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(in alphabetical order by first author's last name)

WELCOME LECTURE

North-South research collaboration – what we learned from the Flora of Thailand

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The term *biodiversity* refers to the richness and variability of life on Earth, most often referring to the number of species in a habitat, region, continent, or the whole World. But biodiversity also covers the molecular level below species and the ecosystem and biosphere levels above the species. The term was coined by Walter G. Rosen in 1985. But obviously research in biodiversity has taken place — under different names — since the beginnings of our civilizations. Taxonomic and floristic research was most strongly undertaken by the colonial powers in their quest to inventory the natural resources of their dependencies in tropical regions, now often dubbed "the South." With the independence during the 1900s, new research institutions developed in the many former colonies. Since then, research in these countries' biological resources, now called "biodiversity," became a collaborative effort between the former colonial power, now dubbed "the North," and the newly independent mostly tropical countries in the South. This North-South collaboration has involved the development of research capacity and establishment of research in biodiversity in the South. In this context, Thailand is different because it was never a colony. Nevertheless, a somewhat similar development has taken place. The relationship between Thailand in the South and other countries in the North was based mostly on commercial exchange, but also, on the vision of King Rama V who established many political and commercial bonds between the South (Thailand) and the North (Europe). The development of the forestry sector in Thailand was part of this trend. In Botany collaboration was established between Thai forest botanist, in particular Prof. Tem Smitinand, and more traditional botanical institutions in Europe in 1965. The **Flora of Thailand** was initiated as an international research project in biodiversity with a South-North leadership. In the first many years the scientific input was dominated by the international collaborators from the England, Ireland, Scotland, France, Netherlands, Germany, and Denmark. But the Royal Forest Herbarium (BKF) in Bangkok provided outstanding Thai leadership and scientific production to the project. As the years have passed the Flora of Thailand project has functioned as a capacity building project in biodiversity research. Currently, the overwhelming majority of contributors come from a large number of Thai academic and scientific institutions, mostly at the universities. The Flora of Thailand project will be finished within the next few years and it stands out as exemplary among North-South collaborative undertakings with a high emphasis on capacity building and gradual take-over of ownership by the South partner.

Keywords: *International collaboration, training, young researchers, botany, capacity building*

ORAL PRESENTATION

Nipa: the lone traveler from the past

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The Nipa palm, *Nypa fruticans* Wurmb, constitutes a monospecific lineage that diverged early in the evolution of palms. This presentation will provide an overview of research projects on Nipa completed in Thailand over the last two decades in collaboration with thesis project students. I will compare the results obtained from our study sites in southern Thailand with those of similar investigations conducted throughout the distributional range of this enigmatic species. I will argue for the uniqueness of the Nipa palm, not only morphologically, but also in its ecology.

Keywords: *mangrove, pollination mechanisms, population ecology, clonality, southern Thailand*

ORAL PRESENTATION

Taxonomy of Thai *Amischotolype* (Commelinaceae)

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Amischotolype Hassk. is a genus belonging to the Commelinaceae, subfamily Commelinoideae, tribe Tradescantieae, subtribe Coleotrypinae. It is distributed in the Old World tropics except in Sri Lanka and comprises approximately 30 species, four of which are found only in tropical Africa. The genus is distinguished by having persistent sepals, inflorescences that penetrate the sheaths, flowers with six fertile stamens, capsular fruits, and seeds with orange arils. In our taxonomic study of *Amischotolype* in Thailand, we examined all material of the genus deposited in major Thai herbaria accessions in Europe and Thailand such as AAU, BK, BKF, K, KKU, PSU, and QBG as well as digitized specimens retrieved from herbaria websites. Type specimens of accepted names and synonyms were compared with descriptions and illustrations of the original publications. We recognize thirteen species in Thailand and provide a key to these. The taxonomic utility of selected morphological traits of *Amischotolype* are discussed such as the indumentum of stems leaf sheaths and leaves, the presence of a peduncle, the number of flowers/capsules per inflorescence/infructescence, and the attributes of sepals and capsules. Finally, we will present the geographic distribution of the species.

Keywords: Amischotolype*, Commelinoideae, Flora of Thailand, revision, taxonomy*

KEYNOTE

Training of new botanists - do we do enough?

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In the past few decades, the number of experts and lecturers in botany, especially in plant taxonomy, has been dramatically reduced, due to retirement. This means that the expertise in this field is insufficient. Therefore, we must encourage young people to specialize in botany. Educational programs are needed that focus on botanical diversity. They should include practical lab exercises and field expeditions, which is a strong motivational factor for young botanists. The current number of graduate students enrolled at Thai universities may be insufficient given the plant diversity of Thailand. However, training new botanists is crucial, especially considering the impact of biodiversity loss, climate change, and conservation needs. There are concerns that current efforts to train botanists and provide them with the necessary skills may not be enough. Modern botanists must learn new skills such as GIS, remote sensing, molecular techniques, and interdisciplinary approaches. An example from Khon Kaen University will be used to showcase how to tackle the problem.

Keywords: *education, taxonomy, fieldwork, interdisciplinary approaches*

ORAL PRESENTATION

Combining traditional and scientific knowledge for plant identification

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This project synergizes scientific knowledge derived from the Flora of Thailand project with the traditional knowledge of the sub-Karen Pakakenyaw ethnic group, focusing on the naming of plants. By integrating traditional indigenous knowledge with scientific plant identification methods, the project aims to enhance existing scientific understanding by adding a new layer information about the plant species. The project also explores compatibility of local folk taxonomy with forest management, and biodiversity conservation. A desired outcome is to harmonize traditional knowledge with scientific techniques and to provide approaches to enhance recognition and application of scientific knowledge among academics and young botanists. As a first initiative of its kind, the project may serve as a model for future forest education programmes. The technological tools provided coupled with the transitional monitoring activities will enable better protection for threatened species in the area. The initiative aligns with several UN Sustainable Development Goals (SDGs 13, 15, 16, 17).

Keywords*: indigenous knowledge, Pagakenyaw ethnic group, botany for young people*

POSTER

Genetic variation of *Glochidion mirabile* and *G. kaweesakii* (Phyllanthaceae) in Thailand based on Start Codon Targeted (SCoT) Markers

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Glochidion mirabile (Müll.Arg.) R.W.Bouman and *G. kaweesakii* (Pornp., Chantar. & J. Parn.) R.W.Bouman are restricted specifically to limestone mountains, which constitutes a threatened habitat. *Glochidion*

mirabile is distributed in Thailand and Lao PDR, whereas *G. kaweesakii* is an endemic species found only in Loei province, Thailand. This work aims to study genetic diversity within and among populations of *G. mirabile* and *G. kaweesakii* using SCoT markers. Eight suitable SCoT primers were selected for analysis. A total of 121 bands were produced, of which 115 bands (94.8%) were polymorphic. The analysis of molecular variance (AMOVA) demonstrated that for *G. mirabile* genetic differentiation was 61% among populations and 39%. within populations. Since *G. kaweesakii* only occurs at one location, it was not possible to compare genetic differentiation among populations. The genetic differentiation was 65% among species and 35%. within species. The result from cluster analysis using the unweighted pair group method with arithmetic mean (UPGMA) and Principal coordinate analysis (PCoA) revealed two major groups, *G. mirabile* and *G. kaweesakii*. The *G. mirabile* group can be further divided into five subgroups. These group do not correspond with the geographical distribution ranges. The present study revealed that *G. mirabile* and *G. kaweesakii* have low genetic diversity and gene flow. The results provide fundamental knowledge that may inform efforts to conserve the two species.

***Keywords**: genetic variation, genetic relationships, Phyllanthaceae,* Phyllanthus kaweesakii, Phyllanthus mirabilis

ORAL PRESENTATION

A comprehensive species-level phylogeny of the palms (Arecaceae) as a tool for understanding plant evolution in the (Asian) tropics

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With >2500 species, palms (Arecaceae) are one of the most iconic tropical plant families. Thanks to their faithful association with the tropics, combined with solid data on distributions, traits and phylogenetic relationships, palms have extensively served as a model group for studying the evolution and ecology of tropical plant diversity. Being most species-rich in the Asian tropics (Thailand alone has 151 native species in 30 genera), palms are ideal for unpicking plant evolution in this hyperdiverse, yet understudied region. However, to fully unlock the potential of palms to shed light on evolutionary processes in the (Asian) tropics, a comprehensively sampled, genomic phylogeny of the family is needed.

To this end, we founded the Palm Phylogeny Working Group (PPWG) at the World Palm Symposium 2015 in Quindío, Colombia, at a time when the "phylogenomic revolution" brought both great promise for species-level systematics and a real risk of different labs adopting different, incompatible approaches. Seeing the first real opportunity to achieve a comprehensive species-level phylogeny for all palms, the PPWG quickly got behind target sequence capture as their approach of choice, jointly focusing on a set of palm-specific standard loci. This early agreement and persistent collaboration is now coming to fruition. We present the first phylogenomic tree of almost all palms (~80% of species), which is now being prepared for publication, and reflect on the important question: what next? Here, we focus on our own plans for using the tree to study the macroevolution of palms, and by extension tropical rainforests. Finally, the full potential of phylogenetic trees can only be unlocked in conjunction with other data, and we introduce a new initiative to gather geographic distribution data for all palm species to complement the phylogenetic tree generated by the PPWG.

***Keywords:** Arecaceae, Palmae, phylogenomics, target sequence capture, species distributions.*

ORAL PRESENTATION

Progress on taxonomy and systematics of Grewieae (Grewioideae-Malvaceae) in Mainland Southeast Asia

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According to the recent circumscription of an expanded Malvaceae, the newly formed subfamily Grewioideae includes 25 genera, most of which were included in former Tiliaceae. Based on a phylogenetic study using *ndh*F sequence data and morphology, both tribes Apeibieae and Grewieae were accepted, and the taxonomically and morphologically controversial genera *Grewia* and *Microcos* in Grewieae were separated. In Mainland Southeast Asia (MSEA), past floristic studies included a number of species belonging to Grewieae, viz. *Colona*, *Grewia* and *Microcos*. However, up-to-date taxonomic information is urgently required to document the biodiversity of this region accurately, to conserve their constituent taxa or to exploit them economically. This project therefore aims to provide a comprehensive taxonomic and systematic revision of these three genera using herbarium vouchers and newly collected specimens. Most of the type specimens within the three genera have already been examined. An updated taxonomic overview of the genera is given here and with an outline of their diagnostic characteristics. Eleven out of a total of 17 accepted names of *Colona* species are recognized and a key provided for their identification. We resurrect *Colona diptera* (Ridl.) Craib. Half of the *Grewia* species are likely to be polygamo-dioecious. Also, new species and records across the MSEA are proposed and the disjunct distribution of *Colona auriculata* (Desf.) Craib and *Grewia* spp. is revealed. Future studies will include phylogenetic and phenetic analyses of the genera for infrageneric classification.
Keywords: Colona, Grewia*, Indochina, Microcos, Tiliaceae*

ORAL PRESENTATION

What's next for Thai Zingiberaceae?

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The volume on Zingiberaceae for the Flora of Thailand was published in 2023. The family is distributed in the tropics and subtropics and comprises about 55 genera and 1800 species; 28 genera and 392 species in the published volume. Many species are useful and about 25% are endemic in Thailand. The first ginger collections were made by Koenig in Phuket in 1779. Subsequently, important collectors were Kerr, Smitinand, Puangpen, and Larsen. The latter two encouraged Thai botanists to study gingers. In total, 15 botanists collaborated on the volume illustrating the importance of cross-border taxonomy. The volume is a big step forward for identification and raising awareness of the importance of gingers for people's livelihood. Since publication, 28 additional species were described, all based on types collected in Thailand. More will be added in future. On-going research using molecular techniques will alter the circumscription of species and genera especially for *Alpinia*. It is important that this new information, including updated keys, will continuously be available online. Even though we are closer to knowing how many ginger species are found in Thailand, more work remains on conservation assessments, especially of species thought to be endemic. The continued collaboration with neighbouring countries to help revise their Zingiberaceae is important and may also improve the knowledge of Thai species. Ecology, including reproductive biology, is poorly known and should be investigated further, not the least for their conservation. Approaches involving assessment of intraspecific variation over entire geographical

distribution within closely related species should be used to assess the circumscriptions of closely related taxa, such as those in *Curcuma*, *Globba*, *Kaempferia*, where new species have been described from small numbers of specimens.

Keywords: *online flora, new species, circumscription, future research*

POSTER

Genetic diversity of *Borassus flabellifer* L. (Arecaceae) in Northeastern Thailand using Start Codon Targeted Markers

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The Palmyra palm (*Borassus flabellifer* L.) is one of the most important plants for the local economy in Thailand. Data on the genetic diversity of Thai palmyra palm are currently reported only from Central and South Thailand. This research project aims to study the genetic diversity of Palmyra palm in the Northeastern part of Thailand. Twenty-seven samples collected from Sakon Nakhon, Nong Khai, Nakhon Phanom, Bueng Kan, Nong Bua Lamphu, and Loei were studied using SCoT markers. The results revealed that two SCoT primers produced 17 discernable bands, including SCoT13 and SCoT15. All seventeen bands (100%) were polymorphic bands. The average Polymorphic Information Content (PIC) was 0.3966. The total genetic differentiation among groups was high (Gst = 0.5589), and the estimate of gene flow among the groups was medium (Nm = 0.3946). In addition, the analysis of molecular variance (AMOVA) showed that the genetic variation within populations (54%) was higher than the genetic variation among populations (46%). A UPGMA (Unweighted Pair Group Method with Arithmetic Mean) cluster analysis and PCoA (Principal Coordinate Analysis) ordination revealed two clusters without a clear pattern of distribution.

Keywords: *Arecaceae, genetic variation, genetic markers, palmyra palm, SCoT*

ORAL PRESENTATION

Plant Collecting spread and densities: a reprise with eight times the amount of data

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In 2003, the newly formed Thai Biogeography group published a paper that utilised a dataset of ca. 6,500 collection records to examine the spread and collecting densities of plant species in Thailand. The paper was the first attempt to present representative aggregate maps of plant collecting localities in Thailand and to discuss their impact on biogeographical studies in that country and the surrounding region. The 2003 analysis showed that the spread of collecting activity was very uneven with 20% of collections coming from a single Changwat (Chiangmai) and that 53% of Changwats had 50 or fewer collections. This paper, still frequently cited, helped to determine some collecting priorities for the Flora project. In this decadal re-assessment we look again at the conclusions reached in the 2003 paper utilising a dataset that is eight times larger (ca. 52,000 records). We also compare the locality information now available to that currently published in the Flora.

Keywords: *Collection localities, distribution maps, biogeography, Changwat, Amphoe, Tambon.*

ORAL PRESENTATION

Collaboration opportunities with the Flora of Nepal

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For many tropical and subtropical families there is considerable overlap at the species level between the floras of Thailand and Nepal. There is, therefore, an excellent opportunity to build on the success of the Flora of Thailand by preparing accounts of particular taxa for the Flora of Nepal. We present a case study of grass genera, of which there are approximately 140 genera in Nepal. Accounts have been prepared for *Apocopis*, *Dimeria* and *Perotis*, which are represented by a total of four species in Nepal, all of which, except *Apocopis paleaceus,* are present in Thailand and which have already been submitted to the Flora of Thailand. Accounts of these genera were prepared for the Flora of Nepal based on specimens examined at the E and KATH (Kathmandu) herbaria, as well as digital images retrieved online from BM, K and TI. They were published online (www.floraofnepal.org), ahead of their physical publication in volume 9 of the Flora of Nepal. This research exemplifies the potential for close relationships between Flora projects in Nepal and Thailand and serve as a model for future collaborations between Nepalese and Thai botanists working on other plant families.

Keywords*: Poaceae,* Apocopis, Dimeria, Perotis, *knowledge exchange*

POSTER

Diversity of Araceae in the National Parks of Kamphaeng Petch Province and Mae Hong Son Province, Thailand

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Diversity, distribution and phenology of Araceae were studied along nature trails in Khlong Lan National Park (220-290 m.a.s.l.) and Khlong Wang Chao National Park (220-300 m.a.s.l.), Tham Pla-Namtok Pha Sue National Park (269-428 m.a.s.l.) and Namtok Mae Surin National Park (384-669 m.a.s.l.). Eight, 10 meter wide transects were established along different nature trails. Thirty-three species in 18 genera were reported: seven *Amorphophallus* species, four *Colocasia* species, three *Hapaline* species, two species each in *Arisaema*, *Pothos*, *Rhaphidophora* and *Steudnera*, and one species in each of *Aglaonema*, *Alocasia*, *Englerarum*, *Lemna*, *Leucocasia*, *Remusatia*, *Sauromatum*, *Schismatoglottis*, *Scindapsus*, *Steudnera* and *Typhonium*. Thirteen species belonging to ten genera were evergreen, 20 species belonging to nine genera were deciduous. Ten species were found in mixed deciduous forest, 11 species in dry evergreen forest and 12 species in both forest types. Comparing the results obtained for two provinces we found that 14 species belonging to ten genera were the same, whereas 19 species belonging to 12 genera were different. The location, altitude, soil type, temperature and relative humidity were all determinants of the diversity and distribution of this family.

Keywords: aroid, distribution, phenology, forest types

POSTER

Flora of Thailand: Past, Present, and Future

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The first botanical survey in Thailand was conducted in 1690 by the German botanist, Dr. Engelbert Kaempfer. During in the period 1821–1899 approximately 30 explorers made plant collections in Thailand. One of them was Johannes Schmidt (Ernst Johannes Schmidt) a Danish botanist with a special interest in Siam. His valuable contributions have later inspired generations of Danish and Thai botanists. This applies in particular to "Flora of Koh Chang", which he published in the Danish Botanical Journal (Botanisk Tidsskrift from 1901 to 1916. This is considered the starting point of Danish botanical explorations in Thailand. Later the Danish ambassador to Thailand Gunnar Seidenfaden (1908–2001), a keen orchidologist himself, organized the “Thai-Danish Botanical Expeditions” that took place during the years 1958–1959 with Prof. Kai Larsen from Aarhus University, Denmark and Prof. Tem Smitinand from the Forest Herbarium (BKF), Royal Forest Department, Thailand. In 1963, Prof. Tem Smitinand and Prof. Kai Larsen launched the Flora of Thailand Project, an international collaborative research project that aims to study the diversity of vascular plant species in Thailand. The editorial board meeting was held in 1964 at the Royal Botanic Gardens, Kew, U.K. The project was officially launched in 1967. The board meetings are held every three years alternating between a country outside Thailand and Thailand. The first volume of Flora of Thailand was published in 1970 and new volumes have appered at regular intervals since then. Today, 15 volumes, 7,542 species belonging to 254 families have been published, which corresponds to approximately 75 percent of the estimated number of vascular plant species in Thailand. Large families that are still in progress comprise: Acanthaceae, Gesneriaceae, Poaceae, Lamiaceae, Orchidaceae, Rubiaceae, and Leguminosae-Papilionoideae. During the publication of the flora, the plant classification system has changed. As a result, the study of various plant groups still needs to be up-dated with modern knowledge such as molecular taxonomy and evolutionary relationships. The Flora of Thailand project have enjoyed support from Thai researchers in various institutions who have contributed with valuable fieldwork. The current editorial team is international lead by Prof. Henrik Balslev, from Aarhus University and Dr. Kongkanda Chayamarit from the Forest Herbarium in Bangkok. From its inception in 1967 to the present, Flora of Thailand has been generously funded by the Carlsberg Foundation and the Danish International Development Agency (DANIDA).

Keywords: *Thai–Danish collaboration, botanical cooperation, Flora of Thailand.*

KEYNOTE

Modern alpha taxonomy and the closing of the Linnaean shortfall

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The Linnaean shortfall, so named 25 years ago, refers to the discrepancy between named species and the number that actually exist. We all hope that nature protection may benefit from new entities being added to already ‘catalogued’ ones. Since different branches of the Tree of Life are studied and named with different methods and *Codes*, closing Linnaean shortfalls requires focusing on particular taxa, here land plants. Kew’s 2023 State of the World’s Plants and Fungi reports 400,000 named plants (incl. bryophytes and algae) and estimates a total of 450,000. Some 2,500 new plant species are named every year, so that at current rates, it should take 20 more years to fully catalogue all plants. To lighten the burden on

professional taxonomists of identifying already known species – freeing up time to focus on 'difficult', perhaps new species – we need to explore AI-based approaches for plant identification. JSTOR Global Plants hosts 2.74 million herbarium specimen images (18 Nov. 2023), which regularly turn up in Google Lens reverse searches when one uploads photos of Thai plant specimens, in some plant groups (e.g., Melastomataceae) yielding good identifications. For the Flora of China, an AI approach trained on 20,000 photos in the Plant Photo Bank of China (http://ppbc.cn, try it), in a recent test correctly identified 222,300 unnamed photos, and for an additional 32,969 gave a few possible names. Surely this tool can also identify many common species from Thailand. A roadblock to the speedy formal naming of the remaining 50,000 plant species is a continued focus on descriptions with (pseudo-)accurate measurements, when instead widely shared and properly archived type material, photos, and DNA sequences from types or topotypes will be key to an efficient cataloguing of species in local floras and the protection of nature.

***Keywords**: AI-based plant identification; Flora of China photo bank; sharing and storing plant photos; Linnaean shortfall closing in 20 years*

POSTER

Update on the Acanthaceae for the *Flora of Thailand*

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The treatment of the family Acanthaceae for *Flora of Thailand* is a collaborative project incolving seven contributors. Four subfamilies of Acanthaceae e.g., Acanthoideae, Avicennioideae, Nelsonioidieae and Thunbergioideae are recognized in accordance with the classification of Manzitto-Tripp et al. 2022. The Acanthus family contains 43 genera and 318 species occurring in Thailand. The seven largest genera are *Strobilanthes* (71 spp.), *Justicia* (51 spp.), *Staurogyne* (29 spp.), *Thunbergia* (20 spp.), *Pseuderanthemum* (16 spp.), *Rungia* (15 spp.) and *Phlogacanthus* (12 spp.), followed by 36 genera with less than 10 species each. Ten species are new to science and c. 96 are endemics. Eighteen species have been reported as being cultivated. As a result of the treatment we propose 60 lectotypifications. We aim at publishing the the treatment of Acanthaceae for *Flora of Thailand* will by the end of 2024.

***Keywords:** Acanthus family, classification, morphology, nomenclature, taxonomy*

POSTER

The tribe Desmodieae (Fabaceae) in Thailand

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More than a decade ago, a study of the tribe Desmodieae in Thailand was initiated, when Prof. Henrik Balslev and many Thai botanists joined and collaborated on this tribe for the Flora of Thailand account. Twenty-two genera and 85 species are recognized. Much of the taxonomic work for the tribe is nearly completed. *Uraria* is the most diverse genus in the country with 16 species followed by *Grona* (10 species).

This tribe is characterized by its articulate pods. The treatment of Desmodieae is planned volume 4, part 3.4 of the Flora of Thailand. Here we present a key to genera, a list of species, and photographs of selected species.

Keywords: Desmodium*, Flora,* Grona*, Leguminosae, Papilionoideae*

ORAL PRESENTATION

Diversity of *Globba* L. (Zingiberaceae) in Thailand

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A taxonomic revision of *Globba* L. was recently completed for Flora of Thailand. It comprises 66 species, claasified in three subgenera and six sections; sect. *Substrigosa* (*G. substrigosa*), sect. *Haplanthera* (3 spp.), section *Ceratanthera* (11 spp.), sect. *Globba* (30 spp.), sect. *Nudae* (19 spp. [subsect. *Nudae* (6 spp.), subsect. *Mediocalcaratae* (12 spp.), subsect. *Pelecantherae* (*G. pelecanthera*)]) and, section *Sempervirens* (2 spp.). Thirty-four species are endemic to Thailand and restricted to small areas. The character traits of the inflorescence, the anther appendages, as well as the fruit, are regarded as crucial for species identification. The revision shows that Thailand boasts a large diversity of *Globba* species. Although twenty-nine new species were described in the last five years, more will probably be discovered can in unexplored regions of Thailand. The information generated will undoubtedly be valuable for flora projects of the neighboring countries. Further studies on hybridization and intraspecific variation are still needed in complex group such as sect. *Globba*.

Keywords: *classification, Flora of Thailand, Globbeae, ginger, taxonomy*

ORAL PRESENTATION

Phylogenetic relationship of the genus *Premna* (Lamiaceae) in Thailand

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The genus *Premna* is a large genus of Lamiaceae with about 130 species distributed in the Old World tropics and subtropics. Early classification and identification of the genus has relied on morphological studies leading to the taxonomic confusion such as misidentification, synonymization or morphology-based classification. This study aims to revise the taxonomic status of the genus *Premna* with an emphasis on species found in Thailand based on evidence from morphological characters and molecular analyses. The molecular markers of four chloroplast regions were used to construct the phylogenetic relationships: *ndhF*, *rbcL*, *rps16* and *trnL-F*. Our findings supported the monophyletic relationships of *Premna* and recovered two major clades (P1 and P2) with some basal clades which are congruent with morphological characters. We resolved taxonomic confusion of *P*. *serratifolia* complex that *P*. *cordifolia*, *P*. *octonervia*, *P*. *paniculata* and *P*. *punctulata* are reinstated as distinct species. The taxonomic treatment and morphology-based relationships are discussed.

Keywords: *Mint family, Premnoideae, reinstatement, synonym, systematics, taxonomy.*

ORAL PRESENTATION

Phylogeny and morphological evolution of the genus *Ophiopogon* (Asparagaceae) based on chloroplast and nuclear genome

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The genus *Ophiopogon* (Asparagaceae) includes about 65 species, distributed mainly in temperate to tropical regions of East Asia and Southeast Asia. The current species delimitation of *Ophiopogon* is quite controversial since it does not account for wide morphological variation that makes renders precise identification imprecise. Due to their short flowering periods, it is often difficult to identify the species, especially in the field. Furthermore, molecular phylogenetic studies of *Ophiopogon* are limited. In the present study, we analyzed both chloroplast and nuclear genome of *Ophiopogon*. We used the whole plastome to construct a highly resolved maximum likelihood phylogenetic tree, and 18 DNA regions to construct a more comprehensive phylogenetic tree with >150 samples. For the nuclear genome, we used the MIG-seq (Multiplexed ISSR Genotyping by sequencing), a PCR-based, genome-wide sequencing method that amplify multiplexed ISSR (inter-simple sequence repeat) regions by next-generation sequencing. Based on all the above molecular results, we reconstructed the morphological evolution of *Ophiopogon* and discuss the implications for species identification.
***Keywords**: ISSR, MIG-seq, monocots, NGS, plastome*

ORAL PRESENTATION

Pollen morphology of *Argyreia* (Convolvulaceae) and its related genera

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Argyreia is the most species-rich genus among tropical Asian Convolvulaceae, with approximately 143 species and five varieties distributed in tropical to subtropical Asia (except New Guinea) and Madagascar. Of that number, there are approximately 50 species recorded in Thailand. The genus is grouped with other spiny pollen genera in the tribe Ipomoeeae including edible crops and ornamentals in the genus, *Ipomoea.* This spiny pollen group is easily distinguishable by being large to very large in size, and having a pantoporate aperture and an echinate surface; however, few studies have explored these traits in detail and most of them focused strictly on *Ipomoea*. The extensive documentation of pollen morphology of *Argyreia* and its related genera will provide valuable information for assessment of the taxonomic value of the palynological variation. Pollen of *Argyreia, Astripomoea, Ipomoea, Lepistemon, Rivea,* and *Stictocardia* were acetolyzed, measured and, described. Photomicrographs were acquired with light microscope (LM) as well as scanning electron microscope (SEM). The presence of a meta-reticulate state of pollen surface, spine length, shape of the spine tip, width of the spine base, the size of pollen grains, the number of pores per grain and the number of spines per grain were evaluated for their ability to classify to genus and tribe level respectively. In addition, we explored the systematic value of pollen

morphology in the light of molecular phylogenetic relationships for *Argyreia* and related genera in the tribe Ipomoeeae.

***Keywords**:* Ipomoea*, morning glory, phylogenetics, SEM, taxonomy*

ORAL PRESENTATION

Palms in a Novel Biosphere

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Palms often play important or even foundation species roles in their native ecosystems. Now anthropogenic changes to the biosphere favor the expansion of at least some species of palms, notably climatic warming and globalization. In this presentation, I discuss conceptual and new empirical work on how these dynamics may play out, the potential ecosystem consequences, and what might be appropriate management responses.

***Keywords:** biogeography, distribution, novel ecosystems, global change*

KEYNOTE

Thailand's Wild Banana Treasures: An In-Depth Exploration Based on Fieldwork and Laboratory Studies

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Wild bananas (Musaceae) are the tropical large herb of the old-world, consisting of 92 accepted species classified in three genera. Our continuing study in Thailand, initiated in 2005, have documented 29 native taxa from two genera. It includes 12 wild and two hybrid species, six subspecies, four varieties, and five forms. Two recently discovered species, *Musa serpentina* and *M. nanensis*, possess a combination of unique character traits. Subspecies are delineated based on clear geographic boundaries, otherwise we use "variety" to describe within species variation. *Musa acuminata*, Thailand's most widespread and diverse banana species, comprise several subspecies particularly in the Isthmus of Kra area, from where we describe a new subspecies. The study also reports new distribution records for well-known taxa, including 'Kluai Tani', an important ancestor of commercial bananas. Based on extensive anatomical, cytometrical, molecular and phylogenetic studies we suggest that classical morphological character traits associated with the petiole, leaf base, inflorescence and flower remain effective for classification at genus, species, subspecies, and variety levels. However, to fully understand the evolutionary history of Musaceae further research is needed. This includes exploring pollination syndromes, the genetic controls of anthocyanin biosynthesis mutants, and inflorescence aberrations, among others.

Keywords: Callimusa, Ensete, Musa, *Musaceae, subspecific classification*

POSTER

Plant diversity in limestone ecosystems in Thailand

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A survey of the diversity of plant species in the limestone ecosystems of Thailand was carried out almost 40 years ago. Most of the underlying studies were conducted in the northern region of Thailand, especially in the Doi Chiang Dao Wildlife Sanctuary in the Chiang Mai province. Limestone ecosystems are

widespread throughout Thailand, but only limited information is available about these, outside the Chiang Mai province. Surveys on the diversity and utilization of plant species in the limestone ecosystem are limited to only a few areas. The studies are scattered and lack in some details. Limestone mountains have been heavily exploited, which has resulted in the loss of several plant species, even before they can be studied and used. Therefore, studies are urgently needed to prevent further loss of plant species from limestone ecosystems. This study focused on underexplored areas, protected areas as well as the forest complexes surrounding the limestone ecosystems. Plants were collected across growth seasons for species identification, acquisition of ecological data, information on use and preliminary assignment of conservation status. In the 41 areas surveyed in total we found 109 families, 379 genera, 736 species. Eleven species were new to science. The project has provided important supporting information for the Flora of Thailand project.

Keywords *: Doi Chiang Dao, forest complex, karst, Flora of Thailand*

ORAL PRESENTATION

Botany on the Wall: Decoding Plant Diversity in a Buddha's Footprint Vihara

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Thai Buddhist temple murals generally depict religious stories. However, they often illustrate elements of everyday life including local fauna and flora. While the artistic and cultural significance of these murals is well-studied, their potential for reconstructing past plant diversity remains largely unexplored. This study investigates the plant life represented in the bas-reliefs and murals of the Buddha's Footprint Vihara, Wat Bang Kaphom, Samut Songkhram Province, Thailand. These more than 200 years old artworks portray Buddhism narratives alongside a diverse flora. By combining art and botanical analyses, we identified approximately 40 plant taxa representing both native and non-native species. These taxa are primarily Eudicots (26 taxa), followed by Monocots (11 taxa), Nymphaeaceae (2 taxa), and Magnoliids (1 taxon). Interestingly, the artist ingeniously substituted the sacred fig (*Ficus religiosa* L.) with native plants that share a similar leaf shape, namely sea hibiscus (*Hibiscus tiliaceus* L.) and portia tree (*Thespesia populnea* (L.) Sol. ex Corrêa). Furthermore, the murals exhibit various fruit trees, such as custard apple, durian, jackfruit, langsat, mango, mangosteen and starfruit. The diversity of plant life depicted on the vihara's walls suggests the historical significance of Samut Songkhram Province as a major agricultural region since ancient times. We hope that this research contributes to our understanding of past ecological diversity in Thailand's lower Maeklong River basin.

Keywords*: Plant diversity, Bas-relief, Mural painting, Samut Songkhram, Wat Bang Kaphom*

ORAL PRESENTATION

Moments in time…from the earliest records until the present: botanists devoted to the Flora of Thailand

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Thailand has a very rich, unique plant biodiversity spread over various habitats, which has long interested people. Thai herbarium specimens or records exist certainly covering the few centuries since the introduction of binomial nomenclature. These have been collected by many botanists, not just plant taxonomists. The completed taxonomic treatments for the Flora of Thailand are largely based around these herbarium materials and reflect much hard work in the field. Anecdotally, it appears that young botanists have little interest in the history of botanical collecting. We, however, believe that it is important to document this historical activity before knowledge of it totally disappears. Unfortunately, a historical compilation of the botanists who have worked in Thailand on the flora is not yet available in any form. Our research aims to amass biographical information on botanists who have devoted themselves to Thai botany. The main source of the names of these botanists is/will be derived from the labels of herbarium specimens: so far over 700 botanists (i.e. collectors, taxonomists, promotors, etc.) have been recorded. As an example, the earliest record we hold so far is of E. Kaempfer (1651-1716) who visited Thailand (then Siam) in 1690. Other good examples are A.F.G. Kerr (1877-1942) and W.G. Craib (1882-1933). Dr. A.F.G. Kerr is honored as a father of Thai botany who worked in this country for nearly 40 years, and established the first systematic study of the botany of Thailand. His life and work have been extensively documented by various authors, whereas Professor W.G. Craib who was the author of over 1,200 scientific plant names is a much lesser-known figure even though he and Kerr lived at the same time and collaborated extensively (e.g. *Florae Siamensis Enumeratio*). This presentation aims to persuade all of us who are involved in the Flora of Thailand to share any information they possess in a standardized format that will enable accurate recording of the history of the botanical exploration of Thailand and which will form part of the first volume in the Flora of Thailand series. As taxonomic study of the Flora of Thailand will end its first phase in the next few years this makes the rapid gathering together of this information vital.

Keywords: *Botanical history, botanical collections, E. Kaempfer, W.G. Craib, A.F.G. Kerr*

ORAL PRESENTATION

Flora projects and their key role in fundamental biodiversity research: examples from species discovery and conservation in Singapore

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In this talk, we highlight how the Flora of Singapore project has given additional impetus to documenting and conserving Singapore's plants, including new genomic insights into tropical forests as well as new species and rediscoveries through greater fieldwork and herbarium specimen identification. We highlight how such programmes are central to biodiversity studies and feed these fundamental data into the broader ecosystem of natural history science, particularly through the published Flora accounts,

identification guides, and accessible and authoritatively named herbarium specimens. Finally, we will emphasise several recommendations for the future of plant diversity science which Flora projects, through herbaria, botanic gardens and universities, are uniquely placed to address, including training the next generation of plant scientists (especially taxonomists and systematists), gap filling fieldwork, production of accessible field guides, and long-term support and succession planning for critical taxonomic research.

***Keywords**: Floras, taxonomy, systematics, species discovery, sequencing, fieldwork*

KEYNOTE

Does the Flora of Thailand contribute to solving the Wallacean shortfall?

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The Wallacean shortfall is used to show discrepancies between known and actual distributions, a problem for tropical areas rich in plant diversity. The answer to the question posed in the title is yes. However, Flora of Thailand (FoT) cannot resolve the shortfall in itself, because species continually change their distributions, especially through anthropogenic land use and climate change. Our work is based on a database compiled by Parnell and colleagues comprising 50,599 entries (amounts mentioned refer to this database). In the early days, the first major collecting was by A.F.G. Kerr and his contemporaries, the highest number, 6,878 collections, were made between 1921-1930. Nevertheless, when FoT started in 1963, Thailand was not well collected. Large numbers of collections were amassed, leading to enormous gains in knowledge about distributions. Many collecting expeditions, often with Japanese or European collaboration, took place and the number of collections increased from 1,446 between 1951-1960, to 12,358 between1991-2000. After 2000, the numbers dropped, due to factors including legal restrictions, lack of money and more selective collecting. The collecting density is uneven, most collections were made in Chiang Mai (11,664) and in the North (19,505 collections); the Peninsular followed with 13,658 specimens. The fewest specimens were collected in the Central part (2,362), with even no specimens from Sing Buri. We will analyze changes between distributions published in FoT and the present. One result is at least that the phytogeographic border between Thailand and the Flora Malesiana area has become less distinct. Distribution patterns still show a lack of knowledge and indicate that many distributions have changed drastically due to human interference. With FoT almost complete it is time to monitor the flora to check for and analyze these changes. Thailand is too big and inaccessible to monitor the whole country, but representative areas may provide sufficient indication of changes. Knowing the changes and their causes will promote sustainable nature conservation.

***Key words:** Anthropocene, Biogeography, Collections, Conservation, Distributions, Patterns.*