5 FEBRUARY 2023 ISSUE 69 YEAR 2022

THE BEAN BAG

A NEWSLETTER TO PROMOTE COMMUNICATION AMONG RESEARCH SCIENTISTS CONCERNED WITH THE SYSTEMATICS OF LEGUMINOSAE/FABACEAE

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WELCOME NOTE

Issue 69: From the Editors

The Bean Bag started in 1974 on the initiative of Charles (Bob) Gunn and Richard Cowan and the first printed issue was distributed 48 years ago in May 1975. The aim of the annual newsletter is to keep legume researchers informed about new publications, events and projects focused on the systematics of the family Leguminosae. Bean Bag Number 69 is another bumper issue reporting on diverse aspects of another vibrant and busy year of global legume systematics research.

This year's Bean Bag includes two new elements. First, we have introduced a new series of short *Student Digests*. These provide short commentaries on important legume papers published during the year, written by graduate students / post-docs. Two student digests are included in Issue 69. We hope that graduate students will continue to contribute to this section of the Bean Bag in coming years. Second, we have added a section entitled '*Gallery of Leguminologists*' with short portraits and photos of past legume researchers. We hope these will be informative, especially for younger readers unfamiliar with some of these historical figures and can also serve some modest archival role. Two portraits appear in Issue 69, and again, we hope that readers will suggest candidates and contribute to this gallery in future issues.

Don't forget to keep an eye on the Legume Data Portal, which also posts news items of interest to the legume research community. You can read more about the Portal in this issue of the Bean Bag.

We have added a third editor, Leonardo Borges, who has kindly agreed to join the Bean Bag editorial team. Thank you Leo! We also thank Gwilym Lewis at Kew for help with checking this issue and facilitating the archiving of the Bean Bag in the Kew Research Repository. Thanks also to you, the legume international community, and our many contributors for sharing their time and insights.

For recent BB issues see the Legume Data Portal
Earlier issues of the BB (1975 to 2022) are available via the Kew Research Repository

Editors:
Colin Hughes (University of Zürich, Switzerland)
Warren Cardinal-McTeague (University of British Columbia, Canada)
Leonardo Borges (Universidade Federal de São Carlos, Brazil)

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Facebook: https://www.facebook.com/groups/1484192248560637/

Mimosa pectinatipinna Burkart, Caesalpinioideae, photo by Colin Hughes.

THE LEGUME PHYLOGENY WORKING GROUP

The Legume Phylogeny Working Group (LPWG) was founded in 2010 with the objective of fostering collaboration and facilitating sharing of material, data and ideas amongst legume systematics researchers. While the initial focus of the LPWG was very much on phylogeny, its remit is wider, and covers all aspects of legume systematics and evolution. Reflecting this broad focus, in May 2020, four LPWG subgroups — Taxonomy, Occurrence Data, Traits and Phylogenomics — were established to advance research collaboration in these four areas which were considered of particular importance to understand the systematics and evolution of legumes. In addition, a new Legume Data Portal was established in 2021 (https://www.legumedata.org/). Updates and progress reports from the working groups are presented below with the aim of encouraging other researchers to collaborate and contribute.

Anyone who is interested in collaborating with one or other of the Working Groups and projects is encouraged to contact the relevant working group coordinators (see below).

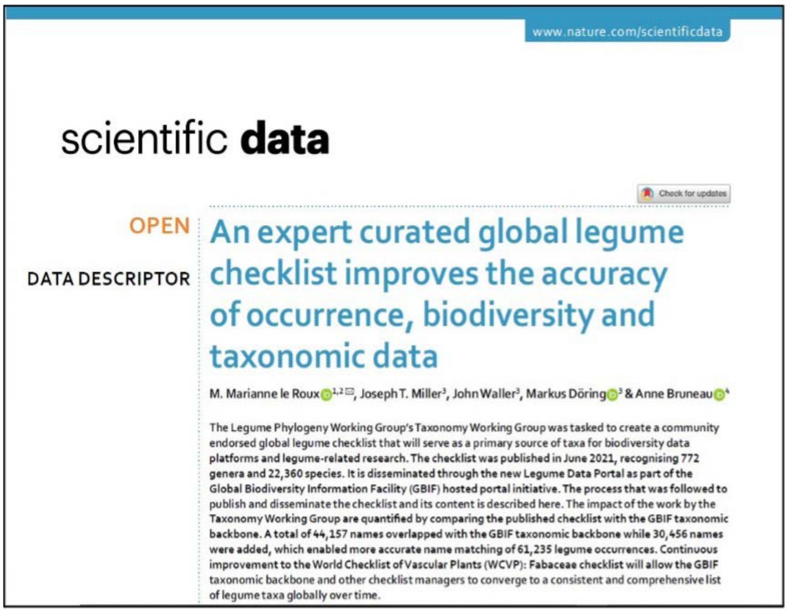
Indet. *Canavalia* DC. sp., Papilionoideae, Pablo Duchen 252 (K), Bolivia, photo by Colin Hughes.

TAXONOMY WORKING GROUP

Impacting biodiversity data using names

Coordinators:
Marianne le Roux (South African National Biodiversity Institute, SANBI, South Africa)
Anne Bruneau (Université de Montréal, Canada)

In 2022, the Taxonomy Working Group continued work on the legume names list with the aim of further enhancing the community-endorsed legume species checklist. The second version of the checklist was published at the end of May after an additional eight taxonomists volunteered their expertise (genera improved are listed below). The latest version of the checklist is available on Checklist Bank (https://www.checklistbank.org/dataset/2304/about) and on the Legume Data Portal (https://www.legumedata.org/). The good news is that this list is now also incorporated into the GBIF and the World Flora Online (WFO) taxonomic backbones.



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DATA DESCRIPTOR

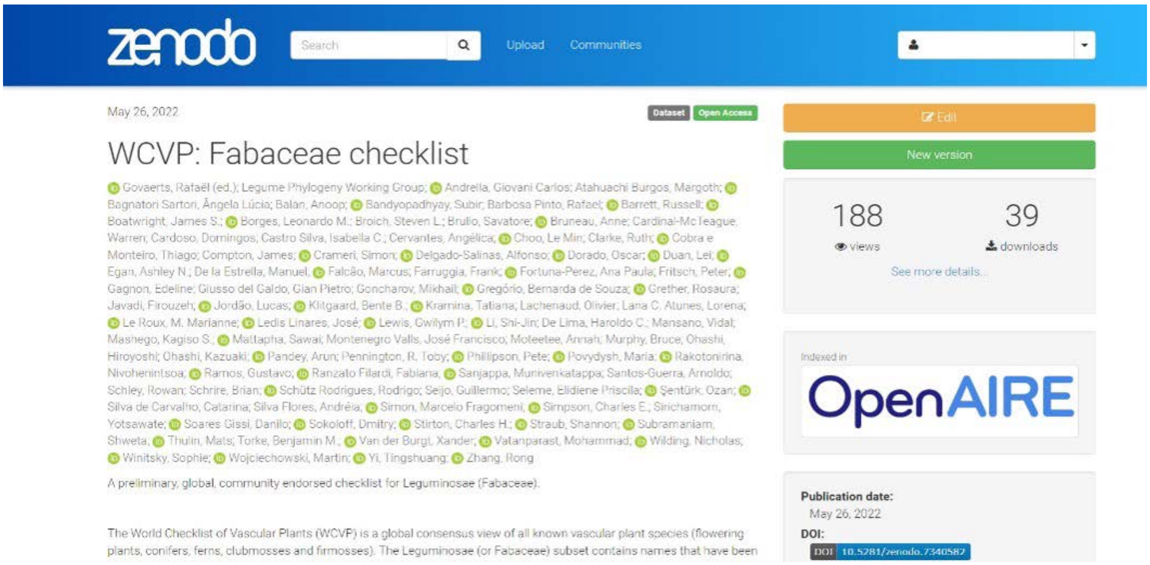
An expert curated global legume checklist improves the accuracy of occurrence, biodiversity and taxonomic data

M. Marianne le Roux[1,2], Joseph T. Miller[3], John Waller[3], Markus Döring[3] & Anne Bruneau[4]

The Legume Phylogeny Working Group's Taxonomy Working Group was tasked to create a community endorsed global legume checklist that will serve as a primary source of taxa for biodiversity data platforms and legume-related research. The checklist was published in June 2021, recognising 772 genera and 22,360 species. It is disseminated through the new Legume Data Portal as part of the Global Biodiversity Information Facility (GBIF) hosted portal initiative. The process that was followed to publish and disseminate the checklist and its content is described here. The impact of the work by the Taxonomy Working Group are quantified by comparing the published checklist with the GBIF taxonomic backbone. A total of 44,157 names overlapped with the GBIF taxonomic backbone while 30,456 names were added, which enabled more accurate name matching of 61,235 legume occurrences. Continuous improvement to the World Checklist of Vascular Plants (WCVP): Fabaceae checklist will allow the GBIF taxonomic backbone and other checklist managers to converge to a consistent and comprehensive list of legume taxa globally over time.

While name checking continued in 2022, the 2021 checklist was used in a study recently published in Scientific Data (Le Roux et al. 2022, https://doi.org/10.1038/s41597-022-01812-6) to illustrate the impact of a curated names list on biodiversity data records. A comparison was made between the legume checklist and the GBIF taxonomic backbone and resulted in adding 30,456 names to improve the GBIF taxonomic backbone. Then, after the GBIF taxonomic backbone was updated, names of all legume occurrence records in GBIF were compared between the older and updated versions. This showed that the names of 61,235 occurrence records were more accurately labelled because they matched better to the updated GBIF taxonomic backbone than before. This is a big achievement: putting numbers to the usefulness associated with a well-curated checklist. This is one example of how the efforts of the Taxonomy Working Group and the legume systematics community as a whole has already enabled more effective collaboration, highlighting the importance of taxonomic work.

Another step for the Legume Taxonomy Working Group was to start archiving versions of the checklist on Zenodo. During interactions with the legume community, it was requested that versioning be considered because the checklist displayed on the Legume Data Portal and Checklist Bank only shows the current and most recent published version. Both the 2021 and 2022 checklists are now available on Zenodo, each dataset with its own DOI and version number (2021: WCVP: Fabaceae 2021v.1, https://doi.org/10.5281/zenodo.7252852; 2022: WCVP: Fabaceae 2022v.2, https://doi.org/10.5281/zenodo.7340582). The DOIs for these lists are being cited in various publications as the source of validated species names/concepts for groups that have been checked.



In 2023, the Taxonomy Working Group will tackle names in the Caesalpinioideae following the publication of Advances in Legume Systematics 14, Part 1 which focused on generic delimitation across that subfamily (https://phytokeys.pensoft.net/issue/3247/). Name checking of other legume groups will also continue. In addition to these planned activities, queries received from GBIF and WFO will also be targeted. We are also planning some name checking activities at the ILC8 Legume Conference in Brazil during August 2023. Keep an eye out for more information about this on the Legume Data Portal.

Taxonomic updates in the 2022v.2 checklist mainly took place in parts of the Caesalpinioideae: *Arquita* Gagnon, G.P.Lewis & C.E.Hughes, *Biancaea* Tod., *Coulteria* Kunth, *Erythrostemon* Klotzsch, *Guilandina* L., *Hoffmannseggia* Cav., *Leucaena* Benth., *Mimosa* L., *Parapiptadenia* Brenan, *Piptadenia* Benth., *Pityrocarpa* (Benth. & Hook.f.) Britton & Rose, *Pomaria* Cav., *Pseudopiptadenia* Rauschert and *Stryphnodendron* Mart.), and Papilionoideae: (*Acmispon* Raf., *Amorpha* L., *Calobota* Eckl. & Zeyh., *Exostyles* Schott, *Harleyodendron* R.S.Cowan, *Holocalyx* Micheli, *Lebeckia* Thunb., *Lecointea* Ducke, *Lotus* L., *Marina* Liebm., *Melilotus* Mill., *Psorothamnus* Rydb., *Robynsiophyton* R.Wilczek, *Rothia* Pers., *Uribea* Dugand & Romero, *Wiborgia* Thunb., *Wiborgiella* Boatwr. & B.-E.vanWyk and *Zollernia* Wied-Neuw. & Nees.

If you want to join the Taxonomy Working Group and contribute to name curation, please contact Marianne or Anne. We need your expertise!

PHYLOGENOMICS WORKING GROUP

Coordinator:
Félix Forest (Royal Botanic Gardens, Kew, UK)

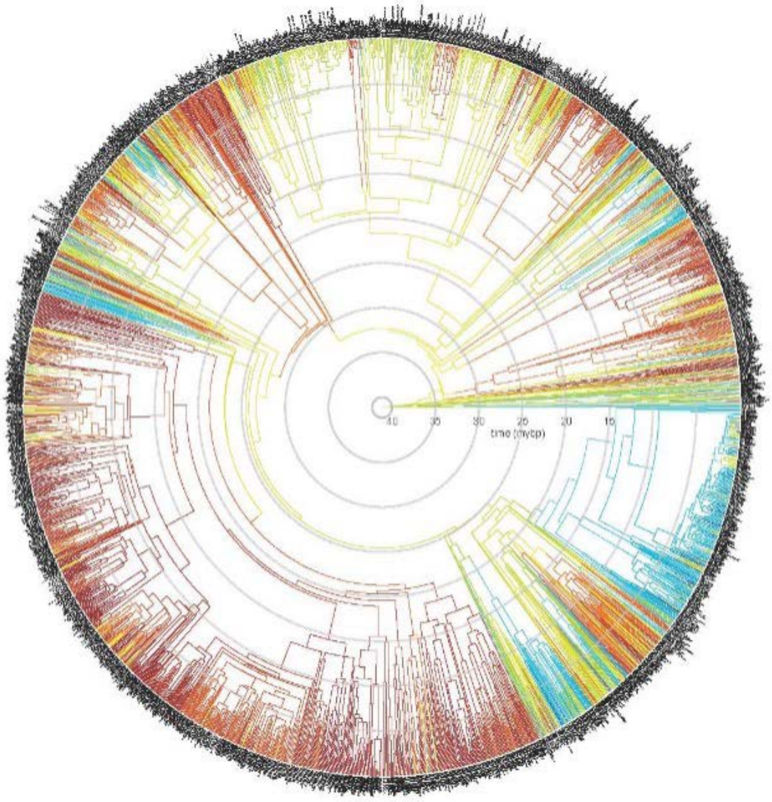
Phylogenomics of legumes

The Plant and Fungal Trees of Life (PAFTOL) project at Royal Botanic Gardens, Kew (https://www.kew.org/science/our-science/projects/plant-and-fungal-trees-of-life) has been making good progress in recent months towards a complete genus-level phylogeny of legumes based on target enrichment sequencing using the universal probe set Angiosperms353. The team, thanks in large part to invaluable help from Gwilym Lewis, has now secured material (DNA, tissue) or sequence data for all genera of legumes currently recognized with just a few exceptions (see below). Lead on the project is Rafaela Trad, postdoctoral fellow at Royal Botanic Gardens Edinburgh, funded by the Botanics Foundation. Working in collaboration with Rafaela and the PAFTOL team are Greg Kenicer, Flávia Pezzini, Toby Pennington, Gwilym Lewis and Bente Klitgaard with support from Janet Sprent. The group will lead on the phylogenomic analyses for the family once the recently acquired material has been sequenced. It is important to note that for these genus-level analyses in PAFTOL, in most cases, only one species per genus has been sampled.

The genera for which material is still sought are *Delgadoa*, *Kanburia*, *Mantiquera*, *Neocolletia*, *Pictarena*, *Sartoria*, and *Vuralia*. We have a few possibilities in mind of source material for these, but if you have access to tissue or DNA for species of these genera, please get in touch with Félix Forest.

Phylogenomics of Caesalpinioideae

A new backbone phylogeny for subfamily Caesalpinioideae, constructed using the 997 nuclear genes of the Mimobaits gene set of Koenen et al. (2020), and sampling 420 species from 147 of the then 152 genera, was published during 2022 (Ringelberg et al. 2022a). The extensive non-monophyly of genera revealed in this phylogeny was documented in detail by Ringelberg et al. (2022a), forming the basis for subsequent re-delimitation of 15 genera across the subfamily which is the focus of Advances in Legume Systematics 14 (Part 1), also published in 2022. This new backbone phylogeny has been deployed to investigate the evolutionary stability of nodulation across subfamily Caesalpinioideae (Faria et al. 2022) and the biogeography of mimosoids (Ringelberg et al. 2022b) and provides the basis for the upcoming new higher-level tribal and clade-based classification of the subfamily in preparation for publication in ALS14 Part 2.



Faria, S.M., Ringelberg, J., Gross, E., Koenen, E.J.M., Cardoso, D., Ametsitsi, J.K.D., Akomatey, J., Maluk, M., Tak, N., Gehlot, H.S., Wright, K.M., Teaumroong, N., Songwattana, P., de Lima, H.C., Prin, Y., Zartmann, C., Sprent, J.I., Ardley, J., Hughes, C.E. & James, E.K. (2022). The innovation of the symbiosome has enhanced the evolutionary stability of nitrogen fixation in legumes. *New Phytologist* 235: 2365-2377. https://doi.org/10.1111/nph.18321

Koenen, E.J.M., Kidner, C., de Souza, E.R., Simon, M.F., Iganci, J.R., Nicholls, J.A., Brown, G.K., de Queiroz, L.P., Luckow, M., Lewis, G.P., Pennington, R.T. & Hughes, C.E. (2020). Hybrid capture of 964 nuclear genes resolves evolutionary relationships in the mimosoid legumes and reveals the polytomous origins of a large pantropical radiation. *American Journal of Botany* 107: 1710-1735. https://bsapubs.onlinelibrary.wiley.com/doi/10.1002/ajb2.1568

Ringelberg, J.J., Koenen, E.J.M., Iganci, J.R., Queiroz, L.P.de, Murphy, D.J., Gaudeul, M., Bruneau, M., Luckow, M., Lewis, G.P. & Hughes, C.E. (2022a). Phylogenomic analysis of 997 nuclear genes reveals the need for extensive generic re-delimitation in Caesalpinioideae (Leguminosae). *PhytoKeys* 205: 3-58. https://doi.org/10.3897/phytokeys.205.85866

Ringelberg, J.J., Koenen, E.J.M., Sauter, B., Aebli, A., Rando, J.G., Iganci, J.R., Queiroz, L.P.de, Murphy, D.J., Gaudeul, M., Bruneau, A., Luckow, M., Lewis, G.P., Miller, J.T., Simon, M.F., Jordão, L.S.B., Morales, M., Bailey, C.D., Nageswara-Rao, M., Loiseau, O., Pennington, R.T., Dexter, K.G., Zimmermann, N.E. & Hughes, C.E. (2022b). Precipitation is the main axis of tropical phylogenetic turnover across space and time. *Science Advances,* In Press. https://www.biorxiv.org/content/10.1101/2022.05.27.493777v2.abstract

OCCURRENCE DATA WORKING GROUP

Coordinators:
Jens Ringelberg (University of Zürich, Switzerland; moving to University of Edinburgh, UK)
Edeline Gagnon (Technical University Munich, Germany; moving to University of Guelph, Canada)
Joe Miller (Global Biodiversity Information Facility, GBIF)

2022 has been a productive year for legume biogeography research. Multiple research groups have spent a lot of time and energy assembling substantial new quality-controlled occurrence datasets, several of which are (nearly) finished and being used to address various exciting research questions about legume biogeography.

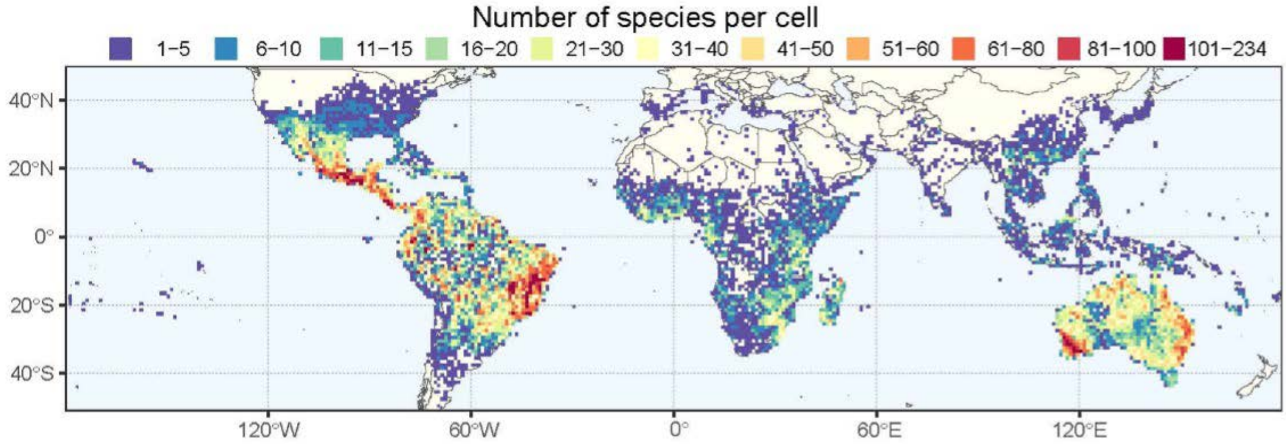
Moabe Fernandes and **Toby Pennington** (University of Exeter, U.K.) are compiling an occurrence dataset for all legumes in the Americas. They are progressing well, have assembled data for almost 90% of their target species and are already producing extinction risk assessments and mapping areas with high densities of threatened species. Their next step will be to combine their occurrence data with phylogenetic information to investigate patterns of phylogenetic diversity across the Americas.

In her MSc thesis, **Charlotte Hagelstam-Renshaw** (Université de Montréal), supervised by **Anne Bruneau** (Université de Montréal) and **Warren Cardinal-McTeague** (University of British Columbia), has compiled occurrence data and species distribution maps for the 14 genera of subfamily Cercidoideae, as part of a study of biome evolution across the subfamily. In addition, the Bruneau and Cardinal-McTeague labs have also assembled cleaned occurrence data for a majority of the 85 species (17 genera) in subfamily Dialioideae.

Jens Ringelberg, supervised by **Colin Hughes** (University of Zurich), has assembled and cleaned species-level occurrence data for 93% of the ca. 3,500 species representing all 100 genera in the mimosoid clade (subfamily Caesalpinioideae). Together with **Erik Koenen** (University of Brussels) and a large number of collaborators, they have used this large new occurrence dataset to assess phylogenetic turnover of mimosoids across the tropics. Their aim was to gain insights into how a single legume clade was able to diversify across all major lowland tropical biomes on every tropical continent and a paper resulting from this work is now in press.

Finally, the upcoming Advances in Legume Systematics, ALS14, Part 2 will feature a synopsis of the 163 genera in subfamily Caesalpinioideae, including detailed distribution maps for all genera based on quality-controlled occurrence data. ALS14 is a highly collaborative project; occurrence data of non-mimosoid Caesalpinioideae have been contributed by **Juliana Rando** (Universidade Federal do Oeste da Bahia, Brazil),

Guilherme Sousa (Universidade Estadual de Campinas, Brazil), **Haroldo de Lima** (Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, Brazil) and **Domingos Cardoso** (Universidade Federal do Bahia & Jardim Botânico do Rio de Janeiro, Brazil), and the data have been compiled and cleaned with the help of many legume researchers.



The distribution of Caesalpinioideae species-richness in one-degree cells across the tropics (Advances in Legume Systematics, ALS14, Part 2, in prep.).

Publications from all these projects are expected in the near future, meaning that 2023 looks set to be another very exciting year in legume biogeography research.

As a researcher it can sometimes be easy to forget that compiling (occurrence) datasets is not the only thing that matters; equally important is how the resulting datasets are stored and made available. Over the past few years, legume researchers have curated various spatial datasets to address specific research questions. These data are usually published with the manuscript as supplementary data, often deposited in Dryad, Figshare, Zenodo and the likes. A lot of work goes into compiling and cleaning these datasets and their reuse can save other people time. Keep your eyes on the Legume Data Portal, where many of these maps based on cleaned occurrence datasets will be made available, and as we continue to explore options for storing both the maps and data. Ultimately, the curated datasets could be integrated into one larger legume-wide global dataset once any discrepancies in data cleaning protocols are reconciled.

GBIF is also exploring how to make these cleaned, quality-controlled data available. They are exploring a rule-based system that would flag occurrences during indexing in a similar way to a researcher using R scripts for data cleaning. GBIF hopes to have a demonstration ready for the ILC8 conference in Brazil in August. The goal is that the legume community could come up with a set of rules that describe quality controlled data that GBIF can implement. Stay tuned!

Also from GBIF, take a look at the new clustering feature to search for similarities in occurrence data fields across datasets shared with GBIF. Joe Miller has used this feature to identify putative duplicate specimens of Senegalia that were collected in Brazil. Check out Joe's GBIF data blog post about the patterns of specimen data sharing between Brazilian herbaria and large northern hemisphere herbaria. Please provide feedback, make comments, and share ideas in the discussion on the GBIF community forum.

Finally, the Occurrence Data Working Group needs your help! As an initial step to make cleaned legume occurrence datasets more easily accessible we are assembling a list with links to all existing datasets that are available online alongside who assembled the data and references to relevant papers. Our aim is to create a list that can easily be updated whenever new data become available. If you have a dataset that you would like to be included, please send us a message!

TRAITS WORKING GROUP

Coordinators:
Leonardo Borges (Universidade Federal de São Carlos, Brazil)
Renske Onstein (Naturalis Biodiversity Centre, Netherlands &
German Centre for Integrative Biodiversity Research, iDiv, Germany)

The Traits Working Group continues to focus on promoting collaboration between researchers working with legume morphology, including functional trait data. Information on on-going projects, research groups, a list of legume traits and definitions, and monographs used to extract trait data are all available in the Traits WG Google Drive (https://t.ly/5yGn0), which acts as a hub for the traits WG.

2022 saw the addition of two new projects working with trait data, both on Papilionoideae, one by Liam Trethowan, Gwil Lewis, and Ruth Clark, and another by Charles Stirton. These are welcome additions, particularly as most on-going trait related work so far has been on mimosoids. For 2023, we expect novelties to remain centered on the mimosoids, as results of ongoing projects start to become available, especially those being conducted by doctoral student Rachel Ferreira in Renske Onstein's group. In addition, Leo Borges is working with Rob Guralnick, Ryan Folk and colleagues at the University of Florida and Mississippi State University to generate a morphological dataset for many mimosoid species.

Short digests of two legume papers focused on legume trait evolution published in 2022, compiled by legume PhD students, Francisco Velásquez Puentes and Rachel Souza Ferreira, are presented elsewhere in this issue of the Bean Bag.

As these initiatives move forward, we will soon have a significant, albeit taxonomically restricted, body of legume trait data available. Facilitating the (re)use of these datasets is extremely important and should become a major goal of the legume community.

Although researchers should be free to deposit data on their preferred platform (e.g., MorphoBank), it is important to promote minimal standardization of data structure and terminology to facilitate joint use of datasets built by different projects. What should be the extent of this standardization and how should data be aggregated are important questions to be discussed and resolved by the legume research community at the forthcoming 8th International Legume Conference in Brazil in August.

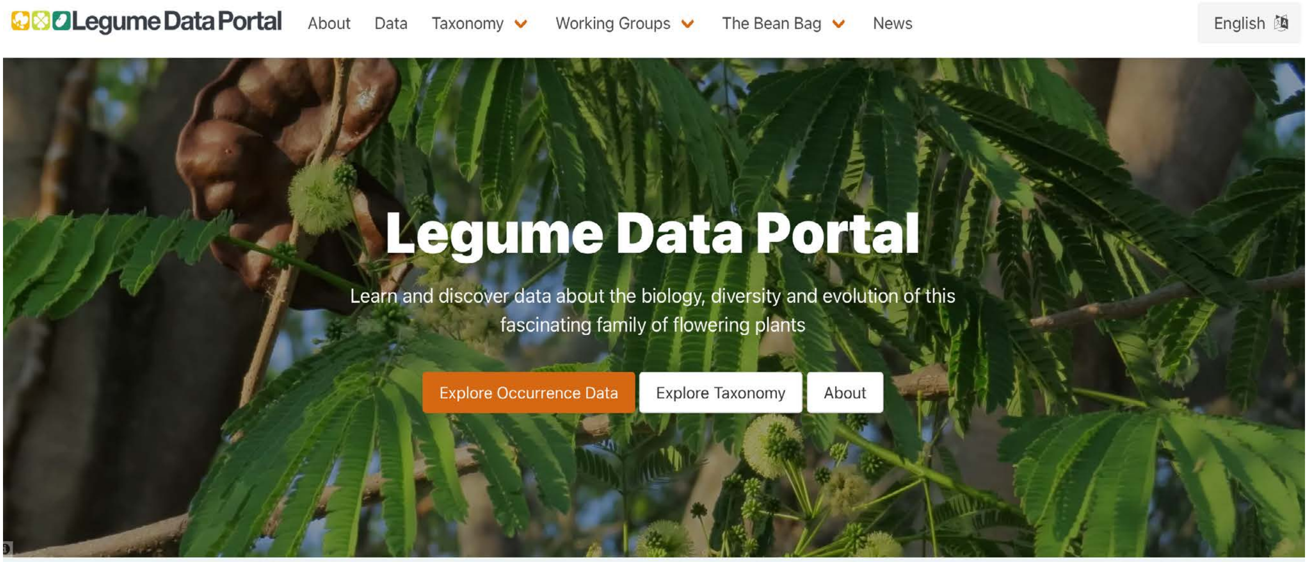
In the meantime, we repeat our invitation for anyone working on legume trait data to share information about your project on the Google Drive mentioned above. It is our main tool to keep the LPWG members up to date on past and current research and to provide opportunities for increased collaboration within our community.

Dissected corollas of four *Mimosa* species, under study by PhD candidate Monique Maianne (Universidade Federal de São Carlos, Brazil). Left to right: *M. bifurca* Benth., *M. elliptica* Benth., *M. hirsutissima* Mart., *M. lewisii* Barneby. Photos by Monique Maianne.

LEGUME DATA PORTAL

Coordinators:
Anne Bruneau (Université de Montréal, Canada)
Carole Sinou (Université de Montréal & Canadensys, Canada)
Joe Miller (Global Biodiversity Information Facility, GBIF)

The Legume Data Portal (https://www.legumedata.org/) was launched in September 2021 to encourage international collaboration and exchange amongst scientists and students, and provide a platform to share data and expertise on the systematics and evolution of the Leguminosae with a broad community of users. The legume species checklist arranged by subfamilies is available on the Portal and is being regularly updated there. This checklist provides the taxonomic backbone for all other legume data initiatives and there are many possibilities for adding new data and resources to the Portal. This raises questions surrounding what additional data should be incorporated and what are the criteria and



processes for adding something to the portal? Since the portal started, decisions about the Data Portal have been taken largely by **Joe Miller** (GBIF) and **Anne Bruneau**, but obviously this is not the best practice. Anne and Joe would like to discuss the Legume Portal content more widely with the legume community to potentially establish a light-touch Content Committee. Please contact Joe and Anne if you would like to be involved and we can progress some ideas and discuss at the August ILC8 (8th International Legume Conference).

Keep your eyes on the home page of the Legume Data Portal for upcoming activities and announcements pertinent to the legume systematics community. If you have news to share (events, prizes, special publications), send us a short summary and photo so that we can post them on the Portal.

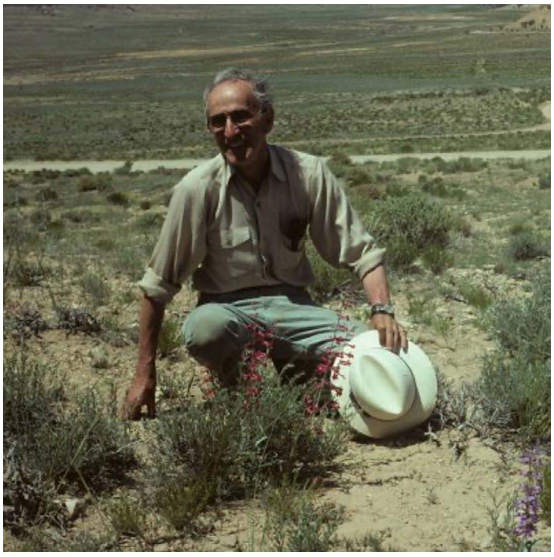
Calliandra nebulosa Barneby (Caesalpinioideae), photo by Colin Hughes.

THE RUPERT BARNEBY AWARD OF THE NEW YORK BOTANICAL GARDEN

Benjamin M. Torke (New York Botanical Garden, NYBG, USA)

FUNDING OPPORTUNITY

The Rupert Barneby Award, named in honor of the late NYBG scientist and renowned legume expert, consists of US$2000 granted annually to assist researchers to visit the New York Botanical Garden to study the rich herbarium collection of Leguminosae. Graduate students and early career professionals with research in systematics and/or legume diversity are given special consideration. ***Projects that will result in the improved curation of the collection are desirable.***



Dr. Rupert Barneby

Anyone interested in applying for the award should submit their: 1) curriculum vitae; 2) a proposal describing the project for which the award is sought; 3) contact information for two individuals who can vouch for the qualifications of the applicant. ***The proposal should address specifically the activities to be performed at NYBG*** and should consist of: 1) title page with proposal title, applicant's name, address, and e-mail address; 2) body of the proposal of no more than two pages, including justification, objectives, and research plan; 3) literature cited; 4) travel budget.

Please email your application to ***Dr. Benjamin M. Torke*** (btorke@nybg.org) no later than ***April 1, 2023***.

Announcement of the recipient will be made by May 1, 2023. Travel to NYBG should be planned for some period between July 1, 2023 and June 30, 2024. Recipients are asked to give a presentation at NYBG about their research.

8TH INTERNATIONAL LEGUME CONFERENCE

Integrating Knowledge on the Legume Family

Marcelo Simon (Empresa Brasileira de Pesquisa Agropecuária, EMBRAPA, Brazil)
Tânia Moura (Instituto Federal Goiano, Brazil)

We are pleased to announce that the global legume community is meeting in-person after five years since our last conference. The 8th International Legume Conference will take place from **6—11 August 2023** in Brazil, a country known for its extraordinary biological and cultural diversity. The host city, the colonial town of Pirenópolis, is located at the heart of the diverse and unique Cerrado, a savanna dominated vegetation home to nearly 1300 legume species. Pirenópolis, one of the most charming places in Goiás state is known for the beautiful waterfalls that surround the town, being the perfect setting for nature lovers. The town, which was founded back in 1725 by gold miners, has numerous well-preserved colonial-era houses, churches, and is home to cultural festivals and typical countryside cuisine.

The 8ILC committee is organizing several excursions, which include a one-day trip (mid-conference excursion) for all participants, as well as post-conference trips targeting different destinations in Brazil.

Copaifera langsdorfii Desf. (Detarioideae), photo by Leonardo Borges

The scientific program of the 8ILC is composed of eight main symposia, which will include invited lectures, talks and posters:

- Assembling global checklists and floras of legumes
- Updates in legume systematics
- Advances in legume morphology and anatomy
- Legumes and society: Genetic resources, uses and conservation
- Legume research in the era of genomics
- Animals and legumes: From mutualistic to antagonistic interactions
- Novelties in legume-rhizobia symbiosis
- Legumes as a model for biogeography, macroecology and evolution

Registration for the 8ILC is now open! Please check the conference website at www.8ilc.com for online registration, abstract submission and additional information.

We are looking forward to warmly welcoming all of you to Brazil, and enhancing collaboration within the legume community.

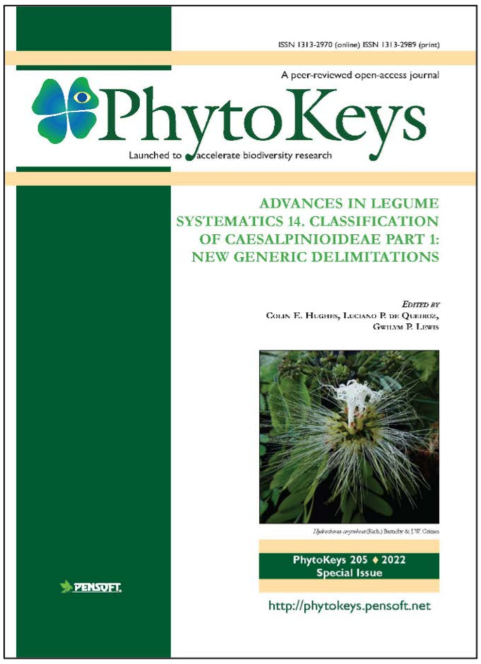
Marcelo Simon & Tânia Moura
on behalf of the 8ILC organizing committee

Downtown Pirenópolis, Goiás, in central Brazil.

ADVANCES IN LEGUME SYSTEMATICS 14

Classification of Caesalpinioideae. Part 1 – New Generic Delimitations

Colin Hughes (University of Zürich, Switzerland)
Luciano P. de Queiroz (Universidade Estadual de Feira de Santana, Brazil)
Gwilym P. Lewis (Royal Botanic Gardens, Kew, UK)



Advances in Legume Systematics (ALS) 14 Part 1, edited by Colin E. Hughes, Luciano P. de Queiroz and Gwilym P. Lewis, was published during 2022 as a Special Issue of the journal PhytoKeys (https://phytokeys.pensoft.net/issue/3247/). It includes 16 papers, involving 54 authors from 13 countries and is focused on generic delimitation across subfamily Caesalpinioideae which includes the mimosoid clade (former subfamily Mimosoideae). Phylogenomic analyses presented in the introductory paper show that 22 of the 152 genera previously recognized in Caesalpinioideae are non-monophyletic or nested within another genus. The papers in ALS14 address this extensive non-monophyly, reclassifying 15 of these 22 genera. Nine new genera are described (*Boliviadendron*, *Gretheria*, *Gwilymia*, *Heliodendron*, *Marlimorimia*, *Mezcala*, *Naiadendron*, *Osodendron*, *Ricoa*), five genera are reinstated (*Anonychium*, *Neltuma*, *Pseudalbizzia*, *Strombocarpa*, *Ticanto*), and three genera are subsumed into synonymy of other genera (*Balizia*, *Elephantorrhiza*, *Pseudopiptadenia*), bringing the number of Caesalpinioideae genera to 163. In total, 139 new name combinations are proposed. These generic re-circumscriptions include splitting of the large pantropical genus *Albizia* (the last 'dustbin' genus of mimosoid legumes) and the amphi-Atlantic *Prosopis*, one of the most important silvopastoral tree genera of tropical drylands. Conversely the genus *Hydrochorea*, previously restricted to the New World, is re-circumscribed with an amphi-Atlantic distribution to include *Balizia* as well as two species from west Africa formerly placed in *Albizia*.

Four of the genera newly described in this Special Issue are named after prominent contemporary legume taxonomists, three women and one man: *Gretheria* for Rosaura Grether, a Mexican specialist on the genus *Mimosa*, *Ricoa* for Lourdes Rico, another Mexican botanist who worked on mimosoid legumes based at Kew, *Marlimorimia*, in honour of Marli Pires Morim of the Jardim Botânico do Rio de Janeiro, Brazil in recognition of her contributions to the taxonomy of mimosoid legumes, and *Gwilymia* named for Gwilym Lewis, in honour of one of the world's most experienced and productive legume taxonomists who is legume research leader in the Herbarium at the Royal Botanic Gardens, Kew.

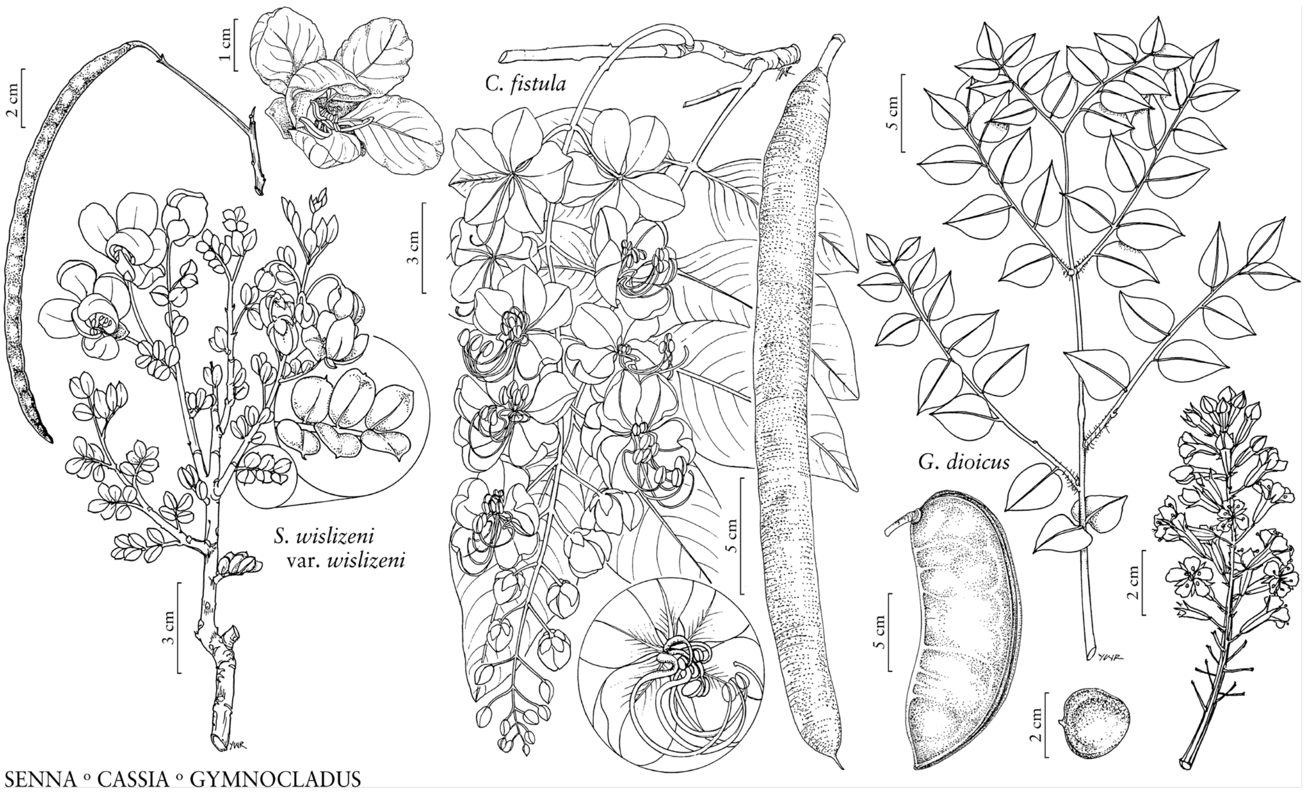
These taxonomic changes fundamentally re-shape the generic classification of Caesalpinioideae and lay foundations for a new higher-level classification of the subfamily which is in preparation and will be published as ALS14 Part 2 in 2023.

New genera described in ALS14 Part 1: **A – C** *Osodendron*; **D** *Marlimorimia*; **E – F** *Gwilymia*; **G** *Naiadendron*; **H – J** *Heliodendron*; **K – L** *Boliviadendron*; **M – N** *Gretheria*; **O** *Mezcala*. Photos: **A – C** William D. Hawthorne, **D** Luciano P. de Queiroz, **E – G** Marcelo F. Simon, **H** Stuart Worboys, **I** BRI AQ0234095, **J** Murray Fagg, Australia Plant Image Index, **K – N** Colin E. Hughes, **O** José Luis Contreras Jiménez.

FLORA OF NORTH AMERICA LEGUME VOLUME

Compiled by Tammy Charron
Flora of North America Managing Editor, Missouri Botanical Garden

The legume volume of ***Flora of North America North of Mexico Volume 11: Magnoliophyta: Fabaceae***, parts 1 and 2 is scheduled for publication by Oxford University Press on 23rd March 2023. The product of a large collaboration involving an international team of experts, this is the first comprehensive treatment of the legumes of North America north of Mexico to reflect the extensive changes to classification resulting from recent research and current understanding of the diversity and distribution of the family. It includes treatments prepared by 70 authors covering 1,345 species in 153 genera. All legume genera, native and naturalized, are treated, including *Astragalus*, the largest genus in the world, with 350+ species in the Flora. Descriptions for all genera, species, and recognized infraspecific taxa are provided, as are occurrence maps for all species and infraspecifics. Every genus and 15% of the species are illustrated. Identification keys are included for taxa at all ranks.



One of the plates of botanical illustrations from the legume volume of *Flora of North America*, drawn by Yevonn Wilson Ramsey, courtesy of the Flora of North America Association.

This volume was edited by James L. Zarucchi†, Lead Editor to 2019, Geoffrey A. Levin, Lead Editor (2019–2021), Michael A. Vincent, Lead Taxon Editor for Fabaceae, David E. Boufford, Thomas G. Lammers, and Jay A. Raveill, Assisting Editors for Fabaceae, Kanchi Gandhi, Nomenclatural and Etymological Editor, Robert W. Kiger, Bibliographic Editor, John L. Strother, Reviewing Editor, and Martha J. Hill, Senior Technical Editor.

The legume volume of FNA is dedicated to Jim Zarucchi, a prominent legume systematist who worked at the Missouri Botanical Garden from 1984 to 2019. Jim was heavily involved in the FNA project, serving as Editorial Director of FNA and as lead editor of *Volume 10, Magnoliophyta: Proteaceae to Elaeagnaceae* and *Volume 11, Magnoliophyta: Fabaceae*, until his untimely death in 2019. A tribute to Jim was published in the Bean Bag, Issue 67 in 2020.

Volume 11 is the twenty-third volume to be published in the planned 30-volume *Flora of North America North of Mexico* (FNA) series, which presents for the first time, in one published reference source, information on the names, taxonomic relationships, continent-wide distributions, and morphological characteristics of all plants native and naturalized in North America north of Mexico. FNA Volume 11 will be available to purchase at global.oup.com/academic/content/series/f/flora-of-north-america-fna/.

A selection of legumes of North America, left to right, top to bottom: *Apios americana* (photo Anne Bruneau), *Astragalus mollissimus* var. *mogollonicus* (photo Marty Wojciechowski), *Pediomelum esculentum* (photo Matt Lavin), *Leucaena retusa* (photo Colin Hughes); *Robinia neomexicana* (photo Marty Wojciechowski); *Lupinus nootkatensis* (photo Colin Hughes).

Notes on the Reproductive Biology, Population Ecology, and Conservation of the Critically Endangered *Sanjappa cynometroides* (Leguminosae: Caesalpinioideae) from India

Gopika Suresh (St Teresas College, Kerala, India)
Krishnaraj M.V. (Baselius College, Kerala, India)

Sanjappa cynometroides (Bedd.) E.R.Souza & Krishnaraj (mimosoid clade, Caesalpinioideae) is a monotypic genus of small legume trees narrowly endemic to Kerala in southern India. The taxonomic identity of this enigmatic taxon, previously placed in the genus *Calliandra*, was recently resolved using morphological and molecular phylogenetic analyses by Souza et al. (2016) who described the genus *Sanjappa* to account for its isolated phylogenetic position. However, despite these taxonomic advances and the conservation importance of the genus, data on the reproductive biology and ecology of *Sanjappa*, that could underpin conservation measures, are still lacking.

This poorly-known legume tree, at one time thought to be extinct, is currently known from just two populations, in Kallar and Rosemala, in the southern portion of Kerala State in the Western Ghats of southern India. *Sanjappa* is thus globally rare and was categorized as Critically Endangered by Souza et al. (2016). Field observations show that both of these populations are found growing near streams, that the number of individuals is fewer than 50, and that there is low fruit set and limited seedling regeneration even though there are 4–6 seeds per fruit. The reasons for poor regeneration in the field are unknown, but heavy fruit predation has been observed. The nearby rubber plantation and local community use the branches of this tree for making household utensils without knowledge of its taxonomic or conservation significance, adversely affecting the populations. The flowering and fruiting time of *Sanjappa cynometroides* is from August to January (Souza et al. 2016). Floral ontogeny of *Sanjappa* is still lacking.

A new study of the reproductive biology and population ecology of *Sanjappa* is being undertaken by doctoral student Gopika Suresh with a programme of field observations during 2022.

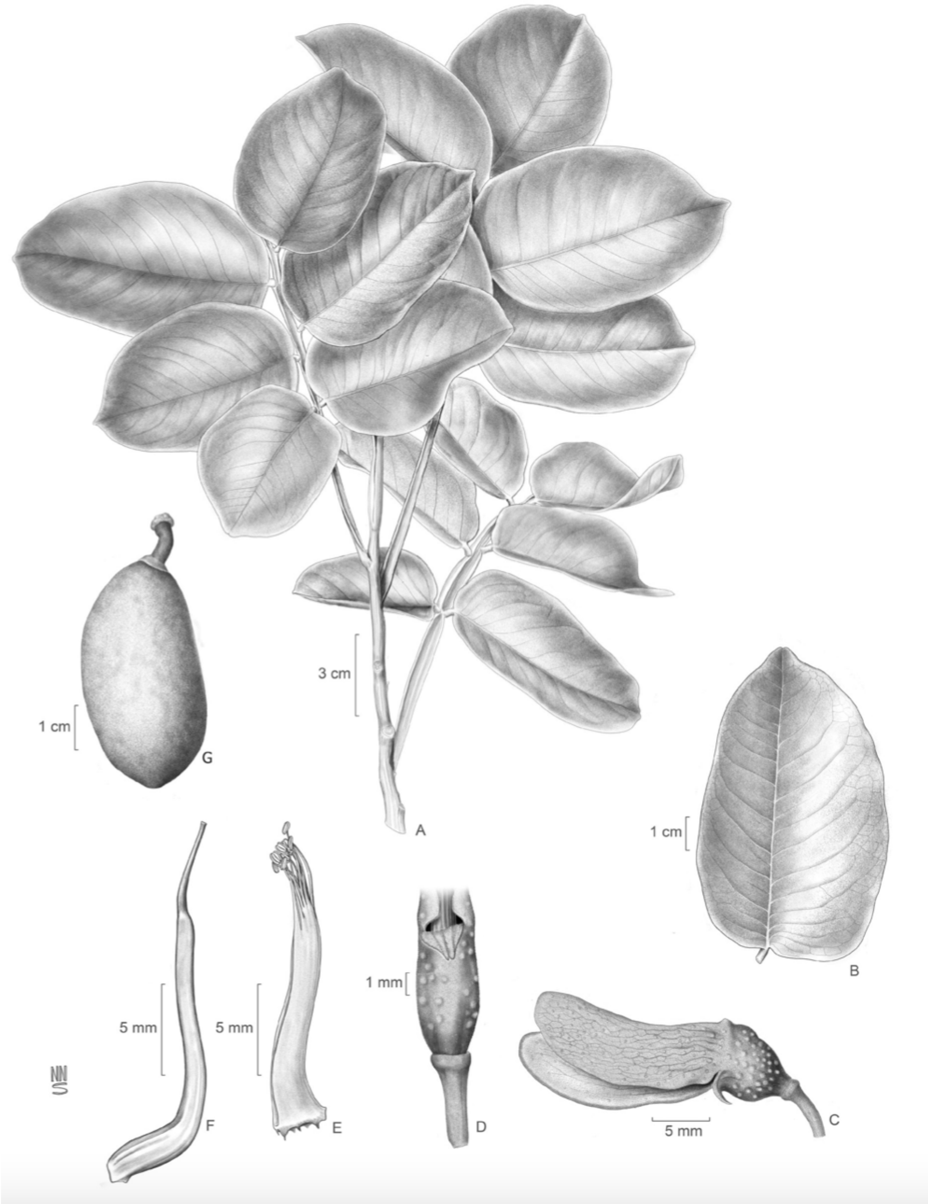
Reference: Souza, E.R., Krishnaraj, M.V. and de Queiroz, L.P. (2016) *Sanjappa*, a new genus in the tribe Ingeae (Leguminosae, Mimosoideae) from India. Rheedea 26(1): 1–12.

Sanjappa cynometroides (Bedd.) E.R.Souza & Krishnaraj (Caesalpinioideae), fruit, photo by authors.

ARTIST SPOTLIGHT: NATANAEL NASCIMENTO

Compiled by Domingos Cardoso

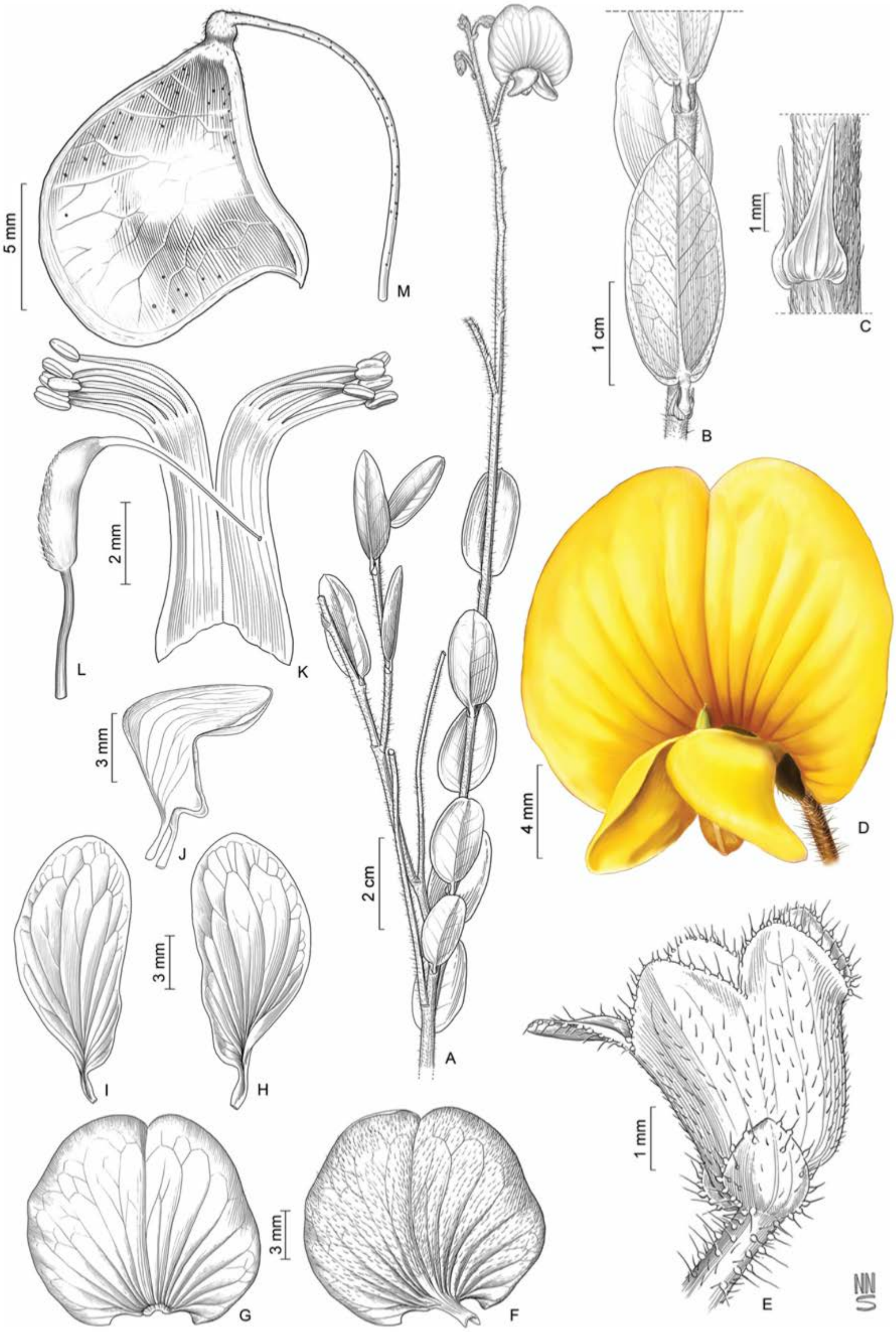
Natanael Nascimento graduated in biological sciences at the Universidade Federal da Bahia, in Salvador, Brazil and has dedicated his career to scientific illustration in botany. Working closely with Domingos Cardoso, Natanael has illustrated a series of new legume species over the last few years including ***Aeschynomene chicocesariana*** D.B.O.S. Cardoso & G. Ramos, and the remarkable new giant Atlantic rainforest tree ***Dipteryx hermetopascoaliana*** C.S. Carvalho, H.C. Lima & D.B.O.S. Cardoso, both illustrated here. The latter species is highlighted in the 2022 New Legume Species Highlights section (page 35). Other recent plates include several stunning new species of the genus ***Harpalyce***, ***Rhynchosia franciscana*** L.P. Queiroz & D.B.O.S. Cardoso, and upcoming monographic sets of drawings of species of the genera ***Monopteryx*** and ***Dipteryx***.



Dipteryx hermetopascoaliana C.S. Carvalho, H.C. Lima & D.B.O.S. Cardoso (Papilionoideae), illustrated by Natanael Nascimento and published in Carvalho et al., *Bot. J. Linn. Soc.* (2023).

In 2018, Natanael won the prestigious Margaret Flockton Prize awarded by the Royal Botanic Gardens Sydney, Australia (https://www.botanicalartandartists.com/news/nataneal-nascimento-wins-margaret-flockton-award-2018). All of his illustrations are made with Photoshop using a pen tablet. Of course, Natanael's work is not confined to legumes. For example, he also did the scientific illustrations for a book on the Brazilian Asteraceae (https://repositorio.ufba.br/handle/ri/31892). Latterly, Natanael has been working on tattoos, spreading the beauty of nature and plants via his designs on people's bodies!

Further information about Natanael is on his website **@natan.bio**
(https://www.instagram.com/natan.bio/)



Aeschynomene chicocesariana D.B.O.S. Cardoso & G. Ramos (Papilionoideae), illustrated by Natanael Nascimento and published in Cardoso et al., *Syst. Bot.* (2019).

GALLERY OF LEGUMINOLOGISTS

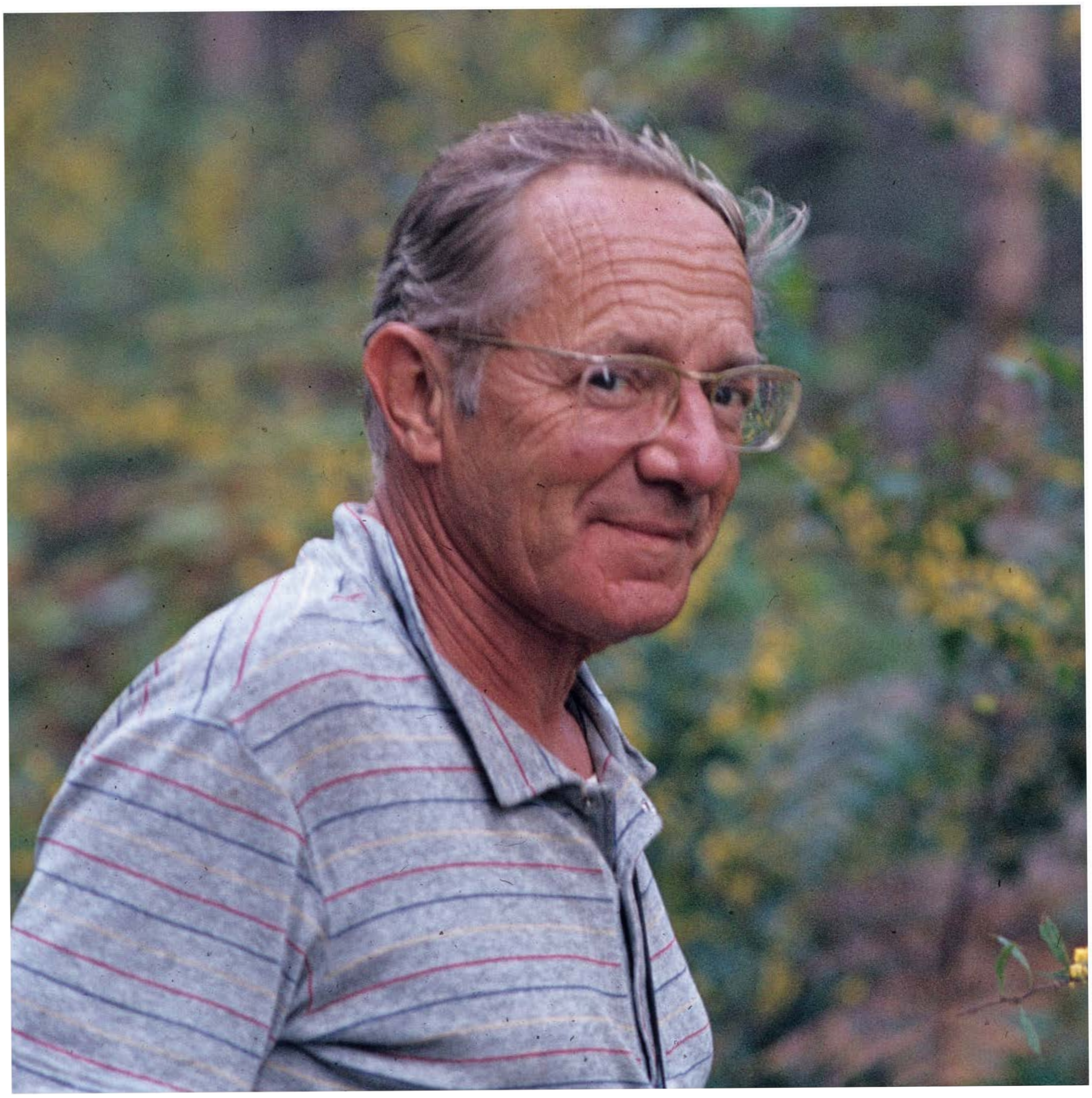
Compiled by Colin Hughes, Bruce Maslin & Helen Fortune-Hopkins

Jacques Vassal (1933–)

Jacques Vassal. Near Donnybrook, southwest Western Australia, examining *Acacia insolita*, 1 August 1981, photo Bruce Maslin, and 2016 in France, photo courtesy of Jacques Vassal.

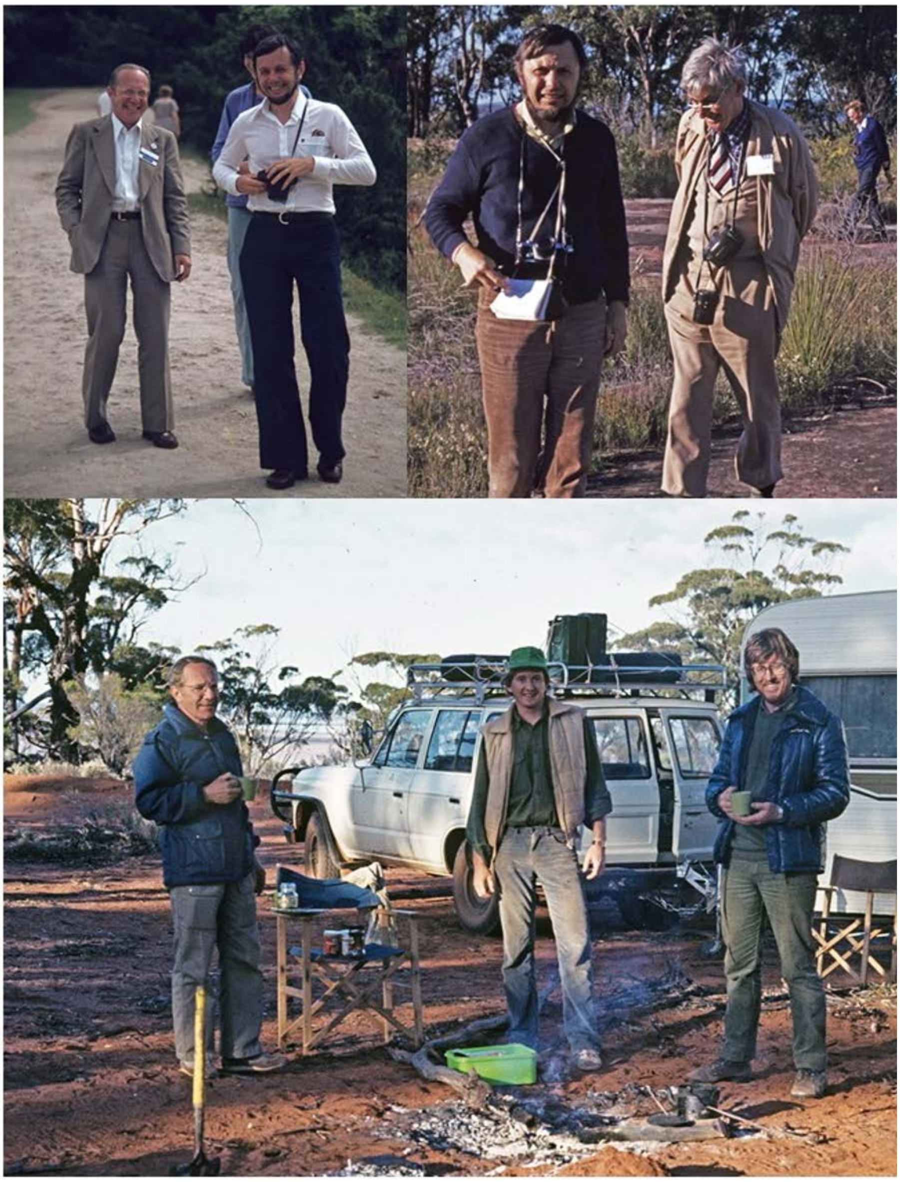
Jacques Vassal was a Professor at the Laboratoire d'Ecologie Terrestre, Université Paul Sabatier in Toulouse, France for most of his professional life. Vassal studied mimosoid legumes and especially the genus *Acacia* s.l., and in 1972 he proposed the first major rearrangement of Bentham's classification of *Acacia* s.l., dividing the genus into three subgenera, *Acacia*, *Aculeiferum* and *Heterophyllum* (= Phyllodineae). This work provided the starting point and conceptual framework for subsequent reclassification of the genus by Pedley and others. Between 1977 and 1991 Vassal made many visits to Sahelian Africa, especially to Mali and Senegal, to study the genus Acacia s.l. and carry out experiments to improve production of Gum Arabic (*Senegalia senegal*) as a means of enhancing livelihoods and stemming desertification. Another of Vassal's achievements was as founder of the *International Group for the Study of Mimosoideae*, IGSM, established in 1973 with 30 members to promote research, communication and collaboration among mimosoid researchers. He was editor of the IGSM Bulletin, which was published annually for the next 19 years (http://worldwidewattle.com/socgroups/igsm/bulletin.php). In terms of their collaborative spirit and approach, the IGSM and Vassal's Bulletin were very much forerunners of the Bean Bag and the Legume Phylogeny Working Group. In his retirement, Jacques saved from destruction and archived various manuscripts, mainly letters from the 18th to 20th centuries, that documented relationships between both French and foreign naturalists with botanists from Toulouse. These are now housed in the local archives (https://archives.haute-garonne.fr/archive/fonds/FRAD031_0242J).

Philippe Guinet (1925–2019)



Philippe Guinet. Northcliffe, southwest Western Australia, 28 Sept. 1983, photo Bruce Maslin.

Philippe Guinet, French horticulturalist, botanist and palynologist worked for most of his career at the Université des Sciences et Techniques du Languedoc, Montpellier, France. Guinet's early work was wide ranging. He started out as a horticulturalist at the school of Horticulture in Versailles where he was head gardener in 1947-1948, and in 1949 was appointed as *ingénieur horticole* to develop a botanical garden at Béni-Abbès in Algeria. In the early 1950s he undertook several field collecting expeditions to the western Sahara, in southern Morocco and Algeria, where, alongside plants, he discovered rock carvings in the Monts d'Ougarta in Algeria in 1950. From 1950-1952 he was also involved in the development of the Botanical Garden in Strasbourg. His early botanical research spanned taxonomic work on grasses and seeds of *Chenopodium*, the latter while he was working as an assistant at the Muséum National d'Histoire Naturelle in Paris. Later, for his PhD, he embarked on study of the extremely diverse pollen of mimosoid legumes, publishing a landmark study in 1969 [Guinet, P. (1969). Les Mimosacées, étude de palynologie fondamentale, corrélations, évolution. Travaux de la Section Scientifique et Technique Pondichéry 9, 1-293] which remains the key reference on the subject. This monumental work formed the basis for Guinet's reviews of legume pollen in Advances in Legume Systematics Part 1 (1981) and Advances in Legume Biology (1986). The genus *Guinetia* L.Rico & M.Sousa (now a synonym of *Calliandra*) was named in his honour. Because pollen is so diverse and taxonomically useful in mimosoids, Guinet became heavily involved in their classification, including delimitation of a number of genera in collaboration with other specialists through the 1980s and 1990s.



Clockwise from top left: Philippe Guinet and Jacques Vassal at Box Hill, London during the third meeting of the International Group for the Study of Mimosoideae, IGSM, at Kew in 1978; Jacques Vassal and Pat Brenan, on an IGSM field trip to Brisbane Waters National Park, New South Wales, Australia, during the fourth IGSM meeting in August 1981; Philippe Guinet, Peter Poli and Bruce Maslin, near Esperance on the south coast of Western Australia, 1983. All photos courtesy of Bruce Maslin.

Besides both being based in southern France, these two mimosoid specialists, Jacques Vassal and Philippe Guinet, were contemporaries and worked together on *Acacia*, publishing several papers jointly [e.g., Guinet, P. and Vassal, J. (1978). Hypotheses on the differentiation of the major groups in the genus *Acacia* (Leguminosae). Kew Bulletin 32, 509-527]. They both visited Australia in the early 1980s to work on *Acacia* with Bruce Maslin, and each of them has a species of *Acacia* named by him in their honour: Vassal's Wattle, *Acacia vassalii* Maslin and Guinet's Wattle, *A. guinetii* Maslin, two narrow endemics from western Australia.

STUDENT DIGEST

Extraordinary and rapid evolution of chemical defenses in the Neotropical legume genus *Inga* Mill.

Francisco J. Velásquez-Puentes, PhD student
German Centre for Integrative Biodiversity Research, iDiv, & Leipzig University, Germany
Universidad del Norte, Barranquilla, Colombia

Unlike animals, legumes and other plants cannot run away from their natural enemies when attacked. As a result, they have evolved an impressive array of physical and chemical defense strategies to deter even the hungriest vegan enemies. Among those defenses, plant secondary metabolites, a plethora of diverse chemical compounds, stand out for deterring herbivores and pathogens. The diversity of secondary metabolites across legumes as a whole has been extensively documented over many decades, culminating in the Phytochemical Dictionary of the Leguminosae (Bisby et al. 1994), but the detailed evolutionary trajectories of legume defense chemicals remain poorly understood, especially at species level. Understanding the evolutionary processes and mechanisms involved in the evolution of novel plant defense compounds is important because natural enemies are detrimental for plant species survival, presenting strong selective pressures for evolution of chemical defenses, thereby potentially driving evolutionary diversification and community assembly, and facilitating species co-existence (Marquis et al. 2016).

In a recently published paper in the *New Phytologist*, Forrister et al. (2022) provide some answers to these fundamental questions using the legume genus *Inga* Mill., which has emerged as a model system for understanding rapid recent evolutionary radiation in Neotropical rain forests (e.g., Richardson et al. 2001; Nicholls et al. 2015). Forrister et al. assembled an impressive chemical dataset using metabolomics to characterize thousands of individual compounds from leaves of more than 800 individuals representing 97 species of *Inga* sampled across Neotropical rain forests in Brazil, Ecuador, French Guiana, Panama and Peru. Using a phylogeny based on targeted enrichment of >800 nuclear genes they deployed comparative phylogenetic methods to analyze the phytochemical and evolutionary uniqueness of chemical profiles across these 97 *Inga* species. What they found was striking. They showed that all species invest in structurally diverse chemical compounds, with an average of 194 distinct compounds per species, and 9,105 unique compounds across these 97 species of *Inga*. In addition to this spectacular chemical diversity, they found that chemical composition is more divergent between sister species occurring in sympatry than for those in parapatry, and more phylogenetically divergent than expected by chance, indicating that secondary metabolite composition is under strong selection pressure. Furthermore, given that the 250-300 species of *Inga* evolved in < 10 million years these diverse chemical compounds seem to have evolved extremely rapidly and multiple times, i.e., they are evolutionary extremely labile. This has resulted in a reduced set of shared pests and pathogens, which favors species co-existence due to reduced negative density dependence effects (Janzen 1970; Connell 1971; Chesson 2000; Kursar et al. 2009).

Inga species from left: flowers of *Inga vera*; young leaf of *I. oerstediana* showing extrafloral nectaries between leaflet pairs; inflorescences of *I. jinicuil*. Photos: Colin Hughes.

But how do those chemical defenses evolve so quickly? The authors suggest that instead of evolving gradually, chemical profiles have evolved under a model of divergent adaptation where transcriptional gene regulation coupled with "lego" chemistry (i.e., addition of chemical side groups in a combinatorial manner from a relatively small set of building blocks) provides the most plausible mechanism to explain the rapid evolution of novel combinations of metabolites and chemical structures. In other words, it seems that genes coding for the enzymes involved in the synthesis of those defenses do not necessarily evolve quickly, but the way those genes are expressed and how metabolites are subsequently assembled varies greatly among species. This model provides a possible explanation for the evolutionary fluidity required to escape from the diverse herbivore assemblages which are exerting disparate selective pressures on their hosts (Endara et al. 2017).

Neotropical rain forests include many species-rich tree clades, including legume groups like, *Inga*, *Jupunba*, *Swartzia*, *Tachigali*, and *Zygia*, several of which appear to have diversified rapidly and recently over the last few million years and which tend to be characterized by high levels of sympatry, i.e., species co-existence. What combinations of abiotic and biotic factors drove these episodes of hyperfast rain forest species diversification remains an open question. What Forrister et al. show in this elegant study, is that secondary plant chemistry is a key niche axis facilitating species co-existence and undoubtedly played an important role in the assembly of the impressive diversity of *Inga* species in rain forests.

References

Bisby, F.A., Buckingham, J. & Harborne, J. (Eds.) (1994) Phytochemical Dictionary of the Leguminosae. Chapman & Hall, London, U.K.

Chesson, P. (2000) Mechanisms of maintenance of species diversity. *Annual Review of Ecology and Systematics* **31**: 343–366.

Connell, J.H. (1971) On the role of natural enemies in preventing competitive exclusion in some marine animals and rain forest trees. In: den Boer, P.J. & Gradwell, G.R. (Eds.) Dynamics of Populations. Centre for Agricultural Publishing and Documentation. Wageningen. 298–312.

Endara, M.J., Coley, P.D., Ghabash, G., Nicholls, J.A., Dexter, K.G., Donoso, D.A., Stone, G.N., Pennington, R.T. & Kursar, T.A. (2017) Coevolutionary arms race versus host defence chase in a tropical herbivore–plant system. *Proceedings of the National Academy of Sciences* **114**: E7499-E7505.

Forrister, D.L., Endara, M., Soule, A.J., Younkin, G.C., Mills, A.G., Lokvam, J., Dexter, K.G., Pennington, R.T., Kidner, C.A., Nicholls, J.A., Loiseau, O., Kursar, T.A. & Coley, P.D. (2022) Diversity and divergence: Evolution of secondary metabolism in the tropical tree genus *Inga*. *New Phytologist* **237**: 631-642. https://doi.org/10.1111/nph.18554

Janzen, D.H. (1970) Herbivores and the number of tree species in tropical forests. *The American Naturalist* **104**: 501–528.

Kursar, T.A., Dexter, K. G., Lokvam, J., Pennington, R.T., Richardson, J.E., Weber, M.G., Murakami, E.T., Drake, C., McGregor, R. & Coley, P.D. (2009) The evolution of anti-herbivore defences and their contribution to species coexistence in the tropical tree genus *Inga*. *Proceedings of the National Academy of Sciences* **106**: 18073–18078.

Marquis, R.J., Salazar, D., Baer, C., Reinhardt, J., Priest, G. & Barnett, K. (2016) Ode to Ehrlich and Raven or how herbivorous insects might drive plant speciation. *Ecology* **97**: 2939–2951.

Nicholls, J.A., Pennington, R.T., Koenen, E.J.M., Hughes, C.E., Hearn, J., Bunnefeld, L., Dexter, K.G., Stone, G.N. & Kidner, C.A. (2015) Using targeted enrichment of nuclear genes to increase phylogenetic resolution in the neotropical rain forest genus *Inga* (Leguminosae: Mimosoideae). *Frontiers in Plant Science* **6**. https://doi.org/10.3389/fpls.2015.00710

Richardson, J.E., Pennington, R.T., Pennington, T.D. & Hollingsworth, P.M. (2001) Rapid diversification of a species-rich genus of Neotropical rain forest trees. *Science* **293**: 2242–2245.

STUDENT DIGEST

A novel hypothesis to explain why some legume lineages retained the ability to fix nitrogen, while others did not.

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German Centre for Integrative Biodiversity Research, iDiv,
& Leipzig University, Germany

All organismic groups across the Tree of Life – plants, animals, protists and fungi – depend on nitrogen to grow and build proteins. Although Earth's atmosphere is rich in nitrogen (N_2), many soils are relatively nitrogen-poor. A small subset of plants, restricted to the N_2-fixing clade of angiosperms evolved specialized organs known as nodules, within which they house intracellular diazotrophic bacteria, collectively known as *Rhizobia*, which allows them to fix and capture atmospheric nitrogen directly (Wagner, 2011). Given the massive economic and ecological importance of N_2-fixing root nodule symbiosis, it is surprising that the evolution of nodulation remains poorly understood. Indeed, there is continued debate surrounding two contrasting evolutionary hypotheses: (i) a scenario of multiple independent parallel evolutionary origins of nodulation with few losses, vs (ii) a single gain followed by multiple independent secondary losses of nodulation potentially triggered by global scale geological and environmental change (e.g., van Velzen et al., 2019). One might expect that a functional trait that potentially confers such obvious advantages would be widespread and universally successful, but only a small subset of species in the N_2-fixing clade are able to nodulate (Werner et al., 2014). Within legumes the majority, but not all genera in subfamilies Papilionoideae and Caesalpinioideae (sensu LPWG, 2017) are generally nodulated, but nodulation is unknown in the other four legume subfamilies. The reasons for this very uneven phylogenetic distribution of nodulation remain poorly understood. Furthermore, the high diversity of nodule anatomies, morphologies and development across nodulating lagumes means that it is extremely difficult to determinate whether nodules in legumes are strictly homologous or not (Doyle, 2016), adding a further layer of debate about the evolutionary origins of nodulation.

In a recently published paper in the *New Phytologist* focusing on the legume subfamily Caesalpinioideae, Faria et al. (2022) explore these questions and suggest a novel hypothesis to explain this very uneven phylogenetic distribution of nodulation. Using a robust phylogenomic tree based on 997 genes from 147 Caesalpinioideae genera, Faria et al. (2022) reconstructed the evolution of two distinct nodule anatomy types: (i) fixation thread-type nodules (FT), where the bacteria are retained within the cell wall and the plasmalemma, and (ii) symbiosome-type nodules (SYM) where the bacteroids are surrounded by symbiosomes. Faria et al. showed that all confirmed nodulating genera in the mimosoid clade have SYM-type nodules, while almost all nodulating species from the non-mimosoid grade subtending the mimosoid clade have FT-type nodules (except a subset of species of the genus *Chamaecrista*). This striking distribution of nodule anatomy across Caesalpinioideae provides a possible explanation for the pattern suggested by Werner et al. (2014) that the mimosoid clade have a 'moderate stable fixing state' compared to the non-mimosoid grade where nodulation is more sporadically distributed across lineages. Faria et al. (2022) documented a six-fold greater rate of evolutionary loss of nodulation through time associated with FT-type lineages than SYM-type lineages, suggesting that the evolution of SYM-type nodules resulted in a significantly more stable occurrence of nodulation compared to lineages with FT-type nodules which appear to be much more susceptible to evolutionary loss of nodulation across Caesalpinioideae.

Left to right: Nodules of the genera *Dimorphandra*, *Erythrophleum*, *Chidlowia* and *Indopiptadenia*. Faria et al. (2022) showed that the first two genera have fixation-thread-type nodules and are placed in the non-mimosoid grade of the legume subfamily Caesalpinioideae, while the latter two have symbiosome-type nodules and are placed in the mimosoid clade. Photos, *Dimorphandra* and *Erythrophleum*: Euan James, James Hutton Institute, Dundee, U.K.; *Chidlowia*: George Ametsitsi, FORIG, Kumasi, Ghana; *Indopiptadenia*: HS Gehlot, JNVU, Jodhpur, India.

Few studies of plant functional trait evolution have hypothesized the sort of massive evolutionary losses that have been suggested for nodulation, nor demonstrated that trait innovation can mitigate against evolutionary loss as elegantly as Faria et al. They attributed this greater evolutionary stability to the greater control conferred by tighter compartmentalisation of the symbiont in SYM-type nodules. It is well established that N_2 fixation is highly energy demanding and only beneficial under certain environmental conditions in which nitrogen limits growth (McKey, 1994; Hoffman et al., 2014; van Velzen et al., 2019), and this is manifest in phenotypic plasticity of nodulation (Goh et al., 2013). This suggests that any innovation which promotes a closer relationship between the host and the symbiont is likely to be critical in maintaining the evolutionary advantages of nodulation.

Faria et al. (2022) highlight the non-mimosoid grade of subfamily Caesalpinioideae as a hotspot of evolutionary transitions including two shifts from FT- to SMY-type nodules and numerous evolutionary losses of nodulation, opening the way for wider genomic studies. Faria et al.'s study also paves the way for wider exploration of nodule anatomy across legumes to see whether similar patterns of evolutionary loss of nodulation in subfamily Papilionoideae are also associated with FT-type nodules, which are also known to occur in a subset of lineages within that subfamily. It appears that there is still much to be done to fully understand the evolution of the prominent functional trait of nodulation.

References

Doyle, J. J. (2016) Chasing unicorns: Nodulation origins and the paradox of novelty. *American Journal of Botany* **103**: 1865–1868.

Faria, S. M., Ringelberg, J. J., Gross, E., Koenen, E. J., Cardoso, D., Ametsitsi, G. K., Akomatey, J., Maluk, M., Tak, N., Gehlot, H.S. and Wright, K.M., Teaumroong, N., Songwattana, P., de Lima, H.C., Prin, Y., Zartman, C.E., Sprent, J.I., Ardley, J., Hughes, C.E. & James, E.K. (2022) The innovation of the symbiosome has enhanced the evolutionary stability of nitrogen fixation in legumes. *New Phytologist* **235**: 2365–2377.

Goh, C. H., Veliz Vallejos, D. F., Nicotra, A. B., & Mathesius, U. (2013) The impact of beneficial plant-associated microbes on plant phenotypic plasticity. *Journal of Chemical Ecology* **39**: 826–839.

Hoffman, B. M., Lukoyanov, D., Yang, Z. Y., Dean, D. R., & Seefeldt, L. C. (2014) Mechanism of nitrogen fixation by nitrogenase: the next stage. *Chemical Reviews* **114**: 4041–4062.

LPWG. (2017) A new subfamily classification of the Leguminosae based on a taxonomically comprehensive phylogeny – The Legume Phylogeny Working Group (LPWG). *TAXON* **66**: 44–77.

McKey, D. (1994) Legumes and nitrogen: the evolutionary ecology of a nitrogen-demanding lifestyle. In: Sprent JI, McKey D, Eds. Advances in Legume Systematics 5: The Nitrogen Factor. Kew, UK: Royal Botanic Gardens, 221–228.

van Velzen, R., Doyle, J. J., & Geurts, R. (2019) A resurrected scenario: single gain and massive loss of nitrogen-fixing nodulation. *Trends in Plant Science* **24**: 49–57.

Wagner, S. C. (2011) Biological Nitrogen Fixation. *Nature Education Knowledge* **3**: 15.

Werner, G. D., Cornwell, W. K., Sprent, J. I., Kattge, J., & Kiers, E. T. (2014). A single evolutionary innovation drives the deep evolution of symbiotic N2-fixation in angiosperms. *Nature Communications* **5**: 1–9.

NEW LEGUME SPECIES HIGHLIGHTS 2022

Colin Hughes (University of Zürich, Switzerland)

The census of new legume species published in 2022 mirrors the diversity of the legume family as a whole. It includes shrubs from mid-elevation oak forests in central Mexico, two endangered rosewood trees from Madagascar, a giant rainforest tree from the Atlantic forests of Brazil, a tree that is seasonally almost submerged in flooded forests in the Amazon basin, a prostrate dwarf shrub from dry valleys of Yunnan in SW China, a woody climber from deciduous tropical forests in Laos, SE Asia, several geoxyles from the fire-prone Cerrado savannas of South America, a set of prostrate herbaceous perennials from tropical Australian grasslands and Eucalyptus woodland, a putative hybrid forming a large tree in urban Singapore, and a rare shrub from a remote area of the Blue Mountains in Australia. In other words, amongst these 2022 novelties we have a representative snapshot of the overall diversity of growth forms, biomes, and geographic ranges found across legumes as a whole. The species highlighted here provide a flavour of the new discoveries of 2022. A full list of taxonomic papers is in the 2022 Legume Bibliography at the end of this issue of the Bean Bag.

Two new *Brongniartia* species narrowly endemic within the Río Balsas Depression in Mexico

Of the c. 60 species of *Brongniartia* (Papilionoideae, Brongniartieae) all but one are distributed in Mexico. The majority of species are shrubs in seasonally dry tropical forests and mid-elevation oak and pine-oak forests. The two new species highlighted here, *B. alvarezii* R. Cruz-Durán, R. Bustamante & Dorado and *B. variabilis* Dorado, R. Cruz-Durán & R. Bustamante add to the already impressive tally of narrowly restricted endemic Brongniartias concentrated in the Río Balsas Depression, especially in the State of Guerrero in Mexico which is a hotspot for the genus. Flowers of *Brongniartia* species are typically coppery maroon; *B. alvarezii* is the second species of the genus with cream-white flowers joining the outlier species *B. ulbrichiana* from S. America which also has pale yellowish flowers.

Brongniartia alvarezii and *B. variabilis*. Photos: Gerardo Cuevas & Óscar Dorado.

Dorado Ó, Cruz-Durán R, García RB (2022) Two new closely related species of *Brongniartia* (Fabaceae, Faboideae) from the Sierra Madre del Sur in Guerrero, México. Phytotaxa **544**(1): 1-10. https://doi.org/10.11646/phytotaxa.544.1.1

Two new Endangered species of *Dalbergia* from Madagascar

Given the international interest and high level of conservation concern surrounding many species of the genus *Dalbergia* (Papilionoideae, Dalbergieae), it is more important than ever that the diversity of species in the genus is well documented. In other words, we need to know how many species there are, where they grow and what their conservation status is, based on rigorous taxonomic evidence, in order to develop plans for their sustainable management. This is because many *Dalbergia* species form durable and beautifully coloured heartwood, so-called rosewoods, which are highly valued for making musical instruments and furniture. Demand for these precious woods means that several species have been subjected to intense, unsustainable, and often illegal logging. As a result, almost all species of *Dalbergia* are listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The genus *Dalbergia* comprises c. 270 species and occupies a pantropical distribution. At least 48 species occur in Madagascar, all but one of them endemic, representing an exceptional hotspot of diversity within the genus. This flock of Madagascan species is the focus of intensive new phylogenomic and population genomic analyses based on more than 600 accessions of Malagasy *Dalbergia* including all the Madagascan species and representing their intraspecific diversity, carried out by Simon Crameri during his PhD at the University of Zurich in collaboration with the Madagascar Precious Woods Project at Missouri Botanical Garden (https://discoverandshare.org/2022/02/10/protecting-precious-woods-in-madagascar/). This prodigious field sampling and DNA sequencing is revealing that a subset of Madagascan species are polyphyletic, prompting description of additional species, including *Dalbergia pseudomaritima* Crameri, Phillipson & N. Wilding and *D. razakamalala* Crameri, Phillipson & N. Wilding, from eastern Madagascar, both of which are categorized as Endangered. It seems that the number of Madagascan *Dalbergia* species has been substantially under-estimated and that more new species are in the pipeline.

Left to right, *Dalbergia razakamalala* habit and flowers, *D. pseudomaritima* flowers and fruits. Photos: Charles Rakotovao and Sandratra Aina Fanantenana Andrianarivelo, Missouri Botanical Garden Madagascar Program.

Crameri S, Phillipson PB, Rakotonirina N, Wilding N, Andriamiarisoa RL, Lowry PP, Widmer A (2022) Taxonomic studies on Malagasy *Dalbergia* (Fabaceae). III. Two new species from southeastern Madagascar and an emended description of the rosewood species *Dalbergia maritima*. Systematic Botany **47**(2): 397-416. https://doi.org/10.1600/036364422X16512564801614

A new giant tree species of *Dipteryx* from the Brazilian Atlantic forest

The newly described *Dipteryx hermetopascoaliana* C.S. Carvalho, H.C. Lima & D.B.O.S. Cardoso (Papilionoideae, Dipterygeae) is a large canopy tree reaching 30m in height and > 100cm in trunk diameter. Material of this species was first collected by Ducke in 1949, but that material and subsequent collections were identified as *D. odorata* until this study using more detailed morphological and phylogenetic evidence clearly showed it to represent a distinct species. One might imagine that large tree species would be easily discovered, but this is the second giant canopy emergent legume tree species described from the Atlantic rain forests of Brazil in the last five years following the description of *Dinizia juerana-facao* G.P. Lewis & G.S. Siqueira in 2017. As pointed out by Carvalho et al. (2022), very often these rain forest giants remain poorly known because they are rare, and infrequently and often incompletely collected. They stand as a stark reminder of how incomplete our knowledge of these hyper-diverse Mata-Atlântica forests remains. Like many Atlantic rain forest trees, *D. hermetopascoaliana* is apparently a rare endemic. Recent surveys have located the species in just one small forest fragment surrounded by a cattle farm and a sugar cane plantation. As pointed out by Carvalho et al. (2022), the continued rapid pace of species discovery in the Atlantic rain forests of Brazil, alongside the fact that some of these new species are giant trees, suggests there are many legume and other plant species still to discover and document, even as these forests disappear.

From left to right, stem of *Dipteryx hermetopascoaliana* with Catarina de Carvalho, the first author of the new species; leaves of *D. hermetopascoaliana*; tree trunk with Domingos Cardoso, Catarina de Carvalho, José Barbosa "Baixinho", and Haroldo de Lima, authors of this new species; the small forest fragment in Alagoas State, NE Brazil which harbours the only population of *D. hermetopascoaliana* located in recent surveys. Photos courtesy of Domingos Cardoso and Débora Zuanny.

Carvalho CS, Lima HC, Zuanny DC, Gregório BS, Cardoso DB (2022) The discovery of a new giant legume tree species in a severely fragmented landscape underscores the alarming threats to the biodiversity of the Brazilian Atlantic Forest. Botanical Journal of the Linnean Society. 8 Oct 2022. https://doi.org/10.1093/botlinnean/boac034

Legume collecting by canoe: A new species of *Hydrochorea* from the Amazon

With only the tree canopy projecting above the waterline in the flooded forests of the Río Negro, deep in the rain forests of the Amazon, the only way to collect and photograph the new ingoid legume, *Hydrochorea uaupensis* M.P. Morim, Iganci & E.J.M. Koenen, was by boat. This new species is known so far from just two collections from the Upper Río Negro region in the Brazilian Amazon (Amazonas state), in seasonally inundated, open vegetation, known in Brazil as "campinarana" on white sand. This new species is described as part of a revision by Soares et al. (2022) of the recircumscribed genus *Hydrochorea* (Caesalpinioideae, mimosoid clade), incorporating the genus *Balizia* and two species of west African trees formerly placed in the genus *Albizia*. Under this new circumscription of *Hydrochorea* the ten recognized species form a robustly supported amphi-Atlantic clade of mainly water-dispersed species of seasonally flooded riverine and coastal rain forests.

Hydrochorea uaupensis, in flooded white sand campinarana vegetation with just the tree crown emerging above the water. Photos: Erik Koenen and João Iganci.

Soares MVB, Koenen EJM, Iganci JRV & Morim MP (2022) A new generic circumscription of *Hydrochorea* (Leguminosae, Caesalpinioideae, mimosoid clade) with an amphi-Atlantic distribution. PhytoKeys **205**: 401-437. https://doi.org/10.3897/phytokeys.205.82775

A new *Indigofera* endemic to Yunnan, SW China

The genus *Indigofera* (Papilionoideae, Indigoferae) is the third largest genus of legumes after *Astragalus* and *Acacia* and occupies a wide distribution with centres of diversity in Africa and Madagascar (c. 550 species), Asia, especially the temperate Sino-Himalayan region (ca. 105 species), Australia (c. 50 species), and the New World (c. 45 species). Of the Asian species, 79 (45 endemics) occur in China, where a steady stream of new species continues to be added, including this year, *Indigofera vallicola* Huan C. Wang & Jin L. Liu, a prostrate dwarf shrub known from just two localities in xerophilous scrub and grasslands in the Luzhijiang valley, central Yunnan.

Flowers of *Indigofera vallicola*. Photo: Huan Chong Wang.

Liu JL, Li SG, Yang F, Wang HC (2022). Indigofera vallicola (Fabaceae), a new species from Yunnan, southwest China. PhytoKeys **199**: 9-16. https://doi.org/10.3897/phytokeys.199.85437

Millettia densiflora: A new woody climber from Laos

Millettia (Papilionoideae, Millettieae) comprises 50-80 species in Asia and is especially diverse, but poorly known in Thailand and the Indo-Chinese region and is under investigation by Sawai Mattapha and colleagues. During botanical expeditions to Bolikhamxai Province in Laos in 2020 and 2021 the new species *Millettia densiflora* Mattapha, Lanors. & Lamxay was discovered. It is a woody climber, grows in mixed deciduous and secondary forests and is currently only known from the type locality.

Flowers, leaves and fruit of *Millettia densiflora*. Photos: S. Lanorsavanh

Mattapha S, Sungkaew S, Pongamornkul W, Lanorsavanh S, Lamxay V, Hein KZ (2022) Notes on the genus *Millettia* (Fabaceae: Millettieae) in the Indo-Burmese region; a new species, new records and lectotypifications. Thai Forest Bulletin (Botany) **50**(1): 75-87. https://doi.org/10.20531/tfb.2022.50.1.08

Mimosa: the inventory of species continues

It seems that every year, new species of *Mimosa* (Caesalpinioideae, mimosoid clade) are discovered and described, adding to the prodigious tally of species in this large genus of now > 600 species. This year is no exception with three new species described from the savannas of the Cerrado in Brazil, one of the diversity hotspots for the genus with c. 270 species. In common with many Cerrado *Mimosas*, and indeed many savanna species in general, all three of these new species are geoxyles, i.e. functionally herbaceous subshrubs with enlarged underground woody lignotubers, a life history strategy that facilitates survival by resprouting after fire. Marcelo Simon, who continues to spearhead work on *Mimosa* in Brazil, says that the inventory of species is still far from complete and that we can expect on-going discoveries as more remote areas are surveyed in the coming years.

Left to right: *Mimosa gustavoi* T.P. Mendes, Marc.F. Simon & M.J. Silva, *M. cavalcantina* T.P. Mendes, Marc.F. Simon & M.J. Silva, *M. venosa* T.P. Mendes, Marc.F. Simon & M.J. Silva, and typical fire-prone Cerrado habitat of *M. venosa*, Goiás, central Brazil. Photos: left, João Bringel, the rest, Marcelo Simon.

Mendes TP, Simon MF & da Silva MJ (2022) Three New Species of *Mimosa* L. (Leguminosae) from the Brazilian Cerrado Hotspot of Biodiversity. Brittonia 9 Sep. 2022: 1-20. https://doi.org/10.1007/s12228-022-09723-x

A proliferation of new species of *Neptunia* in Australia

Neptunia (Caesalpinioideae, mimosoid clade) is unusual among mimosoid legumes in its herbaceous perennial habit and globose to ellipsoidal inflorescences usually comprising a mixture of bisexual and neuter flowers that have yellow, petaloid staminodia. A new taxonomic revision of the Australian and Malesian species published this year includes 10 new species from tropical Australia. This brings the total number of species in the genus to 22.

Neptunia insignis. Photos: K.R. McDonaldWang.

Bean AR (2022) A revision of *Neptunia* Lour. (Leguminosae: subfamily Caesalpinioideae, Mimosoid clade) in Australia and Malesia. Austrobaileya **12**: 59-106.

Ormosia corcovada, a new tree species narrowly endemic in NW Colombia

Of the c. 130 species of *Ormosia* (Papilionoideae, Ormosieae), c. 21 are found in Colombia. *Ormosia corcovada* Herrera-Palma, C.H. Stirt. & D.B.O.S. Cardoso was found among the many un-named herbarium collections of *Ormosia* by Maribel Herrera-Palma as part of her Masters thesis research. This new species forms a tree to 30m, is narrowly endemic to the lower Cauca Valley, NW Colombia, and has flowers with deep inky-purple petals and bright red monochromatic seeds. The species epithet corcovada, meaning hunchback in Spanish, refers to the hunch-back shape of the one-seeded pods.

Tree habit, flowers with deep blackish violet petals, fruits and red monochromatic seeds of *Ormosia corcovada*. Photos: Andrés Cuadro, Maribel Herrera-Palma and Ricardo Callejas-Posada.

Herrera-Palma M, Stirton CH, Ruiz-Bohórquez LK, Callejas-Posada R, Cardoso DB (2022) *Ormosia corcovada*, a new papilionoid legume from the Bajo Cauca Region of Northeastern Colombia. Systematic Botany **47**(3): 861-868. https://doi.org/10.1600/036364422X16573019348839

Beating the drum for *Pultenaea percussa* – described and rediscovered in 2022

Contributed by: Dr Russell Barrett, National Herbarium of New South Wales, Australia.

The bush peas, genus *Pultenaea*, are the largest genus in the largest legume tribe in Australia (tribe Mirbelieae, Papilionoideae). Despite being monographed just 20 years ago, new research is revealing a plethora of new species, especially rarely-collected, local endemics.

One such pea, named by Renner et al. (2022), is the Hollanders River Bush-pea, *Pultenaea percussa*. At the time of naming, it was known from only a single collection, made in 1970 by the amateur botanists T. & J. Whaite, in a remote part of the Blue Mountains in New South Wales, SE Australia. Searches to relocate the species prior to naming were unsuccessful. However, just a few months after the species was named, one of the authors on the paper, Steve Clarke, persisted, first by car, then by push-bike and finally on foot, to traverse suitable habitat along the remote Hollanders River, and located a single population consisting of a few hundred plants of this remarkable species.

The leaves of *P. percussa* are unique in the genus, short, and almost club-shaped, bright green below, but with a wedge sliced out of the top, and the face being strongly glaucous. This is a rather unusual adaptation of the typical in-rolled leaf of related species.

The species epithet is also aptly unique, representing the lived experience of the first author while writing the taxonomic account of this group of species. From the Latin *percussa* 'thrust through' or 'pierced', but also referencing the modern use of this root in 'percussion'. The hollow, club-shaped leaves of this species could either strike like miniature drum sticks, or be struck. The species is dedicated to everyone who lives, or has lived, with a traumatic brain injury, and especially to everyone who supports them.

Rediscovery of this rare species has enabled it to be introduced to cultivation at the Australian Botanic Garden, Mount Annan, home of the new National Herbarium of New South Wales.

Leaves and flowers of *Pultenaea percussa*. Photos: Russell Barrett.

Renner MAM, Barrett RL, Clarke S, Clugston JAR, Wilson TC, Weston PH (2022) Morphological and molecular evidence refute a broad circumscription for *Pultenaea glabra* (Fabaceae: Mirbelieae), with implications for taxonomy, biogeography, and conservation. Australian Systematic Botany **35**(3): 225–277. https://doi.org/10.1071/SB21030

A hybrid of *Sindora* from Singapore

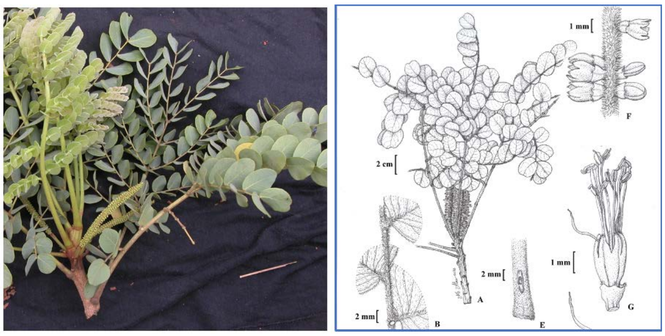
Combining genetic, morphological, geographic and historical evidence, Choo et al. (2022) document and name a putative interspecific hybrid in the genus *Sindora* (Detarioideae). Very often interspecific hybrids result from human disturbance and that could well be the case for *Sindora* × *changiensis* L.M. Choo, Loo, W.F. Ang & Er which is restricted to urban areas in Singapore. However, historical evidence from aerial photographs shows that the hybrid individual, which is a large tree, is probably part of a remnant of natural forest, and radiocarbon dating suggests it could well be more than 200 years old.

Fruits and flowers of Sindora × changiensis. Photos: Le Min Choo.

Choo LM, Loo AHB, Ang WF, Er KBH (2022) A natural hybrid of *Sindora* (Fabaceae, Detarioideae) from Singapore. PhytoKeys **190**: 87. https://doi.org/10.3897/phytokeys.190.79185

A 30% increment in species of the mimosoid genus *Stryphnodendron*

There are 28 species in the recircumscribed *Stryphnodendron* (Caesalpinioideae, mimosoid clade) sensu Lima et al. (2022), nine of which were described as new by Scalon et al. (2022), representing a major increment for the genus. These new species are small to large trees in Amazonian wet forests, savannas (cerrado) and Atlantic rain forests of South America, mainly in Brazil. Several of these new species are globally rare with highly restricted endemic ranges in areas where habitats are being lost, and as a result are categorized as Endangered by Scalon et al (2022).



Stryphnodendron velutinum Scalon.
Photo: Viviane Scalon;
drawing: Maria Alice de Rezende

Scalon VR, De Paula-Souza J, De Lima AG, Souza VC (2022) A synopsis of the genus *Stryphnodendron* (Fabaceae, Caesalpinioideae, mimosoid clade). Phytotaxa **544**(3): 227-279. https://doi.org/10.11646/phytotaxa.544.3.1

LEGUME BIBLIOGRAPHY 2022

Warren Cardinal-McTeague (University of British Columbia, Canada)
with contributions by
Colin Hughes (University of Zürich, Switzerland)
Leonardo Borges (Universidade Federal de São Carlos, Brazil)
Gwilym P. Lewis (Royal Botanic Gardens, Kew, UK)

A total of **151** new publications are presented in the 2022 Bibliography. Compared to recent years, we present a reduced list with emphasis on the following subjects.

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Braga BLP, Matias R, Consolaro H, Souza JT, Almeida NM (2022) Inaccuracy of sexual organ position and spatial variation of styles in monomorphic enantiostylous flowers of *Senna rugosa* (Fabaceae-Caesalpinioideae). *Flora* **293**, 152112. doi:10.1016/j.flora.2022.152112.

Casanova JM, Cardoso D, Barros CF, de Lima HC, de Toni KL (2022) Floral ontogeny of *Tachigali* (Caesalpinioideae, Fabaceae) species. *PeerJ* **10**, e13975. doi:10.7717/peerj.13975.

Coutinho ÍAC, Francino DMT, Dalvi VC, Strozi Alves Meira RM (2022) Extrafloral nectary development, characterization and secretion in *Chamaecrista debilis* and *Chamaecrista desvauxii* var. *langsdorfii* (Leguminosae, Caesalpinioideae). *Nordic Journal of Botany* **2022**, e03430. doi:10.1111/njb.03430.

Gissi DS, Seixas DP, Fortuna-Perez AP, Torke BM, Simon MF, Souza G, Lewis GP, Rodrigues TM (2022) Leaf and stem anatomy of the *Stylosanthes guianensis* complex (Aubl.) Sw. (Leguminosae, Papilionoideae, Dalbergieae) and its systematic significance. *Flora* **287**, 151992. doi:10.1016/j.flora.2021.151992.

Montaño-Arias SA, Camargo-Ricalde SL, Grether R, Díaz-Pontones D (2022) Seed morphology, anatomy and histochemistry in two Mexican species of *Mimosa* (Leguminosae, mimosoid clade). *Flora* **286**, 151970. doi:10.1016/j.flora.2021.151970.

Nejapa R, Cabanillas PA, Pace MR (2022) Cortical origin of the successive cambia in the stems of the charismatic temperate lianescent genus *Wisteria* (Fabaceae) and its systematic importance. *Botanical Journal of the Linnean Society* **199**, 667–677. doi:10.1093/botlinnean/boab091.

Silva TS, Cota MMT, Borges LM, Lima AG de, Tomazello-Filho M, Rando JG (2022) Morphological studies of *Chamaecrista* sect. *Absus* ser. *Setosae* (Leguminosae) with emphasis on the *Chamaecrista setosa* complex, including a new species. *Systematic Botany* **47**, 978–991. doi:10.1600/036364422X16674053033796.

Sinjushin A, Ploshinskaya M, Maassoumi AA, Mahmoodi M, Bagheri A (2022) Variations in structure among androecia and floral nectaries in the inverted repeat-lacking clade (Leguminosae: Papilionoideae). *Plants* **11**. doi:10.3390/plants11050649.

Subramaniam S, Rather SA, Danda S, Pandey AK (2022) The systematic significance of pod morphological and anatomical variations in Indian *Crotalaria* L. (Leguminosae). *Flora* **290**, 152059. doi:10.1016/j.flora.2022.152059.

Zalko J, Deroin T, Sarthou C, Jabbour F (2022) What is inside a papilionoid flower? I. Floral vascular anatomy in the New Caledonian endemic clade *Arthroclianthus-Nephrodesmus* (Fabaceae, Faboideae). *International Journal of Plant Sciences* **183**, 639–651. doi:10.1086/721774.

Zalko J, Deroin T, Sarthou C, Jabbour F (2022) What is inside a papilionoid flower? II. Insights into the vascular anatomy of Faboideae. *International Journal of Plant Sciences* **183**, 652–663. doi:10.1086/721775.

Zhao X, Hou Q, Du M, Zhang H, Jia L, Zhang Z, Ma Z, Sun K (2022) Micromorphological leaf epidermal traits as potential taxonomic markers for infrageneric classification of *Oxytropis* (Fabaceae). *PhytoKeys* **201**, 51–76. doi:10.3897/phytokeys.201.85154.

BIOGEOGRAPHY - 7

Bello A, Stirton CH, Chimphango SB, Muasya AM (2022) Phylogenetic relationships and biogeography of Psoraleeae (Fabaceae). *Botanical Journal of the Linnean Society* **200**, 39–74. doi:10.1093/botlinnean/boac002.

De Castro O, Bacchetta G, Brullo S, Del Guacchio E, Di Iorio E, Piazza C, Caputo P (2022) Variability and nativeness in the Mediterranean taxa: Divergence and phylogeography of *Genista etnensis* (Fabaceae) inferred from nuclear and plastid data. *Plants* **11**. doi:10.3390/plants11223171.

Jiang D, Liao L, Xing H, Chen Z, Luo X, Li H-L (2022) Interplay of ecological opportunities and functional traits drives the evolution and diversification of millettioid legumes (Fabaceae). *Genes* **13**. doi:10.3390/genes13122220.

Rahaingoson FR, Oyebanji O, Stull GW, Zhang R, Yi T-S (2022) A dated phylogeny of the pantropical genus *Dalbergia* L.f. (Leguminosae: Papilionoideae) and its implications for historical biogeography. *Agronomy* **12**. doi:10.3390/agronomy12071612.

Robbiati FO, Moro Cordobés F, Fortunato RH, Anton AM, Urdampilleta JD (2022) Niche conservatism, divergence and polyploidy in *Senna* series *Aphyllae* (Fabaceae: Caesalpinioideae) from arid zones of South America. *Botanical Journal of the Linnean Society* **199**, 773–789. doi:10.1093/botlinnean/boab105.

Schley RJ, Qin M, Vatanparast M, Malakasi P, de la Estrella M, Lewis GP, Klitgård BB (2022) Pantropical diversification of padauk trees and relatives was influenced by biome-switching and long-distance dispersal. *Journal of Biogeography* **49**, 391–404. doi:10.1111/jbi.14310.

Torke BM, Cardoso D, Chang H, Li S-J, Niu M, Pennington RT, Stirton CH, Xu W-B, Zartman CE, Chung K-F (2022) A dated molecular phylogeny and biogeographical analysis reveals the evolutionary history of the trans-pacifically disjunct tropical tree genus *Ormosia* (Fabaceae). *Molecular Phylogenetics and Evolution* **166**, 107329. doi:10.1016/j.ympev.2021.107329.

ECOLOGY - 7

Barral EC, Cruz-Neto O, Borges LA, Costa ACG da, Maia ACD, Machado IC, Navarro DM do AF, Lopes AV (2022) Scented at day and night: Diel variation in the floral scent chemistry of the threatened tree *Amburana cearensis* (Leguminosae) and effects of this variation on its pollinators. *Flora* **297**, 152181. doi:10.1016/j.flora.2022.152181.

Basso-Alves JP, da Silva RF, Coimbra G, Leitão SG, de Rezende CM, Bizzo HR, Freitas L, Paulino JV, Mansano V de F (2022) Heteromorphic stamens are differentially attractive in *Swartzia* (Fabaceae). *AoB PLANTS* **14**, plac041. doi:10.1093/aobpla/plac041.

Cardel YJ, Koptur S (2022) Locations of seed abortion in response to defoliation differ with pollen source in a native perennial legume herb. *American Journal of Botany* **109**, 1730–1740. doi:10.1002/ajb2.16055.

Delaney LE, Igić B (2022) The phylogenetic distribution and frequency of self-incompatibility in Fabaceae. *International Journal of Plant Sciences* **183**, 30–42. doi:10.1086/717329.

Hua X, Cardillo M, Bromham L (2022) Adapting to extremes: Reconstructing evolution in response to changing climate over time and space in the diverse Australian plant genus *Acacia*. *Journal of Biogeography* **49**, 727–738. doi:10.1111/jbi.14339.

ECOLOGY

Kiepiel I, Brown M, Johnson SD (2022) A generalized bird pollination system in *Schotia brachypetala* (Fabaceae). *Plant Biology* **24**, 806–814. doi:10.1111/plb.13433.

Ruiz LTS, Amarilla LD, Torres C, Košútová D, Konôpková J, Ferus P, Galetto L (2022) Reproductive biology of the invasive *Gleditsia triacanthos* L. (Fabaceae). *Flora* **288**, 152010. doi:10.1016/j.flora.2022.152010.

FLORISTICS & CONSERVATION - 12

Barrandeguy ME, Mogni V, Zerda H, Savino C, Dusset F, Prado DE, García MV (2022) Understanding the spatio-temporal dynamics of *Anadenanthera colubrina* var. *cebil* in the biogeographical context of Neotropical seasonally dry forest. *Flora* **295**, 152149. doi:10.1016/j.flora.2022.152149.

Castellanos C, Vargas F (2022) Rediscovery of *Bauhinia conceptionis* (Leguminosae: Cercidoideae), a rare and endemic species of Colombian legume from Chocó-Colombia, after eighty years. *Phytotaxa* **550**, 263–271. doi:10.11646/phytotaxa.550.3.6.

Chagas AP, Garcia FCP, Dutra VF (2022) Flora of Espírito Santo: *Inga* (Fabaceae, mimosoid clade). *Rodriguésia* **73**. doi:10.1590/2175-7860202273017.

Ferreira JJ da S, Perez APF, Lewis GP, Silva JS (2022) *Stylosanthes* (Leguminosae-Papilionoideae-Dalbergieae) in Northeast Brazil. *Rodriguésia* **73**. doi:10.1590/2175-7860202273079.

Gomes AS, Rodrigues EDM, Moura DC, De Melo JIM, Ribeiro RDTM, De Queiroz RT (2022) Fabaceae Lindl. in a conservation unit in the semi-arid region of Paraíba, Brazil. *Phytotaxa* **555**, 17–41. doi:10.11646/phytotaxa.555.1.2.

Jiang K, Tian B, Pan B (2022) Legume additions to the flora of China. *Phytotaxa* **532**, 1–21. doi:10.11646/phytotaxa.532.1.1.

Maassoumi AA, Ashouri P (2022) The hotspots and conservation gaps of the mega genus *Astragalus* (Fabaceae) in the Old-World. *Biodiversity and Conservation* **31**, 2119–2139. doi:10.1007/s10531-022-02429-2.

Morales M, Keller H, Fortunato RH (2022) *Mimosa serra* (Caesalpinioideae, Fabaceae): Conservation insights and its presence in Argentina. *Phytotaxa* **574**, 241–250. doi:10.11646/phytotaxa.574.3.3.

Phillipson PB, Lewis GP, Andriambololonera S, Rakotonirina N, Thulin M, Wilding N (2022) Leguminosae (Fabaceae), legumes. In: Goodman SM (Ed.) *The New Natural History of Madagascar*. Princeton University Press, 2246 pp.

Silva L de A, Alves-Araújo A, Dutra VF (2022) Flora of Espírito Santo: *Mimosa* (Leguminosae: Caesalpinioideae: mimosoid clade). *Rodriguésia* **73**. doi:10.1590/2175-7860202273005.

da Silva GS, Gomes G da S, Goncalves A dos S, de Queiroz RT, da Conceicao GM (2022) Diversity of Leguminosae in the Chapada das Mesas National Park, Maranhão, Brazil: New occurrences for Maranhão and the Brazilian Cerrado. *Phytotaxa* **573**, 140–162. doi:10.11646/phytotaxa.573.2.1.

Sinani TRF, Sciamarelli A, Bueno ML, Sartori ÂLB (2022) Leguminosae endemic to the Chaco facing quaternary climate fluctuations. *Acta Botanica Brasilica* **36**. doi:10.1590/0102-33062021abb0346.

PALEOBOTANY - 7

Bhatia H, Srivastava G, Mehrotra RC (2022) Legumes from the Paleocene sediments of India and their ecological significance. *Plant Diversity* **Early View**. doi:10.1016/j.pld.2022.08.001.

D'Apolito C, Tacoronte Gomes B, Leite FPR, da Silva Caminha SAF (2022) Fossil *Parkia* R.Br. (Fabaceae) pollen from the Miocene of western Amazonia. *Grana* **61**, 401–420. doi:10.1080/00173134.2022.2130009.

Herendeen PS, Cardoso DBOS, Herrera F, Wing SL (2022) Fossil papilionoids of the *Bowdichia* clade (Leguminosae) from the Paleogene of North America. *American Journal of Botany* **109**, 130–150. doi:10.1002/ajb2.1808.

Li W-C, Huang J, Chen L-L, Spicer RA, Li S-F, Liu J, Gao Y, Wu F-X, Farnsworth A, Valdes PJ, Zhou Z-K, Su T (2022) *Podocarpium* (Fabaceae) from the late Eocene of central Tibetan Plateau and its biogeographic implication. *Review of Palaeobotany and Palynology* **305**, 104745. doi:10.1016/j.revpalbo.2022.104745.

Nguyen HB, Huang J, Van Do T, Jia L-B, Nguyen HMT, Doan HD, Li S-F, Zhou Z-K, Su T (2022) First pod record of *Mucuna* (Papilionoideae, Fabaceae) from the late Miocene of the Yen Bai Basin, northern Vietnam. *Review of Palaeobotany and Palynology* **298**, 104592. doi:10.1016/j.revpalbo.2021.104592.

Ramos RS, Brea M, Kröhling DM, Contreras SA (2022) New data for palaeoclimatic reconstructions in the upper/middle Uruguay River basin: Caesalpinioid Fabaceae woods in the Late Pleistocene. *Botanical Journal of the Linnean Society* **200**, 491–523. doi:10.1093/botlinnean/boac023.

Wang Z, Shi G, Sun B, Jia H, Dong C, Yin S, Wu X (2022) A new *Cercis* (Leguminosae) from the middle Miocene of Fujian, China. *Historical Biology* **34**, 94–101. doi:10.1080/08912963.2021.1900170.

PALYNOLOGY - 8

Antonio-Domingues H, Antunes LLC, Rossi ML, Martinelli AP, da Luz CFP (2022) An update to the palynotaxonomy of the Brazilian species of *Aeschynomene* sensu stricto and the recently circumscribed genus *Ctenodon* (Leguminosae – Papilionoideae – Dalbergieae). *Grana* **61**, 321–348. doi:10.1080/00173134.2022.2126727.

Antonio-Domingues H, Fortuna-Perez AP, Rossi ML, Martinelli AP, Lewis GP, Pinto da Luz CF (2022) Palynology of *Amicia* Kunth. (Leguminosae – Papilionoideae – Dalbergieae – informal *Adesmia* clade) set in a systematic and phylogenetic context. *Grana* **61**, 421–435. doi:10.1080/00173134.2022.2130011.

Antonio-Domingues H, Perez APF, Rossi ML, Martinelli AP, da Luz CFP (2022) Pollen morphology, ultrasculpture and ultrastructure of *Poiretia* Vent. (Leguminosae – Papilionoideae – Dalbergieae – *Adesmia* informal clade). *Grana* **61**, 8–26. doi:10.1080/00173134.2021.1984574.

Bahadur S, Taj S, Long W, Hanif U (2022) Pollen morphological peculiarities of selected Mimosoideae taxa of Hainan Island and their taxonomic relevance. *Agronomy* **12**. doi:10.3390/agronomy12051122.

Khan A, Ahmad M, Zafar M, Shah SA (2022) Systematic significance of pollen morphology in rare endemic taxa of *Astragalus* L. (Fabaceae). *Phytotaxa* **561**, 267–290. doi:10.11646/phytotaxa.561.3.4.

Liao M, Ullah F, Deng H-N, Zhang J-Y, Xu B, Gao X-F (2022) Pollen morphology of the genus *Sophora* (Fabaceae) and its taxonomic implications. *Microscopy Research and Technique* **85**, 1723–1741. doi:10.1002/jemt.24034.

PALYNOLOGY

Peixoto JD, Santos MF, Queiroz LP, Santos FD (2022) Pollen morphology of *Galactia* P.Browne and related genera (Papilionoideae, Leguminosae), with emphasis on Brazilian representatives. *Acta Botanica Brasilica* **36**. doi:10.1590/1677-941X-ABB-2022-0220.

Soares EL, Landi LADC, Souza CND, Gasparino EC (2022) Polyads types of the mimosoid clade (Caesalpinioideae, Fabaceae): Size and pollen numbers variations. *Grana* **61**, 45–66. doi:10.1080/00173134.2021.1990397.

PHYLOGENY & EVOLUTION - 12

Boom AF, Migliore J, Kaymak E, Meerts P, Hardy OJ (2022) Nuclear ribosomal phylogeny of *Brachystegia*: New markers for new insights about rain forests and Miombo woodlands evolution. *Plant Ecology and Evolution* **155**, 301–314. doi:10.5091/plecevo.91373.

Choi I-S, Cardoso D, de Queiroz LP, de Lima HC, Lee C, Ruhlman TA, Jansen RK, Wojciechowski MF (2022) Highly resolved papilionoid legume phylogeny based on plastid phylogenomics. *Frontiers in Plant Science* **13**, 823190. doi:10.3389/fpls.2022.823190.

Crameri S, Fior S, Zoller S, Widmer A (2022) A target capture approach for phylogenomic analyses at multiple evolutionary timescales in rosewoods (*Dalbergia* spp.) and the legume family (Fabaceae). *Molecular Ecology Resources* **22**, 3087–3105. doi:10.1111/1755-0998.13666.

De Oliveira DC, Da Costa Moreira AL, Casas Restrepo LC, De Lima HC, De Assis Ribeiro Dos Santos F, Cardoso D (2023) Recurrent evolutionary changes in pollen shape and ornamentation of the vataireoid clade (Papilionoideae, Fabaceae), an early-branching lineage of florally divergent genera. *Botanical Journal of the Linnean Society* **201**, 36–60. doi:10.1093/botlinnean/boac021.

Faria SM, Ringelberg JJ, Gross E, Koenen EJ, Cardoso D, Ametsitsi GK, Akomatey J, Maluk M, Tak N, Gehlot HS, Wright KM, Teaumroong N, Songwattana P, de Lima HC, Prin Y, Zartman CE, Sprent JI, Ardley J, Hughes CE, James EK (2022) The innovation of the symbiosome has enhanced the evolutionary stability of nitrogen fixation in legumes. *New Phytologist* **235**, 2365–2377. doi:10.1111/nph.18321.

Forrister DL, Endara M, Soule AJ, Younkin GC, Mills AG, Lokvam J, Dexter KG, Pennington RT, Kiner CA, Nicholls JA, Loiseau O, Kursar TA, Coley PD (2022) Diversity and divergence: Evolution of secondary metabolism in the tropical tree genus *Inga*. *New Phytologist* **237**, 631–642. doi:10.1111/nph.18554.

Garg V, Dudchenko O, Wang J, Khan AW, Gupta S, Kaur P, Han K, Saxena RK, Kale SM, Pham M, Yu J (2022) Chromosome-length genome assemblies of six legume species provide insights into genome organization, evolution, and agronomic traits for crop improvement. *Journal of Advanced Research* **42**, 315–329. doi:10.1016/j.jare.2021.10.009.

Kholina A, Kozyrenko M, Artyukova E, Yakubov V, Khoreva M, Andrianova E, Mochalova O, Sandanov D (2022) The species of *Oxytropis* DC. of section *Gloeocephala* Bunge (Fabaceae) from Northeast Asia: Genetic diversity and relationships based on sequencing of the intergenic spacers of cpDNA and ITS nrDNA. *Genetica* **150**, 117–128. doi:10.1007/s10709-022-00152-y.

McLay TG, Murphy DJ, Holmes GD, Mathews S, Brown GK, Cantrill DJ, Udovicic F, Allnutt TR, Jackson CJ (2022) A genome resource for *Acacia*, Australia's largest plant genus. *PloS one* **17**, e0274267. doi:10.1371/journal.pone.0274267.

Shepherd LD, Heenan PB (2022) Phylogenomic analyses reveal a history of hybridisation and introgression between *Sophora* sect. *Edwardsia* (Fabaceae) species in New Zealand. *New Zealand Journal of Botany* **60**, 113–133. doi:10.1080/0028825X.2021.1960567.

Sotuyo S, Pedraza-Ortega E, Martínez-Salas E, Linares J, Cabrera L (2022) Insights into phylogenetic divergence of *Dalbergia* (Leguminosae: Dalbergieae) from Mexico and Central America. *Frontiers in Ecology and Evolution* **10**. doi:10.3389/fevo.2022.910250.

Uluer DA, Forest F, Armbruster S, Hawkins JA (2022) Reconstructing an historical pollination syndrome: Keel flowers. *BMC Ecology and Evolution* **22**, 45. doi:10.1186/s12862-022-02003-y.

SYSTEMATICS & TAXONOMY - 58

Andrella GC, Atahuachi Burgos M, Bagnatori Sartori ÂL, Balan A, Bandyopadhyay S, Barbosa Pinto R, Barrett RL, Boatwright JS, Borges LM, Broich SL, Brullo S, Bruneau A, Cardinal-McTeague W, Cardoso D, Castro Silva IC, Cervantes A, Choo LM, Clarke R, Cobra e Monteiro T, Compton J, Crameri S, Delgado-Salinas A, Dorado O, Duan L, Egan AN, De la Estrella M, Falcão M, Farruggia F, Fortuna-Perez AP, Fritsch P, Gagnon E, Giusso del Galdo GP, Goncharov M, Gregório BDS, Grether R, Javadi F, Jordão L, Klitgaard BB, Kramina T, Lachenaud O, Lana C. Atunes L, Le Roux MM, Ledis Linares J, Lewis GP, Li S, De Lima HC, Mansano V, Mashego KS, Mattapha S, Montenegro Valls JF, Moteetee A, Murphy B, Ohashi H, Ohashi K, Pandey A, Pennington RT, Phillipson P, Povydysh M, Rakotonirina N, Ramos G, Ranzato Filardi F, Sanjappa M, Santos-Guerra A, Schley R, Schrire B, Schütz Rodrigues R, Seijo G, Seleme EP, Şentürk O, Silva de Carvalho C, Silva Flores A, Simon MF, Simpson CE, Sirichamorn Y, Soares Gissi D, Sokoloff D, Stirton CH, Straub S, Subramaniam S, Thulin M, Torke BM, Van der Burgt X, Vatanparast M, Wilding N, Winitsky S, Wojciechowski M, Yi T, Zhang R (2022). The World Checklist of Vascular Plants (WCVP): Fabaceae, version 2022. Royal Botanic Gardens, Kew. Checklist dataset doi:10.15468/mvhaj3.

Aviles Peraza G, Koenen EJM, Riina R, Hughes CE, Ringelberg JJ, Carnevali Fernández-Concha G, Ramírez Morillo IM, Can Itza LL, Tamayo-Cen I, Ramírez Prado JH, Cornejo X, Mattapha S, Duno de Stefano R (2022) Re-establishment of the genus *Pseudalbizzia* (Leguminosae, Caesalpinioideae, mimosoid clade): The New World species formerly placed in *Albizia*. *PhytoKeys* **205**, 371–400. doi:10.3897/phytokeys.205.76821.

Bagheri A, Maassoumi AA, Noroozi J, Blattner FR (2022) *Astragalus* sect. *Elvendia* (Fabaceae), a new tragacanthic section recorded from Mt. Alvand, a center of endemism in W Iran. *Plant Biosystems* **156**, 1260–1268. doi:10.1080/11263504.2022.2036846.

Becklund LE, Ayers TJ (2022) The phylogeny of *Errazurizia* (Fabaceae: Amorpheae) and description of the new monotypic genus *Pictarena*. *Systematic Botany* **47**, 1012–1024. doi:10.1600/036364422X16674053033804.

Borges LM, Inglis PW, Simon MF, Ribeiro PG, de Queiroz LP (2022) Misleading fruits: The non-monophyly of *Pseudopiptadenia* and *Pityrocarpa* supports generic re-circumscriptions and a new genus within mimosoid legumes. *PhytoKeys* **205**, 239–259. doi:10.3897/phytokeys.205.82275.

Borges LM, Pastore JFB, Souza AFC, Pirani JR, Simon MF (2023) Let there be clades: Phylogenetics of *Mimosa* series *Pachycarpae* and *Setosae* (Fabaceae) improves the infrageneric classification of the genus. *Botanical Journal of the Linnean Society* **201**, 61–79. doi:10.1093/botlinnean/boac029.

Brown GK, Aju J, Bayly MJ, Murphy DJ, McLay TGB (2022) Phylogeny and classification of the Australasian and Indomalayan mimosoid legumes *Archidendron* and *Archidendropsis* (Leguminosae, subfamily Caesalpinioideae, mimosoid clade). *PhytoKeys* **205**, 299–333. doi:10.3897/phytokeys.205.79381.

Carvalho CS, Lima HC, de Moraes PLR, Cardoso DBOS (2022) Assessing the nomenclatural history of the sucupira-branca trees: Friedrich Sellow's (1789–1831) collections, typification and checklist of the Neotropical legume genus *Pterodon*. *TAXON* **Early View**. doi:10.1002/tax.12823.

Castellanos C, Vargas TF, Lewis GP, Kite GC (2022) *Orphanodendron* (Leguminosae: Papilionoideae), an endemic and little-known genus from Colombia. Pp. 257– 270. In: Forero, E. & C. Castellanos (Eds.) Estudios en Leguminosas Colombianos IV. Biblioteca Jorge Álvarez Lleras No. 43. Academia Colombiana de Ciencias Exactas, Físicas y Naturales & Fundación Universitaria de San Gil – UNISANGIL, Colombia.

Castillon EE, Quintanilla JÁV, Delgado-Salinas A (2022) A new section of *Astragalus* (Fabaceae: Galegeae) from Mexico. *Phytotaxa* **545**, 79–86. doi:10.11646/phytotaxa.545.1.6.

SYSTEMATICS & TAXONOMY

Choi I-S, Wojciechowski MF, Steele KP, Hopkins A, Ruhlman TA, Jansen RK (2022) Plastid phylogenomics uncovers multiple species in *Medicago truncatula* (Fabaceae) germplasm accessions. *Scientific Reports* **12**, 21172. doi:10.1038/s41598-022-25381-1.

Clark RP, Jiang K-W, Gagnon E (2022) Reinstatement of *Ticanto* (Leguminosae-Caesalpinioideae) – the final piece in the *Caesalpinia* group puzzle. *PhytoKeys* **205**, 59–98. doi:10.3897/phytokeys.205.82300.

Del Guacchio E, Caputo P (2022) Towards a rational nomenclature of cultivated plants: Proposal of taxonomic reassessment of *Cicer reticulatum* (Fabaceae) and *Spinacia turkestanica* (Chenopodiaceae). *Phytotaxa* **558**, 298–300. doi:10.11646/phytotaxa.558.3.7.

Del Guacchio E, Tavilla G, Giusso del Galdo G, Brullo S, Stirton C (2022) (2884) Proposal to conserve the name *Bituminaria* (Fabaceae) with a conserved type. *TAXON* **71**, 477–478. doi:10.1002/tax.12703.

Delgado-Salinas A, Lavin M, Snak C, Lewis GP (2022) Systematics of *Vigna* subgenus *Lasiospron* (Leguminosae: Papilionoideae: Phaseolinae). *Systematic Botany* **47**, 97–124. doi:10.1600/036364422X16442668423428.

Demeulenaere E, Schils T, Burleigh JG, Ringelberg JJ, Koenen EJM, Ickert-Bond SM (2022) Phylogenomic assessment prompts recognition of the *Serianthes* clade and confirms the monophyly of *Serianthes* and its relationship with *Falcataria* and *Wallaceodendron* in the wider ingoid clade (Leguminosae, Caesalpinioideae). *PhytoKeys* **205**, 335–361. doi:10.3897/phytokeys.205.79144.

Falcão M, Torke BM, Mansano V (2022) A taxonomic revision of the Amazonian genus *Dicorynia* (Fabaceae: Dialioideae). *Phytotaxa* **554**, 1–31. doi:10.11646/phytotaxa.554.1.1.

Ferm J, Ståhl B (2022) A revised subgeneric classification of the Neotropical genus *Zapoteca* (Caesalpinioideae; Fabaceae). *Systematic Botany* **47**, 208–214. doi:10.1600/036364422X16442668423527.

Fortes EA, Mansano VF (2022) Untangling nomenclatural issues of some Amazonian trees of *Eperua* Aubl. (Leguminosae, Detarioideae, Detarieae). *Phytotaxa* **542**, 189–198. doi:10.11646/phytotaxa.542.2.6.

Garcia-Beltran JA (2022) *Cenostigma pinnatum* var. *oblongifolium* (Leguminosae: Caesalpinioideae) validly published. *Phytotaxa* **548**, 126–126. doi:10.11646/phytotaxa.548.1.13.

Garcia-Beltran JA (2022) Taxonomic and nomenclatural update of *Cenostigma* (Leguminosae: Caesalpinioideae) in Cuba. *Phytotaxa* **543**, 291–296. doi:10.11646/phytotaxa.543.5.4.

Ghahremaninejad F, Joharchi MR, Memariani F (2022) *Astragalus durandianus* (sect. *Trachycercis*) as an Iranian endemic species: Emended description, distribution, and conservation. *Phytotaxa* **550**, 32–44. doi:10.11646/phytotaxa.550.1.2.

Ghahremaninejad F, Joharchi MR, Memariani F, Behroozian M (2022) *Astragalus nigriceps* (Fabaceae, Papilionoideae): An emended description with new data on distribution and conservation status. *Phytotaxa* **536**, 243–251. doi:10.11646/phytotaxa.536.3.4.

Ghosh J, Midday M, Das DS, Maity D (2022) Himalayan *Astragalus* (Leguminosae) with minute calyx lobes: New synonyms of *A. minutidentatus*. *Journal of Japanese Botany* **97**, 77–86. http://www.jjbotany.com/pdf/JJB97-2_77-86_abstract.pdf

Hughes CE, de Queiroz LP, Lewis GP (2022) Editorial. Advances in Legume Systematics 14. Classification of Caesalpinioideae Part 1. New generic delimitations. *PhytoKeys* **205**, 1–2. doi:10.3897/phytokeys.205.89634.

Hughes CE, Ringelberg JJ, Lewis GP, Catalano SA (2022) Disintegration of the genus *Prosopis* L. (Leguminosae, Caesalpinioideae, mimosoid clade). *PhytoKeys* **205**, 147–189. doi:10.3897/phytokeys.205.75379.

Hughes CE, Ringelberg JJ, Luckow M, Jiménez JLC (2022) *Mezcala* – a new segregate genus of mimosoid legume (Leguminosae, Caesalpinioideae, mimosoid clade) narrowly endemic to the Balsas Depression in Mexico. *PhytoKeys* **205**, 191–201. doi:10.3897/phytokeys.205.78297.

Idrees M, Li M, Zhang Z (2022) Lectotypification of *Bauhinia delavayi* and *B. yunnanensis* (Fabaceae: Cercidoideae). *Phytotaxa* **571**, 97–98. doi:10.11646/phytotaxa.571.1.9.

SYSTEMATICS & TAXONOMY

Idrees M, LI M, Zhang Z (2022) Notes on the typification of nine names in *Dalbergia* L.f. (Dalbergieae, Papilionoideae, Fabaceae) in East and Southeast Asia. *Phytotaxa* **558**, 140–146. doi:10.11646/phytotaxa.558.1.11.

Idrees M, Li M, Zhang Z (2022) Erratum: Idrees, M., Li, M. & Zhiyong, Z (2022) Notes on the typification of nine names in *Dalbergia* L.f. (Dalbergieae, Papilionoideae, Fabaceae) in East and Southeast Asia. Phytotaxa 558 (1): 140–146. See also an erratum in *Phytotaxa* **559**, 300. doi:10.11646/phytotaxa.559.3.9.

Koenen EJM (2022) On the taxonomic affinity of *Albizia carbonaria* Britton (Leguminosae, Caesalpinioideae-mimosoid clade). *PhytoKeys* **205**, 363–370. doi:10.3897/phytokeys.205.82288.

Koenen EJM (2022) *Osodendron* gen. nov. (Leguminosae, Caesalpinioideae), a new genus of mimosoid legumes of tropical Africa. *PhytoKeys* **205**, 453–470. doi:10.3897/phytokeys.205.82821.

Le Roux MM (2022) Typification and synonymisation of the overlooked name *Lebeckia subsecunda* (Fabaceae). *Phytotaxa* **559**, 298–299. doi:10.11646/phytotaxa.559.3.8.

Lima AG de, de Paula-Souza J, Ringelberg JJ, Simon MF, de Queiroz LP, Borges LM, de F. Mansano V, Souza VC, Scalon VR (2022) New segregates from the Neotropical genus *Stryphnodendron* (Leguminosae, Caesalpinioideae, mimosoid clade). *PhytoKeys* **205**, 203–237. doi:10.3897/phytokeys.205.82220.

O'Donnell SA, Ringelberg JJ, Lewis GP (2022) Re-circumscription of the mimosoid genus *Entada* including new combinations for all species of the phylogenetically nested *Elephantorrhiza* (Leguminosae, Caesalpinioideae, mimosoid clade). *PhytoKeys* **205**, 99–145. doi:10.3897/phytokeys.205.76790.

Ohashi H, Ohashi K (2022) Enumeration of *Desmodiastrum* (Leguminosae, tribe Desmodieae). *Journal of Japanese Botany* **97**, 249–259. http://www.jjbotany.com/pdf/JJB97-5_249-259_abstract.pdf

Ohashi H, Ohashi K, Ye B (2022) Pollen morphology and systematic position of *Alysicarpus* (Leguminosae, tribe Desmodieae). *Journal of Japanese Botany* **97**, 260–269. http://www.jjbotany.com/pdf/JJB97-5_260-269_abstract.pdf

Ohashi K, Ohashi H, Ye B, Nata K (2022) New systematic position of *Desmodiastrum* (Leguminosae tribe Desmodieae). *Journal of Japanese Botany* **97**, 131–144. http://www.jjbotany.com/pdf/JJB97-3_131-144_abstract.pdf

Paula-Souza J de, de Lima AG, Costa JA, de Queiroz LP (2022) A step out of the chaos—a nomenclatural revision of New World *Copaifera* (Fabaceae, Detarieae). *Annals of the Missouri Botanical Garden* **107**, 467–479. doi:10.3417/2022784.

Planchuelo AM (2022) New varieties and synonyms of *Lupinus* species (Fabaceae, Faboideae) of Northwestern Argentina. *Phytotaxa* **566**, 143–170. doi:10.11646/phytotaxa.566.2.1.

Ramos G, Zartman CE, Lima HC de, Pennington RT, Cardoso DBOS (2022) A taxonomic synopsis of *Aldina*, a florally distinctive and poorly collected Amazonian genus of papilionoid legumes. *Systematic Botany* **47**, 962–977. doi:10.1600/036364422X16674053033859.

Renner MAM, Barrett RL, Clarke S, Clugston JAR, Wilson TC, Weston PH (2022) Morphological and molecular evidence refute a broad circumscription for *Pultenaea glabra* (Fabaceae: Mirbelieae), with implications for taxonomy, biogeography, and conservation. *Australian Systematic Botany* **35**, 225–277. doi:10.1071/SB21030.

Ringelberg JJ, Koenen EJM, Iganci JR, de Queiroz LP, Murphy DJ, Gaudeul M, Bruneau A, Luckow M, Lewis GP, Hughes CE (2022) Phylogenomic analysis of 997 nuclear genes reveals the need for extensive generic re-delimitation in Caesalpinioideae (Leguminosae). *PhytoKeys* **205**, 3–58. doi:10.3897/phytokeys.205.85866.

Saisorn W, Chantaranothai P (2022) A taxonomic revision of two genera, *Pleurolobus* and *Sohmaea* (Leguminosae) in Thailand and Indo-China. *Phytotaxa* **573**, 231–246. doi:10.11646/phytotaxa.573.2.4.

Scalon VR, de Paula-Souza J, de Lima AG, Souza VC (2022) A synopsis of the genus *Stryphnodendron* (Fabaceae, Caesalpinioideae, mimosoid clade). *Phytotaxa* **544**, 227–279. doi:10.11646/phytotaxa.544.3.1.

Silva RCC da, Bezerra JJL, Medeiros MFT (2022) Analysis of historical botanical reports of species of Fabaceae in *Historia Naturalis Brasiliae* (1648). *Rodriguésia* **73**. doi:10.1590/2175-7860202273061.

SYSTEMATICS & TAXONOMY

Silva Santos F da, Snak C, Ribeiro CL, Silva C, de Queiroz LP (2022) Phylogenetic analyses of Phaseolinae (Leguminosae) reveal a new genus endemic to limestone outcrops in seasonally dry forests of Bahia, Brazil. *TAXON* **Early View**. doi:10.1002/tax.12819.

Soares MVB, Koenen EJM, Iganci JRV, Morim MP (2022) A new generic circumscription of *Hydrochorea* (Leguminosae, Caesalpinioideae, mimosoid clade) with an amphi-Atlantic distribution. *PhytoKeys* **205**, 401–437. doi:10.3897/phytokeys.205.82775.

Song Z-Q, Li S-J, Mattapha S (2022) *Huchimingia*, a new genus segregated from *Millettia* (Leguminosae, Millettieae) based on morphological and molecular evidence. *Phytotaxa* **532**, 37–56. doi:10.11646/phytotaxa.532.1.3.

Song Z-Q, Li S-J, Vu QN, Khang NS (2022) Taxonomic notes on the genus *Millettia* (Fabaceae: Millettieae) in Vietnam. *Phytotaxa* **571**, 169–185. doi:10.11646/phytotaxa.571.2.4.

Song Z, Pan B (2022) Transfer of *Millettia pachycarpa* and *M. entadoides* to *Derris* (Fabaceae), supported by morphological and molecular data. *Phytotaxa* **531**, 230–248. doi:10.11646/phytotaxa.531.3.4.

Souto FS, Agra MDF (2022) Typifications of ten names related to *Senna* ser. *Interglandulosae* (Leguminosae, Caesalpinioideae). *Phytotaxa* **547**, 186–192. doi:10.11646/phytotaxa.547.2.6.

Souza AO de, Cavalcante RG, Da Silva MJ (2022) Taxonomic revision of *Chamaecrista* sect. *Absus* subsect. *Absus* (Leguminosae, Caesalpinioideae) with adjustments in the new classification. *Phytotaxa* **565**, 1–82. doi:10.11646/phytotaxa.565.1.1.

Souza ÉR de, de Almeida PGC, Rocha L, Koenen EJM, Burgos MA, Lewis GP, Hughes CE (2022) *Boliviadendron*, a new segregate genus of mimosoid legume (Leguminosae, Caesalpinioideae, mimosoid clade) narrowly endemic to the interior Andean valleys of Bolivia. *PhytoKeys* **205**, 439–452. doi:10.3897/phytokeys.205.82256.

Souza ÉR de, Luz ARM, Rocha L, Lewis GP (2022) Molecular and morphological analysis supports the separation of *Robrichia* as a genus distinct from *Enterolobium* (Leguminosae: Caesalpinioideae: mimosoid clade). *Systematic Botany* **47**, 268–277. doi:10.1600/036364422X16442669847067.

Steier JE, Mandáková T, Wojciechowski MF, Steele KP (2022) Insights into species delimitation of selected species in the flowering plant genus *Medicago* section *Buceras* (Leguminosae). *Systematic Botany* **47**, 431–440. doi:10.1600/036364422X16512564801533.

Tamayo-Cen I, Torke BM, López Contreras JE, Carnevali Fernández-Concha G, Ramírez Morillo I, Can Itza LL, Duno de Stefano R (2022) Revisiting the phylogeny and taxonomy of the *Pithecellobium* clade (Leguminosae, Caesalpinioideae) with new generic circumscriptions. *PhytoKeys* **205**, 279–298. doi:10.3897/phytokeys.205.82728.

Terra V, Ringelberg JJ, Maslin B, Koenen EJM, Ebinger J, Seigler D, Hughes CE (2022) Dilemmas in generic delimitation of *Senegalia* and allies (Caesalpinioideae, mimosoid clade): How to reconcile phylogenomic evidence with morphology and taxonomy? *PhytoKeys* **205**, 261–278. doi:10.3897/phytokeys.205.79378.

NEW SPECIES - 28

Aytaç Z, Ertuğrul T, Erst A, Fişne A (2022) A new *Hedysarum* L. species (Fabaceae) from Türkiye, *Hedysarum dazkiriense*. *Phytotaxa* **574**, 273–281. doi:10.11646/phytotaxa.574.4.2.

Camargo RA, Burnham RJ, Mansano V de F (2022) *Deguelia tenuiflora* (Leguminosae, Papilionoideae), a remarkable new species from the Brazilian Amazon. *Rodriguésia* **73**. doi:10.1590/2175-7860202273048.

NEW SPECIES

Carvalho CS, Lima HC, Zuanny DC, Gregório BS, Cardoso DB (2022) The discovery of a new giant legume tree species in a severely fragmented landscape underscores the alarming threats to the biodiversity of the Brazilian Atlantic Forest. *Botanical Journal of the Linnean Society* **Early View**, boac034. doi:10.1093/botlinnean/boac034.

Castillon EE, Rebman JP, Gonzalez C, Quintanilla JÁV (2022) *Astragalus tijuanensis* and *Astragalus brauntonii* var. *lativexillum*, a new species and a new variety in the genus *Astragalus* (Fabaceae) from extreme northwestern Baja California, Mexico. *Phytotaxa* **577**, 1–13. doi:10.11646/phytotaxa.577.1.1.

Castro-Bonilla MA, Bueno ML, Romano PSR, Dutra VF, Fregonezi JN, Garcia FCP (2022) Species delimitation of the Atlantic Forest endemic *Inga subnuda* (Leguminosae, Caesalpinioideae, mimosoid clade) subspecies based on morphological, ecological, and palaeoecological data. *Systematic Botany* **47**, 417–430. doi:10.1600/036364422X16512564801551.

Choo LM, Loo AHB, Ang WF, Er KBH (2022) A natural hybrid of *Sindora* (Fabaceae, Detarioideae) from Singapore. *PhytoKeys* **190**, 87–102. doi:10.3897/phytokeys.190.79185.

Crameri S, Phillipson PB, Rakotonirina N, Wilding N, Andriamiarisoa RL, Lowry PP, Widmer A (2022) Taxonomic studies on Malagasy *Dalbergia* (Fabaceae). III. Two new species from southeastern Madagascar and an emended description of the rosewood species *Dalbergia maritima*. *Systematic Botany* **47**, 397–416. doi:10.1600/036364422X16512564801614.

Dorado Ó, Cruz-Duran R, Garcia RB (2022) Two new closely related species of *Brongniartia* (Fabaceae, Faboideae) from the Sierra Madre del Sur in Guerrero, México. *Phytotaxa* **544**, 1–10. doi:10.11646/phytotaxa.544.1.1.

Dos Santos AC, de Queiroz LP, Paula AP, de Carvalho R (2022) A new species of *Bauhinia* ser. *Cansenia* (Cercidoideae, Leguminosae) endemic to the Atlantic Forest in the state of Bahia, Brazil. *Phytotaxa* **568**, 213–220. doi:10.11646/phytotaxa.568.2.6.

Dos Santos AC, Vaz A, da Silva M, Paula AP, Feitoza L, Carvalho R (2022) A new species of *Bauhinia* (Cercidoideae, Leguminosae) from the states of Pernambuco and Alagoas, Brazil. *Phytotaxa* **576**, 289–296. doi:10.11646/phytotaxa.576.3.5.

Fonseca-Cortes A (2022) Misidentified for more than 50 years, *Crotalaria rosenii* (Leguminosae, Papilionoideae, Crotalarieae), a cultivated species in Colombia and Ecuador. *Phytotaxa* **533**, 287–297. doi:10.11646/phytotaxa.533.5.4.

Herrera-Palma M, Stirton CH, Ruiz-Bohórquez LK, Callejas-Posada R, Cardoso DBOS (2022) *Ormosia corcovada*, a new papilionoid legume from the Bajo Cauca region of northeastern Colombia. *Systematic Botany* **47**, 861–868. doi:10.1600/036364422X16573019348391.

Karaman Erkul S, Duman H, Ateş MA (2022) *Astragalus oksutdagensis* (Fabaceae), a new species from Turkey. *Nordic Journal of Botany* **2022**. doi:10.1111/njb.03237.

Kumar ESS, Shareef SM, Vikraman RR (2022) *Humboldtia ponmudiana* (Fabaceae-Detarioideae), a new species from Kerala, India. *Phytotaxa* **552**, 115–121. doi:10.11646/phytotaxa.552.1.11.

Lachenaud O, Bidault E (2022) New and little-known species of *Englerodendron* (Leguminosae-Detarioideae) from Central Africa, with a revised key to the genus. *Plant Ecology and Evolution* **155**, 153–164. doi:10.5091/plecevo.84547.

Liu J-L, Li S-G, Yang F, Wang H-C (2022) *Indigofera vallicola* (Fabaceae), a new species from Yunnan, southwest China. *PhytoKeys* **199**, 9–16. doi:10.3897/phytokeys.199.85437.

Mattapha S, Suddee S, Tetsana N, Thananthaisong T, Kaewmuan A (2022) *Millettia sirindhorniana* and *M. tomentosa*, two new species of *Millettia* (Fabaceae: Millettieae) for Thailand. *Thai Forest Bulletin (Botany)* **50**, 89–99. doi:10.20531/tfb.2022.50.2.09.

Mattapha S, Sungkaew S, Pongamornkul W, Lanorsavanh S, Lamxay V, Hein KZ (2022) Notes on the genus *Millettia* (Fabaceae: Millettieae) in the Indo-Burmese region; A new species, new records and lectotypifications. *Thai Forest Bulletin (Botany)* **50**, 75–87. doi:10.20531/tfb.2022.50.1.08.

Mendes TP, Simon MF, da Silva MJ (2022) Three new species of *Mimosa* L. (Leguminosae) from the Brazilian Cerrado hotspot of biodiversity. *Brittonia* **9**, 1–20. doi:10.1007/s12228-022-09723-x.

NEW SPECIES

Ribeiro CL, Snak C, Santos F da S, Queiroz LP de (2022) An overlooked new species of *Macroptilium* (Leguminosae-Papilionoideae) from northeastern Brazil. *Systematic Botany* **47**, 1025–1030. doi:10.1600/036364422X16674053033840.

Silva MJ da, Dos Santos IS (2022) A lovely new, and potentially medicinal, species of *Copaifera* (Detarioideae, Fabaceae) from the Brazilian Cerrado supported by anatomical and morphological data. *Phytotaxa* **552**, 127–150. doi:10.11646/phytotaxa.552.2.1.

Silva MJ da, Fortuna-Perez AP, dos Santos IS, Pinto RB (2022) Studies on *Collaea* species (Fabaceae) occurring in Brazil: Taxonomic novelties, new interpretations about the leaf of the genus, and new leaf anatomical characters for American Fabaceae. *Phytotaxa* **576**, 55–74. doi:10.11646/phytotaxa.576.1.3.

Sotuyo S, Contreras-Jiménez JL, Rico-Arce L (2022) *Coulteria sousae* (Leguminosae: Caesalpinioideae), a new species from the Rio Balsas depression, Mexico. *Systematic Botany* **47**, 691–696. doi:10.1600/036364422X16573019348229.

Telford IIRH, Clugston JAR, Barrett RL (2022) *Pultenaea williamsii* (Fabaceae: Mirbelieae), a new species endemic to the New England Tableland Bioregion of New South Wales. *Telopea* **25**, 165–171. doi:10.7751/telopea15746.

Wang C-M, Chang C-Y, Tseng Y-H (2022*) Smithia yehii* (Leguminosae, Papilionoideae), a new species from Taiwan. *PhytoKeys* **210**, 53–65. doi:10.3897/phytokeys.210.90598.

Ying S 17. A new species of genus *Indigofera* (Fabaceae) from Taiwan. *New Taxa New Names* **5**, 150–158. http://homepage.ntu.edu.tw/~yingshao/

Ying S 50. A new species of genus *Hylodesmum* (Fabaceae) from Taiwan. *New Taxa New Names* **5**, 441–445. http://homepage.ntu.edu.tw/~yingshao/

Zeferino LC, Lewis GP, De Vargas W, Candido ES, Vatanparast M, Da Silva MJ, Murashima PHP, Fortuna-Perez AP (2022) A new species of *Chamaecrista* sect. *Absus* (Leguminosae, Caesalpinioideae) from Minas Gerais, Brazil, with notes on leaf anatomy. *Phytotaxa* **536**, 252–260. doi:10.11646/phytotaxa.536.3.5.

Bauhinia weberbaueri Harms (Cercidoideae), photo by Colin Hughes.