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Abstracts from 16th Flora of Thailand Conference 2014

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INTRODUCTION

The *Flora of Thailand* is a long term project to document all the flowering plants, gymnosperms, ferns, and fern allies of Thailand. Current estimates suggest there are between 10,600–12,000 species. The project was initiated in 1963 as collaboration between Thai and Danish botanists. It was soon realised that wider international collaboration would be needed to ensure the project had the range of botanical expertise required to complete such a mammoth task. An Editorial Board was set up, with expertise initially drawn from the Thailand, Denmark, France, The Netherlands and the UK. It currently has representatives from these five countries plus Germany, Ireland, Japan and Singapore. Botanists from much wider range of countries provide their specialist knowledge to write up accounts of the families, genera and species occurring in Thailand. To date, around 5,000 species have been completed and published in 11 volumes.

The first *Flora of Thailand* Editorial Board Meeting was held at the Royal Botanic Gardens, Kew in 1965. Subsequent meetings have been held every 3 – 4 years, alternating between a Thai and European venue. In the past 20 years they have expanded into major conferences. In September 2014 over 130 delegates gathered at Kew for the 16th *Flora of Thailand* Conference, with the theme 'Thai Botany and the European Connection - Building on 100 Years of Collaboration'. The conference was graciously opened by HRH Princess Maha Chakri Sirindhorn, who has long-standing interests in plant conservation and has visited Kew a number of times. Talks and posters covered a broad range of topics, from progress on the families still being written up to conservation planning and restoration of habitats. The Editorial Board meeting ran concurrently with the Conference and set itself an ambitious target of completing the Flora by 2021, with much greater emphasis on electronic data gathering and dissemination. With careful planning it is felt that this target can be achieved, especially as there is a young generation of talented Thai botanists who are leading and contributing to family accounts.

Abstracts of the oral and poster presentations are given below.

The *Flora of Thailand* is a prime example of a long term, multinational collaborative Flora project which has clear aims and goals and is working to a given deadline, providing essential baseline data about plants for a whole range of potential users. We can be confident that the Flora of Thailand is in good hands to reach a successful conclusion.

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ORAL PRESENTATIONS

Status of *Hackelochloa* (Poaceae) O. Kuntze Based on Anatomical and Phenetic Analyses

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Hackelochloa is a genus of grasses comprising two species worldwide, *H. granularis* and *H. porifera*. Under a revised delimitation, *H. porifera* has been considered a form of *H. granularis*. However, these two species present differences in several features and structures especially in their sessile spikelets. Anatomical and phenetic analyses were applied to resolve this ambiguity. The leaf epidermis in these two species is similar, but characters visible in transverse sections of culms and leaves can distinguish *H. granularis* from *H. porifera*. In leaf transverse sections, the outline of the midrib of *H. granularis* is commonly flattened, but in contrast *H. porifera* has a V-shaped outline with distinctive tissue located on the abaxial surface. Furthermore, the number of bundles adjacent to the middle bundle in *H. porifera* is more than three, but only one or two are present in *H. granularis*. Furthermore, there is only one layer of chlorenchyma cells in the culm of *H. porifera*, whereas that of *H. granularis* has two or three layers. Based on an examination of 20 characters in 35 samples, our dendrogram supports the separation of *H. porifera* from *H. granularis*. Moreover, a matrix comparison plot found significant clustering of eight samples of *H. porifera* as separate from all other samples of *H. granularis* with a matrix correlation value of 0.99273.

Rapid Red List Ratings – harnessing new technology to generate conservation assessments

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With only ~6% of plants with extinction risk ratings included in its most recent update, the IUCN Red List of Threatened Species fails to adequately represent overall threat status to plants globally. By taking a representative sample of plants, as used in the Sampled Red List Index project, we can get a more accurate view of plant status, which suggests about 1 in 5 plants are threatened. However, our ultimate goal is to have all plants (350,000++ species) fully assessed on the Red List so that it may more comprehensively guide conservation planning and actions. To achieve this we need to embrace technologies that can utilise new datasets (e.g. maps of deforestation) and new techniques (e.g. statistical modelling) for rapid, but also auditable and verifiable assessments. A new, freely accessible, open source, web based tool 'GeoCAT' has been developed specifically for rapid, data driven Red List assessments. Further enhancements, planned for future versions of GeoCAT will ensure that we are well equipped to respond to the need for a comprehensive global plant Red List. The use of tools such as GeoCAT will be examined with respect to present efforts to assess threat status of plants in Thailand.

Fabaceae subfamily Faboideae treatment for the Flora of Thailand - progress and plans

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Fabaceae-Faboideae includes approximately 82 genera and 380–390 species in Thailand and is the last subfamily of legumes to be treated. There are draft manuscripts for the introductory parts and several genera by Dr Chawalit Niyomdham (BKF) and Prof. Pranom Chantaranothai (KKU). Further substantial contributions have been offered by Ruth Clark (K) and Ashley Egan (US) and Yotsawate Sirichamorn (Silpakorn University). At least two PhD students (Rumrada Meboonya (BKF) and Akharasit Bunsonthae (AAU)) and possibly one additional PhD student will contribute. We expect that the four parts (3.1, 3.2, 4.1, and 4.2) will be published over the coming three years.

Kai Larsen (1926–2012) and his contribution to the Flora of Thailand

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Kai Larsen studied natural history at the University of Copenhagen (1946–1952) and started his scientific career at that same university. From 1955–1963 he taught botany at the Pharmaceutical University of Copenhagen and it was during that time that he had his first encounter with Thailand and its flora during an expedition in 1958. In 1963 he met Tem Smitinand and together they initiated the Flora of Thailand project. That same year Kai Larsen was named Professor of Botany at Aarhus University. The first Flora of Thailand meeting was held in 1965 at Kew Gardens with international participation from Thailand, England, Scotland, France, Holland, and Denmark. Since then, 15 Flora of Thailand meetings have been held, 204 families have been published and 15 additional families have been finished covering 5238 species. Kai Larsen was Editor-in-Chief for the Flora, together with Tem Smitinand and later Thawatchai Santisuk, during 47 years until he passed away in 2012. Kai Larsen treated 44 families for the Flora, the most important ones being the ceasalpinoid legumes and Myrsinaceae, which he did together with Hu Chi-Ming.

Flora of Thailand treatment completed, and then what?

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Flora treatments constitute a rich source of data that is useful for many other fields of biology. Here we will use palms as a showcase for various usages of biodiversity data extracted from a flora treatment. We will argue for a more efficient sharing of primary biodiversity data through internet based facilities such as Global Biodiversity Information Facility (www.GBIF.org), Species 2000 & IT IS catalogue (www.catalogueoflife.org), the Encyclopedia of Life (www.eol.org) and eMonocot (www.emonocot.org). Taxonomists should adopt a dual role as *both* providers of primary biodiversity data *and* collaborators to research projects outside their scientific comfort zone. Only in this way they will prevail through the ever-changing boundary conditions in science and continue to remedying the so-called Linnean and the Wallacean shortfalls. We will shortly introduce different research projects that take advantage of the data assembled as part of the treatment of palms for the Flora of Thailand. Finally we will demonstrate how information in the printed version of the flora has been made available through an Internet platform created in Scratchpad (http://thaipalm.myspecies.info/).

A revision of *Gomphostemma* Wall. ex Benth. (Lamiaceae)

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A taxonomic revision of *Gomphostemma* Wall. ex Benth. is presented. This revision is the first since that of Prain in 1891 to consider the genus throughout its distribution. Thirty-one species have been recognised including three new species, *G. flexuosum* from Northeast Thailand, Southern Laos and Central Vietnam, *G. longipetalum* and *G. repentum* from Northern Burma. The genus is found mostly in the tropical evergreen forest throughout India, China, Bangladesh, Myanmar, Vietnam, Laos, Thailand, Cambodia, Malaysia, Brunei, Indonesia, and the Philippines. The subdivision of *Gomphostemma*, proposed by Prain (1891) has been evaluated with reference to chemical data (flavonoid and some phenolic characters) and molecular data (two chloroplast DNA regions; *trnL-F*, *rpL32F-trnL*(*UAG*), and two nuclear ribosomal region; ITS and ETS). The results are incongruent with Prain's classification of *Gomphostemma*. Three main clades are supported, but only one can be morphologically diagnosed. The tribe Gomphostemmateae is revealed not to be monophyletic, as proposed by previous studies because other genera of Lamioideae are nested within the *Gomphostemma*-*Chelonopsis* clade.

An overview of the genus *Digitaria* (Poaceae) for the Flora of Thailand

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A taxonomic revision of the genus *Digitaria* for Flora of Thailand Project, based on field collections and herbarium specimens, has been carried out. Thai Digitaria consist of 24 taxa in 23 species and also a cultivated species. Two new species, *D. isanensis* and *D. thailandica*, two new records for Thailand, *D. setigera* var. *calliblepharata*, and *D. thyrsoidea*, and a re-instated taxon, *D. thwaitesii* var. *tonkinensis*, were reported in 2014. The newly described *D. thailandica* is endemic to Thailand. We provide a key to the taxa, taxonomic descriptions, and ecological / geographical distribution data for all species. The species can be classified into subgenera *Leptoloma* and *Digitaria*. The latter can be divided into six sections viz. sections *Digitaria*, *Erianthae*, *Filiformis*, *Heteranthae*, *Ischaemum* and *Remotae*.

The Archive of A.F.G. Kerr – Founding Father of Thai Botany

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Arthur Francis George Kerr (1877–1942) was a pioneering botanist of the early 20th century who collected extensively in Siam during his work as a medical officer for the Siamese Government from 1903 to 1932. A visit to Kew Gardens in 1908 encouraged him to collect as widely as possible, and his work allowed him to travel the length of Siam, a mostly unexplored botanical area at that time. Kerr's work remains a substantial contribution to current knowledge of the flora of Thailand.

Kerr kept meticulous notes of his travels, which include precise locations for his specimens, as well as observations of the people, vegetation, agriculture and local industry he encountered. The Archives at the Royal Botanic Gardens Kew are fortunate to hold some of Kerr's botanical papers and photographs, and this talk will be a brief introduction to the collection and the valuable information it holds for researchers.

Towards a taxonomic revision of the Pandanaceae for Thailand

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The Paleotropical dioecious monocot family Pandanaceae includes ca. 700 species assigned to five genera: *Pandanus* (ca. 450 spp), *Freycinetia* (ca. 200 spp), *Benstonea* (ca. 60 spp), *Martellidendron* (six spp) and *Sararanga* (two spp). Three of these genera occur in Thailand: *Benstonea*, *Freycinetia* and *Pandanus*. While the taxonomy of the first two is in reasonably good shape, *Pandanus* has never been critically reviewed in Thailand and is badly in need of attention. In addition to historical names dating from the late 19th and early 20th centuries, several species were described during the 1960s based on incomplete material. A review of the systematics and biogeography of Pandanaceae in Thailand shows that there are two different corteges of species, each with its own set of affinities and problems. Those from the Peninsular and South-Eastern regions are shared with Indonesia and Malaysia, whereas many endemics are found in the Central and North-Eastern regions. Recent field work has further revealed new synonyms and possible new species, and has confirmed the need of more collections to better understand the morphology of this poorly-collected group. This revision will ultimately serve as a backbone for the forthcoming treatment of Pandanaceae in the Flora of Thailand.

Systematic conservation planning in Thailand

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Thailand is situated in two major biogeographical regions, the Indochinese and the Sundaic regions. The country supports a variety of tropical ecosystems and organisms. Thailand has approximately 15,000 species of plants, which account for 8% of estimated plant species found globally (Office of Environmental Policy and Planning, 1993). However, the forest cover of Thailand has reduced from over 53% of the area of the country to about 33% in 2010 (Royal Forest Department, 2010). The causes of the reduction in forest area and biodiversity are mainly habitat degradation, illegal logging, shifting cultivation and human settlement. As a result, rates of biodiversity loss have been high for some decades. The most effective tool to conserve biodiversity is the designation of protected areas. The effective and most scientifically robust approach for designing networks of reserve systems is systematic conservation planning, which is designed to identify conservation priorities on the basis of analysing spatial patterns in species distributions and associated threats (Knight et al. 2006).

The planned research focuses on the first application of systematic conservation planning in Thailand, focusing on tree species. The research aims to analyse and model tree species distribution in landscapes of Thailand in order to identify and enhance new protected areas. This will be achieved by analysing the collated data on species distributions together with environmental data to generate species distributions, through use of an appropriate spatial modelling approach. This will enable priorities for future reserve locations to be identified, and the coverage of the existing protected area network to be evaluated. Options for new protected areas will be developed, to ensure that the research has significant impact on the development and implementation of national and international policies. This will contribute to the maintenance of biodiversity, while ensuring the provision of ecosystem services.

Red-listing for the Flora of Thailand - progress in the Conservation Assessment of Threatened Plants project

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Some conservation assessments of the Thai flora have already been done as a checklist of threatened plants (2005) and a Red list for Thailand (2006). However, the assessments did not follow the IUCN criteria extensively. The current project has, therefore, been set up and aimed to evaluate rare and threatened plants in Thailand using IUCN criteria. The project will provide an important practical mechanism for the implementation of Global Strategy for Plant Conservation and will be finalized in 2020.

Resolving cryptic species complex in Annonaceae: the case of *Trivalvaria* (Malmeoideae: Miliuseae)

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Annonaceae are a pantropical family with c. 2400 species in c. 108 genera. Genera in the family have been well delimited using molecular phylogenetic analyses in combination with morphological reappraisal. In contrast, species delimitation in Annonaceae is often doubtful, as it is mostly based on morphological differences observed from herbarium specimens only. On this account, two or more distantly related species may be lumped as a single species.

In the present study a cryptic species complex in the Asian genus *Trivalvaria* (Malmeoideae, Miliuseae) is demonstrated and clarified. According to the most recent revision, four species of *Trivalvaria* are recognized, one of which, *T. costata*, is the most morphologically diverse. Several accessions of *T. costata*, as well as accessions of *T. macrophylla* and an accession of *T*. sp. are included in the molecular phylogenetic analyses of combined seven plastid markers (*rbcL* exon, *trnL* intron, *trnL-F* spacer, *matK* exon, *ndhF* exon, *psbA-trnH* spacer, and *ycf1* exon). The results indicate that *T. costata* is polyphyletic and several lineages of which each needs recognition as a distinct species. In addition, the accession of *T*. sp. appears to be new to science. Nevertheless, more accessions of *T. costata*, especially from China and Vietnam, as well as accessions of other taxa of *Trivalvaria* need to be included in order to shed further light on the diversity and character evolution within this genus.

Tissue Culture of Some Terrestrial Orchid hybrids

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In vitro sexual propagation of some terrestrial orchids was performed by culturing seeds under different colours of fluorescent illumination. It was found that hybrid seeds of *Pecteilis sagarikii* and of *Pecteilis* species could germinate well under red light, while hybrids could germinate differently in 3 various temperatures i.e. 22, 25, and 30 ºC. *In vitro* asexual propagation of *Habenaria* hybrids was also carried out. An experiment performed under white and red fluorescent light found that plantlets of a *H. rhodocheila* x *Pecteilis sagarikii* hybrid cultured in 13 ounce-square-shaped plastic vessel, with lid having 1.5 cm filter under red light, had 3 leaves having 0.80 cm of leaf length. However, plantlets in 16 ounce-round-shaped glass vessel covered with polypropylene plastic sheet under white light had only 1.8 leaves having 0.54 cm of leaf length. An inbred example of *H. rhodocheila*, however, showed no differences in term of size and number of leaves, but showed differences in terms of number, diameter, and length of roots in different vessels and light illuminations. Another experiment on another inbred line of *Habenaria* also showed the interaction between vessel type and LED light illumination on its growth.

Comparative leaf anatomy in *Argyreia* Lour. (Convolucaeae)

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Leaf epidermal micromorphological characters of 31 species in the genus *Argyreia* Lour. were investigated by light and scanning electron microscopy. Epidermal cell wall, cuticle, stomata type, stomatal index, and density together with size and length of trichomes of both surfaces were observed. The epidermal cell walls of *Argyreia* were straight to curved, slightly undulate, and sinuous. The cuticles of most species were striate on the adaxial and abaxial epidermis, except in *A. lanceolata* Choisy and *A. wallichii* Choisy, which had stellate cuticle on the adaxial side. The striate-stellate cuticle was found in *A. fulvocymosa* C.Y. Wu and *Argyreia* sp.5. The stomatal complexes were paracytic in most of the species. However, in *A. breviscapa* (Kerr) Ooststr., *A. capitiformis* (Poir.) Ooststr., *A. confusa* (Prain) Raizada, *A. osyrensis* Choisy, *A. roxburghii* Choisy, *A. wallichii* Choisy, *A. thorellii* Gagnep., and *Argyreia* sp.6, both anisocytic and paracytic stomata can be found. Trichomes were often present on the abaxial surface of leaves in all species, whereas trichomes were absent on the adaxial side of 14 species. Leaf epidermal characters investigated in this study can be used to support identification of closely related *Argyreia* species.

A network of Orchid Arks for in situ conservation

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A group of orchid lovers, academic professionals and environmentalists have concluded that native orchids are not necessarily safe in the national parks. Based on the experience from the Dokmai Garden Orchid Ark (http://www.dokmaigarden.co.th/orchidark.php), established in 2011, a network of fenced and controlled private areas could be created where indigenous orchids are grown and propagated by seeds to maintain genetic variation. Such an area should not just be a nursery, but a woodland with orchids and many plant species to stimulate presence of natural pollinators, fungal symbionts and pathogens to prevent a degeneration in germination, morphology, fragrance and immunology by natural selection.

A network is needed to cover many different climate zones which must be natural. Such a network would greatly benefit from governmental salvation picking permits, allowing staff from registered Orchid Arks to legally collect epiphytic orchids which have fallen to the ground. An Orchid Ark is a source of seedlings for restoration projects, a site for studying natural pollination and a local teaching facility to make people aware of wild orchids and their endangered habitats. The significance of Orchid Arks has recently been publicised by Wearn & Schuiteman (2013, Natural History Bulletin of the Siam Society 59(1): 5–14).

Systematic studies of genus *Stephania* (Menispermaceae) in Cambodia

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The genus *Stephania* Loreiro comprises about 60 species distributed in tropical and subtropical Asia, tropical Africa, and Oceania (Lo et al. 2008). Species of this genus are commonly used in folk medicine. Many samples of plants used in scientific studies, for example *S. rotunda* Lour., were identified with great uncertainty. There are six species and two varieties of *Stephania* in Cambodia; among these species, some are recorded from Thailand. The objective was to conduct a systematic study on the Cambodian species of *Stephania*. We collected specimens in Cambodia and had access to the collections of Paris, Kew and Berlin Herbarium.

Six species and two varieties of *Stephania* in Cambodia: *S. rotunda* Lour. (synonym: *S. glabra* (Roxb.) Miers), *S. japonica* (Thunb.) Miers var. *discolor* (Blume) Forman and var. *timoriensis* (DC.) Forman, *S. oblata* Craib, *S. pierrei* Diels, *S. venosa* (Blume) Spreng. A lectotype and then an epitype for *S. rotunda* were designated and a more precise diagnose was provided (Hul et al. 2014). The lectotypification of *Stephania pierrei* is in progress. The key for the Cambodian species was established. We will discuss the relationships among the Cambodian species of *Stephania* based on morphological and molecular characters.

Pueraria: The problem of polyphyly

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The genus *Pueraria* includes the invasive vine, Kudzu (*P. montana* var. *lobata*), introduced into the U.S. from Asia in the late 1800's. The relationship of Kudzu to its congeners is unknown. Previous work has suggested *Pueraria* (Fabaceae) to be polyphyletic based on a limited taxonomic sampling. Although several taxonomic treatments have recognized *Pueraria* as an unnatural grouping since its creation in 1825, no actual revision has been completed, largely due to the lack of knowledge concerning inter- and intrageneric relationships. This work addresses this issue by sampling broadly across phaseoloid legumes with an initial target goal of 156 species including 15 of the ~20 species of *Pueraria*. Ultimately, 104 species across 69 genera were sampled for the nuclear *AS2* gene and 116 species across 64 genera for the chloroplast *matK* marker. Phylogeny reconstruction was carried out using maximum likelihood and Bayesian inference. Both analyses yielded congruent tree topologies and similar support values. This work provides support for the existence of five separate lineages within *Pueraria* spread over more than 25 million years of divergence across the phaseoloid legumes. Taxonomic revisions are proposed, requiring the resurrection of the genus *Neustanthus* for *P. phaseoloides* along with three new genera.

Carl Curt Hosseus and his pioneering work on the Thai flora

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Carl Curt Hosseus (1878–1950), a German botanist, was the first botanical explorer to travel in different parts of Thailand to collect plants, and in particular the first botanist in Northern Thailand (1904–1905). Because of a number of unfortunate circumstances he discontinued his studies on the Thai Flora. After publishing the results of his expedition in ca. 40 publications (mostly botanical, but also on teak exploitation, railways and others), he moved to Argentina in 1913 to continue his research, and where he also died. In addition to zoological, mineralogical and ethnographical collections, he collected an unknown number of cryptogams and over 800 phanerogams in Thailand, including ca. 70 new species. His main herbarium of phanerogams (including unicates) is preserved in the Botanische Staatssammlung München, with duplicates widely distributed. Relevant details of his biography, itinerary and collections will be discussed.

Mistaken identities, mismatched shoots and cryptic taxa: resolving species boundaries in the genus *Nervilia* (Orchidaceae) in tropical Asia

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The genus *Nervilia* remains poorly known in Asia, primarily as a consequence of the constituent species' inconspicuous growth habit, and because their inflorescence and leaves emerge at different times in the annual growth cycle, making complete and correctly matched herbarium collections rare. The situation is complicated by the fact that the genus contains a series of species complexes within each of which leaf morphology is more or less uniform, but for which subtle variation in floral morphology can conceal significant phylogenetic distance. This makes the identification of certain taxa based on leaf morphology alone almost impossible. However, flowers are ephemeral and information on patterns of variation in floral form (especially labellum shape, colour and indumentum) between populations across Asia remains wanting. Here we outline work undertaken on the genus for the forthcoming instalment of Orchidaceae in the Flora of Thailand series. We note the existence of outstanding unnamed Thai species for which insufficient herbarium material currently precludes formal recognition. Ecological and molecular phylogenetic studies are required to resolve true species numbers and relationships.

Flora of Suranaree University of Technology campus: coming of age

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When Suranaree University of Technology in Nakhon Ratchasima province began classes in 1993 in what was once a reserve forest, there were patches of forest but few large trees. At present, much of the forested area remains and some of the trees, such as *Dipterocarpus obtusifolius*, *D. tuberculatus*, Xylia *xylocarpa*, and *Dillenia ovata*, are now producing flowers and fruits. A study has been made of forests in the southern part of the campus, of which 12.8 hectares are being developed into a botanical garden and 23 hectares have been set aside as a permanent conservation area. The vegetation types are dry dipterocarp forest and shrubs and grass in former rice paddies. A total of 78 families, 220 genera, and 278 species of vascular plants have been found. The largest families are Fabacae and Poaceae with 49 and 23 species, respectively. Common trees include *Dipterocarpus tuberculatus*, *D. obtus*ifolius, *Shorea obtusa*, *S. siamensis*, *Xylia xylocarpa*, *Albizia lebbeck*, *Sindora siamensis*, and *Terminalia mucronata*. Uncommon species or species endemic to Thailand include *Selaginella lindhardtii*, *Scolophyllum spinifidum*, and *Artocarpus thailandicus*. *Ipomoea polymorpha* is a possible new record for Thailand.

Phenetic analysis of floral morphological characters within Musaceae in Thailand

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Musaceae is a small family of bananas distributes in tropical region of Asia, Africa, and Australia. The family is divided into three genera based on morphological characters i.e., *Musa*, *Ensete*, and *Musella*. Phylogenetic position of the family is well understood and shown to be a monophyly. However, the taxonomy within the family remains unclear. Aim of this research was to investigate floral morphology of Musaceae in Thailand using phenetic approach. The samples collected from natural habitats included 52 accessions from 21 taxa. Cluster analyses of 34 morphological characters were used in Unweighted Pair Group Method with Arithmetic mean (UPGMA) cluster analysis. The analyses showed that the Musaceae can be divided into two clusters i.e. all *Ensete* species in one clade and *Musella* and *Musa* species in another. The floral morphological characters did not supported previous *Musa* sectional classification; *Rhodochamys* and *Musa* formed a clade, while *Callimusa* separated out. The floral morphology, especially free tepal, shape and stigma shape, were ones of the most distinguishable characters for Musaceae classification.

The genus *Drepanolejeunea* (Spruce) Schiffn. (Lejeuneaceae, Marchantiophyta) in Thailand and Peninsular Malaysia

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The genus *Drepanolejeunea*, with ca. 110 species, is the fourth largest genus of Lejeuneaceae, mainly distributed in the tropical and subtropical regions. The genus is well characterized by yellowish green, presence of ocelli in leaf lobe, hyaline papilla at the proximal side of first tooth of leaf lobule, underleaves bilobed, female bracts connate with bracteole on both sides and asexual reproduction by mean of cladia. A taxonomic revision of the genus in Thailand and Peninsular Malaysia is presented based on the examination of the fresh materials and the herbarium specimens. Twenty-four species and two varieties are recognized, six of them new to Thailand and Peninsular Malaysia and *D. actinogyna* J. Inuthai, R. L. Zhu & Chantanaorr. is a species new to science. Analysing the distribution of the species supported that Thailand is a transition zone forming a bridge between the Sino-Himalayan and Malaysian bryofloras.

Pollen diversity of tribes Persicarieae and Polygoneae in Thailand

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Pollen morphology of 24 taxa belonging to tribes Persicarieae and Polygoneae was investigated in order to allocate the taxonomic position of the specimens collected in Thailand. The specimens were examined with both a light microscope and a scanning electron microscope. The results revealed that the grains of tribe Persicarieae were recognised by medium to large size with oblate-spheroidal to spheroidal shape whereas the tribe Polygoneae was small pollen size and prolate shape. However, three characteristics of pollen data were used for the generic delimitation: the exine sculpturing, aperture type and pollen shape. Morphometric data of the pollen studied will be discussed on the basis of taxonomical aspects.

Anatomical study of leaf characters in the genus *Eremochloa* Buse (Poaceae)

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Leaf anatomical characters of ten grasses species in the genus *Eremochloa* Buse were investigated using fresh specimens from field collections, as well as herbarium specimens collected in Thailand. Epidermal features and transverse characters of leaves were prepared by peeling and paraffin sectioning methods. The results showed that common features found in most species were long cells, short cells, stomatal complexes, micro -hairs, prickles, trichomes and silica bodies. However, the leaf transverse sections revealed differences in the ribs and furrows on both surfaces, shape of midrib, sclerenchyma and parenchyma layers, and the number of adjacent bundles in the midrib region. These findings indicate that leaf anatomical characters can be used to identify species in the genus *Eremochloa* in Thailand.

Brief historical record of Makino Botanical Garden's Myanmar Plant Inventory and a summary of the vegetation types of Natma Taung

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In Myanmar, after the early work of British plant explorers such as Kingdon-Ward, very little plant inventory was undertaken for many decades. Since 1999, Kochi Makino Botanical Garden has had a developing interest in Myanmar plant survey work both in floristic and ethnobotanical aspects, and has been carrying out botanical survey in several places in Myanmar such as Kachin State, Alangdaw Kathapa NP (Sagain Division), Shan State and Natma Taung. A floristic enumeration of Mt Popa was published by the Garden in 2005. In 2012, a multi-national consortium was proposed to consolidate and expedite floristic survey and related research activities toward the preparation of a Flora of Myanmar, in response to the recent escalation of land development in the country. The Consortium was officially formed in Yangon in January 2013 by seven founder members: Myanmar Forest Department, Kunming Institute of Botany (Chinese Academy of Sciences), Makino Botanical Garden, Singapore Botanic Gardens, Queen Sirikit Botanic Garden, Royal Botanic Garden Edinburgh and the US National Herbarium (Smithsonian Institution). Makino Botanical Garden recently conducted a botanical survey of Mt , revealing one new genus, and 15 new species.

Pollen morphology in relation to the taxonomy of Combretaceae from Thailand

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The pollen morphology of 30 taxa from six genera of Thai Combretaceae, including one species each of *Anogeissus* and *Calycopteris*, two species each of *Lumnitzera* and *Quisqualis*, 11 species of *Combretum* and 13 species of *Terminalia* (including one introduced species), was investigated to determine its taxonomic significance. The pollen samples were acetolysed and investigated under light and scanning electron microscopes. Pollen morphology of Thai Combretaceae was described, compared and discussed according to its taxonomic implications. The pollen grains were remarkably uniform monad, radially symmetrical, isopolar, small- to medium-sized, heterocolpate (with tricolporate alternating with subsidiary colpi). Two pollen types and nine subtypes are recognized according to the fusion of subsidiary colpi at the polar area and exine sculpturing patterns.

The Adiantaceae of Peninsular Malaysia and Thailand

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A revision of the fern family Adiantaceae for the *Flora of Peninsular Malaysia* is in progress. The delimitation of the Adiantaceae will be discussed in light of rapidly changing and controversial family delimitations in ferns. The delimitation of the included genera, *Adiantum*, *Antrophyum*, *Haplopteris*, *Monogramma* and *Vaginularia*, will also be discussed. In particular, the reasons for recognising the often overlooked genus *Vaginularia* will be highlighted. Similarities and differences to the Adiantaceae of Thailand will be discussed, particularly to highlight the diversity of *Adiantum* in Thailand compared to Malaysia, but also to note that both regions share the same problem of defining the taxa in the difficult *Adiantum caudatum* complex.

The Systematics of genus *Millettia s. l.* (Leguminosae-Papilionoideae) in Thailand

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Millettia was first described by Wight and Arnott in 1834 based on two species; *M. rubiginosa* Wight & Arn. and *M. splendens* Wight & Arn. Later, Miquel described tribe Millettieae based on the genus. The genus is estimated to comprise approximately 150 species worldwide, including ca. 90–100 species in Africa and ca. 50 species n Asia. Recently, molecular phylogenetic studies have shown the genus to be polyphyletic. In addition, the tribal and generic circumscriptions are still uncertain and need clarification through more comprehensive global sampling. This study aims to clarify the relationships and the evolutionary history of Millettia species and its relatives within the tribe Millettieae using DNA sequence data from *matK* and *trnL-F* chloroplast markers, and nuclear *ITS*. Current research shows genus *Millettia s.l.* comprises 38–40 species including unpublished new species; generic recircumscription in the light of molecular data will likely place these species into multiple genera.

Progress towards an account of the Gesneriaceae for the Flora of Thailand

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In the last three years there have been a small number of new genera and larger numbers of new species of Gesneriaceae described from Thailand. The new genera are *Somrania*, with three new species, and *Tribounia*, with two species, one of which is new and the other originally described in *Didymocarpus*. The new genera will be discussed along with active research on generic delimitation in other groups. As previously unexplored or underexplored parts of Thailand are collected many new species have come to light. The progress on the account for the Flora of Thailand has been delayed so as to ensure these new species can be incorporated. The balance between this desire to ensure maximum coverage and the need to publish the account and set a benchmark will be explored. Parallels between research on Gesneriaceae in Thailand and research in other parts of Southeast Asia, particularly Vietnam, will be discussed.

The Flore du Cambodge, du Laos et du Vietnam

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Cambodia, Laos and Vietnam cover an area about one and a half times the size of Thailand with similar topography and flora. Botanical exploration dates back to the 18th century and a complete Flora was published between 1907–1951. The *Flore du Cambodge, du Laos et du Viet Nam* began in 1960. Thirty-two fascicles have been published treating 82 families, 584 genera and 2,201 species. The total flora is estimated at 289 families, 2,153 genera and 10,164 species so it will take 250 years to finish at this rate! Revisions of three families, Apocynaceae, Polygalaceae and Solanaceae, will be published in 2014 under a co-publication agreement between the Muséum national d'Histoire naturelle, Paris and the Royal Botanic Garden Edinburgh. Reasons for slow progress are discussed and comparisons are drawn to the Flora of Thailand which serves as a model to FCLV. Suggestions of ways to speed up are made.

Overview of the genus *Crotalaria* L. (Leguminosae-Papilionoideae) in mainland of South-East Asia

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The study of *Crotalaria* L. in Myanmar, Thailand, Laos, Cambodia, Vietnam and the Malay Peninsula are presented. Fifty-six species are enumerated, based on available literature, field surveys in Thailand and specimens examination from various herbaria viz. BK, BKF, BM, K, KKU, PSU, QBG and SING. Several species are of commercial important as a fibre crop, fodder and green manure, such as *C. juncea* produces a high quality bast fibre for cordage and fine paper. The plants are distribution in open grassland, limestone, deciduous dipterocarp, mixed deciduous, dry evergreen and evergreen forests. Most species have yellow flowers except purple in *C. sessiliflora* and *C. verrucosa*. *C. pallida*, *C. quinquefolia*, *C. retusa* and *C. verrucosa* are common species in the region. *C. kostermansii* and *C. larsenii* are reported as endemic to Thailand.

Morphometric analysis of *Argyreia* Lour. in Thailand

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Argyreia Lour. belongs to the Convolvulaceae family and comprises about 125 species worldwide. It is one of the largest genera in the family and, due to similarity in morphology, its species identification is complicated. Moreover, the categorization into sections had not been done previously. The aim of this study was to examine inter-specific relationships in *Argyreia* using morphometric analysis. Sixty-six morphological characters were evaluated from 38 herbarium specimens, which belong to 25 taxa. The analysis was done using program NTSYS-pc ver.2.11T. Based on UPGMA clustering, five main groups, mainly characterized by corolla shape and lobing, were identified: two groups with campanulate corollas and three groups with funnel-shaped corollas. Our results reveal that *Argyreia* sp.5, which has quite similar morphology to *A. wallichii* Choisy, seems to be a different species. *Argyreia* sp.6 was different from *A. versicolor* (Kerr) Staples & Traiperm, and seems to be a separate species. Moreover, taxa in the *A. mollis* (Burm.f.) Choisy complex were grouped together. Therefore, more specimens and characters were needed to resolve their inter-specific relationships in future work.

Towards a stable taxonomy of Asian *Schefflera* species (Araliaceae) with highly polymerous flowers: floral morphology, development and molecular phylogeny

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Asian species of the genus *Schefflera* are currently recognized as a monophyletic group, which is awaiting a formal taxonomic description and development of phylogenetic classification of its species. Since evolution of floral merism was shown to be highly homoplastic in various lineages of Araliaceae, precise relationships of species with polymerous flowers remain obscure. Our study of *Schefflera subintegra* with up to 45 stamens and up to 33 carpels revealed its strong similarity with *Tupidanthus calyptratus* (=*Schefflera pueckleri*) in a number of floral traits including mode of carpel arrangement and manner of development of calyptrate corolla. Close relationships between these two species and an enigmatic Vietnamese endemic *Schefflera hemiepiphytica* are confirmed by molecular phylogenetics. One more poorly known species, *Schefflera siamensis*, is considered as possible member of this alliance. *Schefflera angkae* may be treated as a synonym of *Schefflera subintegra* due to the absence of clear morphological differences between them. *Schefflera polyandra*, which was initially regarded as the closest relative of *Schefflera subintegra*, is shown to be a distant relative of the *Tupidanthus* alliance on the basis of morphological data. We suggest maintaining the genus *Tupidanthus* with inclusion of 2–3 more species that share the peculiar floral traits with *Tupidanthus calyptratus*.

First structural and histochemical analysis of the black dots on leaves and flowers of *Stictocardia* spp. (Convolvulaceae)

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The presence of black dots in leaves and flowers is regarded as a taxonomically useful character in order to distinguish *Stictocardia* Hallier f. from other genera in Convolvulaceae. However, the origin and structure of these dots is unknown and available data about them is unclear. So far no studies have been addressed to assess what these black dots are. This research will investigate the morphology, anatomy, and histochemistry of the black dots in order to clarify their structure and possible function in the reproductive biology of the species. Black dots were examined in *Stictocardia tiliifolia* (Desr.) Hallier f. (from Hawaii) and *S. beraviensis* (Vatke) Hallier f. (cultivated in Thailand). Materials were preserved in spirit; additional samples were taken from specimens in the Geneva herbarium. Leaves, sepals and petals of *Stictocardia* were studied using crosswise and lengthwise serial micro-sectioning, Scanning Electron Microscopy, clearing techniques, and histochemistry. The development of black dots was investigated in four developmental stages of flower buds; an early bud, a mid-length bud, a mature bud, and a flower at anthesis. The overall results will be presented at the 16th Flora of Thailand Conference, Royal Botanic Gardens, Kew.

A.F.G. Kerr and friends

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Arthur Francis George Kerr's life is reviewed and related to a previously published account. Kerr's collecting activity is analysed using an expanded version of the Thai Biogeography Group's database of collections. 8,619 of the total 48,970 collections are Kerr's and 3,178 are those of his colleagues and friends. Therefore, the total number of collections made by Kerr and his acquaintances is likely to be larger and more diverse than previously believed. Mapping of these data using GIS show that Kerr's collecting activities focussed on particular regions of Thailand at particular times. Also large areas of the country remained unexplored by Kerr and his acquaintances: a pattern that, to some extent, persists to this day. The large, but dispersed, archive of Kerr's photographs, maps, living collections and correspondence indicate that he was a skilled photographer (taking at least 3,000 images), cartographer (producing many hand-drawn maps) and exceptionally acute, accurate and detailed observer (filling numerous notebooks and leaving other records). It is clear that digitising these collections to form an on-line dedicated website is highly desirable to further progress on the flora of Thailand and surrounding countries and would form an unique record of the social history of early 20thC Thailand.

Do orchid collections in botanical gardens contribute to conservation? Experiences from the "Seidenfaden collection" in Copenhagen

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Using the "Seidenfaden collection" in Copenhagen as an example, we address the common view that botanical garden collections of orchids are important for conservation. Seidenfaden collected live orchids all over Thailand from 1957–1983 and created a traditional collection for taxonomic research, characterized by high taxonomic diversity and low intraspecific variation. Following an extended period of partial neglect, a five-year project now aims at expanding the collection with a continued focus on taxonomic diversity, but widening the geographic scope to tropical Asia. Since its establishment, the collection has contributed significantly to conservation – the contributions being diverse and changing over time. The collection has been (and remains) an important basis for taxonomic and floristic research which has enabled a convincing treatment of the Orchidaceae in the Thai red-list. Recently, however, the primary focus has shifted to micropropagation and cryopreservation (widening the perspectives of ex situ conservation), DNA-barcoding (providing new identification and inventory tools) and phylogenetic analysis (offering "phylogenetic diversity" as an alternative biodiversity measure). The close link between collection-based research and conservation is remarkable and probably applies to orchid collections in botanical gardens in general. Thus, if the collections are assigned scientific attention, they have great opportunities for contributing to conservation.

Leaf micromorphology of some *Pogostemon* Desf. in Thailand

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A previous study of *Pogostemon* Desf. (Lamiaceae) in Thailand enumerated 18 species with some taxonomic problems as a result of morphological variation among populations. Leaf micromorphology of 10 species, *P. auricularius*, *P. benghalensis*, *P. cablin*, *P. cruciatus*, *P. glaber*, *P. globulosus*, *P. hispidus*, *P. menthoides*, *P. myosuriodes* and *P. trinervis* was studied by using light and scanning electron microscopy. Micromorphology of trichomes and epidermal cells has been recognised as taxonomic character in several genera in Lamiaceae. The characters of the epidermal cells, the glandular and non-glandular trichomes, the papillae and the stomata on both leaf surfaces were investigated. The data were analysed by UPGMA cluster analysis. A preliminary result showed that the number of apical and basal cell together with the density of non-glandular trichomes on epidermal surfaces were informative characters. Three clades were formed. The first clade included some members of section *Pogostemon* sensu Press. *Pogostemon globulosus* and *P. trinervis* were clustered as the second clade and the last clade is *P. cruciatus*.

An outline of Aquifoliaceae for the Flora of Thailand

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Currently Aquifoliaceae comprises of the single genus *Ilex* L., with about 600+ species recognised. These are evergreen or deciduous trees, shrubs, rarely climbers; ranging from the tropics to the temperate regions, with the main centres of diversity in South America and Eastern Asia. *Ilex* is distinguished by its simple, mostly alternate leaves; small stipules; is dioecious – male flowers pistillode, female flowers staminode, ovary superior; fruit is a drupe with 4 to several pyrenes. *Ilex* species are important ornamentally, plus as timbers, beverages and for medicinal uses.

Our ongoing research reveals 15 species in Thailand, with some herbarium sheets as yet unidentified. Thai *Ilex* are found from sea level to 2,300 m. altitude. Most occur in the north, with only a few taxa found throughout the country, e.g. *I. triflora* Blume. Several species appear to be endemic to a specific part of Thailand, e.g. *I. englishii* Lace and *I. micrococca* Maxim. occur only in the north; while *I. odorata* Buch.-Ham. ex D.Don is found in the north-east and east and *I. cymosa* Blume and *I. wallichii* Hook.f. are found in the south-east and on the Peninsular. The floristic treatment of Aquifoliaceae is scheduled for completion by the end of 2014.

Karyological investigation of some phytoestrogen-producing *Curcuma* in Thailand

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Species in the genus *Curcuma* (Zingiberaceae) that produce phytoestrogen in their rhizomes are called wan-chak-motluk. Phenotypic variation in both of vegetative and reproductive parts observed among *Curcuma* species may be related to their medicinal properties. This study aimed to investigate genomic relationship among wan-chak-motluk in Thailand. A total of 15 populations belonging to 3 species, *Curcuma comosa*, *C. elata* and *C. latifolia* are classified into 3 groups based on chromosome number and genome size. The first group is *C. comosa* with small rhizome has 2n = 42 and 2C = 1.67–1.72 pg. The second group comprises of *C. comosa* with large rhizome, *C. elata* and *C. latifolia* which contain 2n = 63 and 2C = 2.52–2.63 pg. The third group is another cultivar of *C. latifolia* which has 2n = 84 and 2C = 3.48 pg. Meiotic figure of wan-chak-motluk was reported for the first time. Diploid *C. comosa* showed 21 bivalents, whereas triploid *C. comosa* should be an autotriploid with 21 trivalents. On the other hand, *C. elata* and *C. latifolia* with 2n=63 presented nearly regular and irregular synapsis, respectively, indicating allotriploid species.

A phylogenetic study of the Loxocarpinae (Gesneriaceae)

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Loxocarpinae is the subtribe of Gesneriaceae which includes *Boea* and a number of segregated genera and close relatives. Today, this group comprises over 200 species in about 15 genera. Here the most up to date phylogeny is presented, covering all the genera known to belong to the group, based on Bayesian Inference and Parsimony of the nuclear ITS and the plastid regions *trn*L-*trn*F (intron and spacer) and *ndh*F-*trn*L^{UAG} (spacers). The results show discrepancies between the current generic delimitations in the subtribe and the clades delineated by the phylogeny. As a result *Boea*, *Damrongia*, *Streptocarpus* and *Paraboea* are recircumscribed and the new genus *Middletonia* is described.

Are transitions in life history strategies driven by moisture gradients in mesic environments? A case study from the *Semeiocardium* clade (*Impatiens*)

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Plant life history is evolutionarily labile throughout angiosperms. Transitions from perennial to annual strategies are thought to be driven by increased seasonal aridity. While this has been established for relatively arid environments, it is unclear whether these shifts also occur along moisture gradients in relatively mesic environments. The *Semeiocardium* clade of *Impatiens*, with representatives along the entire spectrum between annual and perennial growth forms, is a suitable group to investigate this. *Semeiocardium* occurs in the South East Asian biodiversity hotspot, and most Thai species are narrow endemics, occurring from wet to dry habitats. Here we first investigate whether annual and perennial species are distributed randomly across the landscape, or whether they inhabit seasonally arid versus mesic areas. Using a dated phylogeny we then assess whether evolutionary transitions in life history can be explained by range expansion across climatic gradients and whether these shifts coincided with increased aridification during established climate change in South East Asia during the Pliocene-Pleistocene.

An updated account of *Justicia* L. (Acanthaceae) from Thailand

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A taxonomic revision of the genus *Justicia* L. is presented for the Flora of Thailand. Forty-eight species and two infraspecific taxa are enumerated and described, including one recently published new species, *J. prachuapensis* Rueangs. & Chantar. Several putative new species will be discussed. The majority of Justicia is found in Northern and Peninsular regions of the country. *Justicia cochinchinensis* Benoist, *J. procumbens* L. and *J. quadrifaria* (Nees) T. Anderson are widespread. Eighteen species (20 taxa) and four species are endemic and introduced to Thailand, respectively. Variation in pollen and seed types within the Thai *Justicia* are also summarised.

Comparative leaf anatomy of some *Durio* spp. (Malvaceae)

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Leaves of six *Durio* species were studied to describe anatomical structures and find their suitable characters for identification. Lamina surfaces were examined using the peeling method, and transverse sections of midrib, margin, lamina, and petiole were investigated using the paraffin method. Several characters of the adaxial and abaxial surfaces were used to construct a key to the species. In addition, another key to species could be constructed from transverse sections of leaves using thickness of epidermis, presence of idioblast on adaxial surface, epidermal cell size at leaf margin, occurrence of upper hypodermis, and presence of spongy mesophyll between the secondary veins.

A preliminary study of the genus *Colura* (Lejeuneaceae, Marchantiophyta) in Thailand

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The genus *Colura* (Dumort.) Dumort., with approximately 76 species, is a member of the family Lejeuneaceae, mainly distributed in tropical and subtropical regions, especially in the Malesian. The genus is easily distinguished from other genera of Lejeuneaceae by the saccate leaf lobule and one underleaf for each lateral leaf. An account of the genus in Thailand is represented here based on literature review, herbarium specimens and field surveys. Twelve species are known in Thailand, including two new records, *C. karstenii* K.I. Goebel and *C. tenuicornis* (A. Evans) Steph.

Morphological characters and ecology of some species of *Glyptopetalum* Thwaites (Celastraceae R.Br.) in Thailand and Laos

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Whilst studying the genus *Glyptopetalum* in Paris herbarium (P) for the Project "Flore du Cambodge, du Laos et du Vietnam" (June 2009), for which I am preparing the treatment of the Celastraceae family, an unusual specimen was found (*J.E. Vidal 5434*, Laos, prov. Vientiane, Viang Chan, 1971). Later, a duplicate of the same specimens was found in CMU (November 2011). The speicmens are very similar to *G. sclerocarpum* (Kurz) M.A. Lawson in Hook. f., but differ by the surface of capsule, which is cracked (fissured) (in *G. sclerocarpum* – with scurfy warts or rough with minute tubercles), and by the leaves which are more sclerified. I have come to the conclusion that this is a new species of the genus. The new species, – *G. vidalii* I. Savinov – differs from *G. sclerocarpum* ecologically also. It grows in seasonal mixed forests, on limestone bedrock (alt. 800–900 m), whilst *G. sclerocarpum* grows in lowland evergreen or mixed forests. Moreover, *G. sclerocarpum* was does not occur in Laos, whereas *G. vidalii* is distributed in Central Lao PDR, Northern and SW Thailand (CMU!). Flowering time is unknown; fruiting time is October–December. Therefore, there are 6 species of *Glyptopetalum* in Thailand (1 endemic); 3 species in Laos (1 endemic).

World Flora Online and the Flora of Thailand

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Target 1 of the Global Strategy for Plant Conservation (GSPC) calls for the development of 'An online Flora of all known plants' by 2020. Responding to this Target, major botanical institutions world-wide have agreed to collaborate and support the development of the World Flora Online (WFO) portal. The WFO is expected to include geographical distributions to at least country level, based on national Floras, Checklists, and Monographs; habitat data; identification tools (e.g. interactive keys, images, and descriptions); conservation status (with links to assessments being carried out under GSPC Target 2); and other enhancements as practicable (e.g. vernacular names). Many of these data already exist in digital or printed format, and they can be used to populate the WFO. The WFO will be a community resource built on the work of a great many individuals throughout the world. Their contributions to the WFO and its influence on GSPC will be appropriately documented and attributed. A portal is being developed at RBG Kew based on eMonocot (www.emonocot.org). This will be a major contributor to the WFO. Flora of Thailand is represented at WFO Council meetings and should be a contributor to WFO, perhaps through Kew's proposed portal. The development of a standalone Flora Of Thailand portal could also be considered.

Species diversity of calciphilous *Derris* (Fabaceae) in Thailand

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Limestone karsts are usually recognized as biodiversity hotspots due to their unique ecological characteristics which support high levels of endemism of both flora and fauna. In Thailand, a number of new and endemic plant species have been discovered from this habitat. Within the genus *Derris* Lour. of Fabaceae, only *D. tonkinensis* Gagnep. has been reported as a limestone species. This species is distributed from Laos, Vietnam, northern and north-eastern Thailand. According to studies of herbarium specimens and field expeditions from 2009 to 2013, however, some unknown specimens are found in limestone areas in south-western and Peninsular Thailand, which resemble the northern specimens of *D. tonkinensis* in many characters. Moreover, it was found subsequently that a Thai endemic species, *D. reticulata* Craib, is often associated with limestone areas. In addition, the new species *D. solorioides* Sirich. & Adema was recently discovered from a dry, isolated and protected limestone area in northern-central Thailand. At least three calciphilous species of *Derris* are now recognised in Thailand. Although the three species are not so closely related based on a molecular phylogeny, they all interestingly have revolute wing petals. Correlation between revolute wing petals and limestone habitats requires further study. Discoveries of new calciphilous species of *Derris* will hopefully not only bring our attention to the high conservation value of karst regions including their surrounding limestone forests, but also highlight the fact that these regions harbour a significant portion of biodiversity.

A Revision of *Eriocaulon* L. in Cambodia, Laos and Vietnam

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An account of the genus *Eriocaulon* L. in the flora of Cambodia, Laos and Vietnam is under way. Field collection in central and southern Laos was undertaken between 2010 and 2013. Six hundred specimens from various herbaria, including E, K, P & VNM, have been consulted. Co-operation with the author of the Eriocaulaceae in the Flora of Thailand has been very helpful in this work. About 45 taxa are recognised, five of which may be new to science. 20 taxa are new records and some four to five are endemic in this region. Many of the species treated in this revision are also found in Thailand. More field work is planned in Vietnam before completion of a manuscript.

The vegetation and local flora of the "Songkhla Lake" Basin, Peninsular Thailand: a fresh water lagoon beyond the northern limit of the Malesian Region on the mainland South-East Asia.

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The "Sating Bhra Peninsula" in Songkhla province, Peninsular Thailand is composed of sandbars produced from sediments deposited by the sea currents along the eastern coast of Peninsular Thailand beyond the northern limit of the Malesian region on mainland South-East Asia. The swamp in between the sandbars of "Sating Bhra Peninsula" and the mainland of Peninsular Thailand has become a large inland lagoon, the so-called "Songkhla Lake" that connected to the open sea of the Thai Gulf. This had created a large floodplain basin. The various topographic features of the basin each have a characteristic floristic composition comprising he following vegetation types: (1) terrestrial coastal vegetation including (1.1) coastal dune/fore-dune grassland; (1.2) coastal dune scrub and (1.3) coastal dune woodland. (2) swamp/aquatic vegetation including (2.1) mangrove swamp forest; (2.2) fresh water swamp/floodplain/riverine forest; (2.3) peat swamp forest; (2.4) tropical bog plant community; (2.5) aquatic plant community and (2.6) floating Island plant community. Most vegetation types are endangered due to over exploitation and reforestation with alien species.

History of Taxonomic Studies of Bananas in Thailand

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The year 2014 marks the 60th anniversary of N. W. Simmonds' pantropical expedition to find bananas (Musaceae). Thailand, at the cradle of banana distribution, was one of his destinations. Since then, unfortunately, not many studies on taxonomy of the banana family have been carried out. Twenty-three banana names from two genera, *Musa* L. and *Ensete* Bruce ex Horan., have been reported from Thailand, of which eight are synonyms, 13 species are native, and two exotic. Of the native bananas, two species, *M. siamensis* Häkkinen & Rich.H.Wallace and *M. serpentina* Swangpol & Somana, were newly described in 2007 and 2011, respectively; two, *M. nagensium* Prain and *M. rosea* Baker have not been found recently and one species, *M. violascens* Ridl., was known only as a specimen, undescribed in the literatures Lately, *Musella lasiocarpa* (Franch.) C.Y.Wu ex H.W.Li, from the third genus of the banana family was introduced to Thailand as an ornamental plant. Due to difficulties in collecting, herbarium specimens of the Musaceae of Thailand are scarce and incomplete. To fill the gap in knowledge, more specimens have been collected and studied and the results will be included in the Flora of Thailand Project.

Systematics of the liverwort genus *Mastigolejeunea* and its occurrence in Thailand

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The status of the liverwort genus *Mastigolejeunea* (Spruce) Steph. and its separation from *Thysananthus* Lindenb. is problematic due to the existence of morphologically intermediate taxa between these two genera. Recent molecular-phylogenetic analysis resolves *Mastigolejeunea* as the sister genus of *Thysananthus* but robust morphological support for this hypothesis is lacking. We propose to keep *Mastigolejeunea* as a separate genus based on a world-wide revision of *Mastigolejeunea*. The study leads to the recognition of 18 species, including 16 extant and two known only from fossils. Of these, five species of *Mastigolejeunea* are found in Thailand, including *M. humilis* (Gottsche) Schiffn., *M. indica* Steph., *M. ligulata* (Lehm. & Lindenb.) Schiffn., *M. repleta* (Taylor) A. Evans, and *M. virens* (Ångstr.) Steph. However, phylogenetic relationships of *Mastigolejeunea* species remain unstudied and should be explored in future.

Limestone plants conservation at QSBG

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Limestone is a unique habitat for several rare and endemic floras. These plants are currently under threat from habitat loss as a result of cement mining. Other threats are not only forest fires which induce outbreaks of exotic weeds but also over-collecting of wild species especially orchids and caudices. To conserve those valuable limestone plants, an imitated limestone habitat or a limestone plant house was constructed for the first time at Queen Sirikit Botanic Garden (QSBG), Chiang Mai in May 2013 together with an evaporative cooling system to mimic a mountain condition. Temperature, air humidity, and plant health are recorded. Six to seven months after the first plants were installed, most of the plants are well established. So far there are more than 80 species of rare limestone loving plants conserved in the house, e.g., *Thepparatia thailandica* (Malvaceae), *Rhododendron ludwigianum* (Ericaceae), *Dracaena kaweesakii* (Dracaenaceae), *Adiantum membranifolium* (Pteridaceae), *Microsorum thailandicum* (Polypodiaceae), *Sauropus poomae* (Euphorbiaceae), *Tirpitzia bilocularis* (Linaceae), *Cycas* spp. (Cycadaceae), *Paphiopedilum* spp. (Orchidaceae), *Impatiens* spp. (Balsaminaceae), etc. In this presentation all successes and obstacles in establishing a new limestone house at QSBG will be presented and discussed.

Chemical Composition, Antibacterial property and Molecular Identification of *Hedychium* J. König

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The chemical composition of fresh flowers, leaves and rhizomes of 23 *Hedychium* species have been identified by GC/MS with HS-SPME, while volatile oils from leaves and rhizomes and floral absolutes have been determined by direct injection technique. Monoterpenes were found to contain as major compounds in most *Hedychium* and contribute to their characteristic odours characterised by gas chromatography/olfactometry of volatile oils of leaves and rhizomes and floral absolutes. The volatile oils and crude extracts of leaves and rhizomes of selected *Hedychium* have been screened for overall antibacterial activities and the minimum inhibitory including with bactericidal concentrations have been investigated. High annealing temperature rapid amplified polymorphic DNA (HAT-RAPD) was used as the screening method to understand the relationship among 23 Thai *Hedychuim* species, a phylogenetic tree was generated. The unique band was selected for sequencing and conversion to the more reproducible and robust sequence characterized amplified region (SCAR) marker specific to *H. flavescens*, which has high monoterpene content and great capacities for antimicrobial and antioxidant properties. These techniques allow this species to be rapidly identified at all developmental stages even without flowers. It could be used as the tool for verification of ornamental *Hedychium* rhizomes in plant markets.

This work was supported by the grants from NUI-RC (NSTDA University Industry Research Collaboration) in the National Science and Technology Development Agency (NSTDA), Department of Pharmaceutical Science, the Faculty of Pharmacy and the Graduate School, Chiang Mai University, Chiang Mai, Thailand.

Leaf epidermis of Thai Oryzeae (Poaceae): a phenetic approach to relationships within the tribe

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The leaf epidermis of nine Oryzeae taxa found in Thailand was examined using light microscopy for taxonomic significance. Some epidermal features proved taxonomically useful at the species level, for instance, shape of bulliform cells, occurrence, type and shape of intercostal short cells, size, distribution and arrangement of papillae, association of papillae with stomata, and type of microhairs. Forty-three qualitative characters of 18 OTUs were used in phenetic analysis. The phenogram showed six major groups as followed: (1) *Hygroryza aristata*, (2) *Zizania latifolia*, (3) *Leersia hexandra*, (4) *Oryza minuta*, *O. rufipogon*, and *O. sativa*, (5) two varieties of *O. meyeriana*, and (6) *O. ridleyi*. It was found that the epidermal characters alone could not provide clear divisions between the species. The combination of morphological and anatomical characters is needed to obtain a more informative phenogram in the future.

The genus *Lindernia s.l.* (Linderniaceae) in Thailand

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As part of a revision of the genus *Lindernia s.l.* for Flora of Thailand, an updated classification of the genus in Thailand is presented. Thai *Lindernia* is separated into 5 genera based on the recent classification of Linderniaceae sensu Fischer et al. (2013): *Bonnaya*, *Craterostigma*, *Lindernia s.str.*, *Torenia s.l.* (crustacea group) and *Vandellia*. Noteworthy remarks on taxonomy, morphology, geographical and ecological distributions and endemic species of each genus are discussed. *V. yamazakii* P.Sutthisaksopon, Chantar. & D.A.Simpson (Phytotaxa 167: 127–132, 2014) and 2 new records, *L. hyssopioides* (L.) Haines and *V. diffusa* L. (submitted to Thai Forest Bull.) are added for Thailand. Information on anatomy of leaves and stem, pollen and phenetics is discussed.

Further notes on Liliaceae *sensu lato* in Thailand

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At the Flora of Thailand Meeting in Chiang Mai in 2011, I reported temporal results of my identification of 15 genera of Liliaceae *sensu lato* (*Daiswa*, *Lilium*, *Disporum*, *Iphigenia*, *Gloriosa*, *Urginea*, *Chlorophytum*, *Polygonatum*, *Disporopsis*, *Theropogon*, *Rohdea*, *Tupistra*, *Aspidistra*, *Ophiopogon* and *Peliosanthes*) from Thailand: ca. 48–54 species in total. Since then, I have newly recognised *Peliosanthes brevicoronata* with Mr. Manop Poopath from Huai Kha Khaeng, and *Chlorophytum longissimum* var. *phukhaense* with Dr. Rachun Pooma from Doi Phukha. Three varieties of *Aspidistra subrotata* Y. Wan & C. C. Huang (var. *subrotata*, var. *angustifolia* Phonsena and var. *crassinervis* (Tillich) Phonsena) were also added to the recognised taxa. At this time, I would like to update the results of my identification of 15 liliaceous genera from Thailand, even though they are still temporal. I would like to refer also to the phylogenetic positions of several recognized species from Thailand as far as possible.

On progress of Thai Commelinaceae

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The position of Thai Commelinaceae is studied and revised. Fifty-two species (54 taxa) belonging to 13 genera are enumerated: *Aetheolirion* (1 species), *Amischotolype* (8 species), *Belosynapsis* (1 species), *Commelina* (7 species), *Cyanotis* (6 species + 2 varieties), *Dictyospermum* (2 species), *Floscopa* (1 species), *Murdannia* (14 species), *Pollia* (5 species), *Porandra* (3 species), *Rhopalephora* (1 species), *Spatholirion* (2 species) and *Streptolirion* (1 species). Eleven taxa are newly recorded: *Amischotolype griffithii*, *A. hookeri*, *Cyanotis arachnoidea*, *Cy. burmanniana*, *Cy. thwaitesii*, *Murdannia clandestina*, *M. macrocarpa*, *M. pauciflora*, *Pollia hasskarlii*, *Porandra microphylla* and *Por. ramosa*. In addition, one species of *Murdannia* and two taxa each of *Commelina* and *Cyanotis* are probably new to science. A key to the genera (based on vegetative parts, inflorescence and floral structure) is provided.

A New Germplasm and Seed Bank for Wild Plant Species in Thailand

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The Thailand Institute of Scientific and Technological Research (TISTR)'s germplasm and seed banks were established in 1980, initially with the intention of banking agricultural resources (species and cultivars of vegetables, fruits and medicinal plants). Over 1,000 accessions of living collections (ex situ and in vitro), and seeds of a few hundred species, were handled by the conservation programme at Technopolis, the head office of TISTR in Pathum Thani province. Since 2012, living plants and seed collections of wild plants are handled at a new facility at Lam Ta Khong Research Station in Nakhon Rachasima Province. This site has 100 hectares available for ex situ cultivation and laboratory facilities for 100,000 seed accessions of regional plant germplasm resources for conservation. Under this project, each species in Thailand is given a conservation assessment so as to assess its priority to be added to the collection. In addition the necessary accompanying study of fruits and seeds helps in our basic understanding of the Thai Flora.

Testing Species Distribution Models

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The Thai Phytogeography Group has published distribution models of the occurrences of plant species in Thailand, in the present and modelled for 2050 under the influence of climate change. The stacked models showed a currently high biodiversity for northern Thailand, but projects an enormous decrease for this area in 2050, while a slight increase is predicted for the northeast of Thailand. Long-term permanent plots were started in the north in cooperation with Queen Sirikit Botanical Garden, and in the northeast in cooperation with the Forest Herbarium (BKF), to monitor changes in floral composition. The first inventories of the plots can be correlated with the predicted species to see if they more or less match and the models can be corrected by including full species distributions, instead of only the occurrence in Thailand. The latter may especially influence the modelled occurrence near the borders of Thailand.

Revision of the Staphyleaceae in Thailand

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The family Staphyleaceae is represented only by the genus *Turpinia* in Thailand. There is discussion to change the generic name to *Dalrympelea* based on non-published analyses of molecular markers. We like to refrain from making new name combinations as long as the phylogeny has not been published. *Turpinia* contains four species in Thailand, of which three (partly) resemble each other strongly in leaf shape. The most conclusive character to separate species is, unfortunately, the number of ovules per locule, though leaf shape, indument, flower size and fruit shape and size help to a certain degree. Typical for the genus are the opposite imparipinnate leaves with interpetiolar stipules leaving a round scar, paired papillate glands at the nodes of the leaf rachis and on the petiolules, 5-merous flowers, 2 outer sepals smaller than inner 3, annular ring-like disc, 3- or 4-locular ovary with 2, 4or 4–6 ovules per locule and very woody drupaceous fruits.

Historical biogeography of *Breynia sensu lato* (Phyllanthaceae)

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The phylogeny of *Breynia* (incl. *Sauropus*) is dated with a single calibration point with the program BEAST. The resulting MCC tree and cladograms are used with S-DIVA (in program RASP) to calculate the probable ancestral distributions. It is interesting that *Breynia* has its major diversification on the SE Asian main land, with a secondary nucleus on New Guinea. In particular, it is surprising to find most species in SE Asia as SE Asia is tectonically quite stable in comparison to the Malay Archipelago. We will try to explain this.

An investigation of biogeographic limits in Sapotaceae with particular reference to the Isthmus of Kra

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The pan-tropical tree family Sapotaceae is well represented in S.E. Asia. However, the circumscription of several genera and the total number of species in the region remains unclear. Flora accounts of Sapotaceae for Peninsular Malaysia and Thailand are in progress and are helping to clarify taxonomic uncertainty. This presentation will highlight the distribution of Sapotaceae species across Southern Thailand and Peninsular Malaysia and will discuss these in the context of current understandings of biogeographic limits in the region. A better knowledge of these limits will help us understand the flora of the region more fully and contribute to global conservation assessments for the family.

eMonocot: Biodiversity Informatics for Monocot Plants

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eMonocot is a project delivering a global online biodiversity information resource for monocotyledons. It enables identification of Monocot plants, promotes understanding of their diversity and evolutionary relationships, and allows the user to explore a wealth of information including descriptions, images, conservation, geographical and ecological data.

eMonocot is in concept a distributed information system. The content underpinning the project has been compiled by monocot plant systematists from many different institutions worldwide . Their data are being contributed through online taxonomic information resources, specifically new community-led scratchpad websites created as part of the project (currently 30; http://about.e-monocot.org/list-emonocot-scratchpads). These scratchpads are providing support and tools to enable monocot taxonomists and their communities to manage and present their taxonomic data online and in doing so contribute to eMonocot. Global participation is essential to developing and sustaining both this data and the expert taxonomic communities that generate and enhance it. A dedicated team of project staff has also compiled content. The Asparagaceae-Nolinoideae scratchpad will be demonstrated, specifically content on Thai species of Dracaena.

The eMonocot portal (emonocot.org) links eMonocot scratchpad content to existing eTaxonomic resources including CATE-Araceae (http://araceae.e-monocot.org/), Palmweb (www.palmweb.org), Grassbase (www.kew.org/data/grasses-db.html) and the Monocot checklist (www.kew.org/wcsp/monocots) via Darwin Core archives (DwC-A). The portal is geared primarily to users of systematic data such as those studying the ecology, evolution or conservation of monocot plants. Its functionality will be demonstrated. The presentation will conclude by examining the further development of eMonocot, including its potential as a model for global biodiversity informatics projects.

Urticaceae in Thailand: a taxonomic, floristic and phytogeographical update

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At a meeting at Chiang Mai in 2001 one of us (IF) reviewed 16 genera and 100 to 80 species of Urticaceae in Thailand. World-wide taxonomic revisions have been made of seven of these genera (four by us: *Girardinia*, *Boehmeria*, *Pouzolzia*, *Debregeasia*; three by others: *Laportea*, *Dendrocnide*, *Leucosyce*) and our revision of *Cypholophus* is under way. These studies change the number of genera to 14, possibly 15, and the number of species to min. c. 60, max. c. 80 species, of which a number in the genera *Pilea* and *Elatostema* are unnamed and possibly new to science. An updated taxonomic and floristic overview of the genera is presented, with identification aids. Compared with the surrounding countries Thailand is relatively poor in Urticaceae genera. The well-known genera show a high diversity of widespread taxa in the northern, mountainous parts of Thailand, but there are also examples of narrow endemism in the southern part of Thailand, particularly in the karstic areas. A cursory review of the genera not yet studied in detail, mainly *Pilea* and *Elatostema*, is also presented; general conclusions cannot be drawn about distribution patterns of these.

Using lichens to monitor changes in biodiversity in Thailand

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Lichens are known to be highly sensitive to changes in air quality and to forest disturbance, both of which are highly relevant in Thailand today. However components of tropical diversity are often poorly known. In 2002 published literature on Thai lichens identified 554 species most of which were in foreign collections. Since that time taxonomic research on Thai lichens has grown exponentially to include many publications of new species so that by 2006 the lichen unit at Ramkhamhaeng University's checklist included <1000 named specimens. Since then the advent of funded international consortia addressing tropical lichen diversity, combining herbarium studies with molecular analysis, has enabled accurate identification of historic and recent collections and reassessment of generic and family boundaries. This continuing investment has made it possible to begin to assess changes in tropical diversity in Thailand. Once the data is available further outputs are possible; including the development of web-based keys with specimen photographs, data and voucher information, available as an app. These keys can easily be tailored to a region or a social group and make identification of material possible that can then be used to accumulate data to actively monitor changes in biodiversity of lichens in Thailand.

The phylogeography of *Paphiopedilum* section *Barbata*

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The *Paphiopedilum* section *Barbata* (Cypripediodeae: Orchidaceae) are an early diverging group of terrestrial orchids native to the Himalayas, Indochina and Malesia for which hybridisation speciation is suspected on the basis of morphological data. We use sequence data from the low-copy nuclear genes *Xdh*, CHS and four plastid [*psaAycf3ex*, *trnF*(*GAA*)-*ndhJ*, *matK* & *ycf1*] regions, and sampled multiple-individuals per taxon to uncover molecular evidence of historical hybridisation in the form of phylogenetic incongruence. We discuss the role of hybridisation in the evolution of *Paphiopedilum* as well as how it relates to the biogeographical history of the region.

POSTER PRESENTATIONS

Unravelling the mysterious origins of Old World Spiny solanums (*Leptostemonum* Clade): lessons from South and South-East Asia

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A giant among the flowering plants, *Solanum* L. (c. 1500 species) has a cosmopolitan distribution and numerous plants of global agricultural importance (e.g., potato, tomato, aubergine). Within *Solanum*, the spiny *Solanum* clade forms the most species-rich major lineage (c. 450 species). In contrast to their New World relatives, Old World spiny *Solanum* have received little attention. The Asian taxa in particular have never been revised in their entirety and have been sparsely sampled in all phylogenetic analyses to date. This has significantly impeded understanding of *Solanum's* evolutionary history. Based on sampling from Africa and Australia Old World taxa have been characterized as a monophyletic group. To test this hypothesis, we are clarifying Asian spiny *Solanum* species delimitation and building broad molecular sampling. Our preliminary results show that these taxa do not all resolve with other Old World taxa, some being instead members of New World clades. Our data refute the monophyly of Old World spiny *Solanum* and suggest at least three independent introductions from the New World, thus shedding new light on biogeography of spiny *Solanum*. We are now enlarging sampling in order to further clarify these patterns and fill this major gap in knowledge of *Solanum* phylogeny.

Systematics of *Clitoria* in South East Asia

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This research project aims to study the systematics of *Clitoria* in South East Asia, including its biogeography and distribution patterns, and its ethnobotany. We intend to produce a phylogeny based on molecular and phytochemical data. Twelve species of *Clitoria* in South East Asia are classified in three subgenera. Firstly, subgenus *Bractearia*, which includes only *Clitoria fairchildiana* Howard. Secondly, subgenus *Clitoria* which comprises two species; *Clitoria ternatea* L. and *Clitoria heterophylla* Lam. Finally, subgenus *Neurocarpum* which is classified in three sections, section *Mexicana*; *Clitoria mariana* L., section *Tanystyloba*; *Clitoria chanondii* W. Chuakul, *Clitoria cordiformis* Fantz, *Clitoria hanceana* Hemsley, *Clitoria javanica* Miq., *Clitoria linearis* Gagnep., *Clitoria macrophylla* Wall. ex Benth. and finally the section *Neurocarpum*; *Clitoria falcata* Lam. and *Clitoria laurifolia* Poir. Based on this revision of SE Asian *Clitoria* species, we will produce a treatment of the genus for the Flora of Thailand. Our study has just started and we expect it to be completed by the end of 2016.

Micromorphology of the lemma of Thai *Eragrostis* (Poaceae) revealed by SEM and its taxonomic significance

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The taxonomy of the genus *Eragrostis* is rather difficult and based generally on morphological characters. In an attempt to carry out the systematics of the genus in Thailand, lemma of 18 species was studied with scanning electron microscopy (SEM). Lemma micromorphological characters including long cells, cork cells, stomata, bicellular microhairs, papillae, silica cells, prickle and macrohairs were investigated and their taxonomic significance were also evaluated. Results showed that the micromorphological characters of lemma varied between different taxa. However, some closely related taxa show similarities. Therefore, the lemma micromorphology of Thai *Eragrostis* is valuable in understanding the taxonomy at specific level in the genus.

Wild fruit tree diversity and phylogenetic study in Thailand

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The diversity of four genera of wild fruit trees namely *Citrus*, *Garcinia*, *Mangifera* and *Nephelium* and in four floristic regions of Thailand was investigated by morphological and phylogenetic methods. Based on a survey of 69 wild fruit trees in natural forests and forest communitiesin Chiang Mai (Northern region), Si Sa Ket (North-Eastern), Chanthaburi (Eastern) as well as Trang and Nakhon Si Thammarat (Peninsular), it was found that there were two species of *Citrus*, 13 species of *Garcinia* six species of *Mangifera* and four species of *Nephelium*. Morphological variation, especially in the shape, size and colour of fruits and flowers within genera and species in the different locations, was found. Some of them could not be identified by morphological characteristics alone. Therefore, molecular phylogenetic studies were carried out using ITS and MatK markers. The information from this study will be used for conservation management and raising awareness in local communities about the need for the conservation of wild fruit trees in protected areas and community forests.

Morphology and distribution of *Phyllodium* group (Leguminosae) in Thailand

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The *Phyllodium* group (Leguminosae) in Thailand was studied. Five genera, 17 species, one subspecies, three varieties and two unidentified taxa, viz. *Akschindlium godefroyanum*, *Aphyllodium biarticulatum*, *Dendrolobium baccatum*, *D. lanceolatum* var. *lanceolatum*, *D. lanceolatum* var. *microcarpum*, *D. olivaceum*, *D. rugosum* var. *rugosum*, *D. thorelii*, *D. triangulare*, *D. umbellatum*, and two unidentified taxa, *Phyllodium elegans*, *P. insigne*, *P. kurzianum*, *P. longipes*, *P. pulchellum*, *P. vestitum*, *Tadehagi rodgeri* and *T. triquetrum* subsp. *triquetrum* are enumerated. Morphological characters and photographs are presented. Four species, *D. lanceolatum* var. *lanceolatum*, *D. triangulare*, *P. pulchellum*, and *T. triquetrum* subsp. *triquetrum* are widely distributed throughout Thailand. Three taxa, *D. baccatum*, *Dendrolobium* sp. 1 and *Dendrolobium* sp. 2 are strictly confined to a very small area in south-eastern, north-eastern and eastern Thai floristic elements, respectively. Most species are found in open areas of dry dipteropcarp, pine-deciduous dipterocarp, dry evergreen and lower montane coniferous forests.

Authentication of dried plant materials composed in Mathura Meha, a Thai traditional anti-diabetic herbal formula

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Therapeutic effects of herbal medicine depend on bioactive compounds contained in herbal preparation. The different plant species usually contain different constituents even though they are closely related species which influence their therapeutic effects. Therefore, it is important to ensure that the correct plant species will be used.

Thai traditional anti-diabetic herbal formula, Mathura Meha, composed of 26 Thai medicinal plants, has been used as complementary medicine for diabetes treatment in Wang-nam-yen hospital. There were 6 problematic plants that could cause confusing in dried materials verification. Three categories of problems were substitution, confusing between vernacular and scientific names, and closely related species. To confront with these problems, the system for identification of dried material should be set up.

In this study, 6 plants were each identified by comparing their microscopical characteristic and TLC chromatograms with authentic sample of all expected species. These plants were identified as *Abutilon indicum* (Lam.) Sweet, *Acanthus ebracteatus* Vahl, *Derris reticulata* Craib, *Premna herbacea* Roxb., *Smilax glabra* Roxb.,and *Tribulus cistoides* L. The identification system exploited microscopic and TLC techniques will be useful for the establishment of a specification or monograph used for quality control of their dried materials.

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

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Embelia Burm.f. (Primulaceae, subfamily Myrsinoideae) is a genus of climbing shrubs distributed mostly in South and South-East Asia and tropical Africa. *Embelia* displays extensive morphological variation (especially regarding the position, shape, size and merosity of the inflorescences) and is only distinguished from other Myrsinoideae by a climbing habit, raising questions as to the monophyly of this group. The last monograph of this genus (made by Mez in 1902) recognised 8 subgenera and 92 species, but the total number of species is currently estimated at 170 – 200 and the subgenera must be assessed and refined. In Thailand, 13 species, distributed all over the country, are currently recognized (4 of them are endemic to the country). Based on morphological data, they can be attributed to 5 of the existing subgenera. Future molecular studies, combined with the analysis of morphological data, will enable a better understanding of the taxonomic framework of the genus.

Orchids of Myanmar (Burma), with notes on floristic affinities to Thai Orchidaceae

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The orchid flora of Myanmar is diverse but very poorly known. While most species have Indochinese affinities, there are also Malesian elements in the south as well as Himalayan and temperate Asian elements in the north. No up-to-date floristic inventory of the orchids is available as yet. The recent literature consists largely of pictorial books as well as taxonomic papers on new and newly recorded species. About 815 species are known to occur in the country at present, but it is widely expected that future botanical exploration of Myanmar will lead to further discoveries. About two thirds (ca. 68%) of the orchid species currently known in Myanmar are also found in adjacent Thailand.

Thailand is smaller than Myanmar in terms of total land area. Nevertheless, the number of orchid species recorded in Thailand is considerably higher (about 1200 species). The main reason are the stronger affinities to the floristically highly diverse regions of Indochina and Malesia. Also the fact that the orchid flora of Thailand is much better explored than that of Myanmar plays a major role. A difference between the two countries is that the Himalayan floristic element is much more pronounced in Myanmar than it is in Thailand.

Floral thermogenesis in showy members of *Tacca* (Dioscoreaceae)

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Genus *Tacca* J.R. Forst. & G. Forst. is a small pantropical group including approximately 15 recognised species, with the greatest diversity in Southeast Asia. They are characterised by inflorescences comprising of flowers arranged in umbellate cymes with long flagelliform bracteoles, subtended by leafy bracts. These may be elaborately showy in some members. While the reproductive biology of the group is not well understood, Zhang et al. (2006, 2007, 2011) have found that selfing predominates in several showy species (*Tacca chantrieri* André, *Tacca integrifolia* Ker Gawl. and *Tacca subflabellata* P.P. Ling & C.T. Ling) Here we present evidence of floral thermogenesis of up to 5 degrees Celsius above ambient temperature in showy members of *Tacca*, as well as its absence in at least one non-showy species, *Tacca plantaginea* (Hance) Drenth. Along with thermogenesis, flowers of showy *Tacca* display characteristic patterns of movement post-anthesis. This is not observed in non-showy *Tacca*. The link between visual display and floral temperature is discussed, with implications for reproductive biology of this genus.

New legumes (Leguminosae) in Thailand

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The family Leguminosae or Fabaceae, known as the bean or pea family, comprises approximately 727 genera and 19,325 species worldwide. It is the 3rd largest family of flowering plants after Orchidaceae and Asteraceae respectively. The legume family is divided into three subfamilies; Caesalpinioideae, Mimosoideae and Papilionoideae, of which the latter is the most species rich.The accounts for the first two subfamilies are already published for the Flora of Thailand. The account for the Papilionoideae, to include more than 500 species, is due to be released in the near future. Here we present leguminous species described since 2013, either by the authors or others. In addition, other unknown species from tribes Millettieae and Phaseoleae-subtribe Cajaninae, currently studied for the Flora of Thailand, are presented. We show that many species new to science are being described in Thailand.

Taxonomic Studies of the Genus *Vigna* Savi (Fabaceae-Papilionoideae) in Thailand

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Taxonomic studies of the genus *Vigna* Savi in Thailand was conducted from October 2009 to September 2012. Nineteen species with three subspecies and six varieties are enumerated. Thirteen species and three varieties are native in Thailand, *i.e*. *Vigna adenantha*, *V. dalzelliana*, *V. exilis*, *V. grandiflora*, *V. luteola*, *V. marina*, *V. tenuicaulis*, *V. umbellata*, *V. vexillata* var. *vexillata*, *V. vexillata* var. *angustifolia*, *V. vexillata* var. *macrosperma*, *V.* sp. 1, *V.* sp. 2, *V.* sp. 3 and *V.* sp. 4. Six species with three subspecies and three varieties are cultivated plants, *i.e. V. angularis* var. *angularis*, *V. angularis* var. *nipponensis*, *V. mungo*, *V. radiata* var. *radiata*, *V. stipulacea*, *V. subterranea*, *V. unguiculata* subsp. *unguiculata*, *V. unguiculata* subsp. *cylindrica* and *V. unguiculata* subsp. *sesquipedalis*, *V. vexillata* var. *macrosperma* is a new record in Thailand, found in dry evergreen forest at Khun Kon waterfall, Chiang Rai province. *V. exilis* is an endemic species of Thailand, this species is confined to the limestone hill in Ratchaburi and Phetchaburi provinces. The genus *Vigna* is distributed throughout the country. The highest concentration of species is in the North. The genus *Vigna* occur in six natural habitats, *i.e.* dry evergreen forest, deciduous dipterocarp forest, montane rain forest, limestone hill, strand vegetation, and disturbed area or roadsides, the lastest has the highest number of species. Fifteen species of the genus *Vigna* were examined for pollen morphology by mean of SEM. The pollen grains in all species are monad. All of the pollen grains have an oblate spheroidal shape, 3-porate, scabrate reticulate or scabrate rugulate. The size and exine sculpture of pollen grains can be used to separate the genus *Vigna* as two groups.

Thai weeds in Highlands: a case study in Nan Province

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This is the first study of weeds throughout Nan Province, Thailand where is located in the remote valley of the Nan River, surrounded by mountains covered with forests. The highest mountain is the 2079 meter high. Nan Province has a tropical savanna climate. A study was done to identify and characterize densities of weeds in agricultural area during 2013–2014 as well as ecological and other environmental data has been collected.

Data was gathered directly in the field from rice farms and vegetable farms. More than 120 species of weeds were recorded. Weed species was associated with altitude and ecological and environmental data. Dominant weeds found are *Galinsoga parviflora* Cav., *Dactyloctenium aegyptium* (L.) P. Beauv., *Ageratum conyzoides* (L.) L., *Brachiaria mutica* (Forsk.), *Echinochloa crus-galli* (L.) P.Beauv., *Leonotis nepetaefolia* (L.) R. Br., *Chromolaena odorata* (L.) R.M.King & H.Rob., *Nephrolepsis biserrata* (SW.) Schot., *Pennisetum pedicellatum* Trin.

Food Plants in Hmong Cuisine in Northern Thailand

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Food plants used by Hmong from six villages in Amphoe Mae Rim, Changwat Chiang Mai, Thailand, were studied during March 2012 to February 2013. Eight informants were interviewed individually in the field and information was verified for three times. One hundred and forty species documented belongs to 58 families and 111 genera. Consumption forms were classified into four types as vegetables (119 species), fruits and nuts (25 species), staple foods (5 species) and desserts (5 species). A threaten plants, *Elsholtzia penduliflora*, and a rare species in Thailand, *Lilium primulinum* var. *burmanicum*, using as vegetable and dessert, respectively, were among the list of Hmong food plants. A kind of soup using vegetables and several culinary herbs boiled with chicken was a popular Hmong diet and the soup main ingredients were plants with volatile oil, e.g. *Acorus gramineus*, *Artemisia vulgaris* and *Elsholtzia penduliflora*. The Hmong believes that this food is a superior tonic to restore strength for farmers. Further study on nutritional properties could reveal potential usefulness of the plants used, indicate value of traditional botanical knowledge and urge for conservation of the plant resources and local wisdom, which will be critical for food security of the communities in the future.

Cytogenetic characters of *Curcuma candida* (Wall.) Techaprasan & Škorničk (Zingiberaceae)

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Curcuma candida (Wall.) Techaprasan & Škorničk is a semi-endemic, rare and vulnerable plant in Thailand.It is edible and also has potential to become medicinal and ornamental plant. Some morphological characters of *C. candida* are similar to those of *Kaempferia* and *Curcuma*. The objectives of this study are to investigate chromosome number, meiotic figure and nuclear DNA content of *C. candida* in comparison to some *Curcuma* and *Kaempferia*. The results revealed that *C. candida* has very small chromosomes less than 2 μm of 2n = 42 in somatic cells with nuclear DNA content of 1.77 pg. The meiotic figure of this plant shows 21 bivalents in first metaphase of pollen mother cell. These chromosome characters and genome size are similar to those found in some *Curcuma*, which are different from those of *Kaempferia*. Therefore, the results of this study suggested that *C. candida* belongs to genus *Curcuma*.

Thai Ethnoflora

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Many ethnobotanists have studied the tremendous variety of plants used by Thai hill tribes and other ethnic groups. We estimate that the list of ethnobotanical plants may include up to 800 species. The task of identifying these species for each new ethnobotanical study is tantalizing and involves big efforts in consulting herbaria and the taxonomic literature. The purpose of this study is to produce a *Thai Ethnoflora* in which all species with known ethnobotanical uses are described, named, and keys are provided for their identification. Following this initial descriptive phase of the study, we will use the database created to answer several questions regarding the useful plants of Thailand. First we will study the phylogenetic impact on the useful plants of Thailand. Secondly we will evaluate the conservation status of useful plants of Thailand. Thirdly we will determine the ecological affinities of each species to determine the importance of different habitats for the provision of ecosystem services in terms of useful plants. Finally we will model the distribution of a selection of the most common and most useful plants to determine possible impacts of climatic change on the future availability of useful plants in Thailand.

Epidermis of Some Vegetative Parts of Endemic Eriocaulaceae from Thailand

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The peeling of leaves, leaf sheaths and scapes of 19 endemic Eriocaulaceae in Thailand including *Eriocaulon chantaranothaii*, *E. escape*, *E. hamiltonianum* var. *acuminatum*, *E. nautiliformoides*, *E. nautiliformoides* var. *hexagynum*, *E. parnellii*, *E. phatamense*, *E. phuchongense*, *E. phuphanense*, *E. phuphanoides*, *E. pseudoescape*, *E. quinquangulare* var. *longibracteatum*, *E. siamense*, *E. siamense* var. *macrophyllum*, *E. siamense* ssp. *hexagynum*, *E. smitinandii*, *E. thailandicum*, *E. ubonense* f. *kradungense* and *E. xenopodium* were investigated under light microscopy. The results showed that the taxonomic charecteristics are as follows– the presence of papillae on leaf surfaces, the presence and position of hairs, the shape of epidermal cells, the comparative size of costal and intercostal cells, and the presence and types of crystal.

Distribution and microhabitat of the genus *Radula* Dumort. (Radulaceae, Marchantiophyta) in Thailand

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The distribution and microhabitats of the genus *Radula* in Thailand have been analysed, based on the materials from field surveys in various phytogeographical regions of the country from April 2012 to May 2014 as well as the herbarium specimens from BCU, BKF, CMU, EGR, HSNU, and PSU herbaria. Among the currently recognized species 31 were collected from various habitats such as rocks, rotten wood, barks, twigs and leaves, but never occur on soil. The majority of the species are epiphytes (24 species), either corticolous or ramicolous. Six species are typically epiphyllous and only one species, *R. lingulata* Gottsche, is restricted to rocks. The total altitudinal range of the genus extends from near sea level to over 2000 m but most of the species occur above 800 m. The greatest diversity of *Radula* in Thailand is found in the Peninsular region with 28 species.

Preliminary study of orchids in Ton Nga Chang Wildlife Sanctuary, Songkhla province, Thailand

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Collection and exploration of orchids at Ton Nga Chang Wildlife Sanctuary, Songkhla province, Thailand was conducted from October 2013 to May 2014. Ninety nine specimens were collected and identified as belonging to 83 species and 52 genera. Common genera are *Dendrobium* and *Bulbophyllum*, with 9 species in each. Of 83 species, 44 species are epiphytes, 19 species are terrestrial and four species are mycoheterotrophics. Also included were 2 species which are new records for Thailand: *Didymoplexiella trichechus* (J. J. Sm.) Garay and *Didymoplexis striata* J.J. Sm. Two species are treated as rare plants namely *Claderia viridiflora* Hook.f. and *Neuwiedia singapureana* (Wall. ex Baker) Rolfe.

The genus *Archidendron* (Leguminosae: Mimosoideae) in Thailand.

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Archidendron is a highly diverse genus with more than 100 species distributed in Asia and Australia: India, Sri Lanka (1 endemic), Indo China a centre of diversity (Thailand, Laos and Vietnam with 10 species) through Malesia (4 spp. endemic to Philippines, 5 in Borneo, 3 in Sulawesi, 3 in the Moluccas and 30 in New Guinea and the Solomon Islands); 7 endemic in NE Australia., 1 sp. extending to Micronesia). The species of the genus are little known and at fruits of at least 25 species have not been found yet. Ecosystem services vary among different species of *Archidendron* since they have uses in construction, for tannins, and food, among others.

Nielsen et al. (1984) revised the genus reporting 94 spp. + 20 undescribed (nov. sp. in obs.); the genus was written up for the Flora of Thailand by Nielsen (1985); Nielsen (1992) treated the species for Flora Malesiana; this poster presents an update of the number of species, their distribution and conservation status.

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Botanical illustrations of Thai banana (Musaceae) species based on morphological data

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More than 300 accessions of wild bananas (Musaceae) were collected from natural habitats in Thailand during 2005–2013. Their morphological characters were investigated using descriptive form modified from previous studies. Fifty qualitative and quantitative characters were recorded. Photos, always accompanied with colour chart and scale, were taken along with sketches of floral parts. Specimens were collected; base, mid part, and apex of third to fourth leaves were dried and inflorescences and mature fruits, if available, were preserved in spirit. The plants were identified based on descriptions in literatures. Ten species from two genera, *Musa* and *Ensete*, were illustrated using water colour and black pen based on at least three accessions from different populations and facilitated by photos, sketches, the morphological data and the collected specimens. While the paintings mainly displayed taxonomically distinctive characters of inflorescences, the line illustrations showed more details of clumps, leaf base, transverse section at midpoint of leaf petiolar canal, inflorescence, bract shape, flower parts including free and compound tepals, anthers, and stigma, a mature hand of fruits, and longitudinal and transverse sections of fruits. The illustrations will be very useful for identification of the banana species found in Thailand and nearby regions.

Leaf Blade Anatomy Characteristics of *Amorphophallus* and *Pseudodracontium* in Thailand Grown in Greenhouse Condition

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Leaf blade anatomy characteristics of 20 species of *Amorphophallus* Blume ex Decne. and 3 species of *Pseudodracontium* N.E.Br. were studied. The plant specimens were collected from several areas of Thailand between November 2008 and May 2012, and grown in greenhouse conditions under 70% of sunlight. The leaflet samples were prepared by free hand section and epidermal peeling slides before being observed by light transmission microscope. The results showed different anatomy characteristics of each species. Midrib shapes in cross section were curved, 5, 6, 7 or 8 lobed. Vascular bundles numbers were 5, 6, 7, 8, 9, 10, 13, 15 or 16 bundles. Upper and lower epidermal cell wall had 3 types, straight-sided, undulate or sinuous anticlinal wall. Both sides of the epidermal cell wall were the same or different in each species. Subsidiary cells were 2, 3, 4 or 6 cells along both sides of paired guard cells and stomata types were also vary from species to species, brachyparacytic, hemiparacytic, amphibrachyparacytic, paratetracytic or parahexacytic. The species of these two genera can be identified with the dichotomous key using leaf blade anatomy characters.

Leaf cuticular sculpturing of Lecythidaceae from South-East Asia

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Leaf epidermal sculpturing of 22 species (27 taxa) of Lecythidaceae from Southeast Asia was investigated by scanning electron microscopy (SEM) to determine its taxonomic significance. Results showed that the shape of epidermal cells is irregular or polygonal. The ornamentation is psilate, granulate or striate. The epidermal wax deposition and papillae are present or absent. The taxonomic value of the leaf epidermal characters in the family is limited. These characters cannot be used for species identification. However, the presence of epidermal wax deposition and papillae can be used to distinguish some species.

RAPD marker for determination of phylogenetic relationship of 15 *Curcuma* species from Thailand

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Curcuma, a rhizomatous herb belonging to the family Zingiberaceae, has been used as a natural food additive, cosmetic and folk medicine in Thailand. The similar morphology of *Curcuma* species makes them difficult to identify. In this study, Random Amplified Polymorphic DNA (RAPD) was employed for determination of the phylogenetic relationships among 15 *Curcuma* species from Thailand. Out of thirty random deca-arbitrary primers, only four produced clear and reproducible polymorphic bands. 23 to 26 products were amplified, with an average of 24.5 bands by each primer. A total of 98 bands ranging from 208 to 4136 base pairs in size were amplified, among which 39 products were found to be polymorphic. The similarity index (SI) ranged from 0.0909–0.9222. The dendrograms were constructed based on the unweighted pair group method with arithmetic averages (UPGMA). The results from the cluster diagram could be divided into six groups and the phylogenetic relationships were correlated with the morphological characteristics. In conclusion, RAPD marker was successful for differentiating between 15 *Curcuma* species from Thailand and providing a simple and rapid tool for differentiation.

Systematics of *Emilia*, *Erechtites*, *Senecio*, *Sinosenecio* and *Synotis* (Senecioneae: Asteraceae) in Thailand

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This report aims to study systematics of *Emilia*, *Erechtites*, *Senecio*, *Sinosenecio* and *Synotis* including its distribution and ecology in Thailand. As a first result, seventeen species have been described and recorded; three species of *Emilia* namely *E. prenanthoidea*, *E. sonchifolia* and *E. khaopawtaensis*, two species of *Erechtites* namely *E. hieraciifolius* and *E. valerianifolius*, seven species of *Senecio* namely *S. ramosus*, *S. boluangensis*, *S. obtusatus*, *S. wightii*, *S. craibianus*, *S. namnaoensis* and *S. scandens*, one species of *Sinosenecio* namely, *S. oldhamianus* and four species of *Synotis* namely *S. cappa*, *S. nagensium*, *S. triligulata* and *S. phupeakensis*. The study provides an identification key to species based on flowering, fruiting materials and morphological characteristics of plants, including the distribution range, ecology, vernacular names and species distribution map.

Increased valorisation of the floristic districts in north-eastern Thailand

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The protection of biodiversity is best served by a profound knowledge of the plants. North-eastern Thailand is severely under-collected and few protected areas exist, while the flora is very rich. Long-term permanent plots were started in the north in cooperation with Queen Sirikit Botanical Garden and in the northeast in cooperation with the Forest Herbarium (BKF) to monitor changes in floral composition. Tree species within these plots were collected, identified and added to the BRAHMS database. DNA samples were taken of each tree to be analysed and added to the worldwide database of DNA barcodes. These collections were used, together with existing ones, to model distributions of the tree species. The modelled distributions were compared with each other and floral districts and their indicator species could then be analysed. These indicator species and knowledge of their distributions are needed to indicate more protected areas. Former studies only used Thai data, but this study also looked at the natural distributions (also data from outside Thailand were taken in account) to see what the influence of Indochina on the Thai flora is and to see how distribution models may differ at the Thai borders if full or only Thai data are used.