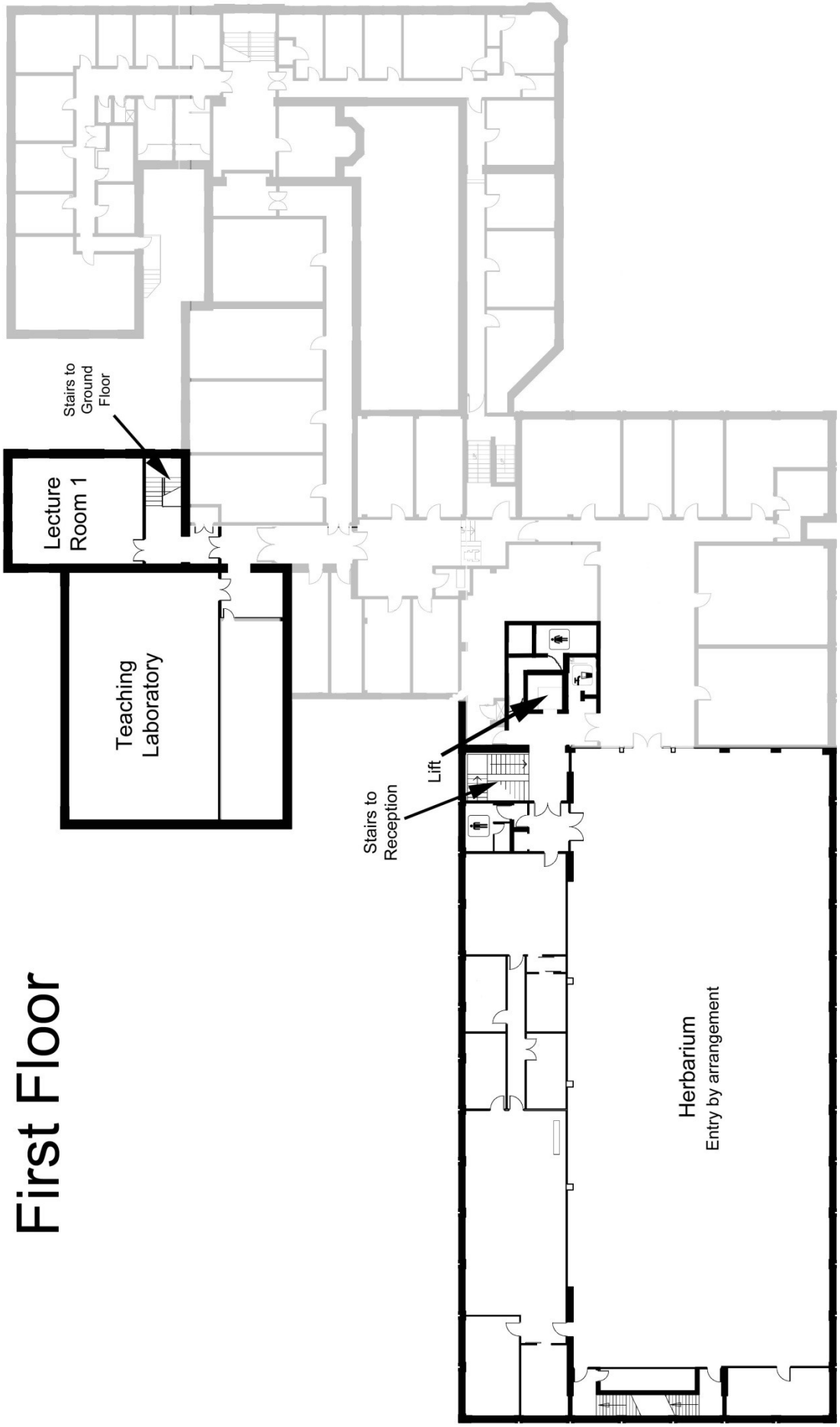
Catering
During the sessions all tea, coffee and lunches will be provided free of charge to registered participants. These will be served in the Fletcher Building. All food during the symposium is halal, and vegetarian options will be provided. On Wednesday (the half day), a packed lunch will be available to registered participants from the Fletcher Building.

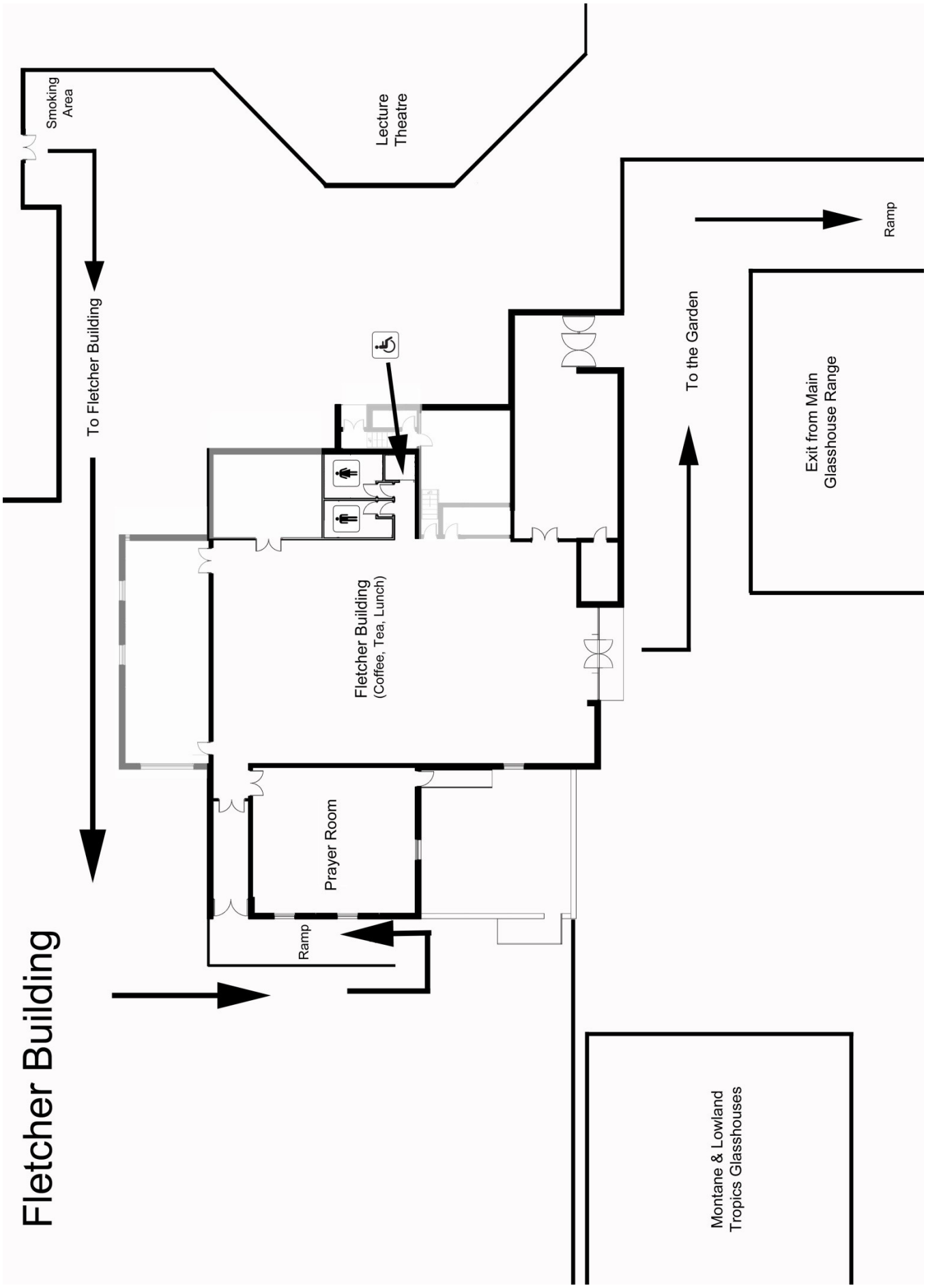
Drinking water
All registered delegates have a biodegradable FM10 water bottle in their conference pack. Water from all taps in the buildings is of drinking quality. A dedicated water tap can be found next door to the conference room and in the Board Room Annex 'Tranquil Zone'.

Prayer room
A prayer room is located in the Fletcher Building next door to where tea and coffee is served.

SYMPOSIUM VENUE MAPS


Ground Floor
To Goldenacre
Inverleith Row
Entrance
(20a Inverleith Row)
To City Centre
Main Entrance
Symposium Reception
Lift
Stairs to First Floor (Teaching Lab & Lecture Room 1)
Board Room Annex (Tranquil Zone)
Board Room
Lift
Exhibition
To Fletcher Building & Garden
Conference Room
To Garden
To Herbarium
(Entry by arrangement)
Lecture Theatre
Fletcher Building
Library
Access Monday-Friday, 10am-4pm


First Floor
Lecture Room 1
Stairs to Ground Floor
Teaching Laboratory
Lift
Stairs to Reception
Herbarium
Entry by arrangement


Fletcher Building
Smoking Area
To Fletcher Building
Lecture Theatre
Fletcher Building
(Coffee, Tea, Lunch)
Prayer Room
Ramp
To the Garden
Ramp
Exit from Main Glasshouse Range
Montane & Lowland Tropics Glasshouses

SCIENTIFIC PROGRAMME

Presentations
The conference will be using MS PowerPoint in all venues. All delegates must submit their presentation to the Registration Desk. For morning presentations, these should be submitted to the Registration Desk by 08:15 at the latest. For afternoon presentations, these should be submitted by the start of the lunch break. Please make sure that the number of your talk (given to you when you submitted your abstract to Easychair) is included in the file name.

All submitted paper presentations are of 15 minutes' duration with 5 minutes for discussion. Please keep to this time so that delegates can move between parallel sessions. Chairpersons have been instructed to interrupt presentations that exceed their time limit.

Instructions for operation of the equipment will be given before each session. Please arrive at your session at least 15 minutes before your session starts.

Posters
Poster boards are available in the Fletcher Building. Please place your poster next to the number allocated to you when you submitted your abstract to Easychair. Pins and Velcro tape will be available to help secure the posters. There is a formal poster session on Tuesday afternoon, but we encourage all posters to be placed on the display boards at the start of the symposium. At the formal poster session we expect authors to be standing next to their posters.

New Publications
Before the poster session on Tuesday afternoon there will be a series of short presentations by several authors who have published new books since the last Flora Malesiana Symposium.

Impromptu meetings
The Board Room will be available to delegates for impromptu meetings. To arrange use of this room please contact the Registration Desk.

Herbarium access during the Symposium
Our Herbarium is available for consulting specimens during the symposium. Access is by arrangement at the Registration Desk and Herbarium staff will be available every half hour at the desk to escort delegates to the collections. You will be asked to complete a form giving your name and institute details, your area of interest and also an example of your handwriting for any determination slips you complete. The Herbarium will be open from 08:30 to 17:00 each day of the symposium.

Speed-detting sessions
Each morning images of some unidentified herbarium specimens will be shown to delegates in the lecture theatre. If you want to have a go at trying to identify these, then let the Herbarium staff know and they will direct you to the area where they have been laid out for consultation.

Library access
Delegates are welcome to use the Library for reference purposes during opening hours (Monday to Friday, from 10:00 to 16:00). Please ring the doorbell at the Library entrance for access. If additional access is required please contact the Reception Desk with details of times and materials required; requests will be passed to the Head of Library and Archives (Lorna Mitchell) for consideration.

Glasshouse access
Delegates are exempt from the usual £5.50 charge for access to the public glasshouses when wearing their conference badge.

SOCIAL PROGRAMME

Welcome reception
There will be a welcome reception in the iconic Temperate Palm House on Monday evening from 18:00 to 20:00. Light refreshments and snacks will be served. Delegates will have a chance to walk through the other glasshouses during this event. This is free to all registered delegates.

Symposium dinner
The symposium dinner will be held on Tuesday in the beautiful City Chambers at the heart of the Royal Mile and is to be hosted by the Lord Provost of the City. Participants should arrive for 19:00. The event will consist of a buffet-style sit down meal, refreshments and entertainment. It is only open to delegates who have purchased tickets; please check at the Registration Desk if you are unsure. The number 23 and 27 buses from outside the Gardens on Inverleith Row will take you to the Royal Mile, from where it is a 2-minute walk to the City Chambers (opposite Saint Giles Cathedral, see city map).

Half day
Wednesday afternoon is free for delegates to do as they wish. If you have taken advantage of the symposium tours on offer via our website, you will be met at the Registration Desk. If places are still available, you will be able to purchase a ticket at the Registration Desk on arrival in Edinburgh.

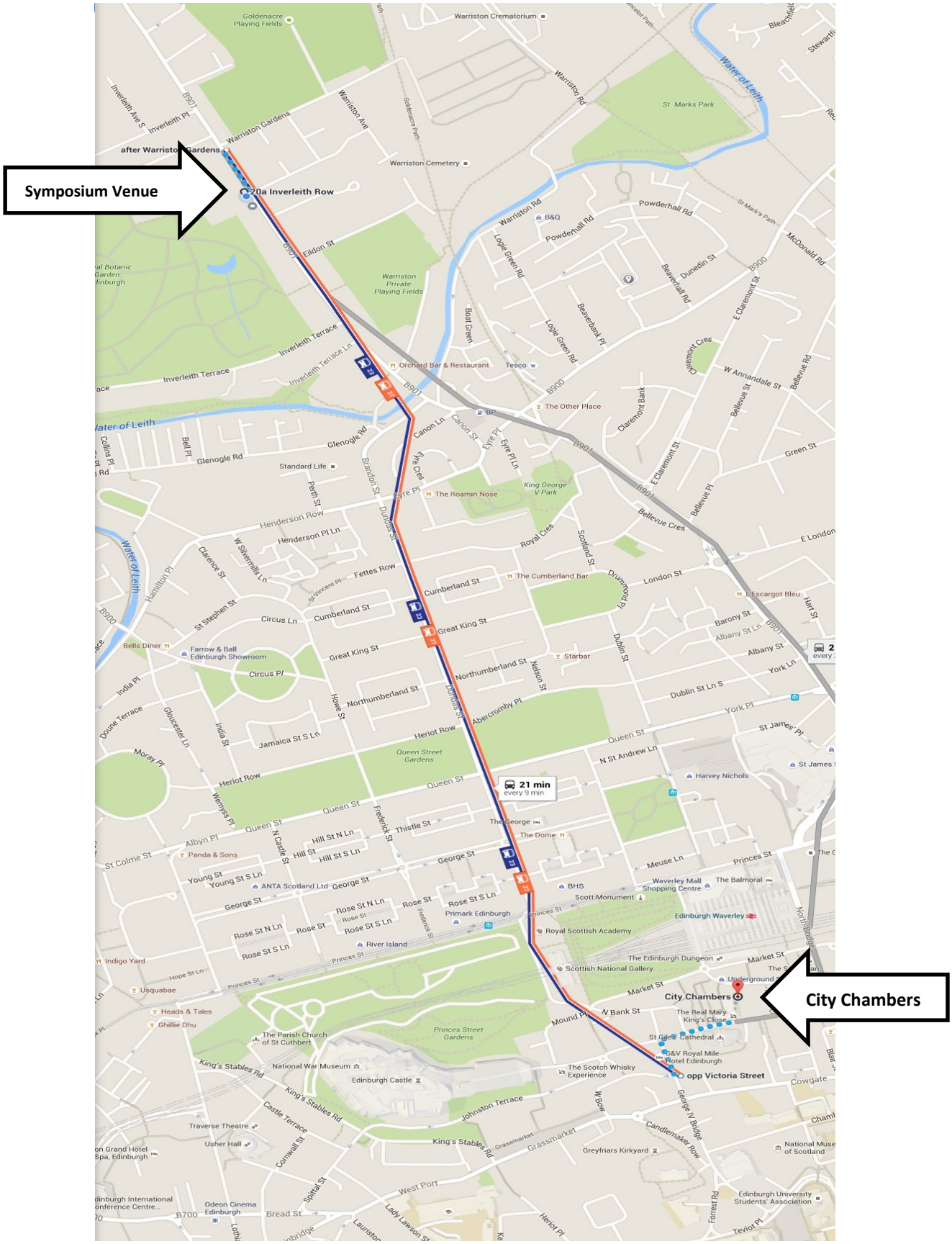
There will also be an opportunity to have a free guided tour of the Garden and Botanics Cottage in the afternoon. These can be booked on the day at the Registration Desk. Delegates will have free access to the glasshouses if they show their symposium badge.

Ceilidh (traditional Scottish dance)
This will take place on Thursday in the Fletcher Building from 19.30 and is free to all participants. Light refreshments and snacks will be provided. This will be your chance to dance with and take pictures of men in kilts!

Nature Mother of Invention Exhibition
There is an exciting free exhibition celebrating the plant family Sapotaceae in the John Hope Gateway at the West Gate of the Garden. This is where you will also find the Botanics shop for those important presents to take home!

BOTANIC GARDEN TO CITY CHAMBERS

(Bus Route 23 or 27)



SYMPOSIUM PROGRAMME OVERVIEW

Sunday 10 July 2016			
14.00–16.00	Registration – Main Reception		
Monday 11 July 2016			
8.00–9.00	Registration – Main Reception		
	Lecture Theatre		
9.00–10.00	Opening ceremony		
10.00–10.40	**Keynote Lecture:** Peter Ashton: Tree demography plots: a neglected resource for systematic and conservation research.		
10.40–11.30	Morning Break (Tea/Coffee)		
	Lecture Theatre	**Conference Room**	**Lecture Room 1**
11.30–12.50	Session 1A. Flora Malesiana	Session 1B. Orchidaceae	
12.50–14.00	**Lunch**	**Lunch**	
14.00–15.20	Session 2A. Species Discovery	Session 2B. Taxonomy & Phylogenetics	Workshop 1: Interpreting and presenting phylogenetic trees
15.20–15.50	**Afternoon Break (Tea/Coffee)**	**Afternoon Break (Tea/Coffee)**	
15.50–17.50	Session 3A. Floras	Session 3B. Taxonomy & Phylogenetics	
17.50–18.00	Group photograph (Lecture Theatre and Palm House)		
18.00–20.00	Palm House welcome reception		
Tuesday 12 July 2016			
	Lecture Theatre		
9.00–9.10	Announcements		
9.10–9.50	**Keynote:** Tony Whitten: The Trees I have Loved and Lost.		
	Lecture Theatre	**Conference Room**	**Lecture Room 1**
10.00–11.00	Session 4A. Botanic Gardens	Session 4B. Ethnobotany	
11.00–11.30	**Morning Break (Tea/Coffee)**	**Morning Break (Tea/Coffee)**	
11.30–12.50	Session 5A. Conservation	Session 5B. Taxonomy & Phylogenetics	
12.50–14.00	**Lunch**	**Lunch**	
14.00–15.40	Session 6A. Biogeography	Conservation 6B. Beyond Red Listing	Workshop 2: Nomenclature Helpdesk
15.40–16.10	**Afternoon Break (Tea/Coffee)**	**Afternoon Break (Tea/Coffee)**	
	Fletcher Building		
16.10–17.30	Session: 7A. New Books & Poster Viewing		
19.00–23.30	Symposium Dinner- City Chambers		
Wednesday 13 July 2016			
	Lecture Theatre		
9.00–9.10	Announcements		
9.10–9.50	**Keynote:** George Argent: Waiting for the flowers- the role of living collections in taxonomic research.		
	Lecture Theatre	**Conference Room**	**Teaching Laboratory**
10.00–11.00	Session 8A. Cultivate	Session 8B. Begoniaceae	Workshop 3A: Cultivation of tropical plants
11.00–11.30	**Morning Break (Tea/Coffee)**	**Morning Break (Tea/Coffee)**	
11.30–12.50	Session 9A. E-taxonomy	Session 9B. Plant-Animal Interactions & Ecology	Workshop 3B: Cultivation of tropical plants
12.50–14.00	**Packed Lunch**		
14.00–17.00	Tours, Free time	FM Board Members meeting (Board Room)	

SYMPOSIUM PROGRAMME OVERVIEW

Thursday 14 July 2016			
	Lecture Theatre		
9.00–9.10	Announcements		
9.10–9.50	**Keynote:** Sara Oldfield: Conserving plant diversity – scaling up action.		
	Lecture Theatre	**Conference Room**	**Lecture Room 1**
10.00–11.20	Session 10A. Taxonomy: Structure and Development	Session 10B. Conservation	
11.20–11.40	**Morning Break (Tea/Coffee)**	**Morning Break (Tea/Coffee)**	
11.40–13.00	Session 11A. Taxonomy	Session 11B. Conservation	Workshop 4: Implementing the Nagoya Protocol on Access and Benefit Sharing in the UK
13.00–14.00	**Lunch**	**Lunch**	
14.00–15.20	Session 12A. Biogeography	Session 12B. Taxonomy	Workshop 5: Submitting Global Red List Assessments to IUCN
15.20–16.10	**Afternoon Break (Tea/Coffee)**	**Afternoon Break (Tea/Coffee)**	
16.10–17.50	Session 13A. Zingiberaceae	Session 13B. Taxonomy	
	Fletcher Building		
19.30–23.30	Ceilidh (traditional scottish dancing)		
Friday 15 July 2016			
	Lecture Theatre		
9.00–9.10	Announcements		
9.10–9.50	**Keynote:** Joeni Setijo Rahajoe: 175 Years of Herbarium Bogoriense and its role in producing an enumeration of biodiversity in Indonesia 2015.		
	Lecture Theatre	**Conference Room**	**Lecture Room 1**
10.00–11.00	Session 14A. Flora Malesiana	Session 14B. Phylogenetics	
11.00–11.30	Morning Break (Tea/Coffee)	Morning Break (Tea/Coffee)	
11.30–12.50	Session 15A. *Hoya*	Session 15B. Ecology	
12.50–14.00	**Lunch**	**Lunch**	
14.00–15.20	Session 16A. Ecology	Session 16B. DNA Barcoding	Workshop 6: Taxonomy Tricks of the Trade
15.20–15.40	**Afternoon Break (Tea/Coffee)**		
15.40–16.30	Closing ceremony		

KEYNOTE LECTURES

Monday 11 July 2016

Tree demography plots: a neglected resource for systematic and conservation research

Peter Ashton
Bullard Professor of Forestry Emeritus at Harvard University

The pantropical network of large, tree demography, plots coordinated by the Smithsonian's Center for Tropical Forest Science has now gone global, as part of the Smithsonian Institution Global Earth Observatories. Some 4 million tropical trees representing about 10,000 species are now tagged, provisionally identified and periodically recensussed; some 3,000 thousand species are captured in the six plots within Malesia. These include species rarely collected, many now endangered. Easy location for periodic examination for fertile material, and detailed ecological data, and seasoned in-country research teams, provide unique opportunities for research collaboration.

Tuesday 12 July 2016

The trees I have loved and lost

Tony Whitten
Director-Asia-Pacific, Fauna and Flora International

The last 40+ years has witnessed a great deal of change in forest cover in the Malesian region, with the result that many forest species have become highly threatened. The speaker will reflect on his experience and observations during that period. The talk will focus on a number of tree and palm species, trace their demise, the causes, and the outlook. It will reflect on the Global Trees Campaign in Fauna & Flora International and summarise the approach, the aspirations and the needs, which will be discussed in more detail in a separate workshop later in the meeting.

KEYNOTE LECTURES

Wednesday 13 July 2016

Waiting for the flowers – the role of living collections in taxonomic research

George Argent
Research Associate, Royal Botanic Garden Edinburgh

Since the establishment of the Royal Botanic Garden Edinburgh in 1670 as a collection of medicinal plants, taxonomy has been at its heart. Even before the publication of *Linnaeus Species Plantarum* it was important to establish the correct identity of medicinal plants for use by the doctors of the day. Over the years the location and focus of the garden has evolved to serve many and varied functions. Taxonomy however has continued to play a key role in preserving the special nature of the garden as a 'botanic garden'. From the earliest years exotic plants were introduced to the garden, giving it an international flavour, and this has continued with staff today collaborating with many different gardens and botanical institutions around the world. For over 300 years, living plants have been brought to the garden, grown to maturity and described. Many of the early novelties came from North America and China, especially Gymnosperms and Rhododendrons. Today much of our efforts are focused on plants from areas that are botanically rich but poorly known such as the Malesian region and on families *Begoniaceae*, *Gesneriaceae* and *Zingiberaceae*. The expertise and ingenuity of the horticultural staff has been essential in cultivating unknown species and bringing them into flower so that they can be scientifically described. This has been aided by an enlightened policy of including horticulturists on collecting expeditions so that their knowledge can be used to bring plants back in good health but also to better understand the natural conditions in which they grow so that the plants can be grown to perfection in Edinburgh.

Thursday 14 July 2016

Conserving plant diversity – scaling up action

Sara Oldfield
Chair of the IUCN/SSC Global Tree Specialist Group

This talk will highlight the work of different agencies involved in preventing the extinction of plant species and the urgent need for more coordinated action. The fundamental importance of taxonomic botany will be emphasised as a basis for conservation decisions. The multi-functional role of botanic gardens as agents for plant conservation will be highlighted with examples of international collaboration. International UN targets have been agreed for biodiversity conservation by 2020 and progress towards these will be discussed using examples from the Flora Malesiana region. Suggestions will be made for prioritising further action.

Friday 15 July 2016

175 Years of Herbarium Bogoriense and its role in producing an enumeration of biodiversity in Indonesia 2015

Joeni Setijo Rahajoe
Head of Botany Division, Research Centre for Biology, Indonesia

The Indonesian archipelago is recognised as one of the world's biodiversity hotspots. To date 120 species of Gymnosperms have been recorded, with the highest diversity found in Sulawesi. It is estimated that there are 30,000–40,000 species of Angiosperms in Indonesia, of which only 19,122 (about 50%) have so far been recorded. Levels of endemism are also exceptionally high in Indonesia with about 40–50% of plants endemic to the country. Of the 1.5 million species of fungi in the world, about 750,000 species have been described so far. In Indonesia there is an estimated 80,000 species, of which 16,000 are macro fungi, and 64,000 micro fungi. Just over 20% of known Pteridophytes are also found in Indonesia. An important source of authoritative information about the Indonesian flora is provided by the collections of Herbarium Bogoriense (BO). Inaugurated with the name 's'Lands Plantetuin te Buitenzorg' in 1817, it was established in Bogor Botanical Garden as the reference of Indonesian plants, especially for agriculture and horticulture. In 1841 the Herbarium was established, followed by Museum Zoologicum Bogoriense (1894) and the microbial cultures collection (InaCC-LIPI) in 2014. These reference collections have played a crucial role in recording, mapping and monitoring the distribution of biodiversity in Indonesia and have allowed the production of the '*Present status of biodiversity in Indonesia*'.

WORKSHOPS

The FM10 workshops are intended to be much more informal and interactive than the general presentations at the symposium. They are about sharing information and ideas!

Workshop 1: Interpreting and presenting phylogenetic trees
Lecture Room 1
Coordinator: Toby Pennington and Subhani Ranasinghe, Royal Botanic Garden Edinburgh.

This workshop is aimed at early career researchers who want to learn a bit more about interpreting phylogenetic trees in publications. It will highlight some of the most common mistakes in interpreting relationships among taxa and what different measures of branch support mean. It will also cover ways and software with which researchers can present their own phylogenetic trees.

Workshop 2: Nomenclature Helpdesk
Lecture Room 1
Coordinator: John McNeill, Chairman, Editorial Committee, International Code of Nomenclature for algae, fungi, and plants.

This workshop will provide an introduction to the history of the code and its evolution between botanical congresses. It will explain how the congress works with respect to nomenclature and then highlight some of the most important aspects of the code itself. It will then go on to highlight proposals submitted to amend the Melbourne code (2011) at the Shenzhen Congress in 2017. After the introduction a general discussion will take place then a nomenclatural helpdesk will be held to deal with specific questions. Arrive early to book a slot with the 'King of Nomenclature'!

Workshop 3: Cultivation of tropical plants
Teaching Laboratory
Coordinator: Sadie Barber, Helen Yeats, Royal Botanic Garden Edinburgh; Wisnu Handoyo Ardi, Kebun Raya, Bogor.

Aimed at horticulturists and scientists alike, this workshop is an introduction to techniques of propagating, cultivating and documenting living plant collections. There will be mini-workshops highlighting the following: field techniques; propagation of Begonias and Gesneriaceae; specialist propagation of ferns; care and cultivation of Zingiberaceae. There will also be opportunity to learn some origami at the 'Botanical Envelopes Table'. This 1-hour workshop will run twice, however numbers will be limited and booking early is advised.

Workshop 4: Implementing the Nagoya Protocol on Access and Benefit Sharing in the UK
Lecture Room 1
Coordinator: Katie Beckett, ABS Project Manager, Regulatory Delivery, The Department for Business, Innovation and Skills, UK Government.

This workshop will provide an introduction to the Nagoya Protocol on Access and Benefit Sharing (ABS) and implementation of the EU Regulation on ABS in the UK. Participants will be introduced to the tools available to understand and address regulatory obligations, including the ABS Clearing House, and will receive an update on the provision of further guidance and support documents. Examples of relevance will be explored in an interactive session and there will be an opportunity for open discussion and to ask questions.

Workshop 5: Submitting Global Red List Assessments to IUCN Red List
Lecture Room 1
Coordinator: Malin Rivers, Botanic Garden Conservation International; Sara Oldfield, IUCN/SSC Global Tree Specialist Group; Saw Leng Guan, Forest Research Institute Malaysia.

Assessing the conservation status of plant species is an essential component of biodiversity conservation action. It is a global priority to assess all plant species to the best extent possible by 2020. This workshop will discuss the process of producing a global assessment using the International Union for Conservation of Nature (IUCN) Red List categories and criteria, with a focus on tree species to facilitate progress with the Global Tree Assessment (a joint initiative developed by BGCI and the IUCN/SSC Global Tree Specialist Group). The workshop will highlight data requirements, including mapping standards, and common pitfalls in the red listing process. Participants will be expected to participate in a review of proposed assessments and to enter new assessments into the IUCN Species Information Service (SIS) database. This workshop will be of interest to all researchers sharing botanical information in the service of conservation. It is particularly important for those who have produced provisional or national red list assessments for trees or any other plant species and who would like to learn more about submitting global assessments to IUCN.

Workshop 6: Taxonomy Tricks of the Trade
Lecture Room 1
Coordinator: David Middleton, Singapore Botanic Gardens; Robyn Drinkwater, Royal Botanic Garden Edinburgh.

This workshop is aimed at early career researchers who want to pick up tips on how to speed up and improve their taxonomic research and publications. Some of the most useful available online resources will be discussed, the most important Malesian literature will be highlighted, and ideas on how best to present your data and what information to include will be explored. Good and bad practice in the drafting and submission of papers for publication will be discussed so that the review and publication process can be as smooth as possible.

SESSIONS – MONDAY

Session 1A

Lecture Theatre

	Session 1A. Flora Malesiana
11.30–11.50	M. Roos: Progress of Flora Malesiana (164)
11.50–12.10	T. D. Hamann: Digitalisation and mark-up of Flora Malesiana: Results and future challenges (53)
12.10–12.30	B. Parris: The Flora Malesiana account of grammitid ferns (Polypodiaceae) – a progress report (43)
12.30–12.50	D. Middleton: The Gesneriaceae in Asia (50)

Session 1B

Conference Room

	Session 1B. Orchidaceae
11.30–11.50	Rusea Go: Current knowledge on Orchid diversity in Penninsular Malaysia including new records and discoveries (8)
11.50–12.10	A. Schuiteman: Anatomy of a hotspot: *Dendrobium* (Orchidaceae) in New Guinea (79)
12.10–12.30	Jing Wei Yap et al.: Molecular systematics and biogeography of the Malesian slipper orchids (*Paphiopedilum* section *Barbata*) (84)
12.30–12.50	C. Yiing Ling & J. Sang: Diversity of Orchidaceae from Murum Dam, Belaga, Sarawak, Borneo (64)

Session 2A

Lecture Theatre

	Session 2A. Species Discovery
14.00–14.20	K. Yan Chong et al.: New records, rediscoveries, and the floristic value of Singapore's last substantial tract of freshwater swamp forest (73)
14.20–14.40	P. W. Fritsch et al.: Plant exploration and discovery in Mindanao, Philippines (86)
14.40–15.00	D. Madulid & **E. M. Agoo**: A review of species discoveries of seed plants in the Philippines for the quarter century 1990–2015 (7)
15.00–15.20	W. H. Ardi & Daniel C. Thomas: Progress in understanding the *Begonia* flora of the Moluccas (157)

Session 2B

Conference Room

	Session 2B. Taxonomy & Phylogenetics
14.00–14.20	V. Linis et al.: Molecular phylogenetics of order Hypnales with emphasis on *Ectropothecium* (Musci: Hypnaceae) (13)
14.20–14.40	R. Clark et al.: *Bauhinia* s.l (Leguminosae-Caesalpinioideae) – how many genera in SE Asia? (59)
14.40–15.00	J. Gagul et al.: Molecular phylogenetics of *Elaeocarpus* (Elaeocarpaceae) with a focus on New Guinea species (87)
15.00–15.20	M. Coode: Progress in Elaeocarpaceae for Flora Malesiana (150)

Workshop 1

Lecture Room 1

14.00–15.20	Workshop 1: Interpreting and presenting phylogenetic trees

Session 3A

	Lecture Theatre
	Session 3A. Floras
15.50–16.10	H. Balslev: The Flora of Thailand – current status and future perspectives (30)
16.10–16.30	C. Pendry et al.: The Flora of Nepal – a born-digital Flora (146)
16.30–16.50	E. Hartono et al.: Flora of Bangka – A preliminary check list (114)
16.50–17.10	S. A. Guerrero et al.: Floristic Inventory at Weda Bay (Halmahera, North Maluku, Indonesia) (56)
17.10–17.30	H. Rustiami et al (**Presented by Dedy Darnaedi**): An introduction to the flora of Lesser Sunda Island (68)
17.30–17.50	S. Swangpol & W. Inta: An update on the banana family (Musaceae) in the Flora of Thailand (121)

Session 3B

	Conference Room
	Session 3B. Taxonomy & Phylogenetics
15.50–16.10	W. Wardani & B. Adjie: Preliminary Study on the genus *Athyrium* in Malesia: names, distribution, and planned project (65)
16.10–16.30	Wai-Chao Leong et al.: (**Presented by Kuo-Fang Chung**): Molecular phylogentics and biogeography of Asian *Begonia,* with an emphasis on the continental species (101)
16.30–16.50	J. J. Obico & **M. E. Ragragio**: A survey of plants used as repellents against hematophagous insects by the Ayta people of Porac, Pampanga province, Philippines (3)
16.50–17.10	I. Haerida: Thalloid liverworts of Bali (15)
17.10–17.30	Saroj Ruchisansakun et al.: A Revision of Balsaminaceae in Myanmar (151)
17.30–17.50	C. Elmido et al.: Evaluation of antibacterial activity of indigenous plants from Cordillera, Philippines against *Pseudomonas aeruginosa* (113)

Group Photograph/Welcome Reception

17.50–18.00	Group photograph (Lecture Theatre and Palm House)
18.00–20.00	Palm House welcome reception

SESSIONS – TUESDAY

Session 4A

Lecture Theatre

	Session 4A. Botanic Gardens
10.00–10.20	P. J. A. Kessler: Hortus Botanicus Leiden – Challenges in an academic environment (38)
10.20–10.40	Sri Rahayu & Didik Widyatmoko: Towards 200 years of Bogor Botanic Gardens and the role role in plant conservation: Plants and people in harmony (167)
10.40–11.00	S. Lindsay & D. Middleton: The Gardens of Singapore – contrasting but complementary ways of enthusing and educating the public about plants (96)

Session 4B

Conference Room

	Session 4B. Ethnobotany
10.00–10.20	C. Hansel & M. Sunggod: Ethnobotanical knowledge in a Maranao community in Lanao del Sur province, Mindanao Island, Philippines (24)
10.20–10.40	Jin-Hyub Paik et al.: The Joint Research Project for Indonesian Medicinal Plants (123)
10.40–11.00	T. Baangcod & K. Balangcod: Ethnomedicinal plants in Bayabas, Sablan, Benguet Province, Luzon, Philippines (34)

Session 5A

Lecture Theatre

	Session 5A. Conservation
11.30–11.50	J. Sang & J. Abdullah: Enhancing the value of Totally Protected Areas in Sarawak (89)
11.50–12.10	V. Amoroso et al.: Mt. Hamiguitan: A UNESCO World Heritage Site and Sanctuary for Philippine *Nepenthes* and Pteridophytes (14)
12.10–12.30	P. Wilkie: A Red List of all Sapotaceae by 2020? (163)
12.30–12.50	P. Hutabarat & P. Wilkie: The Sapotaceae of Indonesia and the potential role of Botanic Gardens in their conservation (145)

Session 5B

Conference Room

	Session 5B. Taxonomy & Phylogenetics
11.30–11.50	H. Atkins et al.: Untangling *Cyrtandra:* a mega diverse genus in the Malesian hotspot (139)
11.50–12.10	A. Kartonegoro et al.: The genus *Aeschynanthus* (Gesneriaceae) in Malesia, how many species are there? (32)
12.10–12.30	Tanawat Chaowasku et al.: More generic novelties in Asian Malmeoideae (Annonaceae) revealed by molecular phylogenetic analyses (124)
12.30–12.50	Wei-Bin Xu et al.: Phylogeography of *Primulina bipinnatifida* (Gesneriaceae) species complex – Insights into limestone karst plant diversification and implication for its classification (100)

Session 6A

Lecture Theatre

	Session 6A. Biogeography
14.00–14.20	J. Richardson: Sapotaceae and the the Malesian floristic interchange (162)
14.20–14.40	D. S. Penneys et al.: A revised classification of the Melastomataceae: implications for the biogeography and conservation of the flora of SE Asia (137)
14.40–15.00	E. Lucas et al.: Eastern origins of fleshy fruited Myrtaceae (126)
15.00–15.20	S. Matuszak et al. (A Muellner-Riehl to present): Origin, evolution, assembly of biodiversity: examples of the mainland Asian – SE Asian connection (140)
15.20–15.40	A. D. Poulsen: The evolution of eastern gingers (152)

Session 6B

	Conference Room
	Session 6B. Beyond Red Listing
14.00–14.20	D. Gill et al.: Steps after Red Listing: how can we prioritise and take action for the region's most threatened trees? (119)
14.20–14.40	Kusumadewi Yulita et al.: Strategic conservation plan and action for the most threatened tree species in Indonesia (104)
14.40–15.00	Leng Guan Saw et al.: Beyond Red Listing: Implementation of action plans for the conservation of threatened plants in Peninsular Malaysia (132)
15.00–15.20	Discussion

Workshop 2

	Lecture Room 1
14.00–15.40	Workshop 2: Nomenclature Helpdesk

Session 7A

	Fletcher Building
	Session: 7A. New Books & Poster Viewing
16.10–16.40	Book Launch
16.40–17.30	Poster Session

Symposium Dinner

	City Chambers
19.00–23.30	Symposium Dinner

SESSIONS – WEDNESDAY

Session 8A

	Lecture Theatre
	Session 8A. Cultivate
10.00–10.20	K. S. Walter: Collections without data – what's the point? (160)
10.20–10.40	T. Lamb: A Botanist in Borneo 1976-2016 – collections and conservation efforts (142)
10.40–11.00	H. Ninnis: The Eden Projects *Musa* Story (39)

Session 8B

	Conference Room
	Session 8B. Begoniaceae
10.00–10.20	D. Girmansyah & M. Hughes: New discoveries in *Begonia* from Kalimantan (134)
10.20–10.40	M. Hughes et al.: Completing the *Begonia* Flora of Sumatra (148)
10.40–11.00	R. Rubite et al.: Three new species of *Begonia* endemic to the Puerto Princesa Subterranean River National Park, Palawan (16)

Workshop 3A

	Teaching Laboratory
10.00–11.00	Workshop 3A: Cultivation of tropical plants

Session 9A

	Lecture Theatre
	Session 9A. E-taxonomy
11.30–11.50	S. James: Integrated Digitized Biocollections (iDigBio): mobilizing natural history collections for enhanced classification and conservation of Malesian floral biodiversity (21)
11.50–12.10	C. Miller & M. Watson: Integrating digital identifiers for the World Flora Online (117)
12.10–12.30	C. Webb: A Morphotype and Taxonomy Clearing House (MaTCH): hacking Malesian plant data (57)
12.30–12.50	R. Page: Open versus closed data and the challenge of creating a 21st century flora (155)

Session 9B

	Conference Room
	Session 9B. Plant-Animal Interactions & Ecology
11.30–11.50	C. Pannell: Taxonomy, plant-disperser interactions, diversification and biogeography of the genus *Aglaia* (Meliaceae) (35)
11.50–12.10	Q. Phillipps: The anachronistic fruit of Borneo dispersed by elephants and rhinoceros (40)
12.10–12.30	Q. Phillipps: The figs of Borneo and their significance in rain forest ecology (51)
12.30–12.50	A. Lapis & H. Apolinario: Growth performance of rattans (Arecaceae: Calamoideae) after 33 years in cultivation as gene bank in the Philippines (165)

Workshop 3B

	Teaching Laboratory
11.30–12.50	Workshop 3B: Cultivation of tropical plants

Half Day/Garden Tours/Tours

SESSIONS – THURSDAY

Session 10A

Lecture Theatre

	Session 10A. Taxonomy: Structure and Development
10.00–10.20	M. Nuraliev et al: Flower development in *Osmoxylon* (Araliaceae): clarifying key taxonomic features of floral structure (20)
10.20–10.40	S. Shahimi et al: Comparative development of the rattan ocrea: a study of the ant-rattan genus *Korthalsia* (33)
10.40–11.00	L. Ronse de Craene: More is beautiful. Meristic change in the flowers of Sapotaceae (153)
11.00–11.20	A. Arbain: Branching system of *Merinthosorus hieronymi* (Drynarioideae) (62)

Session 10B

Conference Room

	Session 10B. Conservation
10.00–10.20	K. Harada et al: Genetic structure of *Dryobalanops beccarii* (Dipterocarpaceae) in northeastern Borneo and the relation with D. aromatica (22)
10.20–10.40	P. Pelser & J. Barcelona: Preliminary findings of a conservation genetic study of *Rafflesia lagascae* (Rafflesiaceae; Philippines) (48)
10.40–11.00	Diversity and breeding system of alien invasive plant species in protected areas of West Sumatra (116)
11.00–11.20	Rafidah Abdul Rahman: A conservation action plan to conserve maximum biodiversity of the limestone fora in Peninsular Malaysia (154)

Session 11A

Lecture Theatre

	Session 11A. Taxonomy
11.40–12.00	S. K. Ganesan: The taxonomy and phylogeny of *Pterospermum* (Dombeyoideae/Malvaceae) in Malesia (136)
12.00–12.20	J. Byng et al: *Syzygium* (Myrtaceae): Monographing a taxonomic giant via 22 coordinated regional revisions (58)
12.20–12.40	M.van Balgooy: Introducing Spot-characters (147)
12.40–13.00	Nor Azahana Abdullah et al: Leaf anatomical adaptation in *Pandus tectorius* Parkinson (135)

Session 11B

Conference Room

	Session 11B. Conservation
11.40–12.00	K. Rembold et al: Plant diversity responses to forest conversion in Sumatra (18)
12.00–12.20	C. D. Heatubun et al: To conserve the botanical treasures of New Guinea: identification and mapping of critical habitats and plant communities in West Papua Province, Indonesia (105)
12.20–12.40	T. Dewi Atikah et al: Land use change effect on endemic flora of East Kalimantan (36)
12.40–13.00	Zozy Aneloi Noli: Shoot cutting method, an initial step in the conservation of Sumatra indigenous species (*Morus macraura* and *Alstonia scholaris*) (67)

Workshop 4

Lecture Room 1

11.40–13.00	Workshop 4: Implementing the Nagoya Protocol on Access and Benefit Sharing in the UK

Session 12A

Lecture Theatre

	Session 12A. Biogeography
14.00–14.20	D. Thomas et al.: Phylogenomics of the recalcitrant Annonaceae Subfamily Malmeoideae (99)
14.20–14.40	L. Pokorny et al.: Probing the phylogenomic community structure of SE Asian forests to uncover the origin and evolution of their astonishing diversity and implications for conservation (83)
14.40–15.00	J. A. Ordas & G. J. Alejandro: The phylogeny and biogeography of the Philippine *Neonauclea* (Naucleeae-Rubiaceae) including a new endemic species from Cebu, Philippines (75)
15.00–15.20	A. Arriola & G. J. Alejandro: Inferences on the biogeographical history and novelties in the Philippine Octotropideae inferred from multiple sequence data (49)

Session 12B

Conference Room

	Session 12B. Taxonomy
14.00–14.20	T. Jimbo & S. Sohmer: Morphological diversity in Papua New Guinea *Psychotria* (Rubiaceae): current status, future plans (12)
14.20–14.40	C. Banag et al.: The Philippine Species of *Ixora* (Rubiaceae) (109)
14.40–15.00	G. J. Alejandro et al.: Molecular phylogeny and taxonomic revision of the Philippine endemic *Antherostele* Bremek (Rubiaceae, Urophylleae), and its implication to *Urophyllum* s.l (91)
15.00–15.20	T. Mulyaningsih & I. Yamada: New record infraspecies of *Aquilaria beccariana* (Thymelaeaceae) in Malinau North Kalimantan (138)

Workshop 5

Lecture Room 1

14.00–15.20	Workshop 5: Submitting Global Red List Assessments to IUCN

Session 13A

Lecture Theatre

	Session 13A. Zingiberaceae
16.10–16.30	M. Ardiyani: The phylogeny of *Zingiber* of Sumatra with an emphasis on *Zingiber engganoense*, a new species recently discovered on Enggano Island (141)
16.30–16.50	M. Newman: Recent progress in Malesian Zingiberaceae taxonomy (149)
16.50–17.10	N. Nasir: The Potential of Wild Zingiberaceae *Elettariopsis slahmong* for Green-pesticide in West Sumatra, Indonesia (55)
17.10–17.30	Nurainas et al.: Taxonomic treatment of the genus *Hornstedtia* (Zingiberaceae) in Sumatra (88)

Session 13B

Conference Room

	Session 13B. Taxonomy
16.10–16.30	Y. Santika & A. Trias-Blasi: Preliminary taxonomic revision of the family Vitaceae in Bali, with some new records (31)
16.30–16.50	T. Utteridge et al.: Progress in Malesian Primulaceae: moving on from 'Myrsinaceae' (47)
16.50–17.10	J. Byng & M. Christenhusz: Progress towards a Genera Malesianum (85)
17.10–17.30	J. Demuria & F. Stauffer: Typifications and the re-establishment of ten species in the *Rinorea anguifera* complex (Violaceae) (161)
17.30–17.50	Long-Fei Fu et al.: Systematic informativeness of seed micromorphology in the core *Elatostema* clade of *Elatostema* (Urticaceae) (76)

Ceilidh

Fletcher building

19.30–23.30	Ceilidh (traditional Scottish dancing)

SESSIONS – FRIDAY

Session 14A

Lecture Theatre

	Session 14A. Flora Malesiana
10.00–10.20	Ed de Vogel: Project Flora Malesiana: Orchids of New Guinea, inventory of a giga flora (42)
10.20–10.40	George Argent: Celebrating 50 years of Professor Sleumer's classic work for Flora Malesiana on the Ericaceae (37)
10.40–11.00	Gemma Bramley: An Overview of Malesian Lamiaceae (106)

Session 14B

Conference Room

	Session 14B. Phylogenetics
10.00–10.20	Rismita Sari et al.: An assessment on *Septogarcinia sumbawaensis* (Clusiaceae) and the transfer to *Garcinia septosumbawaensis* (92)
10.20–10.40	E. Warschefsky: A Phylogeny for the mango genus *(Mangifera,* Anacardiaceae) (127)
10.40–11.00	L. Paraguison & G.J. Alejandro: Generic Position of *Canthium ellipticum* and Psydrax *puberula* inferred from molecular sequence data and a description of two new species (72)

Session 15A

Lecture Theatre

	Session 15A. *Hoya*
11.30–11.50	M. Rodda et al.: Relationships between *Hoya, Dischidia* and *Oreosparte (*108)
11.50–12.10	F. Aurigue: Research updates on Philippine *Hoya* (Apocynaceae) (90)
12.10–12.30	M. Rodda: A revision of *Hoya* of Borneo (107)
12.30–12.50	Sri Rahayu: Current status of Indonesian *Hoya* (Apocynaceae: Asclepiadoideae): inventory, utilization and conservation (69)

Session 15B

Conference Room

	Session 15B. Ecology
11.30–11.50	P. Quakenbush: The pollination, mating system, and phenology of *Medinilla multiflora* (Melastomataceae) on Mt. Makiling, Philippines (78)
11.50–12.10	P. Quakenbush: Niche overlap and species assemblage of *Medinilla* (Melastomataceae) on Mt. Makiling, Philippines (77)
12.10–12.30	M. M. Medecilo & M. Lagat: Floristic composition and vegetation structure of the remaining forests in Upland Cavite, Luzon Island, Philippines (41)
12.30–12.50	J. M. Salim & R. Shahrudin: Four year climatic parameters influence on the abundance and survival of *Websteria confervoides* (Submerged Cyperaceae), a wetland dependent species (156)

Session 6A

Lecture Theatre

	Session 16A. Ecology
14.00–14.20	Maria Elena Ragragio et al.: Plant nickel hyperaccumulators in Lagonoy ophiolite complex, Camarines Sur province, Philippines (1)
14.20–14.40	D. Cicuzza: Impact of fragmentation and change in forest structure on fern species richness in the Xishuangbanna tropical forest, China (52)
14.40–15.00	Michael Calaramo: A study on the vegetation of the Northwestern Luzon, the ecology and floristic composition of its identified major ecosystems (2)
15.00–15.20	Erizal Mukhtar et al.: Comparison of growth rate between primary and secondary forests on a tropical forest in West Sumatra: Implications for forest rehabilitation (80)

Session 16B

	Conference Room
	Session 16B. DNA Barcoding
14.00–14.20	R. Raterta: DNA barcoding for molecular authentication of selected medicinal plants in Batanes group of Islands and commercially sold in Quiapo, Manila, Philippines (10)
14.20–14.40	J. Heckenhauer et al.: DNA barcoding of a mixed dipterocarp forest in Brunei Darussalam and phylogenetic analysis of Dipterocarpaceae (54)
14.40–15.00	M. Arenas et al.: Molecular authentication of selected medicinal macroscopic fungi in five protected areas of Calabarzon region, Philippines (11)
15.00–15.20	J. E. Olivar et al.: DNA barcoding reveals fraud in the Philippine *Vitex negundo* L (lagundi) trade: A call for a quality control protocol to ensure consumer health (95)

Workshop 6

	Lecture Room 1
14.00–15.20	Workshop 6: Taxonomy Tricks of the Trade

Closing Ceremony

	Lecture Theatre
15.40–16.30	Closing Ceremony

POSTERS

Poster No.	Authors	Title
17	Yu, R. & van Welzen, P.	A taxonomic revision of *Trigonostemon* (Euphorbiaceae) in Malesia
19	Ellwood, L. et al.	Worldwide Engagement for Digitizing Biocollections 2016: a call to the Flora Malesiana community to participate in the WeDigBio Global Transcription Event!
23	Bouman, R. et al.	Getting a grip on *Phyllanthus,* a complex genus; phylogeny, historical biogeography and bioactivity screening
28	Kadhimi, A. et al.	Enhancing in vitro screening callus for drought tolerance using gamma rays and growth regulators of *Oryza sativa* CV MR269
29	Alhasnawia, A. et al.	Interaction of β-glucan and NaCl stress on accumulation of antioxidant enzymes and relationships with salt tolerance in callus
45	Cahen, D. & Utteridge, T.	A synopsis of the genus *Smythea* (Rhamnaceae)
60	Azizan, A. & Couvreur, T.L.P.	Evolution of floral morphological characters in Annonaceae
63	Salvana, F.R. & Gruezo, W.	A taxonomic reassessment of genus *Podocarpus* in the Philippines
66	Julius, A. et al.	Generic limits of *Ardisia* (Primulaceae–Myrsinoideae) in Tropical Asia
70	Dubéarnès, A. et al.	Systematics of the genus *Embelia* (Primulaceae – Myrsinoideae)
71	Buot, I. & Sarinas, M.	Conservation education in the 21st Century: the potential of the open online course of the University of the Philippines-Open University
74	Mat Yunoh, S.M.	The genus *Lagerstroemia* (Lythraceae) in Peninsular Malaysia
82	Logatoc, E.L.R. & Gruezo, W.	Moss flora of Puting Bato karst area, Burdeos, Polillo Island, Philippines
93	Hao Wei Hsu & Alejandro, G.J.	Molecular Phylogeny and DNA Barcoding of the Philippine *Argostemma* (Argostemmateae), including a new species
94	Santor, P.J. & Alejandro, G.J.	Phylogeny of the Philippine *Hedyotis* (Rubiaceae: Spermacoceae)
97	Del Prado, Y.L. et al.	Phylogeny of selected Philippine *Ophiorrhiza* (Ophiorrhizeae—Rubiaceae) inferred from multiple sequence data including accounts of two new species
103	Koyama, T. & Baba, Y.	Floristic overview of Cyperaceae in Natma Taung National Park, Chin State, Myanmar
110	Fujikawa, K. et al.	The update of the Taxonomic Enumeration of Natma Taung National Park, Chin State, Myanmar
111	Moore, A.	*Poikilospermum* (Urticaceae) of Tropical Asia: an update
112	Purba, E. et al.	Ethnobotanical value and conservation of Zingiberaceae of the Batak Karo in North Sumatra, Indonesia
115	Arriola, A. et al.	Multi-gene analysis of the Philippine endemic *Gloeocarpus* to reassess its generic status
118	Miller, C.	The World Flora Online – Achieving Target 1 of the Global Strategy for Plant Conservation

Poster No.	Authors	Title
120	Budi Hartono et al.	Flora in Javanese Culture
122	I. Gusti Ayu Rai Sawitri et al.	Balinese Homegarden Based on 'Tri Hita Karana' Concept in Pakraman Villages Buleleng Regency North Bali (Indonesia)
125	Anh, K.-S. et al.	Anti-inflammatory activity of Rutaceae in Vietnam: Based on Ethnobotanical information
128	Nowak, S.	Taxonomic studies on the *Epiblastus* (Epidendroideae, Orchidaceae) toward a revision of the genus
129	Lacdan, N. et al.	Floristic Survey of Trees in the Lowland Tropical Forest of Mt. Daguldul, San Juan,Batangas
130	Hu, J.-M., et al.	Evolution of agamospermy and host specificity of *Balanophora laxiflora* and allied taxa (Balanophoraceae)
133	Yang, A.T-Y, et al.	Exploration of the flora of the Solomon Islands
143	Chamchumroon, V. et al.	Assessment of the distribution and conservation status of wild plants in conservation areas using GIS and GeoCAT
144	Blasco, F. et al.	DNA barcoding of selected medicinal plants and a discovery of a novel species of *Begonia*
158	Suhaimi, S-E. et al.	An overview of Convolculaceae of Peninsular Malaysia
159	Brambach, F. et al.	Biogeography of Malesian tree species along elevational gradients – insights from plot-based inventories
166	Haerida, I. et al.	Flora of Bali, an update

ABSTRACTS

1. Plant nickel hyperaccumulators in the Lagonoy ophiolite complex, Camarines Sur province, Philippines

Author(s): Maria Elena Ragragio, Quinn Ericka Bayas and Shamaine Anne Salvador

Abstract Type: Presentation

Plants that accumulate large amounts of heavy metals can be used in phytoremediation. This study aimed to determine plant species in the Lagonoy ophiolite complex that are hyperaccumulators of nickel. The complex is located in the Municipality of Lagonoy, province of Camarines Sur, and has a mining site which is currently being operated by the Bicol Chromite and Manganese Corporation. Plants were collected from several sampling sites within the mining area and identified. The nickel content was measured using atomic absorption spectroscopy (AAS). A total of 44 species from 30 families were collected from the study site. The plants were classified into non-accumulators, hemiaccumulators, hyperaccumulators and hypernickelophores based on the nickel level ranges defined in Fernando et al. (2013). Six species were classified as non-nickel accumulators, in which the nickel contents were less than 100 ppm (1 ppm=1 µg Ni/g dry matter). Twenty-one species were classified as hemiaccumulators, having Ni levels ranging from 100 up to 999 ppm. There were 11 species of hyperaccumulators with nickel content of >1000 µg/g Ni in dry matter and six hypernickelophores with nickel content of >10000 µg/g Ni in dry matter. The plant with the highest nickel content was *Lygodium circinnatum* (Burm.f.) Sw. The potential of this fern and other hypernickelophores for phytoremediation is discussed.

2. The vegetation of northwestern Luzon: The ecology and floristic composition of its major ecosystems

Author(s): Michael Calaramo

Abstract Type: Presentation

Northwestern Luzon is a unique tropical habitat with rough coastal waves and turbulent winds, and a sandy and rocky shore. This typhoon-prone part of Luzon has an everwet climate in the north while the south has an extreme dry summer. A decade-long Northwesterniana Project was launched in 2007 to cover the northwest range of Cordillera mountains to the coast. Expedition teams identified 11 major ecosystems. Transects were laid in 20 × 20 m plots for tall trees, subquadrants of 7 × 7 m for pole-size trees and 1 × 1 m for herbaceous plants and open ground. Epiphytic, Parasitic and Lianas were counted. The data unveils the uniqueness of the differing ecosystems. Graphs and maps were generated of the vegetation profiles, and photographs collated to depict the flora. The mossy forests of Mt. Palemlem and Mt. Pao had the highest diversity index (Shannon Index 4.717). Pine forest (SI 4.453) stretches from Carasi to Solsona and Nueva Era, distributed mostly in the dorsal part of the mountains. Limestone forest was observed (SI 3.212). Subultramafic forest (SI 3.212) in Sapat, Pasuquin contained *Nepenthes alata* and *Drosera peltata* in stunted vegetation. Savanna is found in Cabarusibsiban, Piddig (SI 2.688), and dry seasonal forest fragments (SI 3.801) occur from Bangui to Ilocos Sur. The vast sand dunes have a drought resistant flora (SI 2.45). Mangrove forests (SI 2.621) with intact vegetation. Intertidal zone or flat bedrocks in the coast of Dillavo Pasuquin (SI 2.516). Inland Beach Forest (SI 4.133). Fresh water swamps with submerged and emergent plant species (SI 2.77).

3. A survey of plants used as repellents against hematophagous insects by the Ayta people of Porac, Pampanga province, Philippines

Author(s): Jasper John Obico and Maria Elena Ragragio

Abstract Type: Presentation

Most popular plants with insect-repellent activity are non-native to the Philippines and can pose an ecological threat when propagated for their utility. Indigenous knowledge provides a wealth of information on native plants with insect-repellent potential. To document the insect-repellent plants used by the Ayta people from Porac, Pampanga, Philippines, 121 informants from five villages aged between 20 and 60 years were interviewed. Data were analysed using the use-value (UV) and informant consensus factor (FIC). The survey resulted in a list of 54 species of plants classified into 49 genera and 26 families. The family Fabaceae contains the most number of species with insect-repellent activity. The most important plants used as insect-repellent based on their UVs are mostly exotic plants and include seven species: (1) *Leucaena leucocephala* (Lam.) de Wit, (2) *Gliricidia sepium* (Jacq.) Walp., (3) *Eucalyptus* sp., (4) *Gmelina arborea* Roxb., (5) *Blumea balsamifera* (L.), DC., (6) *Azadirachta indica* A. Juss., and (7) *Phyllodium pulchellum* (L.) Desv. The FIC value (0.74) indicates that the Ayta agree in their selection of plants. Most of the plant parts used are the leaves and stems, which are dried and then burned. The smoke is said to drive away the insects. New records of insect-repellent activity were found in the exotic *Gmelina arborea* and two native plants, *Blumea balsamifera* and *Phyllodium pulchellum*. The present study provides a baseline for phytochemical screening for insect-repellent compounds. It also serves as an important ethnobotanical documentation of the Ayta community.

7. A review of species discoveries of seed plants in the Philippines for the quarter century 1990–2015

Author(s): Domingo Madulid and Esperanza Maribel Agoo

Abstract Type: Presentation

This paper presents the status of taxonomic research in the Philippines through an analysis of species discoveries in the past 25 years. It covers the number of species published yearly for the past 25 years, families, genera and species studied, location of type specimens, names of researchers and institutions involved in the taxonomic research in the country. There are at least 400 new species discovered during this period. Most of these belong to the families Orchidaceae, Rubiaceae, Asclepiadaceae, Rafflesiaceae, and Cycadaceae. These are products of collaborative research between Filipino and foreign taxonomists. Most of the type specimens are however deposited in herbaria outside of the Philippines. The surge of species discoveries in the early 2000s could be attributed to the interest in Philippine flora and its conservation. The study also reviews local herbaria actively involved in taxonomic research and the interests of botanists.

8. Current knowledge of orchid diversity in Peninsular Malaysia including new records and discoveries

Author(s): Rusea Go

Abstract Type: Presentation

Orchidaceae is one of the largest angiosperm families found in Malaysia. Botanical exploration for orchids in various forests and vegetation types from 1999 to the present date have revealed tremendous changes in our knowledge of species diversity and distribution in Peninsular Malaysia. A total of 35 species are identified as new to Peninsular Malaysia, which increases the total number to 950 species of orchids in 153 genera. From these, 202 species (21.3%) are endemic to Peninsular Malaysia. As studies of orchid diversity continue, the number of species is bound to change. It might increase in the future if more currently inaccessible vegetation is botanised and more specimens are collected, or it might decrease if rare and endemic species vanish due to habitat destruction and conversion to other land use. Environmental fluctuations could also increase or decrease the number, as some species flourish to certain changes; nevertheless some might succumb and be lost forever. Apart from these factors, taxonomic and nomenclature study could also affect the number of species recognised. It decreases if some are reduced to synonymy or increases if some are raised from varieties, forms, or subspecies to species, or species complexes are resolved into multiple genera or species.

10. DNA barcoding for molecular authentification of selected medicinal plants from the Batanes Islands commercially sold in Quiapo, Manila, Philippines

Author(s): Ruby Raterta

Abstract Type: Presentation

Incorrect plant identification and unsustainable extraction from their natural habitat may result in adulteration and substitution of herbal medicines in the market. This study evaluated DNA barcoding techniques as a powerful tool to rapidly identify selected Philippine medicinal plants and assessed the most effective DNA barcode from three chloroplast regions (*matK*, *rbcL*, *trnH-psbA* and ITS) and one nuclear region (ITS) with single primer pairs. We generated nucleotide sequences of the four barcode loci (*matK*, *rbcL*, *trnH-psbA*, ITS) of medicinal plants, assessed the performance of the four potential barcodes based on the universality of the markers used and discriminatory power using pairwise sequence divergence analysis and determined the species resolution. A total of 68 medicinal plants collected in Batan and Sabtang islands, Batanes Province, northernmost part of the Philippines and commercially sold in Quiapo, Manila constitute 35 families and 57 genera dominated by Rubiaceae, Rutaceae, Fabaceae, Compositae, and Moraceae. The genomic DNA of the medicinal plants was extracted, amplified, sequenced and analysed using bioinformatics tools. In this study, *matK* and *trnH-psbA* showed the highest PCR and sequencing success rate, exhibited the best species discrimination and may serve as effective barcode markers by resolving 80% with 53 confirmed taxa of medicinal plants composed of 10 from Quiapo and 43 from the Batanes Islands, including 11 identified Philippine alkaloid-containing plants. The present study provides the first information on DNA barcoding of medicinal species of the Batanes flora, a fact that renders this study a worthwhile contribution to the Philippines flora.

11. Molecular authentication of selected medicinal macroscopic fungi in five protected areas of the Calabarzon region, Philippines

Author(s): Minerva Arenas, Edwin Tadiosa, Grecebio Jonathan Alejandro and Renato Reyes

Abstract Type: Presentation

Macroscopic fungi including mushrooms are a diverse group of organisms recognised for their ecological, economical and medicinal uses. Protected areas in the Philippines, and particularly in Calabarzon, are known to have high macroscopic fungal diversity due to their cool climate and rich vegetation. Documentation of medicinal mushrooms in the Philippines using molecular data through DNA barcoding is not yet fully utilised. Hence, molecular identification of selected medicinal macroscopic fungi in five protected areas of Calabarzon was undertaken to establish their molecular identity. A total of eight species of selected medicinal macroscopic fungi were collected: *Auricularia auricula-judae* (Mont.) Sacc., *Auricularia mesenterica* (Dicks) Pers., *Auricularia polytricha* (Mont.) Sacc., *Dictyophora indusiata* (Vent.) Desv., *Ganoderma applanatum* (Pers.) Pat., *Ganoderma lucidum* (Leys.) Karst., *Schizophyllum commune* Fr., and *Volvariella volvacea* (Bull.) Sing. Efficiency of nuclear ribosomal DNA internal transcribed spacer (ITS) and large subunit (LSU) regions as barcodes was evaluated in terms of universality and discriminatory ability using the collected samples. Results for universality revealed that ITS yielded higher polymerase chain reaction (PCR) success rates (79%) than LSU (64%). In DNA sequencing success rates, LSU proved higher (89%) than ITS (82%). In terms of discriminatory power based on species identification and resolution, both barcode markers were able to identify all the taxa, resolving 100% identity. Moreover, interspecific and intraspecific sequence divergence of the ITS and LSU barcode loci were significantly different from each other ($\rho \leq 0.01$) when compared in a Wilcoxon Mann-Whitney Test.

12. Morphological diversity in Papua New Guinea *Psychotria* (Rubiaceae): current status, future plans

Author(s): Tiberius Jimbo and Dr. Seymour Sohmer

Abstract Type: Presentation

Morphological diversity in Papua New Guinea *Psychotria* L. has yet to be fully understood. With 120 described species, Papua New Guinea is a centre for diversity for *Psychotria* in South East Asia. No comprehensive treatment of Papua New Guinea *Psychotria* has been attempted since the work of Sohmer (1988) despite new discoveries and descriptions of new species for the region. We intend to initiate a research project to ascertain how many species of the genus exist in PNG, what their relationships within PNG are, and how they relate to neighbouring portions of Malesia. The systematic treatment of the nonclimbing species of *Psychotria* in New Guinea and the Bismarck Archipelago by Sohmer (1988) will anchor our study. This paper presents an introduction to our plans to integrate morphological and molecular data to establish a solid taxonomic and phylogenetic framework for understanding Papua New Guinea *Psychotria*, and the significance of this morphological diversity. A reliable database with workable taxonomic keys for PNG *Psychotria* and species-level phylogenies using molecular data is the proposed outcome of the project.

13. Molecular phylogenetics of order Hypnales with emphasis on *Ectropothecium* (Musci: Hypnaceae)

Author(s): Virgilio Linis, Jeremy Bruhl, Mishler Brent and Shubiao Wu

Abstract Type: Presentation

Membership of Hypnales has long been in a state of flux and the phylogeny of one of its largest genera, *Ectropothecium*, is virtually unknown. To infer evolutionary relationships we assembled two datasets covering 75 and 59 species of moss for three cpDNA regions (*rpL32-trnL*, *trnH-psbA*, *trnSGG*) and ITS2-5.8S-ITS2 nDNA regions in combination. The results of analyses from the first dataset were resolved while results of similar analyses from the second dataset were partially resolved. Both maximum parsimony and maximum likelihood analyses of the first dataset showed that *Ectropothecium* as currently circumscribed is not monophyletic due to the inclusion of *Hypnum plumaeforme* and *Trachythecium verrucosum* within a strongly supported 'Ectropothecium' clade. Sister to that clade were the two species of *Vesicularia*. Analyses of the second dataset recovered several strongly supported clades within the *Ectropothecium* clade. The type of the genus, *E. tutuilum*, however, fell within one of the inclusive clades, which calls for more sampling of *Ectropothecium* species as well as completeness of molecular sequence data and/or addition of more (better) regions. Overall, results of the analyses revealed a clear framework for understanding the relationships of *Ectropothecium* and thus provided a scope for a combined molecular and morphological analysis of this group.

14. Mt. Hamiguitan: A UNESCO World Heritage Site and sanctuary for Philippine *Nepenthes* and pteridophytes

Author(s): Victor Amoroso, Thomas Gronemeyer, Fulgent Coritico, Florfe Acma and Peter Fritsch

Abstract Type: Presentation

Mount Hamiguitan Range Wildlife Sanctuary in Davao Oriental, southeastern Philippines was designated a UNESCO World Heritage Site in June 2014. An updated species richness and conservation assessment of *Nepenthes*, ferns and lycophytes in the sanctuary are provided on the basis of repeated transect walks, recent field surveys, and the examination of herbarium specimens. Six species of *Nepenthes*, and 152 species of ferns and lycophytes belonging to 27 families and 72 genera, are recorded. The species figure is about 13% of the total number of fern and lycophyte species in the Philippines and nearly 20% of the total number on Mindanao Island. Nine species are new records for Mindanao. The species of ferns that exhibit the highest importance value (SIV) include *Taenitis blechnoides* (Willd.) Sw., *Tapeinidium luzonicum* (Hook.) Kramer and *Selaginella alligans* Hieron. Thirteen species are broadly distributed Philippine endemics and eight more are found only on Mindanao. Of these, five species are site-endemic: *Nepenthes hamiguitanensis*, *N. justinae*, *N. micramphora*, *N. peltata*, and *Lindsaea hamiguitanensis*. Mt. Hamiguitan holds the highest number of site-endemic species of *Nepenthes* in the Philippines. Of the 23 threatened species recorded, three are critically endangered, seven are endangered, and 13 are vulnerable. In situ and ex situ conservation activities are being conducted in an effort to save the remaining threatened and endemic species of Philippine *Nepenthes* and pteridophytes.

15. Thalloid liverworts of Bali

Author(s): Ida Haerida

Abstract Type: Presentation

Nine species of thalloid liverworts were discovered during our surveys of Bali in 2013 and 2015: *Aneura pinguis* (Aneuraceae), *Asterella vulcanica*, *Reboulia hemisphaerica* (Aytoniaceae), *Dumortiera hirsuta*, *Marchantia acaulis*, *M. emarginata*, and *M. geminata* (Marchantiaceae), *Metzgeria lindbergii* (Metzgeriaceae), and *Wiesnerella denudata* (Wiesnerellaceae). Among them, *Dumortiera hirsuta* and *Marchantia emarginata* were already recorded in Bali, but the other seven species were new records. The discovery of new records in Bali indicates the importance of conserving these areas.

16. Three new species of *Begonia* endemic to the Puerto Princesa Subterranean River National Park, Palawan

Author(s): Rosario Rubite, Mark Hughes, Ching-I Peng, Patrick Blanc, Kuo-Fang Chung and Grecebio Alejandro

Abstract Type: Presentation

Begonia is a megadiverse genus of flowering plants prone to generating micro-endemic species, especially on limestone habitats. During fieldwork in the Puerto Princesa Subterranean River National Park, Palawan (Philippines), three species were encountered which did not match any previously described from the region. Following morphological, molecular phylogenetic and cytological investigation, a hypothesis of three new species is supported. The three new species belong to a clade endemic to Palawan and Borneo. The limestone habitats in the Puerto Princesa Subterranean River National Park environs support a unique flora. The description of three new species from a small area within the park demonstrates how much remains to be discovered there, and the importance of its continued protection.

17. A taxonomic revision of *Trigonostemon* (Euphorbiaceae) in Malesia

Author(s): Renyong Yu and Peter van Welzen

Abstract Type: Poster

The Euphorbiaceae genus *Trigonostemon* Blume contains about 60–65 species ranging from India to China, throughout the South East Asian mainland and Malesia to north east Australia and the Western Pacific (Govaerts et al. 2000). This genus was established by Blume in 1825, where he defined it as a group of monoecious shrubs or small trees with 5-merous flowers, three or five connate stamens and a trilocular ovary with bifid styles. In this study, the Malesian species of *Trigonostemon* are taxonomically revised. According to the result, 37 species and four varieties are present in the region, of which five species are newly described. The indumentum, inflorescences and the floral structure show critical characters for identification and classification. A few species complexes exist in this genus with wide ranges of continuous variation. Species boundaries based on distinct discontinuities in morphology are proposed and applied in the revision. Furthermore, *Trigonostemon* is probably closely related to another genus, *Dimorphocalyx*, which has two whorls of stamens instead of one. Müller Argoviensis (1866) tended to adopt the genus in a wide sense and included *Dimorphocalyx* within *Trigonostemon* as a section, a view not followed by other botanists (e.g., Bentham 1880, Hooker 1887, Pax & Hoffmann 1931). A molecular phylogenetic study in the future with sufficient samples of both genera and related taxa will hopefully elucidate the delimination of the genera.

18. Plant diversity responses to forest conversion in Sumatra

Author(s): Katja Rembold, Hardianto Mangopo, Sri Sudarmiyati Tjitrosoedirdjo and Holger Kreft

Abstract Type: Presentation

Indonesia is a global centre of biodiversity, but at the same time the country with the highest deforestation rates worldwide. We studied the impact of forest conversion and land-use intensification on vascular plant diversity across four dominant land-use systems: lowland rainforest, jungle rubber, rubber plantations and oil palm plantations, in Sumatra (Indonesia). Plot-based species inventories were conducted in two mirrored landscapes in the lowlands of Jambi Province. Overall, forest had the highest levels of plant diversity including alpha and beta diversity followed by jungle rubber. Oil palm plantations had a high density of herbaceous plants, but low species numbers and low beta diversity. Rubber plantations had the lowest species numbers and density across all systems, but showed higher beta diversity than oil palm plantations. Forest had a clearly distinct floristic composition while the other systems and especially the two plantations showed a higher floristic similarity to each other. While forest was almost entirely composed by indigenous species, all three transformation systems showed high numbers of alien plant species. The number and relative abundance of introduced species increases from forest towards the plantations and corresponds with increasing canopy openness towards plantations. Forest conversion therefore not only causes a loss in species richness at local and landscape scale, but also a change in floristic composition and a shift from native to alien species.

19. Worldwide Engagement for Digitizing Biocollections 2016: a call to the Flora Malesiana community to participate in the WeDigBio Global Transcription Event!

Author(s): Libby Ellwood, Shelley James, Paul Kimberly, Rob Guralnick, Paul Flemons, Kevin Love and Austin Mast

Abstract Type: Poster

During its inaugural year, Worldwide Engagement for Digitizing Biocollections, WeDigBio 2015, involved citizen scientists from >50 countries in transcribing biodiversity specimen labels from a variety of taxonomic groups over four days. Participants at onsite events at museums, universities, and science classrooms, along with individuals across the globe, used online platforms at DigiVol, Les Herbonautes, Notes from Nature, Smithsonian Institution's Transcription Center, and Symbiota to transcribe almost 30,000 specimen labels. Participants learned about collections and biodiversity, interacted with researchers, played games, shared experiences via social media, and contributed to the growing database of digital biocollections information. WeDigBio 2016 is aiming to double the number of onsite events, online participants, and completed transcriptions, and we encourage herbaria and citizen scientists of the Flora Malesiana community to take part in activities. Resources are being developed to help make the event even more fun, educational, and productive, such as: improvements to the dynamic dashboard at wedigbio.org, enhanced interoperability with transcription platforms, lesson plans for teachers, activities for participants at transcription events, and interaction between transcribers across events. Certain platforms, such as DigiVol.org, can host images of specimen collections from the Malesian region needing transcription. WeDigBio 2016 can be a way to increase the visibility of your herbarium, engage with local citizen scientists, and expedite digitization of botanical specimens, while being a part of a well-publicised global event. Consider being one of the many online participants helping to mobilise biodiversity collections data, or hosting a WeDigBio event from October 20–23, 2016. Learn more at wedigbio.org.

20. Flower development in *Osmoxylon* (Araliaceae): clarifying key taxonomic features of floral structure

Author(s): Maxim Nuraliev, Alexei Oskolski and Dmitry Sokoloff

Abstract Type: Presentation

The genus *Osmoxylon* comprises about 60 species. It is widely distributed throughout the Malesian region. *Osmoxylon* is characterised by a number of traits unusual for Araliaceae, including the unique

pronounced corolla tube with stamens exposed through its orifice. Another noteworthy feature is the outstanding variation of floral merism with stamen numbers ranging from 4 to 30. The ovary locules are approximately in the same number but sometimes reduced up to a single locule resembling a (pseudo?)monomerous condition. The number of sepals and petals is often ambiguous because they show no free lobes in mature flowers. Besides, inflorescences bear sterile bacciform flowers of obscure morphology and function. Our investigation of *Osmoxylon boerlagei* and *O. geelvinkianum* allowed obtaining the first reliable data on perianth merism for polymerous flowers of *Osmoxylon*. Both sepals and petals possess short free lobes at early stages. Corolla (12-16-merous in *O. boerlagei*, 15-17-merous in *O. geelvinkianum*) is nearly isomerous with androecium but calyx merism is about two times less. This is also confirmed by our investigation of vascular system. The bacciform flowers are structurally female, i.e. possess a large gynoecium and lack an androecium. They contain significantly less ovary locules (5–6 and 6–9) than in fertile flowers; the locules bear superficially normal ovules. Finally, bacciform flowers possess sepals (about 10 in *O. geelvinkianum*) and petals (6–8 in *O. boerlagei*) in higher number than locules. Our data amend species descriptions and provide taxonomically useful features. This study was funded by the Russian Foundation for Basic Research (project 15-04-05836).

21. Integrated Digitized Biocollections (iDigBio): mobilising natural history collections for enhanced classification and conservation of Malesian floristic biodiversity

Author(s): Shelley James

Abstract Type: Presentation

Advancements in digital technologies are rapidly improving efficiency in the aggregation, use, and sharing of natural history collections and biodiversity specimen data. Researchers now have access to ever increasing herbarium data sets for visualisation, analysis, and modelling to assist with taxonomic research and conservation assessments. iDigBio (www.idigbio.org), the national resource for the U.S. National Science Foundation's Advancing Digitization of Biodiversity Collections (ADBC) programme, is mobilising data and images for millions of biodiversity specimens. Botanical specimen data from the Malesian region is available in electronic format through the iDigBio web-based graphical interface (www.idigbio.org/portal) and APIs. It provides a wealth of information for the research community, government agencies, students, educators, and the general public, including baseline data for biodiversity assessments and non-native or invasive species distribution, providing data and images for new species discovery, and assisting with efficient location of voucher specimen collections for further research. This presentation will highlight the portal, available tools, data gaps, potential research uses of the data as they pertain to expanding the understanding of the biodiversity and biogeography of Malesian flora and the communities they comprise.

22. Genetic structure of *Dryobalanops beccarii* (Dipterocarpaceae) in northeastern Borneo and the relation with *D. aromatica*

Author(s): Ko Harada, Fifi Dwiyanti and Koichi Kamiya

Abstract Type: Presentation

We examined the genetic structure of *Dryobalanops beccarii*, one of the dominant dipterocarp species in Borneo based on microsatellite and chloroplast non-coding DNA sequence variations. We collected 235 samples of *D. beccarii* from 16 populations in northeastern Borneo (Sabah and Sarawak) including one isolated population in the Malay Peninsula. Additional samples of *D. aromatica*, a sister species of *D. beccarii*, were collected from two sympatric habitats (Gn. Panti in the Malay Peninsula and Similajau in Sarawak) and examined at the same time. A STRUCURE analysis based on eight microsatellite markers revealed clear discrimination of the two species represented by two clusters. Possible hybridisation occurred in the sympatric habitats. By sequencing 14 chloroplast DNA non-coding regions, one species-specific nucleotide polymorphism (C/A substitution) was found in PetL/PsbE spacer. C (cytosine) at this position was specific for *D. aromatica*, while A (adenine) was specific for *D. beccarii*. In two sympatric habitats *D. beccarii*, which was suspected to be hybrid had C at this site showing that *D. beccarii* is a pollen donor in the hybrids. The STRUCTURE analysis revealed there are at least six clusters in *D. beccarii* populations and genetically differentiated them

into five geographic groups. Geographical areas divided by this grouping could be considered as conservation units and supplied for seed sources for rehabilitation of the forest. On average, *D. aromatica* showed a higher level of genetic variation than *D. beccarii*. We discuss the evolutionary process of speciation in these two species in Borneo.

23. Getting a grip on *Phyllanthus*, a complex genus; phylogeny, historical biogeography and bioactivity screening

Author(s): Roderick Bouman, Paul Keßler and Peter van Welzen

Abstract Type: Poster

The genus *Phyllanthus* (Phyllanthaceae) contains over 800 species and occurs in all tropics and subtropics. This widespread group displays a large variability in morphology and has a rich history in traditional medicine. Some species have also become invasive, making it even more important to study this large genus. The circumscription of the genus has come under fire since recent phylogenetic studies have shown it to be paraphyletic. Instead of creating a giant genus, we opt to further divide *Phyllanthus* in smaller monophyletic groups. *Phyllanthus* in its current circumscription contains many subgenera that can be recognised based on morphology. With increased sampling these groups can potentially be raised to generic status if supported by molecular data, thereby resolving some of the taxonomic problems in the group. The historical biogeography of *Phyllanthus* is being studied to see where it originated and if the dispersal can be linked to palaeoclimatic events and plate tectonics. The group is also renowned for its variety of uses in traditional medicine and to further elucidate these effects, we will screen several species for bioactive compounds.

24. Ethnobotanical knowledge in a Maranao community in Lanao del Sur province, Mindanao Island, Philippines

Author(s): Carmelita Hansel and Mariam Sunggod

Abstract Type: Presentation

Ethnobotanical knowledge was documented in a Maranao community in Lanao del Sur province, Mindanao Island, Philippines so as to preserve this knowledge before it is lost because of non-transmittal to the younger generation. Through semi-structured interviews and focus group discussions, information on the different interactions between Maranaos and plants was elicited from 30 respondents. This included their use of plants for various purposes such as food, medicine, perfume and personal care, utensils and furniture, musical instruments, and firewood. There were 37 uncommon or typically Maranao plants used for food, 90 used for medicine, 12 used as perfume or for preserving clothes during storage, 16 used for beauty and personal care, 21 used for home-made implements, utensils and furniture, 10 used for home-made musical instruments, and 15 used for firewood. Details on usage of each plant for each purpose were also obtained. Through an awareness of the various traditional uses of these plants and their importance, their continued cultivation and/or preservation in the wild could be more likely instituted so as to promote their conservation.

28. Enhancing in vitro screening callus for drought tolerance using gamma rays and growth regulators of *Oryza sativa* CV MR269

Author(s): Ahsan Kadhimi, Che Radziah Che Mohd Zain and Arshad Alhasnawi

Abstract Type: Poster

This study aimed to examine somatic embryogenesis in vitro and monitor the drought stress tolerance of rice callus by using mature embryos as explants. Seeds of local rice genotype (MRQ74) were exposed to 350 Gy of radiation (Caesium-137) in the Malaysian Nuclear Agency. Mature embryos of (MS) supplemented with three concentrations of 2.4-D (1.0, 2.0, or 3.0 mg/L) and Kin (0.1 and 0.2 mg/L). Screening was conducted by subculturing the callus for four weeks with optimised callus MS media supplemented with Polyethylene glycol (MW 6000) at 1.5%, 3%, 4.5%, 6%, and 7% as

chemical drought inducer. Healthy callus at the highest concentration of PEG were subcultured with MS and different concentrations of growth regulators for shooting and root. Significant differences in percent (%) were observed between the callus induction and callus fresh weight of the genotype (radiation and non-radiation). The genotype exhibited the best response regarding callus growth at 2.4-D (3 mg/L) and Kin (0.1 mg/L). Fresh weight was reduced, and proline concentrations increased along with increasing PEG concentration. Excellent shooting and rooting was observed in MS + 3.0 mg/L (BPA) + 0.1 mg/L (NAA) for shooting and MS + 1.0 mg/L (IBA) + 0.1 mg/L 2, 4-D for root. However, the irradiated genotype exhibited the highest fresh weight and proline concentrations in 7% PEG compared with the non-irradiated genotype. Therefore, radiation positively influenced drought tolerance. More studies are required to improve the drought-tolerant genotype under various drought conditions to develop food security and rice productivity.

29. Interaction of β-glucan and NaCl stress on accumulation of antioxidant enzymes and relationships with salt tolerance in callus

Author(s): Arshad Alhasnawia, Che Radziah Che Mohd Zaina and Ahsan Kadhimia

Abstract Type: Poster

Background: Rice (*Oryza sativa* L.) is one of the most important cereal crops globally, as it feeds half of the world's people. Salinity is a natural constraining influence in agriculture and a major challenge for food security. Mushroom polysaccharides (β-glucan) consist of beta glucan, which is a chain of glucose molecules that acts as an antioxidant and protects the plant from free radical damage. Callus responds to β-glucan and NaCl signals through various chemical and biochemical processes. However, no prior study on β-glucan signals specific to in vitro plants or callus cultures of rice has been conducted. Therefore, we assessed the response of rice callus to β-glucan pretreatment. Results: The exogenous addition of polysaccharides (β-glucan) to stress media significantly increased salt tolerance of callus by enhancing antioxidant activity. However, Na accumulation and Na/K ratio significantly decreased callus throughout the experimental period. Conclusions: β-glucan as antioxidants scavenge reactive oxygen species to mitigate injury on biomembranes under salt stress. β-glucan application may induce an adaptive response in callus by stimulating antioxidant enzyme activities. β-glucan improves the salt tolerance of this rice.

30. The Flora of Thailand – current status and future perspectives

Author(s): Henrik Balslev

Abstract Type: Presentation

The first Editorial Board for the Flora of Thailand was established in 1965 under the leadership of Prof. Tem Smitinand and Prof. Kai Larsen. Since then there have been 16 Flora of Thailand meetings. Initial estimates were that the flora would contain some 30,000 species, but the latest estimates are that there are nearly 11,000 species of vascular plants in Thailand. Until 2014 about half of the flora had been published, including the large families Euphorbiaceae (436 sp, Chayamarit & van Welzen), Cyperaceae (277 sp, Simpson & Koyama), Araceae (210 sp, Boyce et al.). This had taken 50 years, and maintaining the speed of publication meant that the flora would be completed in 2066. At the Flora of Thailand meeting at Kew 2014 it was decided to aim at finishing the Flora of Thailand over the next 10 years. The presentation will illustrate how that is planned, and how it involves a closer interaction between the Editorial Board and the team of editors and the many authors who have committed themselves to preparing treatments.

31. Preliminary taxonomic revision of the family Vitaceae in Bali, with some new records

Author(s): Yessi Santika and Anna Trias-Blasi

Abstract Type: Presentation

As part of the Flora of Bali project, several Vitaceae species have been encountered in Bali. Nine species of Vitaceae are tentatively recognised: *Ampelocissus arachnoidea*, *Cissus javana*, *C. adnata*,

C. aristata, *C. quadringularis*, *Tetrastigma lanceolarium*, *T. papilosum*, *T. mutabile* and *T. pisicarpum*. Six of these species are newly recorded for Bali. Recent exploration in West Bali yielded additional specimens, which remain to be examined and might increase the species count in the area. Work is underway to produce a key to the species, generic and species descriptions and distribution maps.

32. The genus *Aeschynanthus* (Gesneriaceae) in Malesia, how many species are there?

Author(s): Abdulrokhman Kartonegoro, Hannah Atkins and David Middleton

Abstract Type: Presentation

The genus *Aeschynanthus* Jack (Gesneriaceae, subfamily Didymocarpoideae, tribe Trichosporeae) contains about 160–170 species and is found in the Himalayas, India and Sri Lanka, throughout South East Asia to the Solomon Islands. The genus is presently divided into six sections based largely on seed morphology: *Aeschynanthus*, *Diplotrichium*, *Haplotrichium*, *Microtrichium*, *Polytrichium* and *Xanthanthos*. A phylogeny based on nuclear ribosomal internal transcribed spacer (ITS) sequences selected to include all biogeographic areas and infrageneric groupings divided the genus into two major clades, resulting in the monophyly of all but section *Microtrichium*. The number of species in Malesia, however, is not clear as there is undoubtedly still a lot of undescribed diversity. Preliminary accounts suggest about 136 species in five sections are found in Malesia. New Guinea has the largest number of species (c.42) followed by the Philippines (c.33) and Borneo (c.29) with many of the species restricted to one island. Some of the species have not yet been assigned to section as the seeds have not been observed.

33. Comparative development of the rattan ocrea: a study of the ant-rattan genus *Korthalsia*

Author(s): Salwa Shahimi, Julie Hawkins, Paula Rudall, Christina Prychid and William Baker

Abstract Type: Presentation

The rattan palm genus *Korthalsia* is the second largest genus of the subfamily Calamoideae, with an estimated 27 species (Dransfield et al. 2008). In some rattan palms, such as *Calamus* and *Korthalsia*, there is an unusual structure of leaf sheath which forms an extension above the leaf petiole known as an ocrea. The ocrea is well developed, unarmed or variously spiny. It can be formed into different structure such as fibrous net-like, collar-like rims to elongate papery. In *Korthalsia*, there are four broad types of ocrea: tightly sheathing and truncate; fibrous and net-like; inflated and clasping; and inflated and divergent. *Korthalsia* species are also known as ant-rattans because some have an intimate relationship with ants. In 10 of 27 species, the types of ocrea that are inflated, swollen and divergent serve as domatia so ants can nest within. We present a comparative study of early leaf development in seven species of *Korthalsia*. The early leaf development was examined using scanning electron microscopy (SEM) while later stages were studied using light microscopy (LM). The seven species of *Korthalsia* that have been examined have three types of ocrea, which are described here. The result shows that only two types of ocrea are occupied by ants.

34. Ethnomedicinal plants in Bayabas, Sablan, Benguet Province, Luzon, Philippines

Author(s): Teodora Balangcod and Kryssa Balangcod

Abstract Type: Presentation

With emerging diseases and the need for more affordable medicine, documentation of the claimed medicinal plants by local communities is very important because it will unlock opportunities for the discovery and development of new and less expensive medicines. In Benguet province, Cordillera Adminstrative Region (CAR), Luzon, Philippines, traditional knowledge on plant use is usually held by the older generation, and hence there is an urgent need for its documentation. This study aimed to document the medicinal plants and the traditional knowledge that is associated with the plants such as plant part used, manner of preparation, ailments cured, etc., among local residents of Bayabas, Sablan, Benguet. Bayabas is one of six municipalities in Benguet province and is predominantly inhabited by the Ibaloi, one of the indigenous groups in the CAR. Ethnobotanical survey using

interviews and focused group discussions revealed that there are 75 plants that belong to 68 genera and 43 families which have medicinal value. The leaves are predominantly used for the treatment of various ailments. Decoction is the major mode of preparation and the leaves are common plant parts used for the cure of cough, kidney ailments, and stomach disorders such as diarrhoea, ulcers and related ailments. With the scarcity of literature about traditional knowledge on plant use especially in the CAR, this study is a significant contribution.

35. Taxonomy, plant-disperser interactions, diversification and biogeography of the genus *Aglaia* (Meliaceae)

Author(s): Caroline Pannell

Abstract Type: Presentation

There can be no better 'natural laboratory' in which to study the evolution of interactions between plants and animals than the Indo-Australian-Pacific region, where widespread plant groups inhabit areas of radically different faunas. Recent work has improved our understanding of the movements of tectonic plates and the construction of this complicated combination of sea, islands and continents. Fossils have been used to date molecular phylogenies of plant and animal groups and have shed light on the deep history of migrations and subsequent diversification of plants and animals through millions of years. This presentation will focus on a case study spanning nearly four decades in which a monographic revision of *Aglaia*, the largest genus in the mahogany family, has been combined with field investigation of the biology of the interactions between different species and their vertebrate seed dispersers. The biogeographical patterns exhibited by the genus, its colonisation of Australasia and south-western Pacific islands during the last 10 million years and the radiations of new species that followed establishment of the genus in these different faunal zones will be examined. The importance of refining species delimitations in a taxonomically intractable genus will be emphasised. Further field work, along with morphological and molecular investigations should result in the resolution into monophyletic species of at least some of the many complex and variable species in the genus. This will be mean that conservation priorities can be set more accurately, more informative molecular phylogenies built and improved analyses of the historical biogeography of the genus produced

36. Land use change effect on endemic flora of East Kalimantan

Author(s): Tika Dewi Atikah, Bayu Arief Pratama, Ruliyana Susanti and Elizabeth A. Widjaja

Abstract Type: Presentation

Kalimantan has the highest forest cover in Malesia after Papua and West Papua. However, the rate of forest loss is very high and is threatening the survival of the large number of endemics found there. According to our data collected from BO, L, K, 302 species from 43 families were found to be endemic to Kalimantan (not including Sabah, Sarawak, Brunei). Of these species 135 species from 31 families are endemic to East Kalimantan. Based on data from BO, Orchidaceae (44 species) has the highest number of endemic species in East Kalimantan, followed by Rubiaceae (16 species), Gesneriaceae (12 species), Malvaceae (8 species), Ericaceae (6 species), Melastomataceae (5 species) and Myrtaceae (5 species). During exploration of West and East Kutai in 2015, only one endemic species was found (*Orophea dodecandra* Miq.), although there are about 132 endemic species in the area.

37. Celebrating 50 years of Professor Sleumer's classic work for Flora Malesiana on the Ericaceae

Author(s): George Argent

Abstract Type: Presentation

An outline of the change in the concept of the family and how this affects the Malesian region will be given. The major taxonomic changes that have been made within the family since publication of this

classic account will be presented and some examples of Professor Sleumer's acuity in taxonomic research will be made.

38. Hortus Botanicus Leiden – Challenges in an academic environment

Author(s): Paul J.A. Kessler

Abstract Type: Presentation

The Hortus Botanicus Leiden is the oldest botanical garden in the Netherlands and, since its foundation in 1590, a key facility of Leiden University. The necessity of existence within a university context has been questioned regularly nationwide, unfortunately leading to a decrease of university gardens in the Netherlands from eight to three. Fortunately Leiden University unanimously supports the garden in various ways, not only financially. This is due to several factors, three of them paramount to our success no only to survive but also to thrive. 1. Strengthening and enlarging scientific and higher education activities not only within their own Science faculty but university-wide and internationally. 2. Implementation of a robust business model with a diverse range of income sources and especially increasing contributions through donations, grants, and gifts. 3. Increasing the visibility within and outside the university. Good practice examples will be presented for each factor including a number of scientific projects based on our South East Asian living collection of orchids and carnivorous plants, education programmes, programming, and public activities with their revenue model.

39. The Eden Project's *Musa* Story

Author(s): Henrietta Ninnis

Abstract Type: Presentation

At the Eden Project our aim is to engage our visitors who, unlike botanical garden visitors, often do not have much interest in plant conservation. We want to help them realise that we are completely dependant upon plants. We do this with horticultural displays and stories that link people to plants. We discuss today's issues but in an empowering and positive way, which will hopefully leave our visitors feeling connected, enlightened and ready to do something positive towards looking after our planet and plants. We have had the privilege of telling some brilliantly positive stories, and have done this in unique and entertaining ways: from an exhibit that played the 'bananas in pyjamas' song while giving our visitors sound bites from real banana growers, to our banana monorail which tells the story of sustainable production, to highlighting the importance of banana diversity and conservation in the process of breeding to overcome pests and disease in banana cultivation. There have been many ups and downs with Eden's collection of bananas. The whole exhibit has been replanted twice in the 15 years the Gardens have been open. We have also faced challenges with soil anomalies, disease and dealing with an exhibit that did not fit the space. Despite these changes and challenges we continue to be greatly inspired by the banana, and wish to expand our collection and tell more stories about the origin, biodiversity and breeding of *Musa* plants and their relationship to people.

40. The anachronistic fruit of Borneo dispersed by elephants and rhinoceros

Author(s): Quentin Phillipps

Abstract Type: Presentation

The majority of tree species in the Bornean rainforest have animal dispersed seeds. Throughout Borneo the largest frugivorous birds and animals such as hornbills and pheasants, elephants and rhinos have become rare in many areas and thus many trees with large fruits or seeds have lost a critical partner for seed dispersal. These un-dispersed fruit that lie rotting on the forest floor are commonly known as 'anachronistic fruit'. Until relatively recently elephants, rhinos and tapirs were important dispersers of the largest seeds of rainforest trees. By sorting large fruits and seeds into different dispersal guilds and taking into account the current ecology of the parent tree, we can recognise separate distinct dispersal guilds for both the elephants and the rhinoceroses. I illustrate examples of the most important dispersal guilds with an emphasis on the largest fruit and seeds such

as the large mangoes *Mangifera caesia* and *Mangifera pajang*, which evolved to be dispersed by elephants and rhinoceroses. Next I explain how the climatic history of Sundaland influenced the evolution of large seeds such as *Eusideroxylon zwageri* (belian) and *Borrassodendron borneensis* that were dispersed both by rivers and by elephants and rhinos. Finally I discuss the implications of the loss of large seed dispersers for forest diversity both in Borneo and Malesia.

41. Floristic composition and vegetation structure of the remaining forests in upland Cavite, Luzon Island, Philippines

Author(s): Maria Melanie Medecilo and Myra Lagat

Abstract Type: Presentation

Cavite province lies in the western monsoon forest zone and is considered as a tropical lowland rainforest, making it a haven for diverse plants and animals. The existing total land forest area is 8,624.956 hectares, but the only proclaimed national park is the Mts. Palay-palay/Mataas na Gulod Protected Landscape. However, the remaining forests are not spared from biodiversity loss due to their close proximity to Metro Manila that will eventually lead to unsustainable use of natural resources. This study was conducted to characterise the floristic composition and analyse the vegetation structure and provide an inventory of plants. Data collection was done from June 2014 to March 2016. Fifty-two plots (20 × 20 m) were used for tree species composition. For shrub and non-woody plants, 5 × 5 m quadrats were established while for herbaceous plants, a 1 × 1 m quadrat size was used. Plant diversity and environmental variables were measured and recorded in each plot. Canonical Correspondence Analysis (CCA) was used to analyse the relationships between vegetation and environmental variables. A total of 450 species belonging to 270 genera and 85 families were documented. The forest is characterised as lowland evergreen dipterocarp rainforest dominated by *Shorea guiso*, *Diospyros pyrrhocarpa*, *D. philippinensis*, *Archidendron clypearia* and *Alstonia macrophylla*. The forest floor is dominated by *Anaxagorea luzonensis*, *Aglaonema commutatum* and *Bolbitis rhizophylla*.

42. Project Flora Malesiana: Orchids of New Guinea, inventory of a giga flora

Author(s): Ed de Vogel

Abstract Type: Presentation

Project Flora Malesiana, Orchids of New Guinea using software of ETI, was executed at the Nationaal Herbarium Nederland from 1996 until the present date. Twenty field trips were made to 46 locations in 12 New Guinea provinces, resulting in 7,500 collections of live plant cuttings for Botanical Gardens Port Moresby and Leiden. 2,500 Leiden plants have produced flowering herbarium and spirit vouchers so far. Plants and flowers were photographed; 70 new species have been described, many still await description, for example *Dendrobium* sect. *Diplocaulobium* has 80 described species; some 40 undescribed species were detected so far. A synopsis with 2,716 described New Guinea orchids was published on six CD-ROMs, based on published descriptions, expertise of the authors, and data collected during fieldwork and from herbarium specimens. 2,000 Latin descriptions were translated in English. All species have a description, habitat, flowering and distribution details, colour descriptions of the flowers and indications for cultivation. 16,000 illustrations are included: distribution maps, type images, and original and published drawings and photographs, including 1,000 stereo photographs. On modern 64-bit computers the CDs do not work. Naturalis Biodiversity Center produced a website programme called Linnaeus New Generation in which the CD information was merged. Based on the same information Wolfgang Bandisch in PNG designed a different website. Ed de Vogel is now updating the websites to include the c.150 species described after the CDs were published. Both websites will be demonstrated.

43. The Flora Malesiana account of grammitid ferns (Polypodiaceae) – a progress report

Author(s): Barbara Parris

Abstract Type: Presentation

Fourteen genera and approximately 380 species of grammitid ferns (formerly Grammitidaceae, now Polypodiaceae) occur in Malesia. Flora Malesiana accounts of six small genera are complete: *Acrosorus* (nine species), *Archigrammitis* (two species), *Chrysogrammitis* (two species), *Micropolypodium* (one species), *Scleroglossum* (five species) and *Xiphopterella* (ten species). Accounts for three other genera are nearly complete: *Ctenopterella* (six of eight species complete), *Dasygrammitis* (nine of ten species complete) and *Radiogrammitis* (23 of 27 species complete). The other five genera are at varying stages of completeness: *Calymmodon* (43 of c. 52 species complete), *Oreogrammitis* (80 of c. 113 species complete), *Prosaptia* (43 of 76 species complete), *Themelium* (20 of 27 species complete) and *Tomophyllum* (25 of 36 species complete). Current studies involve working through species that have long been herbarium dumping grounds, such as *Calymmodon cucullatus*, *Prosaptia contigua*, *Radiogrammitis hirtella* (as *Grammitis hirtella*) and *Tomophyllum subfalcatum* (as *Ctenopteris subfalcata*). The rich assortment of undescribed species found under these names will be discussed.

45. A synopsis of the genus *Smythea* (Rhamnaceae)

Author(s): Daniel Cahen and Timothy Utteridge

Abstract Type: Poster

Smythea is a genus of 10 species of mostly South East Asian tropical climbers in the Rhamnaceae. It was first described by Seeman in 1862, when he recognised one species – *Smythea pacifica* Seem., (= *Smythea lanceata* (Tul.) Summerh.) – a mangrove species with a wide distribution, whose fruits may float in seawater for months. The genus is closely related to *Ventilago* with which it forms Ventilagineae, a tribe unique in Rhamnaceae in their fruits having a pronounced apical appendage. The genus has been revised and four new species have been recognised on the basis of a morphological study. We will present descriptions and identification characters, a discussion of generic delimitation between *Smythea* and *Ventilago*, as well as illustrations and distribution maps.

47. Progress in Malesian Primulaceae: moving on from 'Myrsinaceae'

Author(s): Timothy Utteridge, Clare Drinkell, Anne Dubéarnès, Suzana Sabran and Avelinah Julius

Abstract Type: Presentation

The 'Myrsinaceae' are conspicuous members of the forest understorey in South East Asia but the group is now treated within several subfamilies in Primulaceae following the Angiosperm Phylogeny Group classification. The majority of the traditional 'Myrsinaceae' are now placed in Primulaceae-Myrsinoideae – a largely tropical group with approximately 40 genera and 1,300 species; in addition, the genus *Maesa* Forssk. is placed in the monotypic Primulaceae-Maesoideae. There are several species-rich genera in Malesia, especially *Ardisia* Sw. (with at least 150 species in Malaysia alone, for example), *Embelia* Burm.f., *Maesa*, as well as numerous smaller genera with unclear generic limits. The 'Myrsinaceae' were last monographed in 1902, and there is no contemporary floristic treatment for the Malesian region. The most recent Flora treatment is the Tree Flora of Malaya account by Stone (1989), but as most taxa are not large enough to merit descriptions, they are included only in the species keys. This paper will give an overview of the family and its new classification; taxonomic revisions and new species discoveries in *Maesa*, *Ardisia*, *Embelia* and *Systellantha* B.C.Stone; and observations on generic delimitation in *Hymenandra* A.DC. ex Spach, *Antistrophe* A.DC., *Fittingia* Mez, and *Discocalyx* Mez. Plans for future work and opportunities for further collaboration will be presented.

48. Preliminary findings of a conservation genetic study of *Rafflesia lagascae* (Rafflesiaceae; Philippines)

Author(s): Pieter Pelser and Julie Barcelona

Abstract Type: Presentation

Rafflesia (Rafflesiaceae) is a small Malesian genus of endo-holoparasites of *Tetrastigma* (Vitaceae). Most *Rafflesia* species are rare and endangered and the tropical rainforests in which they live are decreasing in size owing to development, logging and 'slash-and-burn' agriculture. These species are thus in desperate need of effective conservation strategies. In order to inform conservation management of the Philippine endemic *Rafflesia lagascae*, we use microsatellite data to determine the genetic diversity and connectivity of its populations. In this presentation, we will present our preliminary findings of this study. In addition, these data provide new insights into the reproductive biology of this species and its taxonomic delimitation. We will also discuss whether *R. lagascae* shows evidence of host-race formation.

49. Inferences on the biogeographical history and novelties in the Philippine Octotropideae (Rubiaceae) inferred from multiple sequence data

Author(s): Axel Arriola and Grecebio Jonathan Alejandro

Abstract Type: Presentation

The Philippine Octotropideae is represented by *Hypobathrum* (three species) and *Villaria* (seven species) which are considered to be undertreated due to the lack of information regarding their phylogeny, taxonomy and biogeography. Therefore this study aims to unravel novel information on the phylogenetic position of the group as well as provide inferences by reconstructing the biogeographical history of the Philippine representative utilising multiple cpDNA sequences (accd-psa1, petD, rpl16 and trnL-F). The strongly supported (PP=1.00; BS=100%) Octotropideae forms two subclades; unilocular ovary clade (*Villaria*) and bilocular ovary clade (sampled Octotropideae). Meanwhile, *Villaria* is paraphyletic due to the placement of the three Philippine *Hypobathrum* (*H. coriaceum, H. multibracteatum* and *H. purpureum*). Moreover, the *Hypobathrum* clade is likewise unnatural due to the placement of *Diplospora sessilis* and *D. sorsogonensis*. Morphological observation on the Philippine species showed congruence with our molecular result, thus we propose nomenclatural changes. The result of both S-DIVA and BBM analyses suggests that the Philippine Octotropideae originated from African ancestry with several dispersal and vicariance events from Africa to Asia and is robustly supported [PP=0.97 (S-DIVA) and PP=0.87 (BBM)]. The biogeographical analysis suggests that Africa played a vital role as a centre of diversification and radiation of the Philippine Octotropideae and the whole tribe.

50. The Gesneriaceae in Asia

Author(s): David Middleton

Abstract Type: Presentation

In the last 20 years there have been substantial changes in generic delimitation in Asian Gesneriaceae, including the synonymisation of many genera. However, phylogenetic research and further exploration has also resulted in the description of new genera, especially from Thailand and Vietnam. It is likely that we are nearing stability in the generic delimitation of known taxa. Some of the new genera described, however, have resulted from the collection of plants which have been found to belong to distinct and previously unknown lineages. The possibility of further new genera being discovered cannot be ruled out. Of the major eastern Asian modern Floras an account of the Gesneriaceae has only been completed for the Flora of China. Accounts for the Flora of Thailand and the Flora of Peninsular Malaysia are progressing well but accounts for the Flora of Cambodia, Laos and Vietnam and Flora Malesiana are far from completion. Exploration of previously uncollected or undercollected areas associated with efforts for the Flora of Thailand has led to the description of many new species. The very much lower numbers of taxa for most genera in Cambodia, Laos and Vietnam are likely to be an artefact of low collecting density and this must be addressed before an accurate Flora account could be produced for this area. An account for Flora Malesiana would have to be tackled in two phases: one to revise all genera other than *Cyrtandra* and the other to tackle *Cyrtandra*. This will require a large and coordinated team of taxonomists.

51. The figs of Borneo and their significance in rain forest ecology

Author(s): Quentin Phillipps

Abstract Type: Presentation

Along with New Guinea, Borneo is one of two world centres of diversity for the figs, with over 150 species recorded. In Borneo the genus *Ficus* includes plants with enormous morphological variety from banyans and giant stranglers to small rheophytic shrubs. Figs provide both a staple diet to many nomadic mammals such as binturongs, bats and green pigeons as well as a fall back 'lean season' fruit supply between forest masting episodes to gibbons, orangutans, hornbills and many other animals. Within the 150 *Ficus* species we can recognise at least 11 different dispersal syndromes where the figs are targeted (by shape, size, colour and smell) at a particular disperser. Examples of some dispersal guilds are illustrated including bats, small birds, large birds, primates and deer. Due to their unique pollination system, figs can be regarded as 'obligate colonial breeders' with a minimum population of around 30 individuals required for survival in any area and the implications for conservation and cultivation are discussed.

52. Impact of fragmentation and change in forest structure on fern species richness in the Xishuangbanna tropical forest, China

Author(s): Daniele Cicuzza

Abstract Type: Presentation

Xishuangbanna, the southern prefecture of Yunnan, China, with its 20,000 km^2 represents 0.2% of the surface area of China and hosts more than 15% of the Chinese flora. The area is botanically relevant due to the diverse vegetation in lowland, montane and karst areas of the forest, all of which contribute to a high species diversity and community composition. Climatically we observe the introgression of tropical and subtropical climate and strong Indian monsoon. Floristically this area has numerous elements from the Malesian region. We present first the results of fern species diversity from an extensive survey throughout Xishuangbanna. The survey resulted in more than 200 species being identified, spatially divided between the highland and the more extensive lowland region. Moreover, the limestone complex stands separately with a unique fern diversity and forest structure. The recent conversion of extensive areas to rubber, banana and tea plantation has reduced and fragmented the distribution of many plant species as well as ecosystem services. The study shows how change in forest structure alters the micro-climatic conditions excluding numerous interior forest fern species. This habitat filtering has reduced species occurrence and pushed others to become locally extinct. This highlights the endangered species affected by landscape change and their new IUCN status. Despite ferns having good dispersal strategy, fragmentation reduces the chance to establish or maintain local species population. This effect could be replicated in other South East Asian countries where the cultivation of tropical crops, such as rubber and banana, are expected to expand in the coming decades.

53. Digitalisation and mark-up of Flora Malesiana: Results and future challenges

Author(s): Thomas D. Hamann

Abstract Type: Presentation

Finally, after several years of hard work, 2016 sees the completion of the XML mark-up of Flora Malesiana. In this presentation I will discuss the procedures followed to convert the digital text files to a format suitable for database import using the programming language Perl. Topics covered will include preparatory work, a short primer on exploitable patterns in semi-structured text, and challenges encountered prior and during the mark-up process. I will then present the results of the mark-up process, and talk a bit about possible applications. Furthermore, I will dwell briefly on the results obtained with two other major Naturalis floras, Flore du Gabon and Flora of the Guianas, and compare and contrast their results with those of Flora Malesiana. Based on this comparison, I will make some suggestions with regard to improving both writing and editorial procedures to facilitate

easy and automated conversion in the future, specifically by reducing the time required for proofreading. Lastly, I will talk about some remaining challenges for which solutions will have to be found, and make some suggestions with regard to further research on these topics. One of these is the many different taxonomic terms found in taxonomic publications and their conceptual evolution throughout time, a topic that will need to be properly dealt with if we want to fully exploit the information found throughout all taxonomic literature.

54. DNA barcoding of a mixed dipterocarp forest in Brunei Darussalam and phylogenetic analysis of Dipterocarpaceae

Author(s): Jacqueline Heckenhauer, Kamariah Abu Salim, Turner Barbara, Michael H.J. Barfuss, Mark W. Chase and Rosabelle Samuel

Abstract Type: Presentation

A clear understanding of how forest communities are structured is important for conservation and restoration of ecosystems and thus their contribution to sustaining human populations. Here we assess, using DNA barcoding, the biodiversity and phylogenetic community structure of a 25 ha mixed dipterocarp forest at Kuala Belalong (Brunei Darussalam), set up by the Centre of Tropical Forest Science (CTFS). Taking different ecological niches of the 25 Ha forest into consideration, all individual woody plants (>1 cm diameter at breast height) were sampled from 76 subplots (10 × 10 m) giving a total of 4,200 specimens for barcoding. Standard plant barcoding markers rbcL and matK revealed 56 plant families in the 25 Ha forest, with Dipterocarpaceae being the dominant one. Phylogenetic relationships in the South Asian subfamily Dipterocarpoideae remain poorly resolved, barcoding its species using small fragments of matk and rbcL leads to an unresolved backbone in the phylogenetic tree since closely related species have identical sequences. In order to address this issue, we conducted phylogenetic analysis using complete rbcL, matK and trnT-trnL-trnF plastid DNA sequences. Here we included most genera of the subfamily Dipterocarpoideae from different parts of Asia (Sri Lanka, Thailand, Brunei), as well as individuals of the other subfamilies Monotoideae and Pakaraimaeoideae. Phylogenetic trees were calculated using maximum parsimony, maximum likelihood and Bayesian interference. The topologies of the trees are consistent with the morphological taxonomy as well as previous molecular studies and provide new insights into the large genus Shorea of Dipterocarpoideae, which is not monophyletic.

55. The potential of wild Zingiberaceae *Elettariopsis slahmong* for green-pesticide in West Sumatra, Indonesia

Author(s): Nasril Nasir

Abstract Type: Presentation

The goal of this study was to identify an environmentally friendly natural insecticide for reducing chemical pesticides used in Indonesia. Wild Zingiberaceae *Elettarioposis slahmong*, grown in West Sumatra, has a particular character which produces a very strong stink bug odour, similar to methidation, a chemical insecticide being distributed widely in the country. The essential oils obtained by warm distillation of the leaves, rhizomes and roots were analysed by GCMS. One of the principal green-pesticide components in the oil was 5-alkylthiomethylhydantoin-S-oxides. The discovery of this component led to the pre-investigation of using it against *Drosophilla melanogaster*. *D.melanogaster* is one of the vectors of Blood Disease Bacterium, the most destructive banana disease in Indonesia. The disease killed 1.40% of banana in 1998, however this increased dramatically to 37.9% in 2003. Currently, there is no banana plantation free from Blood Disease in Indonesia. This study examined the effect of the oils on the mortality, antifeedant and repellent levels against *D. melanogaster*. Feeding inhibitions of *D. melanogaster* were observed by treating bait with the oils. Treatments including control were conducted in five groups. The vector was starved for six hours before exposure. Work was developed in 300 ml transparent plastic bottles. The result of this research indicated that the oils significantly affected the mortality (40%), antifeedant (93%) and repellent (99.6%) of *D. melanogaster*. The underlying assumption behind this result was that the pungent alkyl thio-sulfinates in the essential oil of *E. slahmong* has a poisoning element which is harmful to insects' respiration system.

56. Floristic Inventory at Weda Bay (Halmahera, North Maluku, Indonesia)

Author(s): Susana Arias Guerrero, Peter Phillipson, Deby Arifiani, Tjut Jul Fatisa Bangun, Mary Merello, Tariq Stevart, Ismail Rachman, Max Van Balgooy, Peter Lowry, Gavin Lee and Peter Van Welzen

Abstract Type: Presentation

A partnership between Weda Bay Nickel (WBN), the Missouri Botanical Garden (MO), Herbarium Bogoriense (BO) and Naturalis Biodiversity Center (L) lead to floristic inventory work in Halmahera, an under-explored part of the Malesian region. Over an 18-month period, a total of 3,603 herbarium collections were made – more than doubling the number available from the island globally – as well as 999 living orchid collections (maintained on site) yielding fertile spirit specimens. Corresponding DNA samples and an extensive photographic record were also made. Identification of duplicates was done at BO, MO and especially at L, where extensive expertise provided in-house and by visitors added significantly to the quality of the inventory. The project aimed to compile a checklist of vascular plants based on critical identifications as a baseline for biodiversity management at WBN's proposed mining project. The collections were databased in Tropicos®, and a dedicated online project was established to compile specimen and species-level information, including images. The project also supported efforts at Naturalis to scan the ca. 27,000 Maluku specimen records at L and conduct post facto georeferencing – possible for nearly 50% of the specimens. The inventory resulted in valuable material of poorly known species, data on species new for the Maluku islands, and the discovery of species new to science, thus making a significant contribution to botanical knowledge of the region as a whole. By making data and images available online, the project has ensured that these are available for ongoing and future studies.

57. A Morphotype and Taxonomy Clearing House (MaTCH): hacking Malesian plant data
Author(s): Campbell Webb

Abstract Type: Poster

For anyone without ready access to herbaria and libraries, naming Malesian plants presents some major obstacles. i) Online data, including names lists (e.g., ThePlantList), primary literature (BHL), DNA sequences, specimen records (GBIF), and images of living plants and specimens (Flickr, iDigBio), while increasingly available, are not integrated in any easy fashion, and cross-matching between resources is difficult. ii) The available names for many plants in Malesia are of questionable reliability, because of extensive synonymy, the absence of recent monographs for most species-rich taxa, and the frequent misidentification of specimens and plant images. I am developing a web resource (MaTCH; http://i2i2t.net) that addresses these problems. The server contains scripts that regularly extract data from other sites (with permission) via their APIs or 'page-scraping', caches these data and then serves them up in an integrated way. Until there are universally adopted data sharing protocols and APIs, such a 'bespoke' solution remains the only way that sites can be connected. A key feature of MaTCH permits users to match their own plant to online images (living or specimen) of other plant individuals, and not just to a name, thus producing persistent data about this match, including a measure of confidence. The emerging network of individual-to-individual matches represents important data, both in the absence of traditional names, and as a key resource for taxonomists engaged in species discovery, delimitation and description. In the poster, I will outline the philosophy behind the project, the informatics details, and the web-resources incorporated.

58. *Syzygium* (Myrtaceae): monographing a taxonomic giant via 22 coordinated regional revisions

Author(s): James Byng, Berhaman Ahmad, Claudia Baider, Benedetta Bernardini, Edward Biffin, Fabian Brambach, David Burslem, Maarten Christenhusz, Vincent Florens, Eve Lucas, Rajasri Ray, Erik Smets, Neil Snow, Joeri Strijk and Peter Wilson

Abstract Type: Presentation

Syzygium Gaertn. is the largest woody genus of flowering plants in the world. Unpublished but extensive recent herbarium surveys suggest 1200–1800 species distributed throughout the Old World tropics and subtropics. Until recently, *Syzygium* exemplified a recurring taxonomic impediment among megadiverse genera, wherein few taxonomists worked on the group in any sustained manner, a majority of the herbarium specimens remained undetermined or misidentified, few if any attempts were made to look at the genus globally, and limited or no molecular studies were available to provide a predictive phylogenetic context of the genus. Taxonomic outputs on *Syzygium* also have been increasing across its range with the description of new species, resolution of nomenclatural and typification issues, and some regional revisions being initiated or updated. However, virtually all regional treatments (which some areas lack) need urgent revision because they are severely outdated, have limited molecular sampling and are error-ridden. We are coordinating a genus-wide taxonomic update of *Syzygium* through a series of 22 regional revisions, including nine in the Flora Malesiana region. Each treatment will include a phylogenetic framework with species descriptions, type information, synonymy, distributions, ecological notes, and keys. Field images and/or line drawings will be included with the goal of every species being illustrated. This paper outlines our progress to date, with a particular emphasis on the Malesian region, and recent biogeographic and phylogenetic insights into the genus.

59. *Bauhinia* s.l. (Leguminosae-Caesalpinioideae) – how many genera in South East Asia?

Author(s): Ruth Clark, Barbara Mackinder and Hannah Banks

Abstract Type: Presentation

The genus *Bauhinia* has a long and complex history, and has been variously considered to be a single, large genus consisting of 300–350 species, with many subgenera and sections, or to be as many as 26 distinct genera. Recent molecular-based analyses have demonstrated that *Bauhinia* sens. lat. is not a natural taxon, and in 2005 Lewis et al. proposed eight segregate genera. One of these, *Phanera*, has been understood to comprise 120–130 lianescent species distributed across both South East Asia and South America. However, following the recent segregation of the Neotropical species from this group as the genus *Schnella*, *Phanera* sens. strict. is now circumscribed as a group of c.90 spp., restricted to South East Asia. Nevertheless *Phanera* remains a somewhat heterogeneous taxon. Here we propose a new genus comprising the species of *Phanera* subsection *Corymbosae*, based upon morphological, molecular, and biogeographical characteristics. *Lasiobema* is another putative segregate genus of *Phanera* sens.strict. The molecular sampling to date of species of *Lasiobema* has been limited, and results have been inconclusive. Robust synapomorphies to delineate the group are also lacking. The evidence to recognise *Lasiobema* as a genus is examined here.

60. Evolution of floral morphological characters in Annonaceae

Author(s): Amira Azizan and Thomas L.P. Couvreur

Abstract Type: Poster

Annonaceae is the most diverse family of Magnoliales and one of the most important lineages in the early angiosperm radiation. Species in this family are highly concentrated in tropical rain forests, especially in Indo-Malayan regions. The myriad form and structure of their flower have diversified in different ways, while certain floral features exhibit a conservative ground plan. Many taxonomic and systematic studies have been carried out to characterise extant species in order to determine the generic delimitation of Annonaceae. Despite this considerable amount of work, there is still more to be discovered on the origin and the evolutionary history of the flower within this family. Therefore, in this present study we reconstruct the evolutionary history of two important characters: sympetaly and the fusion of ovaries. For this, we use the recently published phylogeny and classification based on molecular sequence data that includes 90% of known genera. Using PROTEUS, we coded both these morphological characters for one representative species per sampled genus. We reconstruct how many times both these features have evolved in Annonaceae, and estimate the ancestral states in each case using the phylogenetic comparative method. The results of these analyses are discussed in the light of the evolutionary trends of Annonaceae floral diversity.

62. Branching system of *Merinthosorus hieronymi* (Drynarioideae)

Author(s): Ardinis Arbain

Abstract Type: Presentation

Based on micromorphological observation the branching modus of *Merinthosorus hieronymi* will be described. Unlike the other drynarioid ferns the branching system of *Merinthosorus hieronymi* shows a phylomconjunct branching system with two parallel branch primordia in a monostichous leaf arrangement.

63. A taxonomic reassessment of genus *Podocarpus* in the Philippines

Author(s): Florence Roy Salvana and William Gruezo

Abstract Type: Poster

There are 10 species of *Podocarpus* L'Herit. ex Persoon in the Philippines considered in this work. Examination of all available herbarium specimens supported the close morphological resemblance of some species such as *P. ramosii* and *P. pilgeri; P. costalis* and *P. polystachyus*. These species, however, are distinguished from each other using leaf characters, particularly leaf shape, apex and margin, which can be easily utilised especially in the examinations of sterile specimens. Other distinguishing characters such as the pollen cone and seed structure are also utilised. Notable results of this study are: (1) the existence of variable leaf forms in *P. pilgeri* is correlated to the type of habitat in which this species occurs; (2) variable leaf forms and sizes are observed in mature and juvenile leaves of all species; (3) *P. palawanensis* is considered a distinct species in the Philippines and is treated under Section *Macrostachyus* de Laub.; (4) differences between the wild and cultivated representatives of *P. costalis* are recognised based on the leaf characters; (5) new distribution areas of *P. ramosii, P. pilgeri*, *P. costalis*, *P. neriifolius*, *P. rumphii* and *P. polystachyus* are recorded; and (6) comprehensive examination of herbarium specimens result in the correct identification of many specimens. This study shows that some *Podocarpus* species are in a wide range of altitude, relative humidity gradient and soil pH range. There are certain species that need much attention in terms of conservation due to decreasing populations in the wild brought about by various threats, primarily conversion of forests to agricultural lands.

64. Diversity of Orchidaceae from Murum Dam, Belaga, Sarawak, Borneo

Author(s): Chea Yiing Ling and Julia Sang

Abstract Type: Presentation

Murum Dam in Sarawak is located about 70 km upstream of Bakun Dam, on Sungai Murum, Sungai Danum and Sungai Plieran forming a reservoir over an area of 245 km sq. The areas consist of mainly lowland to hill mixed dipterocarp forests, with riparian and alluvial forests along the main rivers and streams, as well as patches of mossy and heath forests. Most of these forests are logged-over forests and some areas have been converted into oil palm plantations. A flora rescue project was carried out to collect selected plant species including orchids from the areas affected by the dam. Most epiphytic orchids were collected from partially submerged trees. Over 2,000 specimens of orchids from 82 genera and at least 294 species were collected from May 2013 to December 2014. The most abundant genus recorded is *Bulbophyllum* (c. 44 species). Of these, 35 species are endemic to Borneo, one newly described species (*Bulbophyllum upupops* J.J.Vermeulen & Lamb) and seven species are new records for Sarawak. The collection of species from such work provides valuable materials for research and conservation of orchids from vulnerable areas such as dams.

65. Preliminary study on the genus *Athyrium* in Malesia: names, distribution and planned project

Author(s): Wita Wardani and Bayu Adjie

Abstract Type: Presentation

Athyrium is a genus in Athyriaceae, previously also recognised under Woodsiaceae, mostly distributed in temperate and subtropical regions. In Malesia, this genus grows in high altitude areas with high humidity. *Athyrium* is often treated in a broad concept that includes *Diplazium*, *Deparia*, *Anisocampium* and *Cornopteris*. We have scrutinised names listed in the literature as well as those used on herbarium specimens in BO and L that are possibly true *Athyrium*. There are at the moment 37 species names listed with more than half of them attributed to the Philippines. Thirteen species are recognised from Java, while other parts of Malesia are known to have less than ten species. Java and the Philippines seem to be well studied compared to other major islands with high mountains. Five species are known only from the northern part of Borneo and 12 species only occur in the Philippines. We have planned a project to carry out a complete examination and seek collaboration in working on the revision.

66. Generic limits of *Ardisia* (Primulaceae-Myrsinoideae) in Tropical Asia

Author(s): Avelinah Julius, Timothy Utteridge and Tadashi Kajita

Abstract Type: Poster

Ardisia, one the most species-rich (ca. 500 species) genera of Primulaceae-Myrsinoideae (traditionally placed in the family Myrsinaceae), is very diverse in Malesia with at least 150 species in Malaysia alone; *Ardisia* is also one of the most commonly collected groups in botanical surveys. The genus displays extensive morphological variation which is currently used to define the existing subgeneric classification, but this appears to be paraphyletic and polyphyletic. Preliminary molecular analyses have revealed that there are mono-, para- and polyphyletic groups within the genus. In addition, some taxa have been moved between different related genera due to differing opinions on generic delimitation; for example, *Ardisia porosa* was originally treated within *Tetrardisia*. *Ardisia* has also several morphologically similar genera, for example *Antistrophe*, *Hymenandra* and *Tetrardisia*, which were split off from *Ardisia* chiefly based on one or two morphological characters. Therefore, the relationships between *Ardisia* and other related genera are being tested using a combination of improved sampling, alpha taxonomy and molecular phylogenetics. The poster will present the current taxonomic framework for the genus, initial findings from the current studies, and future work to provide a better definition for the limits of *Ardisia*.

67. Shoot cutting method, an initial step in the conservation of Sumatra indigenous species (*Morus macraura* and *Alstonia scholaris*)

Author(s): Zozy Aneloi Noli

Abstract Type: Presentation

Morus macroura Miq. and *Alstonia scholaris*(L).R.Br. are indigenous species of Sumatra. Recently, it was observed that populations of both species are slowly declining in Sumatra. Shoot cutting is one of the methods used to propagate the trees to conserve these species. In this study, the effect of some auxins on root induction of shoot cuttings was evaluated under green house conditions. The results showed that the number of roots, root length and the growth of shoot cuttings of both species was enhanced by some auxins.

68. An introduction to the flora of the Lesser Sunda Islands

Author(s): Himmah Rustiami, Rugayah, Abdulrokhman Kartonegoro, Yessi Santika, Wita Wardani, Deden Girmansyah, Florentina Windadri, Eka Tihurua, Lulut Sulistyaningsih and Siti Sunarti

Abstract Type: Presentation

Lesser Sunda Islands (LSI) is comprised of the Province of Bali, West Nusa Tenggara (Lombok & Sumbawa island), East Nusa Tenggara (Flores, Sumba, Timor, Rote, Alor, Sabu, Adonara, Solor, Komodo) and Maluku (Wetar, Tanimbar). Plant distribution patterns suggest that most dispersal to the area is from Western Malesia rather than Australia. Due to the history of their formation, geographic isolation from other large Malesian Islands and the influence of a dry climate, the islands have many endemic species. Some islands such as Sumba, Rote, Alor and Wetar are poorly known and with continuing collections more novelties and endemic species can be expected. In order to cover the diversity of LSI, Herbarium Bogoriense (BO) has five-year projects on inventorying the flora. A floristic study of Bali has already begun and will be presented separately. Lombok island is the first location for a five-year LSI project (2015–2019). Although some recent studies have been conducted, such as Tobe et al. (2010), Wardani et al. (2012), Ardiyani et al. (2012), recent exploration in 2015 has resulted in new records for the island (such as *Freycinetia sumbawaensis*, *Daemonorops melanochaetes*) and several, presumably new, species. One unidentified species, *Freycinetia* sp. needs further study to solve its taxonomic status. Some other interesting species information will be presented. A Checklist Flora for each island from LSI will be published at the end of this project.

69. Current status of Indonesian *Hoya* (Apocynaceae: Asclepiadoideae): inventory, utilisation and conservation

Author(s): Sri Rahayu

Abstract Type: Presentation

Indonesia is a major centre of *Hoya* species diversity. In this paper we review and analyse activities to inventory, document, utilise and conserve Indonesian *Hoya*, from the Dutch Era until the present e-Era. The data was collected from literature, herbaria, botanic garden reports and catalogues, and social media. The first and most complete documentation was compiled by Miquel in 1800s. Other authors compiled local island Floras that included records of *Hoya* species. The utilisation of this genus in Indonesia was formerly limited to local communities for traditional medicine, and there is not very much documentation about this. Of particular interest during the 1960s was the depiction of *Hoya cinnamomifolia* on the Indonesian Rupiah note issued in 1959. Bogor Botanic Gardens was the only place in Indonesia for ex situ conservation of this genus from the Dutch Era until 2000s. In the 2000s, other Indonesian Botanic Gardens helped to expand the effort. The trend of developing new local botanic gardens in Indonesia has increased the number of collected Hoyas from the wild. In recent times, during the e-Era, we have been promoting via social media the participation of local communities in inventorying, cultivating and conserving the genus. A summary of the current status for Indonesian *Hoya* is as follows: there are 62 *Hoya* species reported from the Indonesian region, of which about 50 species have been cultivated in 19 Indonesian Botanic Gardens and local community gardens. Five of them have been published as new species, and about ten are still unidentified.

70. Systematics of the genus *Embelia* (Primulaceae – Myrsinoideae)

Author(s): Anne Dubéarnès, John A.N. Parnell, Trevor R. Hodkinson and Timothy M.A. Utteridge

Abstract Type: Poster

Embelia Burm.f. (Primulaceae, subfamily Myrsinoideae) is a genus of climbing shrubs distributed mostly in South and South East Asia, tropical Africa and Madagascar. *Embelia* displays extensive morphological variation – especially regarding the position, shape, size and merosity of the inflorescences and flowers. The genus is distinguished from other Myrsinoideae only by the climbing habit, and therefore the monophyly must be investigated, especially as the relationship with morphologically similar genera like *Cybianthus* (Neotropics) and *Oncostemum* (Madagscar) has not

been critically evaluated. The last monograph of *Embelia* by Mez (1902), recognised eight subgenera and 92 species, but the total number of species is currently estimated at 150–200, and the subgenera used by Mez must be critically assessed. In Malesia, approximately 60 species are currently recognised and, based on morphological data, they can be attributed to five of the existing subgenera and one new subgenus that will therefore need to be created. Future molecular studies, combined with the analysis of morphological data, will enable a better understanding of the taxonomic framework of the genus and, by extension, of the Myrsinoideae as a whole.

72. Generic position of *Canthium ellipticum* and *Psydrax puberula* inferred from molecular sequence data and a description of two new species

Author(s): Lyn Paraguison and Grecebio Jonathan Alejandro

Abstract Type: Presentation

The utilisation of molecular data has resulted in the establishment of well-supported groups in the tribe of Vanguerieae. The genus *Canthium* sensu stricto (s.s.) was recircumscribed to include representatives with spines resulting in the transfer of other species to either *Pyrostria* s.s. or *Psydrax*. For a continuing taxonomic effort in Philippine Vanguerieae representatives of the tribe were collected to determine their generic positions utilising both molecular and morphological data. This study aims to determine the generic affiliation of the spineless *Canthium ellipticum* (Merr.) Merr. and *Psydrax puberula* Arriola and Alejandro as well as identify the two diverging species of *Pyrostria* collected in Mt. Mariveles and Mt. Mingan. The majority-rule consensus tree of the ITS-trnLF datasets showed a well-supported (PP=1.00; BS=100) clade of the whole Vanguerieae. Interestingly, Bayesian inference strongly supports the placement of *C. ellipticum* and the two diverging *Pyrostria* within *Pyrostria* clade (PP=1.00; BS=100) and *P. puberula* within *Psydrax* clade (PP=0.98; BS=90). Morphological examination of *C. ellipticum* and the two *Pyrostria* cf showed features of *Pyrostria* although the latter revealed diverging characters with the currently known species of the genus. Therefore, three novelties are herein proposed including a new combination and two new species.

73. New records, rediscoveries, and the floristic value of Singapore's last substantial tract of freshwater swamp forest

Author(s): Kwek Yan Chong, Reuben C.J. Lim, Jolyn W. Loh, Louise Neo, Wei Wei Seah, Siu Yueh Tan and Hugh T.W. Tan

Abstract Type: Presentation

The unique plant communities of the freshwater swamp forests of south Johor (Malaysia) and Singapore attracted the attention of E.J.H. Corner but there have been no comprehensive follow-up studies to his seminal work. Meanwhile, Malesian freshwater swamp forests have been mostly lost to logging and in-filling for plantations or urban development. The Nee Soon catchment contains the last substantial tract of this forest type in Singapore. We report the results of a three-year investigation into the freshwater swamp forest at Nee Soon. From 40 20×20m vegetation plots, we have so far identified 674 species from 117 families, of which 289 tree species from 60 families were represented by at least one stem ≥5-cm DBH. The catchment is especially species-rich and abundant in Myristicaceae (23 species; 126 stems), Phyllanthaceae (21 species; 217 stems), and Myrtaceae (20 species; 124 stems). The most dominant family in terms of basal area was the Anacardiaceae (8.95%), most of which were contributed by *Campnosperma squamatum* and *Campnosperma auriculatum*. We also rediscovered 13 species presumed to be nationally extinct, and recorded 11 species and three varieties new to the flora of Singapore. Using multivariate classification, ordination techniques, and indicator species analysis, nine species were determined to be characteristic of the freshwater swamp forest: *Baccaurea bracteata*, *Horsfieldia crassifolia*, *Lophopetalum multinervium*, *Macaranga recurvata*, *Mussaendopsis beccariana*, *Palaquium xanthochymum*, *Pandanus atrocarpus*, *Pometia pinnata*, and *Pternandra coerulescens*. There is a dire need to ensure that freshwater swamp forests are adequately represented in conservation planning for Malesia.

74. The genus *Lagerstroemia* (Lythraceae) in Peninsular Malaysia

Author(s): Siti-Munirah Mat Yunoh and Syahida-Emiza Suhaimi

Abstract Type: Poster

The genus *Lagerstroemia* (Lythraceae) comprises about 50 species of shrubs, or small or taller trees, distributed from India to Japan, extending southeast through Malesia to Australia. In Peninsular Malaysia seven species are native in the forest, while three species are introduced and cultivated as garden ornamentals or trees along roads or naturalised around villages. Native species used as ornamentals are e.g. *Lagerstroemia floribunda*, *L. langkawiensis* and *L. speciosa*. Generally, *Lagerstroemia* is easily recognisable by its showy, mostly pinkish-purple, flowers. Incorrect use of names of some species persists by growers and landscape suppliers, as well as by buyers, because of limited knowledge and lack of information. In this poster, morphological characters to identify the species correctly will be explained with the help of images. The genus will soon be taxonomically treated in the Flora of Peninsular Malaysia.

75. The phylogeny and biogeography of the Philippine *Neonauclea* (Naucleeae-Rubiaceae) including a new endemic species from Cebu, Philippines

Author(s): Jorge Anton Ordas and Grecebio Jonathan Alejandro

Abstract Type: Presentation

The Philippine archipelago comprises perhaps the most biogeographically complex area in the Malesian region. Because of its intricate geological history and its assemblage of rich and unique biota, the Philippines became a universally significant model in understanding the evolutionary mechanisms within island archipelagos, yet well-sampled angiosperm phylogenies across the region are still lacking. Previous molecular studies on the tropical genus *Neonauclea* have failed to investigate representative species from the Philippines, and the monophyly of the genus remains unresolved. Therefore, the first molecular study of the Philippine *Neonauclea* is presented utilising three DNA Markers (ITS, rbcL, and trnT-F). Combined parsimony and Bayesian inferences confirm their phylogenetic placements within the genus and highlights the polyphyly of the Philippine *Neonauclea*, with representatives descended from different lineages. However, the monophyly of the genus pends further reassessment. Results from the Statistical Dispersal-Vicariance Analysis (S-DIVA) suggest a profound biogeographical history for *Neonauclea*, with several dispersal and vicariance events that resulted in its present distribution and diversity. The complex structure and geological history of the Philippine archipelago greatly influenced the rapid diversification of *Neonauclea*, wherein several independent lineages from Asia and the Pacific have immigrated and simultaneously radiated. In addition, a new endemic species, *Neonauclea connicalycina*, is described and illustrated. It is closely allied to *N. formicaria* based on morphological and molecular data, found in Cebu, Philippines.

76. Systematic informativeness of seed micromorphology in the core *Elatostema* clade of *Elatostema* (Urticaceae)

Author(s): Long-Fei Fu, Xiao-Qin Chen, Fang Wen, Azim Mallik and Yi-Gang Wei

Abstract Type: Presentation

Elatostema J.R.Forst. & G.Forst. is one of the largest genera in Urticaceae which consists of ca 500 species. Recent research on delimitation of *Elatostema* and closely related genera recovered a monophyletic *Elatostema* which included *Pellionia* but excluded *Elatostematoides* and *Procris*. Within this delimitation *Elatostema* includes four strongly supported clades: core *Elatostema*, *Pellionia*, *Weddellia* and *Afroelatostema* for which morphological characters were also evaluated. The robust molecular phylogeny did not match the morphological evidence within each clade, especially the most species-rich clade, core *Elatostema*. We examined seed micromorphology to seek additional morphological characters and evidence to interpret the relationships among species within the core *Elatostema* clade. We examined seed micromorphology of 50 species from the core *Elatostema*

clade by scanning electron microscopy (SEM). Karst and non-karst species divided into two strongly supported clades. We found length-width ratio of the seeds to be a significant character that distinguishes the karst and non-karst group. Seed size (0.3–2.0 mm), colour (brown, white, black, purple) and seed coat (smooth, ribbed, tuberculate, puncticulate, winged) provided characters useful for distinguishing species. However, these have low systematic significance because of multiple occurrences in each clade. We argue that different adaptation mechanisms might have occurred in the karst and non-karst groups resulting in significant differences in length-width ratio by t-test ($P<0.01$), which will be further tested by germination experiments.

77. Niche overlap and species assemblage of *Medinilla* (Melastomataceae) on Mt. Makiling, Philippines

Author(s): Peter Quakenbush

Abstract Type: Presentation

Many plant species, sometimes even species that are closely related, somehow manage to coexist in the same locality. For example, the large genus *Medinilla* (Melastomataceae), is represented by 10 species on Mt. Makiling. It is possible to find a majority of these species within several metres of each other. This is approximately one-sixth of the total species pool on the island of Luzon, many of which are quite similar. According to the 'limiting similarity principle', coexisting species tend to exhibit a low degree of similarity and niche overlap as a result of competition. Environmental filters are also thought to help define niches. Rather than chance, these factors could help determine which species of *Medinilla* persist in a given location. To investigate these theories, variables for each *Medinilla* species on Mt. Makiling were collected and compared using the Pianka's niche overlap index. These variables were spatial (defined by watershed, habitat, habit, and size), environmental (defined by elevation), temporal (defined by flowering seasonality), and related to pollination (defined by flower type). Phylogenetic similarity (defined by informal genus subgroups) was also considered. Species proved to be separated by a number of variables and showed distinct niches. Results support a niche-based theory of coexistence and indicate that both environmental filtering and interspecific competition likely had a role in the *Medinilla* species assemblage on Mt. Makiling.

78. The pollination, mating system, and phenology of *Medinilla* Multiflora (Melastomataceae) on Mt. Makiling, Philippines

Author(s): Peter Quakenbush

Abstract Type: Presentation

The paleotropical genus *Medinilla* (Melastomataceae) is a diverse component of many vulnerable mountain ecosystems. It has high endemism and is valued horticulturally. Although the reproductive biology of a taxon implicates biotic interactions, population genetics, dispersal, and conservation strategies, such information is almost completely lacking for *Medinilla*. Therefore, reproductive aspects of *Medinilla multiflora* on Mt. Makiling, Luzon, were examined to better understand and describe the species and give insights into the broader genus. This study included pollinator observations, hand pollination and bagged insect exclusion experiments (to determine the mating system), and characterisation of phenology (from field observations and herbarium records). *M. multiflora* was found to provide a year-round source of pollen (and fruit), to attract generalist bee pollinators, and to require pollination but not cross-pollination. Generalist pollinators and self-compatibility (despite inbreeding) are advantageous traits for establishment in the isolated mountain habitats where this species resides. However, losses of this natural habitat due to climate change and direct human disturbances could have profound consequences for *M. multiflora*, other similar *Medinilla* species, and those species that utilise them.

79. Anatomy of a hotspot: *Dendrobium* (Orchidaceae) in New Guinea

Author(s): Andre Schuiteman

Abstract Type: Presentation

More than one-third of the c.1,500 species of *Dendrobium*, the second largest orchid genus in the world, occur in New Guinea. No other area of comparable size has such a large concentration of *Dendrobium* species. The genus probably originated in what is now continental Asia, between 25 and 40 million years ago. Of the 31 sections recognised within the genus, 21 are found in New Guinea. Of these, only one is endemic, but another nine probably evolved within New Guinea, and this may also be true for two additional sections. Therefore, it can be assumed that species of *Dendrobium* have colonised New Guinea at least nine times, and that the minimum number of emigration events may have been similar. We consider the geographical and ecological distribution of the sections, and discuss several patterns.

80. Comparison of growth rate between primary and secondary forests in a tropical forest in West Sumatra: implications for forest rehabilitation

Author(s): Erizal Mukhtar, Rafdinal, Adi Bejo Suwandi, Delfina Saswita, Syamsuardi and Hermansah

Abstract Type: Presentation

Comparison of growth rates between primary and secondary forests were studied based on long-term observations from 1981 to 2014. Our study sites were named Pinang-pinang plot, 590 m a.s.l (primary forest) and Gajabuih plot, 630 m a.s.l (secondary forest), 17 km east from Padang, West Sumatra, Indonesia. In Pinang-pinang plot, the growth rate varied between emergent, canopy, subcanopy and pioneer trees. The highest growth rate was observed for pioneer tree species (*M. pruinosa*) but their growth trend decreased over the three decades. Of the canopy tree species, *Mastixia trichotoma* showed the higher growth rate. The growth rate trend of *Hopea* dryobalanoides decreased. Between subcanopy tree species, *Grewia florida* showed the higher growth rate. The growth rate of *Gonistylus forbesii* decreased. The emergent tree species (*S. schwenkii*) showed the lowest growth rate. Furthermore, in Gajabuih plot, from 10 important tree species we found five species belonged to Euphorbiaceae. The highest growth rate was found in *Macaranga triloba*. Total basal area in Pinang-pinang plot was 39.96 m^2/ha whereas in Gajabuih plot it was 14.03 m^2/ha. The average growth rate in Pinang-pinang plot was 0.13 cm/cm/yr whereas in Gajabuih plot it was 0.87 cm/cm/yr. Twenty-nine years of succession is concluded to be sufficient time for the return of most primary forest species.

82. Moss flora of Puting Bato karst area, Burdeos, Polillo Island, Philippines

Author(s): Eugene Lorence R. Logatoc and William Sm. Gruezo

Abstract Type: Poster

Karst landscapes are generally regarded as havens of biodiversity both above ground and below in cave habitats. The catalogue of the moss flora of Puting Bato karst area in Burdeos, Polillo Island (Quezon Province), based on a 2013 expedition conducted by the University of the Philippines Los Baños – Museum of Natural History, includes a total of 20 species and one variety belonging to nine (9) genera and six (6) families. Twelve (12) taxa newly recorded for the island are: *Calymperes aeruginosum* Hampe ex Lac., *C. robinsonii* Tan & Reese, *Circulifolium exiguum* (Mont.) S. Olsson, Enroth & D. Quandt, *C. microdendron* (Bosch & Lac.) S. Olsson, Enroth & D. Quandt, *Fissidens braunii* (C. Müll.) Dozy & Molk., *F. maceratus* Thwait. & Mitt., *F. zippelianus* var. *robinsonii* (Broth.) Iwats. & Suzuki, *F. zollingeri* Mont., *Lorentzia bifaria* (Bosch. & Lac.) Buck & Crum, *Orthomnion dilatatum* (Mitt.) Chen, *Pinatella ambigua* (Bosch & Lac.) Fleisch., and *P. mariei* (Besch.) Broth. The area also contains five (5) widespread species namely *Calymperes graeffeanum* C. Müll., *Fissidens zippelianus* Dozy & Molk. in Zoll., *Neckeropsis cyclophylla* (C. Müll.) S. Olsson, Enroth & D. Quandt, *Neckeropsis lepineana* (Mont.) Fleisch. and *Thuidium plumulosum* (Dozy & Molk.) Dozy & Molk. This updates the number of moss taxa of *Polillo* Island from 15 species to 26 species and one (1) variety, excluding the widespread taxa. The role of mosses, with emphasis on calcosaxicolous species, on the ecology of karst areas is discussed.

83. Probing the phylogenomic community structure of South East Asian forests to uncover the origin and evolution of their astonishing diversity and implications for conservation

Author(s): Lisa Pokorny, Livia May, Steven Dodsworth, Timothy M. A. Utteridge, William J. Baker, Ilia J. Leitch and Félix Forest

Abstract Type: Presentation

Most tree species are concentrated in tropical latitudes, with the Indo-Pacific region being as rich as the Neotropics and each region harbouring about 22,000 tree species. Although tree species diversity is similar in these two regions, the level of threat they face is in sharp contrast. South East Asian forests have the highest deforestation rate of all tropical regions and are particularly vulnerable to disturbance due to the current refugial stage in which they are assumed to be. As part of the ongoing research programme 'Global tree conservation through seed science' at RBG, Kew (funded by the Garfield Weston Foundation), we present an overview of our project investigating tree community assembly across South East Asia. We wish to explore how the drastic geological and climate shifts our planet has experienced throughout its history have affected speciation, extinction, and migration processes through time and space. We intend to achieve this by integrating new analytical methods (e.g., gene-species tree approaches) and high-throughput sequencing techniques (i.e., Hyb-Seq), together with climate and niche modelling, to create a community phylogenomics framework. Among the hypotheses that we wish to explore are whether the tropical angiosperm flora of South East Asia has overwhelmingly arisen from the immigration of species from neighbouring areas or if it is the product of in situ speciation/extinction processes. The data generated for this study will also highlight areas within the South East Asian region comprising the highest levels of unique diversity (e.g. phylogenetic diversity, phylogenetic endemism) and hence of most pressing conservation concern.

84. Molecular systematics and biogeography of the Malesian slipper orchids (*Paphiopedilum* section *Barbata*)

Author(s): Jing Wei Yap, Sven Buerki, Andrew Leitch, Ilia Leitch, Mike Fay and Yung-I Lee

Abstract Type: Presentation

The *Paphiopedilum* section *Barbata* (Cypripediodeae: Orchidaceae) are a morphologically diverse and evolutionarily young group of terrestrial wet forest orchids whose range encompasses the Himalayas, Indochina, Sundaland, Wallacea and Papua New Guinea. The group contains several interesting species complexes, putative hybrid species and displays variable chromosome numbers (2n=28-42). We use sequence data from the low-copy nuclear genes Xdh and CHS as well as four plastid [psaAycf3ex, trnF(GAA)-ndhJ, matK, ycf1] regions and sampled multiple-individuals per taxon to evaluate the phylogenetic relationships and estimate the crown age of *Paphiopedilum* section *Barbata*. We evaluate our findings in relation to the biogeographical history of the region and discuss the likely speciation processes driving the diversification of the group.

85. Progress towards a Genera Malesianum

Author(s): James Byng and Maarten Christenhusz

Abstract Type: Presentation

Since being initiated in 1950 the multi-volume flora describing plants from the Malesian region is estimated to be about 20% completed. Progress on Flora Malesiana continues to be slow but steady with new treatments being prepared and associated revisions continually being published and new species described. In the last 20 years increased molecular data has led to many changes in the plant classification system leading to confusion about familial and generic circumscriptions. Subsequently many of the completed treatments of Flora Malesiana are severely outdated and in need of revision. Recent global higher level classifications, floristic treatments and overviews of vascular plant families have been published, or are ongoing but close to completion, but these overviews are still lacking at the regional level. This paper highlights progress towards a Genera Malesianum with a summary of all vascular plants at the rank of genus of the region. Keys,

illustrations and identification notes for each genus are being included. A generic overview of the diversity, biogeography and taxonomic effort of the region will also be given in light of this recent work.

86. Plant exploration and discovery in Mindanao, Philippines

Author(s): Peter W. Fritsch, Victor B. Amoroso, Darin S. Penneys, James R. Shevock, Benito C. Tan, Fulgent P. Coritico and Jeffrey P. Mancera

Abstract Type: Presentation

Mindanao, the southernmost major island of the Philippines Archipelago, has a particularly rich land plant biota that is still poorly known. We conducted expeditions in central Mindanao and the island of Camiguin off Mindandao's north coast in April–May 2014 and June–July 2015, mainly focusing on the Angiosperms families Melastomataceae and Ericaceae, and also the ferns, lycophytes, and bryophytes. Surveyed areas were Mt. Apo, Mt. Dulang-Dulang, Mt. Hamiguitan, Mt. Hibok-Hibok, Mt. Kiamo, Mt. Limbawon, and Mt. Timpoong. Two clades in Melastomataceae, the Astronieae and Medinilla, have a Philippine centre of diversity and endemism. We found at least two new species of *Astronia*, rediscovered *Beccarianthus ickisii*, and redocumented the Phillipine endemic monotypic genus *Astrocalyx calycina*. Some collections of *Medinilla* likely represent undescribed species. In Ericaceae we discovered two new species of *Diplycosia* and anywhere from five to seven new species of *Vaccinium*, and rediscovered several other species known only from types. *Drosera rotundifolia* L. (Droseraceae), a species of the temperate Northern Hemisphere with a disjunct occurrence in montane West Papua, was discovered as a new record for the Philippines. For the ferns, two potential new species of *Oreogrammitis* were documented, as well as the new Philippine record *Alsophila ramispina* and the new Mindanao record *Selaginella repanda*. Three species of mosses new to science were collected, and another 16 moss species new to the Philippines were documented. Our work suggests that many more new plant species and new records await discovery in Mindanao and other islands in the southern Philippines.

87. Molecular phylogenetics of *Elaeocarpus* (Elaeocarpaceae) with a focus on New Guinea species

Author(s): Janet Gagul, Lars Nauheimer and Darren Crayn

Abstract Type: Presentation

Elaeocarpus L. is the largest genus in Elaeocarpaceae comprising approximately 360 species of trees and shrubs. It is distributed throughout tropical and subtropical zones from Asia to the Pacific region, with outliers in Madagascar. The genus is distinguished from other Elaeocarpaceae by the possession of fringed petals and drupaceous fruits. New Guinea is a major centre of *Elaeocarpus* diversity harbouring almost 100 taxa. However, with a few exceptions the phylogenetic relationships of the New Guinea taxa are unknown. This knowledge gap is largely due to the difficulty in obtaining suitable material for molecular phylogenetic studies. Our study builds on recent work on the genus that has resolved c. 30% of the species diversity, the main lineages and their phylogenetic relationships, and aspects of their historical biogeography. We aim to address the New Guinea sampling gap together with increasing taxon representation from other under-sampled areas such as Sulawesi. Plastid *trnL-F*, *trnH-psbA* and *trnV-ndhC* sequence data will be used for phylogenetic tree reconstructions, molecular dating and biogeographical analyses to better understand evolutionary history of *Elaeocarpus*.

88. Taxonomic treatment of the genus *Hornstedtia* (Zingiberaceae) in Sumatra

Author(s): Nurainas, Syamsuardi, Ardinis Arbain and Axel Dalberg Poulsen

Abstract Type: Presentation

The genus *Hornstedtia* in Sumatra is revised. Keys to species are constructed. Nineteen taxa are enumerated. *H. gadis* and *H. tomentosa* var. *viridis* have been proposed as new taxa. *H. fusiformis*

var. *fusiformis* and *H. fusiformis* var. *grandis* are reported with a new status and *H. padangense* and *H. vestita* as new combinations. Eight species are endemic and four species are new records for Sumatra.

89. Enhancing the value of Totally Protected Areas in Sarawak

Author(s): Julia Sang and Julaihi Abdullah

Abstract Type: Presentation

The State Government of Sarawak through Sarawak Forestry Corporation has recently launched the project on 'Research for Intensified Management of Bio-Rich Areas of Sarawak'. Known as RIMBA SARAWAK, the project is focusing on three bio-rich areas of Lanjak Entimau Wildlife Sanctuary (LEWS), Batang Ai National Park (BANP) and Sebuyau National Park in Sarawak. The project was initiated to provide a platform for collaboration with international and regional researchers to carry out various research on plants and animals in these areas for better management and conservation of their rich biodiversity. Plant surveys in LEWS and BANP started in early 1970s and intensified in 1997–2009 during the project implemented by the International Tropical Timber Organization (ITTO) in collaboration with Sarawak Forest Department. As a result, over 3,000 specimens representing 108 families and c.800 specimens representing 85 families of flowering plants have been collected from LEWS and BANP respectively. In Sebuyau NP, specimens have been collected since the 1950s resulting in 125 specimens representing 45 plant families. These specimens formed a very important basis for the understanding of forest and biodiversity of these areas. While trees species were traditionally well collected, some other plant groups have been overlooked and not well collected particularly for the biodiverse areas of LEWS and BANP. There are more species to be discovered and studied through focused research by the experts to enhance the value of these TPAs. Focused collection of begonias and other plant groups will be used as an example to highlight this scenario.

90. Research updates on Philippine *Hoya* (Apocynaceae)
Author(s): Fernando Aurigue

Abstract Type: Presentation

The number of new species of *Hoya* found in the Philippines has increased tremendously over the last six years. In 2015 alone, 21 species and nine subspecies were published in an online publication, *Hoya* New. Some of these new taxa were based only on herbarium materials and lack living specimens. The absence of a live plant and fresh flowers for direct observation and for comparison with previously known and authenticated species makes it difficult to classify with certainty the identity of a supposedly new species. To help classify a *Hoya* plant, samples of morphologically similar species available are obtained and subjected to any one of the following methods: 1) conventional analysis of the measurements ('traditional' morphometrics) and descriptions of the different parts; 2) outline analysis, specifically Elliptic Fourier Analysis; 3) chemical analysis of plant compounds from extracts, following established protocols; and 4) DNA analysis. Some results of different studies that used the aforementioned methods are presented as examples. There are advantages and disadvantages in using any of the four methods with regard to quantity of plant samples or materials needed, cost of analysis, time required in obtaining the results, and ease of conduct of the procedure. In the end, it is best to combine two methods in order to confirm the plant identity or establish species relationship more confidently.

91. Molecular phylogeny and taxonomic revision of the Philippine endemic *Antherostele* (Rubiaceae, Urophylleae), and its implication to *Urophyllum* s.l.

Author(s): Grecebio Jonathan Alejandro, Jasper John Obico and Jayson Chavez

Abstract Type: Presentation

The imperfectly known Rubiaceae genus *Antherostele* Bremek. is endemic to Luzon, Visayas and Palawan islands of the Philippines. Its traditional affiliation in Urophylleae is not in question, as the genus possesses the essential characters of the tribe such as woodiness, indehiscent fruits and

multiovulate locules. Antherostele is rather unique in Urophylleae by having domatia on the leaves, trichomes on the corolla lobes and fused anthers. Recent molecular phylogeny of Urophylleae sensu Smedmark & Bremer failed to include the genus. To determine the position and monophyly of *Antherostele* in the tribe with more certitude, 36 new sequences of cpDNA (*rps16* and *trnT-F* regions) and nrDNA (ITS) of seven *Antherostele* isolates and five species of Philippine Urophylleae from *Pleiocarpidia*, *Praravinia* and *Urophyllum* were generated. Bayesian inference and parsimony analysis of the combined rps16-trnT-F-ITS dataset strongly support the monophyly of *Antherostele* (PP=1.00, BS=100%) but nested within *Urophyllum* s.l. along with other putative segregates (*Pleiocarpidia*, *Praravinia*, and *Pravinaria*). The inclusion of Philippine Urophylleae representatives in the tribe suggests that genera nested within *Urophyllum* s.l. require revisions on their generic boundaries. For now we favour recognising *Antherostele* as a segregate genus, to resurrect the genus *Axanthes* Blume which is the former circumscription of the two Sri Lankan *Urophyllum* species and *Urophyllum* s.str. to only include *Pleiocarpidia*, *Pravinaria* and *Praravinia*. We recognise *Antherostele* with a total of six species, including a new one (*A. palawanensis*) described here. A revision of *Antherostele*, including a key to species, descriptions, distribution map and illustrations, is presented.

92. An assessment on *Septogarcinia sumbawaensis* (Clusiaceae) and the transfer to *Garcinia septosumbawaensis*

Author(s): Rismita Sari, Sandra Abell and Paul Gadek

Abstract Type: Presentation

An assessment of a monotypic genus endemic to West Sumbawa (Indonesia), *Septogarcinia sumbawaensis* Kosterm., was undertaken based on a molecular and morphological analysis to determine its taxonomic status in Clusiaceae. Although several authors have previously suggested a close affinity with *Garcinia* on vegetative characters, particularly with taxa of section VIII (Jones 1980), strong support for a formal transfer has been lacking. A molecular analysis was carried out using sequences of the internal transcribe spacer (ITS) of nuclear DNA of 66 taxa, including an outgroup *Clusia major* L. *Septogarcinia sumbawaensis* clustered with *G. bancana* Miq, *G. gummi-gutta* (L.)Roxb., *G. loureiri* Pierre, *G. nigrolineata* Planch., *G. syzygiifolia* King, *G. tetrandra* Pierre, all previously placed in Section VIII *Brindonia* of Jones (1980). Another six taxa were also included in this clade: *G. leggeae* W.E.Cooper, *G. mestonii* F.M.Bailey, and four unidentified *Garcinia*. These taxa in Sect. VIII *Brindonia* share synapomohorphic fruit characters. The closest taxon *G. syzygiifolia* shows similarity with *S. sumbawaensis* in sessile multiple flowers with four sepals and petals. Within the genus *Garcinia, S. sumbawaensis* shares synapomorphic features in general vegetative characters. The pollen images taken by scanning electron microscope (SEM) indicated that the pollen shape is round with reticulate ornamentation and pentacolporate aperture concordant with the analysis of Jones (1980). The result of this study suggests that *S. sumbawaensis* is a derived taxon within *Garcinia* with dehiscent fruit as the apomorphic character. A new name is proposed to replace the previous name *Septogarcinia sumbawaensis* Kosterm. to *Garcinia septosumbawaensis*.

93. Molecular phylogeny and DNA barcoding of the Philippine *Argostemma* (Argostemmateae), including a new species

Author(s): Hao Wei Hsu and Grecebio Jonathan Alejandro

Abstract Type: Poster

Argostemma Wall. is the largest paleotropical genus under the tribe Argostemmateae. The Philippines currently recognise nine undertreated species and misidentification of its members has been apparent due to morphological similarities among its members. To address this issue, several *Argostemma* species were collected from 10 localities and were subjected to taxon differentiation and phylogenetic analysis. Five molecular data sets (*trnT-L*, *trnL-F*, *rps16*, *rbcL*, and ITS) were used to answer the following objectives: to test the phylogeny of the Philippine *Argostemma* species sensu Ginter; to evaluate the best DNA barcode for the genus; and provide comprehensive morphological description for the cryptic *Argostemma* species. The results showed that *trnL-F* and *rps16* proved to be the most universal having a 100% PCR and sequencing success rate. Using kimura-2-parameter,

almost all markers have higher inter- than intraspecific divergence. Wilcoxon two sample test however revealed that only ITS and *rps16* have significant differences in their inter- and intraspecific divergences (p=<0.05). The generated majority-rule consensus tree proved its monophyly and endemic status with PP=1.0 and showed it to be closely related to the Psychotrichoides group. A novel species from Mt. Halcon, Oriental Mindoro, is proposed in this study.

94. Phylogeny of the Philippine *Hedyotis* (Rubiaceae: Spermacoceae)

Author(s): Propa Joy Santor, Porferio Bangcaya and Grecebio Jonathan Alejandro

Abstract Type: Poster

Hedyotis L. and related genera are highly debated groups in the family Rubiaceae. Previous molecular studies identified 13 well-supported monophyletic groups across the Hedyotis-Oldenlandia complex including a defined *Hedyotis* s. str. group. However, recent studies failed to include representative species from the Philippines. Hence, the first molecular study of Philippine *Hedyotis* is presented here. This study focused on collecting Philippine *Hedyotis* and related taxa and resolving their taxonomic placement. Twenty-six (26) accessions belonging to 19 species were collected from 11 Philippine provinces. Bayesian and maximum likelihood analyses of the combined ITS, *petD*, and *rps16* datasets were used to reconstruct the phylogeny within the tribe. Morphological and molecular analyses support the taxonomic placement of the endemic *H. atropurpurea*, *H. longipendiculata*, *H. microphylla*, *H. papafranciscoi*, and *H. pilosissima* in the *Hedyotis* s. str. clade. The same analysis revealed that *Exallage buruensis*, *Oldenlandia apoensis* and *O. yoderi* should be reinstated to *Hedyotis* and *H. vestita* to *Exallage*.

95. DNA barcoding reveals fraud in the Philippine *Vitex negundo* (lagundi) trade: a call for a quality control protocol to ensure consumer health

Author(s): Jay Edneil Olivar, Joanner Paulus Erik Alaba and Grecebio Jonathan Alejandro

Abstract Type: Presentation

DNA barcoding has gained attention in product quality control due to its practicality and efficiency in species authentication. Its application in plant-based materials, however, has been slow due to (1) the lack of a standard DNA barcoding locus in plants and (2) the poor DNA yield from powderised plant products. This study reports the successful application of DNA barcoding in the authentication of five *Vitex negundo* L. herbal products sold in the Philippines. The first standard reference material (SRM) herbal library for the recognition of authentic *V. negundo* samples was established using 42 gene accessions of ITS, *psbA-trnH*, and *matK* barcoding loci. Authentication of the herbal products utilised the SRM following the BLASTn and maximum likelihood (ML) tree construction criterion. Barcode sequences were retrieved for ITS and *psbA-trnH* of all products tested and results revealed that only one out of five herbal products satisfied both BLASTn (BLASTn queries show *V. negundo* as top hit with ID>98% and e-value<0.01) and ML tree reconstruction criterion (forming a monophyletic clade with *V. negundo* and BS>70%) and was considered to contain authentic *V. negundo*. This study prompts the urgent need to utilise DNA barcoding in authenticating herbal products available in the Philippine market. Authentication of these products will secure consumer health preventing the negative effects of adulteration, substitution and contamination.

96. The Gardens of Singapore – contrasting but complementary ways of enthusing and educating the public about plants

Author(s): Stuart Lindsay and David Middleton

Abstract Type: Presentation

Singapore has several public gardens of which two, Gardens by the Bay and Singapore Botanic Gardens, are of particular national and international renown. These two gardens have contrasting but complementary ways of enthusing and educating the public and of gaining their support for horticultural excellence, botanical research and conservation. Gardens by the Bay opened only 4

years ago but has already attracted more than 20 million visitors. Its main attractions are its artificial Supertrees covered in tropical epiphytes and its two enormous cooled conservatories. Founded in 1859, Singapore Botanic Gardens is a much older and more established garden with a long history of horticultural and botanical research, plant exploration and conservation. It became a UNESCO World Heritage Site in July 2015, the world's first tropical Botanic Garden to receive this accolade. Like most Gardens, Gardens by the Bay and Singapore Botanic Gardens rely on public appreciation of what they do to maintain political support and associated funding. This is achieved not just through innovative landscaping and horticultural displays but through exhibitions, educational programmes, and active engagement in wider Singaporean society. In their contrasting ways both Gardens enthuse and educate the public about plants and the natural world. By instilling an appreciation of plant biology, diversity and horticulture, the Gardens will have a wider pool of advocates for the work in which they are engaged.

97. Phylogeny of selected Philippine *Ophiorrhiza* L. (Ophiorrhizeae—Rubiaceae) inferred from multiple sequence data including accounts of two new species

Author(s): Yñigo Luis Del Prado, Jay Edneil Olivar and Grecebio Jonathan Alejandro

Abstract Type: Poster

Ophiorrhiza L. is a complex genus in the family Rubiaceae with a high endemicity in the Philippines (29 out of 31 species recorded) recognised for having helicoid cymes and dry rhomboidal fruits. No worldwide treatment of the genus has ever been attempted despite its wide use in medicine particularly in cancer treatment because of (1) its taxonomically complex nature owing to its high morphological variability and homogeneity and (2) its great number of members. This study aims to (1) establish the first phylogeny of selected Philippine *Ophiorrhiza* using combined ITS, *rbcL*, and *rps16* datasets, (2) resolve the identity of two divergent *Ophiorrhiza* species, and (3) provide morphological descriptions and illustrations of the two divergent species. The first molecular phylogeny of *Ophiorrhiza* was established using eight species following Bayesian inference and maximum parsimony (MP) of combined ITS, *rbcL*, and *rps16* datasets. Morphological analysis was done on the two divergent species and complete descriptions and illustrations were provided to prove their novelty. Results of this study support the monophyly of the genus *Ophiorrhiza* (PP=1.00, BS=90%) and revealed two novel subclades. Subclade A (PP=0.99, BS=88%) is comprised of species with axillary inflorescences, caducous stipules, and glabrous stems. Subclade B (PP=0.95, BS=98%) is composed of species with terminal inflorescences, persistent stipules, and pubescent stems. The two divergent species were named *Ophiorrhiza malinaoensis* sp. nov., recognised by its cupuliform corolla lobe shape, linear lanceolate leaves that are brownish red when dry, and *Ophiorrhiza amplistipula* sp. nov., characterised by its long stipules and entirely pubescent organs.

99. Phylogenomics of the recalcitrant Annonaceae Subfamily Malmeoideae

Author(s): Daniel Thomas, Tatiana Arias, Magnus Lundberg, Thomas Couvreur, Hervé Sauquet, Laetitia Carrive, Roy Erkens, Rita Brandao, Lars Chatrou, Jenifer de Carvalho Lopes, Bine Xue, Tanawat Chaowasku and Richard Saunders

Abstract Type: Presentation

Annonaceae (ca. 2400 species of trees, shrubs and lianas) are species-rich and ecologically important in tropical lowland forests of both the Neotropics and the Old World. There have been substantial advances in resolving the backbone phylogeny of the family in recent years, but there are notable exceptions. Intertribal relationships in subfamily Malmeoideae (seven tribes, 49 genera, >770 species) and intergeneric relationships in its largest tribe, Miliuseae (26 genera, ca. 540 species, centre of diversity in continental Southeast Asia and western Malesia), remain very poorly understood. This has impeded downstream analyses such as investigations of the historical biogeography and character evolution in the family. We used a phylogenomic approach to resolve the relationships in subfamily Malmeoideae. Data from sequencing of total genomic DNA on the Illumina HiSeq2000 platform was used to assemble near-complete plastome and partial nuclear ribosomal DNA sequences. The dataset comprised 55 newly sequenced accessions including samples of all seven tribes and representatives of 44 of 49 genera in the subfamily. These data were analysed

separately and by integrating a supermatrix of previously published DNA data using likelihood and Bayesian phylogenetic reconstruction methods. We present the first near-complete plastome sequences for Annonaceae, and highlight observed structural mutations including a major inversion (ca. 7.3 kb) in the large single-copy unit of Miliuseae taxa. The resulting phylogenetic reconstructions provide various new insights into intertribal and intergeneric relationships in Annonaceae subfamily Malmeoideae. These new insights and their implications for the historical biogeography of Annonaceae and character evolution in subfamily Malmeoideae are discussed.

100. Phylogeography of *Primulina bipinnatifida* (Gesneriaceae) species complex – insights into limestone karst plant diversification and implications for its classification

Author(s): Wei-Bin Xu, An-Ya Chu, Yi-Hsuan Hsu and Kuo-Fang Chung

Abstract Type: Presentation

Primulina, formerly a monotypic genus, was recircumscribed and expanded in 2011 to include *Chirita* sect. *Gibbosacus*, *Chiritopsis*, and two species of *Wentsaiboea*. With the addition of more than 50 species since 2011, this gesneriad genus currently contains ca. 170 species, mostly narrow endemics known only from a handful of sites, distributed almost exclusively in the limestone karsts stretching across the bordering areas of southern China and northern Vietnam. Although Primulina is among the most characteristic genera of the Sino-Vietnamese limestone karst flora, Weber et al. (2011) argued that 'too many species have been described with numerous pairs or small groups of species growing in adjacent areas and differing only in slight, quantitative characters'. One example involves *P. bipinnatifida*, a highly variable species in its leaf morphology, and *P. lingchuanensis*, and *P. jianghuaensis* known only locally in Guangxi and Hunnan Provinces, respectively. To test whether these species are each supported as reciprocal monophyletic groups and what evolutionary mechanisms have contributed to their variation, we sampled 219 plants from 15 localities across their distributional range and sequenced two hypervariable chloroplast marker *rpS16-trnQ* and *rpl32-trnL*. Our analyses revealed a marked phylogeographic pattern, dominated by high population differentiation, strong isolation-by-distance, and limited dispersal; however, none of the nominal species shows reciprocal monophyly molecularly. Our data suggest geographic isolation, likely resulting from successive karstification triggered by the onset of the East Asian monsoon during the late Miocene could have facilitated population differentiation, a phenomenon also responsible for the species accumulation in Sino-Vietnamese limestone *Begonia*.

101. Molecular phylogenetics and biogeography of Asian *Begonia*, with an emphasis on the continental species

Author(s): Wai-Chao Leong, Ching-I Peng, Yan Liu, Rosario Rubite, Ruth Kiew, Mark Hughes, Rimi Repin and Kuo-Fang Chung

Abstract Type: Presentation

With recent estimates of more than 1,800 species distributed throughout tropical and subtropical Africa, America, and Asia, *Begonia* sits firmly as one of the 10 most speciose plant genera, representing an ideal study system to understand the origins of tropical biodiversity. We present an updated phylogenetic and biogeographic analysis of Asian *Begonia* based on five chloroplast DNA markers, sampling 188 species of 13 Asian sections of *Begonia*, with an emphasis on continental Asian species. In our analyses, Indian species are placed as a basal grade and the rest are placed in two clades, viz., Malesian Clade and Continental Clade. Within the Continental Clade, a highly supported Evergreen Subclade is derived from within tuberous and deciduous species adapted to seasonal habitats. Ancestral area reconstruction suggests that the Malesian Clade migrated through continental Asia to the Malesian Archipelago. The Continental Clade migrated through India to the Himalayas, SW China and Indochina. The Evergreen Subclade has also evolved in these areas and dispersed to the rest of China, Taiwan, and Peninsula Malaysia. Our results indicate a complicated migration history between continental Asia and the Malesian Archipelago. Rapid diversification of the Evergreen Clade beginning in the late Miocene may be related to the uplifting of the Himalaya-Tibetan Plateau.

103. Floristic overview of Cyperaceae in Natma Taung National Park, Chin State, Myanmar

Author(s): Tetsuo Koyama and Yumiko Baba

Abstract Type: Poster

Since 2000, Makino Botanical Garden (Kochi, Japan) has been conducting a floristic survey programme in Myanmar in collaboration with the Myanmar Forest Department with particular emphasis on the florula of Natma Taung National Park in Chin State. The florula of Chin State is very interesting as this area is where Indian, Sino-Japanese and Malesian floristic elements join the flora of South East Asia and hence the florula appears to be rich and highly diverse. Based upon 592 specimens of our newly acquired Cyperaceae collections, supplemented by type and historical collections on loan from BM, E and K, we conducted a taxonomic study of Cyperaceae to be a part of the taxonomic enumeration of the florula of Natma Taung National Park. In Cyperaceae 21 genera and 119 species are represented. Two taxa of *Carex*, one of *Cyperus*, two of *Fimbristylis* and one of *Schoenus* were new to science and ten cases of geographical range extensions were recorded. Range extensions of Sino-Japanese elements included: *Carex nitidiutriculata* var. *heterostachya*, *C. sinodissitiflora, C. echinochloiformis*, *C. caudispicata* and *C. fluviatilis*. These mark a considerable range extension into Myanmar as they have hitherto been recorded from central and southwestern China such as Sichuan, Yunnan and Guangxi Provinces and nearby areas. Western and north eastern extension of Indian elements and Malesian elements were represented by *Fimbristylis nigro-brunnea*, *Cyperus amabilis*, and *by Carex tricephala* respectively. Himalayan elements, *Carex nubigena* and *C. longipes*, were seen at disjunct locations at high elevations on Natma Taung.

104. Strategic conservation plan and action for the most threatened tree species in Indonesia

Author(s): Kusumadewi Yulita, Tukirin Partomihardjo, Kuswata Kartawinata, Titi Kalima, Setia Budiawan, Yayan Kusuma and Kristio Budiasmoro

Abstract Type: Presentation

Indonesia is estimated to contain 30,000–40,000 species of Spermatophytes, yet many plant populations and species are highly threatened by an alarming rate of habitat loss. Of the 1,237 species of Liliopsida and Magnoliopsida of Indonesia assessed by the IUCN Red List, 411 are considered threatened, including 382 tree species of which 150 are Dipterocarpaceae. There is therefore an urgent need to obtain good estimates of plant diversity and identify priority taxa for conservation in order to minimise species extinctions. Several policy documents concerning conservation and sustainable utilisation have been issued by Indonesian authorities to guide conservation action but these are mainly descriptive lists of species that often lack scientific measures. Here, we aimed to select priority taxa requiring urgent conservation. Target species were compiled from a list of rare and endemic species of Indonesia, priority species for conservation in Indonesia and the IUCN Red List. Species were scored on their potential use, restricted distribution and endemicity, threat status and available in situ conservation sites of FFI. Eleven species were selected representing four families of timber and non-timber species. Species included in the most critical category of threat requiring urgent conservation action included *Dipterocarpus cinereus*, *D. littoralis* and *Vatica bantamensis* (three narrow endemic species with severely fragmented populations). Stakeholders for each target species were identified including local government, forestry regional offices, local NGOs and institutions to ensure conservation action is effective and adequately monitored.

105. To conserve the botanical treasures of New Guinea: identification and mapping of critical habitats and plant communities in West Papua Province, Indonesia

Author(s): Charlie Danny Heatubun, Petrus Dimara and Paul van Nimwegen

Abstract Type: Presentation

The island of New Guinea is known to have the highest plant diversity and endemism in the Malesian region. The western half of the island comprises the Indonesian Provinces of Papua and West Papua.

The Government of Indonesia has chosen mining and agriculture as the economic driving-force and basic foundation for regional development. Minerals extraction and converted-land agriculture are a serious threat to the tropical rainforest and other ecosystems in WNG. A big loss of botanical diversity, including critical habitats and unique plant communities is observed due to deforestation and forest degradation as a direct impact of unwise development policy and practices. Recently, awareness of natural conservation and sustainable development within the area has increased significantly and the declaration of West Papua Province as a Conservation Province in Indonesia, followed by drafting of regulations to accommodate this issue at provincial level is a sign of a changing view and paradigm of development practices in Western New Guinea and Indonesia. However, one important challenge to be faced is how to integrate this conservation and preservation initiative into development policy and development practices, especially from a spatial planning point of view. It is very important to have all information about ecosystems, habitats and plant communities of West Papua Province in a single map and further to integrate and synchronise with provincial regional spatial planning documents. We present our progress in identification and mapping ecosystems, critical habitats and plant communities in West Papua Province, Indonesia.

106. An overview of Malesian Lamiaceae

Author(s): Gemma Bramley, Bhanubong Bongcheewin, Nina Davies, Rogier de Kok, David Mabberley, Somran Suddee, Lesley Walsingham and James Wearn

Abstract Type: Presentation

A full draft of the treatment of the Lamiaceae for Flora Malesiana is complete. Fifty genera and 302 species are recognised: 18 genera, formerly included in Verbenaceae and Symphorematacеae, are newly revised for Flora Malesiana, and 28 genera are updated from Keng's (1978) Flora Malesiana Labiatae account. Five genera included by Keng are removed, and four genera are added owing to change in taxonomic status. During revisionary work for the Flora, 18 new species discoveries have been made in *Callicarpa*, *Clerodendrum*, *Gmelina*, *Premna* and *Teijsmanniodendron* (13 from Borneo, three from Sulawesi, two from New Guinea). The centres of Lamiaceae species diversity in Malesia are Borneo (126 spp.), the Philippines (120 spp.), and Malay Peninsula (112 spp.), all with over a third of the Malesian Lamiaceae species present. Endemism is highest in Borneo (36%), the Philippines (23%) and New Guinea (16%), and is below 8% in Peninsular Malaysia, Sumatra, Java, Sulawesi, the Lesser Sunda Islands, Moluccas and New Guinea. With the exception of the relatively low number of species present in New Guinea, these patterns follow the general trends in species richness and endemism in the plant families revised for Flora Malesiana reported in van Welzen & Slik (2009).

107. A revision of *Hoya* in Borneo

Author(s): Michele Rodda

Abstract Type: Presentation

Hoya is the most species-rich genus of Apocynaceae and is also of high horticultural importance because more than 100 species are widely cultivated by hobbyists both in tropical and temperate climates. The genus as a whole has not been revised in modern times. Hoyas are generally epiphytic climbers and they are difficult to collect and often overlooked during general collecting trips. Additionally, they rarely bloom in the wild. For a comprehensive study of *Hoya*, cultivation of sterile, wild-collected materials is therefore essential. In recent years this approach has been successfully carried out in Sabah (Malaysian Borneo), where numerous new taxa have been described based on nursery-grown plants. A guidebook to *Hoya* of Borneo has just been published and a revision is in preparation. Borneo has in excess of 80 *Hoya* species, more than 50% of them endemic. The diversity of *Hoya* in Borneo will be illustrated and a comparison between the morphological and molecular diversity of the genus on this island and in other centres of diversity (Philippines and Papua) will be presented.

108. Relationships between *Hoya*, *Dischidia* and *Oreosparte*

Author(s): Michele Rodda, Gillian Khew, Enrico Ercole, Nadhanielle Simonsson Juhonewe and Tatyana Livshultz

Abstract Type: Presentation

Hoya and *Dischidia* are the two largest genera of epiphytic Asian Apocynaceae. Phylogenies published thus far do not establish whether they are each monophyletic but instead show clearly that the smaller genera *Absolmsia*, *Clemensiella*, *Eriostemma* and *Micholitzia* are nested in *Hoya*. The position of *Oreosparte*, a monotypic genus from Sulawesi, is still doubtful. Recent expeditions to Papua New Guinea and herbarium studies have led to the identification of four additional putative *Oreosparte* species. The phylogeny here presented, based on four chloroplast and two nuclear markers, includes samples of all putative *Oreosparte*, including the type of the genus *O. celebica* and a selection of *Hoya* and *Dischidia* species as ingroups. The results show that *Dischidia* is monophyletic while the monophyly of *Hoya* is poorly supported. The monophyly of *Oreosparte* is also poorly supported. Its position is ancestral to the Hoya-Dischidia split suggesting that *Hoya* and *Dischidia* did not originate from Indo-Burma/Himalaya as currently hypothesised.

109. The Philippine species of *Ixora* (Rubiaceae)

Author(s): Cecilia Banag, Grecebio Jonathan Alejandro, Ulrich Meve and Sigrid Liede-Schumann

Abstract Type: Presentation

Ixora is a pantropical genus of shrubs and small trees with approximately 530 species. A revision of the Philippine species of *Ixora* was done following the methods of classical herbarium taxonomy. In total, 31 species are recognised. A detailed morphological, anatomical and biological documentation of Philippine species of *Ixora* is given. All species are extensively described, native species illustrated and a taxonomic key to native and cultivated species are provided, 27 taxa are lectotypified and three species are neotypified. Distribution maps with full citations of all specimens seen are supplied for each taxon.

110. An updated taxonomic enumeration of Natma Taung National Park, Chin State, Myanmar

Author(s): Kazumi Fujikawa, Yumiko Baba, Tetsuo Koyama and Nyi Nyi Kyaw

Abstract Type: Poster

Myanmar, occupying the western part of South East Asia and situated at the eastern border of the Indian subcontinent, is a unique place where four floristic elements intersect: the Indian, Sino-Japanese, South East Asian and Malesian elements. Because of this geographical advantage, Myanmar is believed to have a rich biodiversity but no comprehensive floristic investigation in Myanmar has been performed to date and there are insufficient botanical collections. To remedy this situation, Makino Botanical Garden carried out intensive field surveys at Natma Taung National Park under the endorsement of the Forest Department between 2000 and 2014. Based on 15,695 specimens we, with an international collaborative team of botanists, are currently compiling a taxonomic enumeration of the National Park. Thus ca. 1816 species representing 142 families have been identified to date. The Asteraceae, one of the biggest families in the National Park, consists of 120 species, of which 27 are new records to Myanmar and one species each of *Ainsliaea*, *Himalaiella* and *Taraxacum* appear to be new to science. In Primulaceae 20 species representing six genera were recorded, four of which were found to be new records. In Fagaceae, one of the main components of the hill evergreen forest, 16 species in three genera, with two new records were identified. We aim to publish the enumeration in March 2017. With the success of this project, we will extend field collections to other regions of the country, carrying out related taxonomic researches which are the vital first steps towards the Flora of Myanmar.

111. *Poikilospermum* (Urticaceae) of Tropical Asia: an update

Author(s): Alison Moore

Abstract Type: Poster

Poikilospermum is a genus of woody, hemi-epiphytic scramblers with aerial roots comprising approximately 20 species. Commonly found in riverine and swampy forests as well as damp, lowland habitats, they are distributed throughout tropical Asia extending slightly into Continental Asia. The most comprehensive revision of the genus was carried out by Chew Wee Lek (1963). Although Berg (1978) transferred the genus to the Cecropiaceae, according to APGIII it is best placed within the Urticaceae, following Chew. A new revision of the genus utilises more collections than were available at the time of previous studies. Here, the major departures from Chew's treatment will be presented, including some alternative identification features and updated distribution maps.

112. Ethnobotanical value and conservation of Zingiberaceae of the Batak Karo in North Sumatra, Indonesia

Author(s): Endang Purba, Nisyawati and Marina Silalahi

Abstract Type: Poster

Studying local knowledge about plant species is increasingly important in determining strategies and actions for conservation. The present work was undertaken in three villages of Karo Regency, Semangat Gunung, Jaranguda and Merdeka, from April to June 2014. We expected to encounter high levels of ethnobotanical knowledge of Zingiberaceae in the community due to its localisation in a region of high biodiversity. Semi-structured interviews were employed, with participant observation and exploration. Six key informants (three village elders and three traditional healers) and 87 respondents (45 men and 42 women) participated in the research. A total of 15 used species of Zingiberaceae which were classified into the following use categories: medicinal, food, ritual/ornaments, and dye-colours. Most of the plants were used as medicines. The plants with the greatest Index of Cultural Significance were *Etlingera elatior* (42) and *Curcuma longa* (30). The stem and leaves of *Etlingera elatior* were used as medicine; the fruits and flowers were used as food. Plant names along with the parts used, ethnobotanical application and conservation strategies are discussed.

113. Evaluation of antibacterial activity against *Pseudomonas aeruginosa* of indigenous plants from Cordillera, Philippines

Author(s): Charlotte Elmido, Teodora Balangcod and Ronie Calugay

Abstract Type: Presentation

The Cordillera Administrative Region has a rich floral biodiversity and its people have long used these plants for various purposes including for the treatment of ailments. Despite this, few biodiversity studies have been done and scientific understanding of medicinal activity is not well-established. Hence, the study aimed to test the antibacterial activity of 13 indigenous plants against *Pseudomonas aeruginosa*, an opportunistic bacterium that has become a serious therapeutic challenge in the fields of medicine and pharmacy. Standard disc diffusion assay was used to evaluate the antibacterial activity of selected indigenous Cordillera plant extracts by measuring the zones of inhibition. Briefly, 20 µL of each extract (4 mg/mL) was loaded onto sterile discs (6 mm diameter) and then placed on each LB plates spread with overnight culture of 100 µL *P. aeruginosa*. The plates were incubated for 24 hours at 37°C. The antibiotics used as positive controls were ampicillin, erythromycin, kanamycin, streptomycin and vancomycin and ethanol as the negative control. Significant zones of inhibition were detected using five of the 13 plant extracts: *Nepenthes alata* (11.3 mm), *Coriaria intermedia* (14.7 mm), *Bauhinia pupurea* (14 mm), *Ficus* sp. (14 mm) and *Melastoma malabathricum* (10.5 mm). Moreover, *N. alata* and *C. intermedia* both obtained the lowest MIC which was 250 µg/mL. Some of the indigenous plants tested have potential and can be further tested for other antimicrobial activities.

114. Flora of Bangka – a preliminary checklist

Author(s): E. Nurtjahya, E. Sari, A. Anggraeni, U. Umroh, R. Robika, T. Alesti, D. Andayani, S. Selviana, D. Frilano, M. Sari, N. Nurhidayah, S. Virgianty, S. Rahmawati, Y. Yusita, D.S. Fiona, F. Fitri, S. Sarinah, Z. Zalia, R.S. Tarmie, D. Setiadi, E. Guharja, Y. Setiadi, I. Muhadiono, D. Dorly, D. Susanto, H. Rustiami

Abstract Type: Presentation

The island of Bangka is located to the east of Sumatra. The island was well known for white pepper production in the past and, together with Belitung, is the second largest tin producer in the world. It has a surface area of 11,700 km^2 and is mainly lowland below 50 m with some hills at 400–700 m. It has a type-A climate, with an average daily temperature of 23–32°C, and an average annual rainfall of approximately 2,400 mm. Bangka is in Riau Pocket which has a specific flora. Primary and secondary data, mostly in the last ten years, were collected from various sites across the island. They record up to 1,200 species of nearly 200 families of terrestrial, aquatic, mangrove, and offshore plant species. Approximately 500 tree species, 180 shrub, and more than 300 herb species are listed, besides bryophytes and ferns, algae and seagrass species.

115. Multi-gene analysis of the Philippine endemic *Gloeocarpus* to reassess its generic status

Author(s): Axel Arriola, Jocel Andee Bejoc, Andrea Louise Medina, Rina Jean Ombid and Grecebio Jonathan Alejandro

Abstract Type: Poster

Gloeocarpus Radlk. was established to accommodate the Philippine *Cupaniopsis patentivalvis* Radlk. This monotypic genus is endemic in the Philippines and can only be found in the provinces of Laguna and Quezon. Gloeocarpus is monophyletic according to previous phylogenies, although it was only assessed using the internal transcribed spacer (ITS). With the availability of more gene markers, however, it is necessary to challenge the generic status of the genus because increasing the gene number irrespective of the taxa used may be a prerequisite for improving phylogenetic accuracy. In this study the ITS, *matK*, and *rbcL* sequences of *Gloeocarpus* were aligned with the currently available sequences from the GenBank. The phylogenetic tree recovered from Bayesian inference analysis and Parsimony analysis revealed a robustly supported family of Sapindaceae (PP=1.00; BS=100%). Meanwhile, *Gloeocarpus* nested within the strongly supported *Cupania* clade (PP=1.00; BS=100%) and is monophyletic. Morphological features of *Gloeocarpus* such as the presence of hairy petals with slight folded margins and sinuate branchlets supports our molecular results.

116. Diversity and breeding system of alien invasive plant species in protected areas of West Sumatra

Author(s): Syamsuardi, Yuranti Wella, Wita Yulianti, Usman Setria and Nurainas

Abstract Type: Presentation

An assessment of invasive alien plant species is very important to controlling them in protected areas of tropical forest. Sixty-four alien invasive plant species belonging to 23 families were recorded at six protected areas of West Sumatra. There were differences of species composition among the six protected areas. School forest for biological research and education, Limau Manis, and Solok Botanical Gardens have the highest value of Jaccard Similarity Index (SI=0.533). By contrast, very different ecological factors and the long distance between Solok Botanical Gardens and G. Talamau resulted in the lowest similarity between them (SI=0.133). It is very important to note that some of the worst alien plant invasive species in the world such as *Imperata cylindrica*, *Clydemia hirta*, *Lantana camara, Leucaena leucocephala, Mikania micrantha* and *Mimosa pigra* have invaded protected areas in West Sumatra. The existence of these plant invaders in protected areas is a danger to plant conservation due to their effect of decreasing biodiversity. The pollen-ovule ratio (P/O ratio) method was used to clarify the breeding system of these alien invasive plant species. The results of our analyses are discussed in this paper.

117. Integrating digital identifiers for the World Flora Online

Author(s): Chuck Miller and Mark Watson

Abstract Type: Presentation

In its decision X/17 at the 10th Conference of the Parties held in Nagoya, Japan in October 2010, the Convention on Biological Diversity (CBD) adopted a consolidated update of the Global Strategy for Plant Conservation (GSPC) for the decade 2011–2020. The updated GSPC includes five objectives and 16 targets to be achieved by 2020. Target 1 aims to complete the ambitious target of 'an online flora of all known plants' by 2020, which is now the World Flora Online (WFO) project. A widely accessible Flora of all known plant species is a fundamental requirement for plant conservation and provides a baseline for the achievement and monitoring of other targets of the strategy. A WFO Council has been formed with 34 participating institutions worldwide and supporting Technical and Taxonomic Working Groups. An information portal is online at http://www.worldfloraonline.org. The structure of the WFO will be a framework capable of accommodating regional floristic information (at national or lower level) that can provide answers in both regional and global contexts, as well as monographic information. Merging descriptive records of an estimated 400,000 species from multiple global data sources, aligning them with consistent taxonomic data, and enabling ongoing enhancements presents a significant technical challenge. Many different data identification methods and sources are currently used that must be combined into a unified portal for the WFO. This presentation will discuss the challenges, discoveries and progress towards integrating distributed digital floristic data using digital identifiers and software tools and techniques.

118. The World Flora Online – Achieving Target 1 of the Global Strategy for Plant Conservation

Author(s): Chuck Miller

Abstract Type: Poster

In its decision X/17, the Convention on Biological Diversity (CBD) adopted a consolidated update of the Global Strategy for Plant Conservation (GSPC) for the decade 2011–2020 at its 10th Conference of the Parties held in Nagoya, Japan in October 2010. The updated GSPC includes five objectives and 16 targets to be achieved by 2020. Target 1 aims to complete the ambitious target of 'an online flora of all known plants' by 2020. A widely accessible Flora of all known plant species is a fundamental requirement for plant conservation and provides a baseline for the achievement and monitoring of other targets of the strategy. Drawing from the knowledge gained in producing The Plant List, a project to create an online world Flora of all known plant species is now underway. An information portal is online at http://www.worldfloraonline.org. The structure of the WFO will be a framework capable of accommodating regional floristic information (at national or lower level) that can provide answers in both regional and global contexts. Enhancements will include more complete synonymy; geographic distributions to at least country level, drawing on national floras, checklists, and monographs; habitat data; identification tools, principally interactive keys, images, and descriptions; conservation status; and other enhancements as practicable, e.g., vernacular names. This poster will describe the vision, technical approach, progress to date and plans for this significant global project.

119. Steps after Red Listing: how can we prioritise and take action for the region's most threatened trees?

Author(s): David Gill, Georgina Magin, Victoria Price and Tony Whitten

Abstract Type: Presentation

As a result of significant land use change across Indonesia, Malaysia and the Philippines, more than 1,000 tree species in the region are classified as threatened with extinction by the IUCN Red List. Many of these tree species are naturally rare, have short-range dispersal mechanisms and long life-cycles, making them highly sensitive to habitat loss and limiting their capacity to shift distribution in response climate change. Prioritising and implementing conservation action for threatened tree

species in the region is a major challenge, requiring not only an understanding of the species threat status, but also an understanding of the level and type of conservation required and the social, cultural and ecological values attached to different tree species. This presentation provides an introduction to a session focused on the challenges and opportunities behind prioritisation and follow-on conservation action for the region's most threatened tree species. The session will include three presentations covering different prioritisation methods and approaches to tree conservation from Indonesia, Malaysia and the Philippines. It will conclude with an open discussion on ways forward for the conservation of the region's threatened trees, with reference to the Global Trees Campaign, a partnership between Fauna & Flora International and Botanic Gardens Conservation International which aims to prevent tree species extinctions in the wild.

120. The flora in Javanese culture

Author(s): Eddy Nurtjahya Budi Hartono, Joko Wantoro and Fx Paula Era Linahadomi

Abstract Type: Poster

Various plant species which are part of the life cycle of the Javanese of two provinces, namely Central Java and Yogyakarta are studied. To collect information relating to floral diversity in the daily life of nearly 35 million people in these provinces, a literature review was conducted. School curricula for elementary schools, junior high school and senior high school, and Javanese language supplements including song and traditional game books were sampled. At least 90 species of nearly 49 families, all terrestrial species, were recorded. As many as 45 species have local names for their flowers, 31 species for leaves, 13 species for young fruits, and 17 species for seed.

121. An update on the banana family (Musaceae) in the Flora of Thailand

Author(s): Sasivimon Swangpol and Wandee Inta

Abstract Type: Presentation

Collecting expeditions by N.W. Simmonds in the 1950s shed light on the diversity of bananas throughout the tropics. Thailand, among the major 'hotspots', is at the centre of origin of the banana family, Musaceae. From a total of 74–78 species and three genera in the world, 10–16 species found in Thailand belong to two native genera; *Musa* and *Ensete*. One ornamental species in *Musella* has been introduced into the country. Apart from two new native *Musa* species found in Thailand and published by our team in 2011 and 2015, a number of putative taxa await study and description. Several approaches have been used including morphometrics; anatomy by light and scanning electron microscopes; palynology; analyses of genome sizes, and molecular biology. A revision of the family is being prepared for the Flora of Thailand project. Our conclusions on banana taxonomy mark the importance of fertile land as a cradle of endangered bananas and urge conservation of their fragile germplasm and natural habitats.

122. Balinese home gardens based on the 'Tri Hita Karana' concept in Pakraman villages, Buleleng Regency, North Bali

Author(s): I Gusti Ayu Rai Sawitri, Nisyawati and Eko Baroto Walujo

Abstract Type: Poster

Home gardens in the Pakraman villages in Bali are based on 'Tri Hita Karana' concept which manages and regulates the garden space into Parahyangan, Pawongan and Palemahan zones, each with its own plants species. This study aimed to explore the diversity of plants species and compile information about their potential use. The location of the study includes 52 gardens in 41 Pakraman villages from the lowlands to the highlands in Buleleng regency north Bali. Data were obtained through observation, semi-structured interview (individual and group discussions) and questionnaires. The results revealed some specific plants species in each zone, such as *Michelia alba*, *Michelia champaca*, *Plumeria acuminata* in the Parahyangan zone which is used for ritual and Balinese Hindu ceremonial plants. Plants species in the Pawongan zone such as *Schefflera arboricola*, *Phyllanthus*

buxifolius, *Allamanda cathartica*, *Codiaeum variegatum*, *Mangifera indica and Nephelium lappaceum* were used as ornamentals, in rituals, as food, shade, for social purposes and income generation. The plant species found in the Palemahan zone included *Pandanus amaryllifolius*, *Piper betle*, *Sauropus androgynous*, *Zingiber officinale* and *Musa paradisiaca*. These plants were used as medicines, dyes, food and spice. Ethnobotanical study of domestic gardens in Balinese culture is needed so that local wisdom may be preserved.

123. Real Collaboration: The Joint Research Project for Indonesian Medicinal Plants

Author(s): Jin-Hyub Paik, Jinki Kim, Sei-Ryang Oh, Imam Paryanto, Fifit Juniarti and Doddy Irawan

Abstract Type: Presentation

Indonesia contains a great number of diverse plant resources together with a variety of traditional knowledge. The Joint Research Project for Indonesian Medicinal Plants between KRIBB and BPPT began in 2008 and is still going. The main purpose of the project is to conduct bioprospecting of Indonesian medicinal plants for establishing a twin extract-bank at both institutes and initial screening of biological activity. The joint project has produced not only enormous outcomes such as high quality herbarium specimens and plant extracts (more than 2,300 samples), publications, and databases, but also provided a high possibility of success in the development of high value natural drug materials (highly potential samples) for the benefit of both countries. Materials for the development of natural drug or nutraceuticals will be continuously studied.

124. More generic novelties in Asian Malmeoideae (Annonaceae) revealed by molecular phylogenetic analyses

Author(s): Tanawat Chaowasku, Ngo Tri Dung and Le Thai Hung

Abstract Type: Presentation

Annonaceae are a pantropical family with c. 2400 species in c. 108 genera. Four subfamilies have been distinguished on the basis of morphology and molecular phylogenetics. The pantropical subfamily Malmeoideae exhibits previously undiscovered or cryptic generic diversity. For example, the genera *Mwasumbia*, *Sirdavidia*, *Wangia* and *Winitia* were recently established based on their phylogenetic position and unique morphology. In addition, the disentanglement of the polyphyletic *Polyalthia* necessitated the establishment and reinstatement of the genera *Huberantha* and *Monoon*, respectively. However, there are more undiscovered genera in Asian Malmeoideae. By performing molecular phylogenetic analyses of seven combined plastid markers (*rbcL*, *matK*, *ndhF* and *ycf1* exons; *trnL* intron; *trnL-trnF* and *psbA-trnH* spacers), a potential new genus endemic to Vietnam which is the sister group of *Monocarpia* (Monocarpieae) has been identified. It primarily differs from *Monocarpia* in the inflorescence position and fruit morphology. Furthermore, the tribe Miliuseae harbours two potential new genera. One of them is also endemic to Vietnam, but is morphologically largely unknown because only a fruitlet was collected and currently is just a sapling. The other potential new genus is from Thailand and has been recovered as the sister group of the Neotropical clade of Miliuseae. Its morphology seems intermediate between genera in that clade and *Meiogyne*. These novelties highlight the importance of evergreen forests in mainland Asia as a reservoir of generic diversity found in Asian Malmeoideae.

125. Anti-inflammatory activity of Rutaceae in Vietnam based on ethnobotanical information.

Author(s): Kyung-Seop Anh, Bach Tran-The, Ok-Kyoung Kwon and Sangmi Eum

Abstract Type: Poster

Ethnobotanical information plays a key role for developing natural products such as new drugs, cosmetics for use in health care in many countries. The main goal of this survey was to validate the effectiveness of traditional medicine in Vietnam where 54 ethnic groups occur. In this study, 46 species of Rutaceae distributed in Vietnam were collected and extracted for screening of anti-inflammatory bioactivity by MTT assay and NO production and then compared with information from ethnobotanical literature. Among 22 species in which anti-inflammatory function was documented in

traditional literature, seven (32%) species showed high anti-inflammatory bioactivity. This represents a lower correspondence between both data than expected. To verify the precise value of ethnobotanical data used by local people, extended experiments are needed. Our study provides a correlation between known ethnobotanical uses and experimental results of anti-inflammatory bioactivity. Also, it attempted to provide preliminary information and to indicate future directions for natural product research within Vietnam.

126. Eastern origins of fleshy fruited Myrtaceae

Author(s): Eve Lucas, Peter Ashton and Thais Vasconcelos

Abstract Type: Presentation

Myrtaceae is an ecologically important, hyperdiverse family with centres of diversity in the forests of the Old and New Worlds. Myrtaceae is unusual – for its size in species numbers – in having four genera with >500 species. Three of these, *Syzygium*, *Eugenia* and *Myrcia* have fleshy fruits (c. 1000, 1000, 700 species respectively) and represent a significant taxonomic impediment. The fleshy fruited condition appears to have arisen in the part of Gondwana that makes up present day Australasia. *Syzygium* (tribe Syzygieae) is an exclusively Old World group. *Eugenia* and *Myrcia* (tribe Myrteae) are predominantly New World, but the oldest representative genera within the tribe occur in Southeast Asia and Australia. Speciation rates are faster in these tribes than on average in Angiosperms. In Myrtaceae only one other tribe has fleshy fruits: Tristanieae (in *Xanthomyrtus* with c. 25 species) also from South East Asia. Phylogenies of the cited tribes were analysed to map biogeographical patterns and trait-dependent diversification rates. Results are presented that indicate the key innovation of the fleshy fruit to have taken place in what is now Asia. The association of this character with hyper-speciation will be demonstrated along with the most likely biogeographical routes taken by the different tribes in conjunction with historical geo-climatic events. The biogeographical fates of the three fleshy fruited lineages will be explored, in particular, the relative species paucity of *Xanthomyrtus* and the restriction of Syzygieae to Southeast Asia and the Paleotropics in comparison to Myrteae.

127. A phylogeny of the mango genus (*Mangifera*, Anacardiaceae)

Author(s): Emily Warschefsky

Abstract Type: Presentation

The mango genus, *Mangifera*, is one of the largest in the family Anacardiaceae encompassing approximately 69 species. Of these, more than two-thirds are endemic to Malesia, and some 26 are regionally cultivated for their edible fruits. The most recent systematic treatment of *Mangifera*, based on morphology, hypothesised two subgenera and six sections. Despite the global and regional importance of *Mangifera*, the taxonomy and systematics of the genus have received relatively little attention in the past 20 years. Here, we present a molecular phylogeny of 30 *Mangifera* species, representing all proposed subgenera and sections, based on Bayesian and maximum likelihood analysis of two high copy and two single copy nuclear genes. We also present preliminary evidence from next generation sequencing analysis of these species, with data from over 5,000 loci throughout the genome. These results inform our understanding of the evolutionary history of *Mangifera* and lay the groundwork for further investigations into the morphological diversification and phylogeography of this globally and regionally important genus.

128. Taxonomic studies on *Epiblastus* (Epidendroideae, Orchidaceae) towards a revision of the genus

Author(s): Sławomir Nowak

Abstract Type: Poster

Epiblastus Schltr. is a poorly known genus which contains 23 accepted taxa (according to the World Checklist) and only one synonymous name (*E. seranicus* J.J.Sm.) Representatives of *Epiblastus* are

common in the montane forests of New Guinea and are well represented in herbaria. At the same time, it is very difficult to identify the species. The taxonomy is extremely confused and it would seem that even some of the more frequent species are at present still undescribed. A thorough revision is therefore urgently needed. Many of the diagnostic characters cannot be established from photographs and it is thus necessary to examine the actual specimens. After preliminary taxonomic studies, morphological features useful for taxonomy of *Epiblastus* have been specified. They are illustrated and briefly discussed. A first attempt at an infrageneric classification of the genus is proposed. The results presented are based on study of herbarium specimens revised by classical taxonomic methods.

129. A floristic survey of trees in the lowland tropical forest of Mt. Daguldul, San Juan, Batangas

Author(s): Natividad Lacdan, Kristal Divine Brosoto and Abbigael Visto

Abstract Type: Poster

The lowland tropical forest of Mount Daguldul, in Barangay Hugom, San Juan, Batangas is part of the Batangas mountain range which is ranked third in the list of biodiversity hotspots in the Greater Luzon Island. This study aimed to conduct an inventory of forest trees in Mt. Daguldul by adopting a modified BIOMON, a programme developed by the Smithsonian Institute (SI/MAB). Forest trees were sampled in three 40 × 40 m plots constructed at 180 masl, 190 masl, and 220 masl altitudes. Data analysis revealed that 34 non-dipterocarp species belonging to 18 families existed in the area at altitudes and edaphic conditions characteristic to the species. Tree mapping showed numerous trees with smaller basal areas and closer spacing than trees with wider basal areas. *Pterocymbium tinctorium* was found to be the most dominant and most important species. *Capparis microcantha* had the highest relative frequency, while *Albizia* sp. had the highest relative density. Species in the Sterculiaceae had the highest importance value among the families observed. The area has high species diversity, species evenness, species richness and low ecological dominance. Mount Daguldul was undergoing a secondary stage of succession and was mostly of non-dipterocarp, broad leaf evergreen in character with high biodiversity.

130. The evolution of agamospermy and host specificity in *Balanophora laxiflora* and allied taxa (Balanophoraceae)

Author(s): Jer-Ming Hu, Huei-Jiun Su, Yun-Chen Hsieh and Shian-Tsan Geng

Abstract Type: Poster

Agamospermy, the formation of seeds without sexual reproduction, can be achieved by complete or partial suppression of meiosis during embryogenesis. The phenomenon is usually unnoticed unless a detailed examination of reproduction in the flowering plants is carried out. However, it would be easier to recognise if only females are present in plants with unisexual flowers, such as occurs in *Balanophora japonica* and *B. yakushimensis*, two members of the holoparasitic Balanophoraceae. These two taxa are closely related to *B. laxiflora*, a dioecious species widely distributed in Taiwan and southern China. The three taxa form a monophyletic group in the rDNA/ITS phylogeny, with an extremely high substitution rate. However, the intraspecific variation of these sequences is very low in *B. japonica* and *B. yakushimensis*, where there are notably high divergences among the individuals of *B. laxiflora*. We also identified the hosts of the three *Balanophora* species by PCR and sequencing of the associated roots. The results showed that *B. laxiflora* has a wide range of hosts, including *Elatostema*, *Acer*, *Morus*, *Ficus*, *Alnus*, *Rubus*, and *Ardisia* species. By contrast, *B. japonica* showed a host preference for *Symplocos* species. Interestingly, *B. yakushimensis* showed a host switch pattern, preferring *Distylium racemosum* in Japan and Schima superba in Taiwan. The results suggest a narrower genetic variation and host specificity in the agamospermic *Balanophora* species. Canalisation can restrict the potential niche of agamospermic taxa, unless a new niche/balance is found, e.g. for the host switch in *B. yakushimensis*.

132. Beyond Red Listing: Implementation of action plans for the conservation of threatened plants in Peninsular Malaysia

Author(s): Leng Guan Saw, Chua Lillian Swee Lian and Yong Wendy Sze Yee

Abstract Type: Presentation

National Red Listing of Malaysian plants started in 2005. To date we have conducted assessments of over 1,400 plant species. Red Listing of Malaysian plants was conducted using a two-prong approach. First, as revisions of plant families were conducted for the Flora of Peninsular Malaysia project, species revised were also assessed for their conservation status. At the same time, high priority groups were also assessed independently even before they were revised. This was done for the Dipterocarpaceae, Begonia and Aquilaria. From these assessments, FRIM has identified a number of species with high conservation concerns each of which was subjected to more in-depth ecological and phenological studies for the purpose of developing appropriate action plans, management plans and detailed prescriptions for species and habitat conservation. In addition, we share some of the success stories arising from the engagement established with stakeholders.

133. Exploration of the flora of the Solomon Islands

Author(s): T.-Y. Aleck Yang, Jer-Ming Hu, Chia-Wei Li, Fred Pitisopa and Jen-Yuan Yeh

Abstract Type: Poster

The Solomon Islands in the southern Pacific consists of over 1,000 islands, with a total land area of 28,400 km^2 and mountains close to 2400 m high. The diverse topography and its tropical environment give rise to a tremendously abundant fauna and flora, estimated at >7,000 vascular plant species. Led by the National Museum of Natural Science in Taiwan, a consortium was formed between Makino Botanical Garden of Japan, the Minister for Forestry and Research of Solomon Islands, National Museum of Natural Science, Dr. Cecilia Koo Botanic Conservation Centre, and the International Cooperation and Development Fund of Taiwan. A project entitled 'Investigation of Plant Resources and Compilation of the Flora for Solomon Islands' was initiated in 2007, with many participants from Taiwan and other countries. Plant surveys have been conducted in selected regions of Guadalcanal Province, New Georgia Island, Kolombangara Island, Western Province, Choiseul Province, Isabel Province, Malaita Province, and Central Province. Over 7,000 collections were made during expeditions from 2012 to 2015, focused on the major islands in the above regions. Near 400 orchid and 400 fern species have been collected, including several new species recently named or to be named. The ongoing project will aim for publications on the plant list, and eventually a complete flora of this under-explored nation. More information can be seen at our website: http://siflora.nmns.edu.tw/, which contains the up-to-date plant list, the scanned specimens, and selected living plant photos.

134. New discoveries in *Begonia* from Kalimantan

Author(s): Deden Girmansyah and Mark Hughes

Abstract Type: Presentation

Borneo is the second largest island in Malesia after New Guinea, comprising Sabah, Sarawak, Brunei Darussalam and Kalimantan. Kalimantan has more than four times the area of Sabah, Sarawak and Brunei combined; potentially home to many *Begonia* species. At present 199 species are described from Borneo with only 10 species known from Kalimantan. We estimate the true number to be 200-300 species based on the richness of other parts of Borneo. Only about 170 herbarium collections of *Begonia* have been collected in Kalimantan, mainly from East Kalimantan with very limited collections from other provinces, especially South Kalimantan. More field trips are needed to fill this knowledge gap, and much remains to be done to complete our knowledge of potentially the most diverse *Begonia* flora in Indonesia. Here, we present two new *Begonia* species from Long Duhung, Berau, East Kalimantan, some new records for Kalimantan, and plans for future work.

135. Leaf anatomical adaptation in *Pandanus tectorius* (Pandanaceae)

Author(s): Nor Azahana Abdullah, Noraini Talip, Wickneswari Ratnam, Nurnida Mohd Kamal, Noor Solihani Shamsuddin and Nor Dahlia Abdullah Siam

Abstract Type: Presentation

A leaf anatomical study of *Pandanus tectorius* Parkinson, a species of Peninsular Malaysia, was carried out. The objective of this study was to investigate the adaptive leaf anatomical characteristics of the species studied. Leaves of 12 accessions of *Pandanus tectorius* from different localities were used. The study has been done by observation under light microscope. Results showed that the leaf anatomical characteristics of all accessions were very similar. However, the accession from Mersing, Johore showed thickest cuticle layer, highest value of stomatal index and little gap between vascular bundles. The number of palisade layers for every accession was in a range of two or three layers, but the accessions collected from Terengganu and Selangor had three or four layers. Results showed that most accessions had aerenchyma cells without air lacunae. In conclusion, there was little variation in anatomical characteristics in *P. tectorius* in different localities, but there were still some significant differences in some accessions. Therefore there are leaf anatomical adaptations present in *P. tectorius* towards its surrounding habitat.

136. The taxonomy and phylogeny of *Pterospermum* (Dombeyoideae/Malvaceae) in Malesia

Author(s): S. K. Ganesan, David Burslem and Peter Wilkie

Abstract Type: Presentation

A revision of the ecologically important Asian tree genus *Pterospermum* Schreb. in Malesia is currently being undertaken. In this paper, I will present the taxonomy and phylogeny of the genus. The taxonomy was carried out using classical herbarium techniques augmented by field observation. The revision is the first to cover the whole of Malesia and addresses confusion in nomenclature, misapplied names and incompletely known species in the Malesian literature. The molecular phylogeny presented using markers from the chloroplast and nuclear genomes is the first known phylogeny of the genus and has led to the re-circumscription of several species.

137. A revised classification of the Melastomataceae: implications for the biogeography and conservation of the flora of South East Asia

Author(s): Darin S. Penneys, Frank Almeda, Peter W. Fritsch and Fabian A. Michelangeli

Abstract Type: Presentation

Melastomataceae comprise ca. 170 genera and over 5,000 species distributed primarily in humid, tropical and subtropical environments worldwide. Traditional family-level classifications based on morphological characters have mostly recognised two subfamilies and between nine and 13 tribes. In most schemes, individual tribes have been considered to be restricted to either the Neotropics or Paleotropics. In order to test earlier hypotheses of relationships, biogeographical distributions, and patterns of morphological character change within the family, the most comprehensive data set to date was assembled and analysed using maximum likelihood and Bayesian phylogenetic methods. Taxon sampling included 1,105 OTUs representing 152 genera, plus additional outgroup taxa and sequence data for c. 6,800 aligned bp (nrETS, nrITS, *accD-psaI*, *ndhF*, *psbK-psbL*, *rbcL*, *rpl16*). These analyses indicate that only the two long-recognised subfamilies and one tribe within the family are monophyletic; a new classification of the Melastomataceae derived from this phylogeny is thus proposed. This study suggests that four tribes have pantropical distributions, each likely attributable to an independent long-distance dispersal event. Neotropical lineages are now well-understood, but far more extensive sampling of paleotropical clades is needed to clarify tribal and generic circumscriptions. The Sonerileae, a tribe that currently includes about 50 poorly understood genera and over 1,000 species common in South East Asia, is particularly problematic because of under-collection, lack of study, and generic over-description of regional variants; our preliminary evidence

suggests rampant paraphyly in this tribe. This investigation has also elucidated novel and unexpected hypotheses of phylogenetic relationships among members of the Dissochaeteeae and Melastomeae.

138. New records of infraspecies of *Aquilaria beccariana* (Thymelaeaceae) in Malinau, North Kalimantan.

Author(s): Tri Mulyaningsih and Isamu Yamada

Abstract Type: Presentation

Malinau (Bumi Intimung) is a district in North Kalimantan Province, Indonesia, located at the border of Sarawak and North Kalimantan (Indonesia). According to van Tieghem (1893), Ding Hou (1960) and Tawan (2004), *Aquilaria beccariana* was found in Sarawak, Brunei Darussalam, common in Kalimantan. However, during visits in 2006 and 2010 six varieties of *Aquilaria beccariana* were found. Information on the type of inflorescence and fruit observed in the field, and on specimens collected was compared to isotypes and holotypes at BO, F, G, K, L and P. It was concluded that these varieties are *Aquilaria beccariana* var. *beccariana* (local name: gaharu daun keriting), *Aquilaria beccariana* var. *sagittata* (local name: gaharu nimbung), *Aquilaria beccariana* var. *caudata* (local name: gaharu pantai), *Aquilaria beccariana* var. *indumenta* and *Aquilaria beccariana* var. *macrocarpa* (local name: gaharu beringin).

139. Untangling *Cyrtandra*: a megadiverse genus in the Malesian hotspot

Author(s): Hannah Atkins, Gemma Bramley, Abdulrokhman Kartonegoro, John R. Clark and Mark Hughes

Abstract Type: Presentation

Current research on *Cyrtandra* the largest genus of Gesneriaceae, with over 800 species will be presented. A revision of *Cyrtandra* on the island of Sulawesi will be discussed; a preliminary phylogeny of the genus across its distribution will be presented and initial taxonomic and biogeographical observations made. Plans for taking research on this large genus forward will also be presented.

140. Origin, evolution and assembly of biodiversity: examples of the mainland Asian – South East Asian connection

Author(s): Sabine Matuszak, Adrien Favre, Jan Schnitzler and Alexandra Muellner-Riehl

Abstract Type: Presentation

The origin and evolution of major diversity hotspots associated to the Qinghai-Tibetan Plateau (QTP) or the Indo-Australian Archipelago (IAA) remain poorly understood. Particularly, the contribution of biological interchange between the QTP and the IAA to (sub)global patterns of plant diversity has not been sufficiently studied. We use a combination of approaches (phylogenetics, biogeography, diversification rates, distribution and niche modelling) to investigate how (and if) origin, evolution and assembly of floras in biodiversity hotspots are influenced by geological and climatic changes. Based on investigations of several plant lineages, we shed light on sink and source areas of biodiversity, dispersal routes (lowland vs. mountain taxa), and patterns of spatio-temporal evolution.

141. The phylogeny of *Zingiber* of Sumatra with an emphasis on *Zingiber engganoense*, a new species recently discovered on Enggano Island

Author(s): Marlina Ardiyani

Abstract Type: Presentation

A preliminary study of the phylogeny of *Zingiber* from Sumatra was carried out using the internal transcribed spacer (ITS) of the nuclear region. Three species of *Zingiber* which only occur in Sumatra

(*Z. loerzingii*, *Z. macradenia* and *Z. engganoense*), three species of *Zingiber* occurring both in Sumatra and the Malay Peninsula (*Z. aurantiacum*, *Z. kunstlerii*, and *Z. spectabile*), two unidentified *Zingiber* spp. from Sumatra, and one widespread species, *Zingiber zerumbet*, were sequenced for their ITS. Four species (*Z. montanum*, *Z. gracile*, *Z. multibracteatum* and *Z. fraseri*) failed to yield good sequence readings due to sequence polymorphisms. Thus, nine samples representing nine species were sequenced in this study. Another 32 sequences representing 24 species were added from the NCBI GenBank including *Zingiber* from outside Sumatra and the Malay Peninsula. *Kaempferia parviflora* and *K. elegans* were used as the outgroup. Maximum likelihood analysis showed that *Zingiber engganoense* is placed basally compared to other Sumatran species, grouped with *Zingiber ellipticum* a non-Sumatra species with low BS value 55. The remaining Sumatran species are placed in two clades grouped with Malay Peninsular species (BS 75 and 62), and one clade grouped with South China species (BS 69). More samples from Sumatra and more markers are needed to give a more meaningful conclusion to the phylogeny of *Zingiber* of Sumatra.

142. A botanist in Borneo 1976–2016 – collections and conservation efforts

Author(s): Anthony Lamb

Abstract Type: Presentation

The speaker worked in the Agricultural and Horticultural fields in the Department of Agriculture, Sabah, Malaysian Borneo from 1962 to 2001. Since retiring he has continued to photograph, study and collect native plants, especially those of horticultural interest. He is currently attached to the Sandakan herbarium, at the Forest Research Centre, Sepilok, Sabah. He started his botanical studies in 1976 being persuaded by the Forest Botanist in Sabah to work on the orchid flora. This he did with the help of the RBG Kew and established a conservation collection of native orchids in Tenom, Sabah. This was followed by projects with Dr Argent and Anthea Phillipps to elucidate the rhododendrons for which a living collection was established at RBG Edinburgh by Dr Argent and his colleagues. This was followed by collecting *Nepenthes* and edible native fruits in Sabah. He also worked with the late Rosemary Smith on wild gingers, establishing a collection of over 100 species in 15 genera at Tenom. Over the last two years he has worked mainly on orchids, *Hoya* and *Orchidantha* of Borneo with Kipandi Park and their living collections.

143. Assessment of the distribution and conservation status of wild plants in conservation areas using GIS and GeoCAT

Author(s): Voradol Chamchumroon, Nanthawan Suphuntee, Sommanussa Saengrit, Naiyana Tetsana and Manop Poopath

Abstract Type: Poster

Measuring the abundance of particular plant species in particular areas is one part of a project to assess which species in Thailand should be listed as threatened, according to IUCN guidelines. This information is used when formulating policies and regulations for the conservation of natural resources. In this study two methods of assessment were used: Line transect Sampling with GIS (Geographic Information System) and GeoCAT (Geospatial Conservation Assessment Tool). For the former, three endangered species of *Acer* (Aceraceae), *A. calcaratum* Gagnep., *A. pseudowilsonii* Y. S. Chen and *A. thomsonii* Miq. were targeted in Doi Phu Kha National Park and Nanthaburi National Park, Nan Province, Phu Hin Rong Kla National Park, Phitsanulok Province, Nam Nao National Park, Phetchabun Province, Doi Chiang Dao Wildlife Sanctuary, Chiang Mai Province and Phu Luang Wildlife Sanctuary, Loei Province. Area of Occupancy (AOO) and Extent of Occupancy (EOO) were calculated following IUCN guidelines, and the three species were confirmed to belong to the 'endangered' category. For the latter, 61 species of threatened plants in Phu Wua–Phu Langka forest in Phu Langka National Park, Nakhon Phanom Province and Phu Wua Wildlife Sanctuary, Buengkan Province were targeted. Data from a nature trail survey and herbarium records were used in order to calculate AOO and EOO. Ten species were critically endangered (CR) and four were endangered (EN).

144. DNA barcoding of selected medicinal plants and a discovery of a novel species of *Begonia*.

Author(s): Freddie Blasco and Grecebio Jonathan Alejandro

Abstract Type: Poster

The province of Surigao del Sur in Southern Mindanao, Philippines, has a vast flora of medicinal and a good number of endemic plants. This study aims to identify and authenticate the medicinal plant species by the barcoding technique using four chloroplast markers. Sixty-six plants belonging to 31 families and 43 genera were randomly collected from a mountain range occupying three municipalities (Tago, Lanuza, Tandag). Ten informants were questioned about the self-care uses of these plants, which include ten endemic species and are mostly represented by the family Rubiaceae. From the samples collected, a new species of *Begonia* in section *Petermannia* was identified and proposed after the type locality as *Begonia lanuzaensis*. This monoecious perennial herb species is endemic to Mount Nabuywang in Lanuza, Surigao del Sur. *Begonia lanuzaensis* is allied to *B. mindanaensis* and *B. agusanensis* but is very distinct in having broad glabrous leaves. It shares the inflorescence of *B. mindanaensis* and the leaf of *B. agusanensis*. Out of 66 species collected, only 50 are of medicinal value and were selected for barcoding. Results of the PCR and sequence success rate revealed that *trnH-psbA* had the highest success rate with 100%, followed by *trnL-F*, 85%, *matK*, 83% and *rbcL*, 34%. *TrnH-psbA* and *trnL-F* had the highest sequence rate with 79% each, followed by matK with 49% and *rbcL* with 32%. *MatK* showed the best discrimination ability within the intra-genus divergence while *trnH-psbA* had the best values in discriminating between inter-genus divergence.

145. The Sapotaceae of Indonesia and the potential role of Botanic Gardens in their conservation

Author(s): Prima Hutabarat and Peter Wilkie

Abstract Type: Presentation

There are over 160 species in 15 genera of Sapotaceae currently recorded in Indonesia. The collection at Bogor Botanic Garden currently comprises 13 genera, 214 collection numbers and 274 specimens of native and non-native species of Sapotaceae. With unprecedented threats to the forests in which they are found, this presentation will focus on the role that botanic gardens, in particular those in Indonesia, may be able to play in their conservation. It will highlight the exciting '47 Botanic Gardens of Indonesia' initiative and how ex situ and in situ conservation might be developed within this programme. It will also discuss the need to capture the expertise and skills needed to cultivate tropical trees. The lack of IUCN threat data for the family in Indonesia will be discussed and how this impinges on the ability to deliver conservation actions.

146. The Flora of Nepal – a born-digital Flora

Author(s): Colin Pendry, Mark Watson, Pullan Martin and Bhaskar Adhikari

Abstract Type: Presentation

The Flora of Nepal has been actively revising the plants of this Himalayan country since 2004. It is a collaboration between Nepalese, Japanese and UK institutions and is coordinated by the Royal Botanic Garden Edinburgh. Although it follows in the tradition of RBGE's Himalayan floristic research, it is an innovative 'born-digital' Flora which, from its inception, has managed all specimen data, species descriptions and photographs within the in-house Padme database. The use of Padme ensures maximum flexibility in reusing and updating outputs. The project website gives access to all data, images and online versions of completed accounts. These accounts are also freely available as pdf downloads which are permanently archived and citable. Independent Padme datasets are used to manage other taxonomic research projects at RBGE, such as the Zingiberaceae and Sapotaceae studies, and these datasets are also used to generate the content which is available via the respective project websites.

147. Introducing Spot-characters

Author(s): Max van Balgooy

Abstract Type: Presentation

Spot-characters are those features of plants that are distinctive and relatively rare. Following on the legacy of Prof. C.G.G.J. van Steenis, who started to record spot-characters, the senior author has considerably augmented the collection. This has resulted in a trilogy, Malesian Seed Plants, vol.1 Spot-characters (1997), vol. 2 Portraits of tree families (1998) and vol. 3 Portraits of non-tree families (2001). The present authors felt the need to re-write, especially, vol. 1. The new book contains 119 spot-characters arranged alphabetically to family (following APG III) and not according to genus. The previous publication was illustrated by line drawings, the present one, wherever possible, by colour photographs. The book is intended for use in the herbarium, especially for incomplete material.

148. Completing the *Begonia* Flora of Sumatra

Author(s): Mark Hughes, Deden Girmansyah and Adi Mahardika

Abstract Type: Presentation

In the last few years, 23 new *Begonia* species have been published from Sumatra, bringing the total number of accepted species known from the island to 63. These belong to five sections, namely *Bracteibegonia*, *Petermannia*, *Platycentrum*, *Reichenheimia* and *Sphenanthera*. A key to the sections and species of Sumatran *Begonia* has been published, and work is under way to describe the remaining new taxa and revise each section. Progress towards a stable higher level classification of Asian *Begonia* will be presented, based on molecular phylogenetic data. The feasibility of delimiting monophyletic sections will be discussed, and some potentially useful informal clade names will be introduced. Preliminary insights into the biogeography of Sumatran *Begonia* will also be presented, including the effects of the Barisan orogeny and dispersal to and from other areas of the Sunda Shelf.

149. Recent progress in Malesian Zingiberaceae taxonomy

Author(s): Mark Newman

Abstract Type: Presentation

In 2004, Newman, Lhuillier & Poulsen published a Checklist of the Zingiberaceae of Malesia. This presentation will review progress made in the 12 years since then. New genera, such as *Kedhalia* and *Myxochlamys* have been published. Revision of species has been slow but significant contributions have been made by Poulsen (*Etlingera* of Borneo and *Etlingera* of Sulawesi) and by Droop and Newman (*Amomum* of Sumatra). Many smaller contributions have been made, including work under way to publish a checklist of the Zingiberaceae of Indonesia by M. Ardiyani and co-authors.

150. Progress in Elaeocarpaceae for Flora Malesiana

Author(s): Mark Coode

Abstract Type: Presentation

Despite the ‘new’ circumscription of Elaeocarpaceae to include the three genera of Tremandraceae, the list of genera known from Malesia remains at five. Recent advances in New World *Sloanea*, confirming the erratic distribution of ‘bristle-spines’ on the fruit, will be also be mentioned. The fruit of *Dubouzetia galorei* and its reported effect on cassowaries will be described. No further important knowledge has been added to *Aceratium* and *Sericolea*, but in the last few years many new species of *Elaeocarpus* have come to light; the initial survey of Malesia is now complete, keys written and descriptions of all taxa and local variants of *Elaeocarpus* (376 in all) recorded in Delta. Comparison of species numbers and endemics for the 11 areas of Flora Malesiana is revealing, and recent findings

of molecular work in Cairns by Darren Crayn and his students Yumiko Baba, Sook Ngoh Phoon and Janet Gagul, have leant support to some but not all of the groupings suggested by previous work using morphology.

151. A revision of Balsaminaceae in Myanmar

Author(s): Saroj Ruchisansakun, Piyakaset Suksathan, Timo van der Niet, Erik Smets, Saw Lwin and Steven Janssens

Abstract Type: Presentation

The family Balsaminaceae consists of more than 1,000 species, but only two genera are currently recognised. Of these, *Impatiens* is a species-rich genus, whereas *Hydrocera* is monospecific. Southeast Asia is one of the hotspots of *Impatiens* with over 250 species known. To understand the variation in the family and to provide correct species delimitations for each taxon, poorly studied, yet species-rich regions should be more thoroughly investigated. Nearly a century after Hooker's and Toppin's taxonomic works on Balsaminaceae in Myanmar, we provide a detailed revision based on new collections made during field expeditions (July-December 2015) and on herbarium specimens (local herbaria: RAF, YANG, and MAND, other herbaria: AAU, BK, BKF, BM, C, E, K, L, P, QBG and SING). In total, more than 50 *Impatiens* species were recognised in Myanmar. Of these, several are expected to be new to science, while several new records to Myanmar were added. This revision not only clarifies the delimitations of *Impatiens* species in Myanmar but also contributes to the definition of species boundaries in its neighbouring countries, and shows the variation of some widespread *Impatiens* species.

152. The evolution of eastern gingers

Author(s): Axel Dalberg Poulsen

Abstract Type: Presentation

Gingers are present in all tropical forests but most genera and species are found in Malesia. Wallace's Line clearly separates species between west and east: there are fewer genera and species to the east. Two genera, *Pleuranthodium* and *Riedelia*, are only found here. These, as well as the Carolinensis Clade of *Alpinia*, and the genus *Etlingera* are examples of radiation of eastern taxa. Based on the island of Ambon, Rumphius initiated the exploration and understanding of eastern gingers more than 300 years ago. Thorough fieldwork is still much needed in forests of New Guinea and on neighbouring islands to secure high quality collections. These are essential to establish the foundation for a molecular-based methodology in order to elucidate the evolutionary pattern and taxonomy of eastern gingers.

153. More is beautiful: Meristic change in the flowers of Sapotaceae

Author(s): Louis Ronse de Craene

Abstract Type: Presentation

Sapotaceae represents a largely tropical family of basically pentamerous and isomerous flowers. However, within subfamily Sapotoideae there is a strong tendency for meristic change with either an increase in merism from five to six or eight, or a reduction to four. The increase affects all floral whorls indiscriminately or only part of the floral organs. Linked with the overall increase in merism of the flower, the number of perianth whorls may increase, with a reduction of the merism within each whorl, as a higher number of organs do not necessarily fit spatially within a whorl. It is demonstrated that pentamery shifted to octomery and hexamery at least five times and that these shifts are taxonomically significant. Changes of floral merism are independent of changes in the androecium, where one whorl can be staminodial, or stamens can be secondarily increased. This indicates that any descriptions only stating organ numbers in flowers or emphasising the number of perianth whorls are misleading in the inference of evolutionary relationships.

154. A conservation action plan to conserve the maximum biodiversity of the limestone flora in Peninsular Malaysia

Author(s): Rafidah Abdul Rahman and Ruth Kiew

Abstract Type: Presentation

The need to exploit limestone products for national development impinges on the conservation of rare and endangered limestone species. One strategy to minimise this is to map the distribution of rare and endangered limestone species so that karst hills of particularly high conservation importance are identified. Among limestone flora families, the Gesneriacaceae is outstanding for the number of taxa characteristic or restricted to limestone including many species with narrow distributions as well as many rare and endangered species.

155. Open versus closed data and the challenge of creating a 21st century flora

Author(s): Roderic Page

Abstract Type: Presentation

What should a flora look like in the 21st century? As data about plants (specimens, literature, sequences, and more) moves online, there is a huge opportunity for synthesis and discovery by not only aggregating data, but by cross linking it. Yet the biodiversity community seems determined to make things difficult for itself by restricting the right to access data (often by trading that right in exchange for digitisation of the data), and a sluggish adoption of new methods of linking and disseminating information. This talk makes a plea to set the data free, and to exploit automated methods as much as possible in order to increase our knowledge of both what we know (often without knowing it), and what we do not know.

156. Four year climatic parameters influence on the abundance and survival of *Websteria confervoides* (Submerged Cyperaceae), a wetland dependent species

Author(s): Jamilah Mohd Salim and Rohani Shahrudin

Abstract Type: Presentation

Four years effect of climatic parameters (temperature and rainfall) on the survival and abundance of seasonal freshwater wetland plant *Websteria confervoides* was examined. The adaptability of *W. confervoides* to seasonal freshwater wetland is confirmed as it can survive following temporary desiccation up to 7 days. Rainfall factor is crucial in determining survival of this species, as prolonged drought could abolish the entire local population. Ex situ conservation and management plan for its habitat (ecosystem conservation) is crucial considering the climate change threat to this region.

157. Progress in understanding the *Begonia* flora of the Moluccas

Author(s): Wisnu H. Ardi and Daniel C. Thomas

Abstract Type: Presentation

Our understanding of the *Begonia* flora of the Indonesian Maluku Islands (also known as the Moluccas) is very limited because of the paucity of herbarium collections from the region and a lack of alpha–taxonomic baseline work on eastern Malesian *Begonia*. Two recent expeditions, the Fairchild's commemorate expedition to Halmahera co-organised by Fairchild Tropical Botanic Gardens and Kebun Raya Bogor, and expeditions to Seram and several adjacent smaller islands by Bali Botanic Gardens, have provided additional valuable material. As a result one endemic species (*B. holosericea*) was rediscovered after 153 years from Ternate, five endemic new species were described (*B. aketajawensis* Ardi & D.C.Thomas, *B. galeolepis* Ardi & D.C.Thomas, *B. holosericeoides* Ardi & D.C.Thomas, *B. manuselaensis* Ardhaka & Ardi and *B. sageaensis* Wiriad.), and two species (*B. rubra* Blume and *B. saxatilis* Blume) will be reinstated from synonymy with

Begonia muricata Blume. Four more new species will be published in the near future raising the total number of *Begonia* species reported from the archipelago to 11 (one in section *Sphenanthera*, one in *Baryandra*, and nine in *Petermannia*), and available cultivated material at Bali and Bogor Botanic Gardens indicates that several more new species are awaiting description. This clearly indicates that additional field collections are paramount for advancing our understanding of the Moluccan *Begonia* flora.

158. An overview of Convolvulaceae of Peninsular Malaysia

Author(s): Syahida-Emiza Suhaimi, George Staples, Siti-Munirah Mat Yunoh and Rafidah Abdul Rahman

Abstract Type: Poster

The family Convolvulaceae is well represented with 59 genera and about 1,880 species worldwide. The family occurs throughout tropical and warm temperate regions. Malaysian Convolvulaceae were taxonomically revised in several important papers by Clarke (1883), Hallier (1893, 1897), Prain (1894, 1896, 1903, 1906), Ridley (1923), Ooststroom and Hoogland (1953), and Ng (1989). Ridley (1923) in the Flora of The Malay Peninsula recognised 54 species, treated in 14 genera. Later, Ng (1989), revised the family in the Tree Flora of Malaya; however, because the emphasis was on trees, only brief accounts were provided since most of the species are climbers, herbaceous, shrubs and only rarely trees. With many more Malaysian collections of Convolvulaceae available now, it was timely to review and re-examine the taxonomic concepts of the family. The current Flora of Peninsular Malaysia account (Staples & Syahida-Emiza, 2015) recognises 79 species (including three incompletely known species) in 16 genera. Two taxa, *Calystegia hederacea* Wall. and *Dichondra micrantha* Urb., have not been documented in Peninsular Malaysia, but both are likely to become naturalised. Keys to genera and species, descriptions, vernacular names, ecological information, line drawings, colour photographs, distribution maps, and provisional conservation statuses are provided in the Flora account.

159. Biogeography of Malesian tree species along elevational gradients – insights from plot-based inventories

Author(s): Fabian Brambach, Christoph Leuschner and Heike Culmsee

Abstract Type: Poster

Malesia harbours the largest number of tree species of any tropical region worldwide. In recent years, biogeographic relationships of a growing number of tree taxa have been elucidated using molecular and phylogeographic methods. These studies showed that most taxa were present either in Asia or in Australia before c. 20 Mya. Then, as Wallacea, the central part of Malesia, formed, migration between the two major land masses became possible and the 'Malesian floristic interchange' began. During that interchange, the Asian taxa presumably have been much more successful than their Australian counterparts, dominating most of the Malesian ecosystems today. While relationships are clear for single genera and families, we know little about how tree species of the two groups contribute to the composition of different vegetation types and whether their relative dominance changes along the elevational gradient. Here, we used data from our own plot-based tree inventories along an elevational gradient in Sulawesi and supplemented these with published results from other plots in the Malesian subregions of Sumatra, Borneo, Java, the Philippines and the Moluccas. Applying results from phylogenetic studies as well as distribution and fossil data, we assigned each species occurring in the inventory plots to one of two ancestral areas: Asia or Australia. The results show that patterns change clearly along the elevational gradient, both in number of species and number of individuals. Based on these results we discuss different possible migration pathways during the Malesian floristic interchange.

160. Collections without data – what's the point?

Author(s): Kerry S. Walter

Abstract Type: Presentation

We are surrounded by vast quantities of easily accessible information, but are we looking after our own institutional collection data? Botanic gardens and herbaria build expensive and unique collections to serve a variety of purposes, including research, education, amenity, visitor attraction, conservation, restoration, etc. No matter what purposes collections are put to, those purposes are best served by fully capturing, curating and analysing the data underpinning the collections themselves. Too often 'plant records', 'computerising/digitising specimens' or other such activities are considered separate from and secondary to the act of building and utilising the collections, and often assigned to different individuals or departments; in the worst-case scenario these activities may even be considered optional or non-core. Such decisions can have detrimental consequences for the longevity, usefulness and value of the collections and, ultimately, for the long-term viability of the institution itself. Some institutions are more successful than others in integrating data- and specimen-curation with other activities, thereby invariably getting more value from their collections. Although not necessarily expensive to do so, ensuring that institutional structures and priorities maximise the worth of collections can be slow and painful and may be met with fierce resistance from some staff. However, doing so presents the most cost-effective and sustainable way forward for any institution holding biological collections.

161. Typifications and the re-establishment of ten species in the *Rinorea anguifera* complex (Violaceae)

Author(s): Jennifer Demuria and Fred Stauffer

Abstract Type: Presentation

The classification of *Rinorea anguifera* (Lour.)Kuntze as designated by Jacobs (1967) and all nomenclatural synonyms listed in Flora Malesiana (Jacobs & Moore, 1971) are evaluated. The taxonomic assessment of specimens stored at A, BK, BO, BM, E, G, K, KW, L, NY, MO, P, SING, TCD, USA, and WAN necessitates the re-establishment of 10 unique species included in the *Rinorea anguifera* complex that were subject to polymorphic consolidation as a single taxon (*R. anguifera*) in the aforementioned taxonomic treatments. Results of our revision are clearly indicative of the vast biodiversity found within the Malesian floristic region. The *Rinorea anguifera* complex is conceptualised as a 'provisionally natural group' of pantropical tree-violets. In our study we designate, eight lectotypes, two neotypes, two new synonyms and three new combinations. Typifications in the *Rinorea anguifera* complex provide a framework of clarification for matters of nomenclature, a necessary first step in our larger systematic revision of tropical Asian *Rinorea*.

162. Sapotaceae and the the Malesian floristic interchange

Author(s): James Richardson

Abstract Type: Presentation

Results of biogeographic analyses of Malesian Sapotaceae are presented based on a dated molecular phylogeny. This will be compared with other studies of patterns of migration and diversification in South East Asia. Migration across Wallace's Line has predominantly been from west to east and possible explanations for this pattern are presented. A comparison of diversification patterns in Sapotaceae is made between Southeast Asia and other parts of the tropics.

163. A Red List of all Sapotaceae by 2020?

Author(s): Peter Wilkie

Abstract Type: Presentation

Sapotaceae are an ecologically and economically important plant family but to date only nine of the estimated 1,300 species have been assessed using IUCN Red List Categories and Criteria (v 3.1). This presentation will highlight the importance of the family, the taxonomic research currently being undertaken on it and the development of a project to deliver target 2 of the Global Strategy for Plant Conservation (GSPC), 'An assessment of the conservation status of all known plant species, as far as possible, to guide conservation action' for Sapotaceae. It will also discuss the impediments and opportunities related to this goal.

164. Progress of Flora Malesiana

Author(s): Marco Roos

Abstract Type: Presentation

Notwithstanding difficulties due to shortage of financial resources and lack of scientific support, Flora Malesiana has made progress over the years. Since the last FM Symposium a number of goals have been achieved. FM as published so far has been digitised and is available in BHL as well as in the CBD via XML-marked up files. The Linneaus NG software has been launched as a system to house taxonomic information, and will also accommodate the CDB data. The Naturalis Bioportal provides access to all L digitised collections. All Blumea, Leiden Botanical Series and FM volumes are available from the Naturalis Repositorium as searchable pdf-files. From the next volume onwards FM will be published electronically and as PoD only. The research organisation and financial position of Naturalis has changed considerably. This has consequences for the role Naturalis can play in the FM network. Input from others in the coordination efforts is solicited, as well as more commitments, especially from the national institutes in the region. All those who value FM need to join forces and share information, jointly with other flora projects, and in cooperation with networks like World Flora Online and Encyclopedia of Life. The way forward is to share existing data and newly generated relevant information by people of various disciplines and research goals. This will form the information back bone of future treatments and taxa still wanting revision, proving the importance of well-established taxonomies and well-identified collections.

165. Growth performance of rattans (Arecaceae: Calamoideae) after 33 years in cultivation as a gene bank in the Philippines

Author(s): Aida Lapis and Haira Apolinario

Abstract Type: Presentation

The paper presents the 33-year growth performance of Phillippine rattan species cultivated in the 5 hectare rattan gene bank, a living garden, of the Ecosystems Research and Development Bureau located in the Los Baños Experiment Station, Mt. Makiling Forest Reserve, Los Baños, Laguna, Philippines. The rattan gene bank was established in 1983 as a conservation effort to rescue the rattans which were threatened due to heavy cane harvesting for furniture and handicraft industries, massive logging activity and forest conversion. The ex situ conservation initiative is composed of rattan species collected from the natural habitat of forested areas of Luzon, Visayas and Mindanao where rattans used to abound. The data include the species, information of the plantation site, location of planting material sources either by seedlings or wildlings, average total stem length and average diameter and number of suckers produced. Information on the flowering and fruiting events were observed and recorded. An account of experiences and efforts done to establish and maintain the area are included. The significance of the gene back to research and public awareness will also be discussed. The paper includes the current onsite images that show growth behaviour of rattan species.

166. The Flora of Bali, an update.

Author(s): Ida Haerida, Retnowati Atik and Deby Arifiani

Abstract Type: Poster

Recent information about progress on the Flora of Bali is presented. A complete flora from this area is lacking and information concerning the flora of Bali (including bryophytes, fern and fungi) is urgently needed. The Flora of Bali is based on herbarium specimens from BO, L, and the Herbarium of Bali Botanical Garden Ekakarya as well as new collections from several recent expeditions. The number of specimens collected, new records, and published papers on The Flora Bali Project are also presented.

167. Towards 200 years of Bogor Botanic Gardens and the role role in plant conservation: Plants and people in harmony

Author(s): Sri Rahayu & Didik Widyatmoko

Abstract Type: Presentation

Bogor Botanic Gardens will celebrate its bicentenary anniversary on 17 May 2017. It had much experience of ex situ conservation of plants with its strengths of utilisation and basic botanical research during the Dutch Era (1817–1945 and 1948–1952). The 'golden era' for research was during Treub's Directorship in the early 1900s with work on auxin and mycorhiza. Innovations in economic botany resulted in increasing wealth for the Dutch Government with the development of plantations for agro-industries for exotic species i.e. oil palm, rubber, coffee, tea, quinine and tobacco. Increasing plant collection was followed by many publications including floras and new species descriptions. Bioprospecting via ethnobotanical research did not result in emergent industry except for 'Jamu'. During the Japanese Era we experienced status quo (1945–1948). Under Indonesian rule the management of plant collection and research has gone through several reorganisations and LIPI was founded. In 1950s and 1960s, plant conservations was supported by Bank Indonesia and in the 1970s and 1980s, collection and conservation of Indonesian crop plants was supported by the Ministry of Agriculture. In 1990s plant exploration was recharged and resulted in many new collections and new species discoveries. During this period local government botanic gardens were started, to face the challenge of Indonesian plant conservation. To date, 30 new local botanic gardens have been established. Current research focuses on plant conservation, reintroduction and restoration, domestication, economic botany and plants and climate change. A focus on public education and awareness is the main method towards 'plants and people in harmony'.

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