VI International Rubiaceae and Gentianales Conference

(VI Conferência Internacional de Rubiaceae e Gentianales)

October 19-22, 2014, Salvador, Bahia, Brazil

PROGRAM AND ABSTRACTS

VI International and Gentianales Conference

October 19-22, 2014, Salvador, Bahia, Brazil

Convention Center of the Hotel Fiesta

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Financial Support

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CONFERENCE PROGRAM

Sunday, October 19

8:00 – Arrival and registration

9:30 – Conference opening

10:30 – Coffee break

11:00 – Opening address

- Dr. Charlotte Taylor (Missouri Botanical Garden, USA) – **Neotropical Rubiaceae 2014: a diverse assemblage**

12:00 – Lunch

14:00 - 15:30 – Invited speakers:

- Dr. Piero Delprete (Cayenne Herbarium, French Guiana) - **Rubiaceae of the Guianas: progress towards the understanding of one of the floristic centers of diversity in South America**

- Dr. Roberto Salas (University of Corrientes, Argentina) – **The Neotropical Spermacoce clade (Rubiaceae): results and future challenges**

16:00 - 18:00 – **Session 1: Biodiversity and Taxonomy (Rubiaceae)**

Contributed Papers:

1. Sandra V. Sobrado & Elsa L. Cabral - **Biosystematic studies on *Borreria* subsect. *Latifoliae* (K. Schum.) Bacigalupo & Cabral (Spermacoceae, Rubiaceae)**.
2. Laila M. Miguel & Elsa L. Cabral – **Contributions to taxonomy, palynology and seed micromorphology in *Borreria* subsect. *Borreria* of South America.**

3. Andrea A. Cabaña Fader, Beatriz G. Galati, Roberto M. Salas & Elsa L. Cabral - **A multidisciplinary study of *Diodia* s.l. (Spermacoceae-Rubiaceae).**

4. Alma P. Bautista Bello & Gonzalo Castillo Campos – **The genus *Hoffmannia* Sw. (Rubiaceae) in Veracruz, Mexico.**

5. Carla Maldonado, Alexandre Antonelli, Carlos Molina, Alexander Zizka, Claes Persson, Joaquina Alban, Eder A. Chilquillo Torres & Nina Rønsted - **Mapping diversity and distribution using novel bioinformatics tools: Do we still need taxonomists? The tribe Cinchoneae (Rubiaceae) as a case study.**

6. João A. M. Carmo, Luiza S. Kinoshita & André O. Simões – **Rubiaceae of Camanducaia, Minas Gerais, Brazil.**

20:00 – Opening ceremony and welcome reception of the **Latin American** and **Brazilian Botanical Congress**

Monday, October 20

9:00 - 10:30 – Invited speakers:

– Dr. Victor A. Albert (University of Buffalo, USA) - **The Coffee genome provides insight into the convergent evolution of caffeine biosynthesis**

– Dr. Mary E. Endress (University of Zurich, Switzerland) - **Dealing with dissention in the ranks: a formal and informal solution for Apocynaceae s. str.**

11:00 - 12:00 – **Session 2: Morphology and Anatomy**

Contributed papers:

1. Alexander Vrijdaghs, Petra De Block & Erik Smets – **Cryptic character states in corollas in the Spermacoceae alliance (Rubioideae, Rubiaceae).**

2. Marina D. Judkevich, Roberto M. Salas & Ana M. Gonzalez – **Colleters in Spermacoceae (Rubiaceae): distribution and morpho-anatomy description**

3. Brecht Verstraete, Steven Janssens, Erik Smets & Steven Dessein - **Bacterial leaf endophytes in African Rubiaceae.**

12:00 – 13:00 – Gentianales working group

13:00 – Lunch

14:00 - 15:30 – Invited speakers:

– Dr. Sigrid Liede-Schumann (University of Bayreuth, Germany) - **Biogeography of the genus *Metastelma* (Apocynaceae-Asclepiadoideae).**

– Dr. André Olmos Simões (University of Campinas, Brazil) -**New insights in the systematics, evolution and biogeography of the ViWiTa clade (Apocynaceae): What have we learned in the last four years?**

16:00 - 18:00 – **Session 3: Phylogeny and Biogeography (Gentianales)**

Contributed papers:

1 - Vincent S.F.T. Merckx & Erik F. Smets - **Subterranean Homesick Blues: The transatlantic distribution of the mycoheterotrophic genus *Voyria* (Gentianaceae).**

2. Patrícia L. Ribeiro, Alessandro Rapini & Cássio van den Berg - **Population studies in *Minaria* (Apocynaceae): trying to understand the endemism in the Espinhaço Range.**

3. Maria Fernanda Calió, Katherine B. Lepis, José R. Pirani & Lena Struwe – **New insights into the generic circumscription of Helieae (Gentianaceae).**

4. Rosemeri Morokawa, Luiza S. Kinoshita, André O. Simões & Alexandre Antonelli - **Historical biogeography of a Pantropical clade (Apocynaceae, Rauvolfioideae).**

5. S.B. Janssens, I. Groeninckx I., P. De Block , B. Verstraete, E. Smets & S. Dessein - **Dispersing towards Madagascar: Biogeography and evolution of the Malagasy endemics of the Spermacoceae tribe (Rubiaceae).**

6. Kathy Mathews & Lena Struwe - I**ntertribal and Interspecific Relationships of *Spigelia* (Loganiaceae).**

18:00 – Plenary Lecture of the **Latin American Congress**

19:00 - Poster session

Tuesday, October 21

9:30 - 10:30 – Invited speaker:

– Dr. Sylvain Razafimandimbison (Bergius Foundation, Sweden) - **Molecular phylogenetics of the sister tribes Psychotrieae and Palicoureeae (Rubiaceae): implications for their generic limits and the evolution of schizocarps in *Psychotria* L.**

11:00 - 13:00 – **Session 4: Phylogeny and Biogeography (Rubiaceae)**

Contributed papers:

1. Xiang-Lan Wang, Li-Li Xu, Chad Husby, Zhang-Li Hu & Tao Chen - **Molecular identification and genetic analysis of a new cultivar in the genus *Mussaenda* L. (Rubiaceae).**

2. Piero Delprete - **Phylogeny and biogeography of the tribe Sipaneeae (Rubiaceae).**

3. Carla P. Bruniera, Paola L. Ferreira, Daniela C. Zappi & Milton Groppo - **Phylogenetic analysis of *Rudgea* Salisb. (Psychotrieae, Rubiaceae) inferred from rps16 and ITS sequence data.**

4. Carla Maldonado, Joaquina Alban, Ruy J. V. Alves, Claus Cornett, Rasmus Dahlberg, Steen H. Hansen, Alessandra M. Paiva, Claes

Persson, André O. Simões, Eder A. Chilquillo Torrez, Charlotte Taylor, Alexandre Antonelli & Nina Rønsted - **The quest for *Cinchona* - a phylogenetic tale.**

5. Alejandro Torres-Montúfar & Helga Ochoterena - **Systematics of the *Arachnothryx* complex (Guettardeae).**

6. Jenny E. E. Smedmark, Sylvain G. Razafimandimbison & Birgitta Bremer - **A molecular phylogenetic study of the Vanguerieae Alliance.**

13:00 – Lunch

14:00 –15:30 – Invited speakers:

– Dr. Luiz Orlando de Oliveira (University of Viçosa, Brazil) - **Phylogeography of *Carapichea ipecacuanha*: Does a forgotten plant hold clues to a hidden past?**

– Dr. Alexandre Antonelli (University of Gothenburg, Sweden) - **How the Gentianales conquered the world.**

16:00 –17:30– **Session 5: Phylogeny and Biogeography (Rubiaceae)**

Contributed papers:

1. Kent Kainulainen, Sylvain G. Razafimandimbison, Niklas Wikström & Birgitta Bremer - **Island hopping, long-distance dispersals, and species radiations in the western Indian Ocean: a biogeographic study of the Coffeeae alliance.**

2. Eder A. Chilquillo Torres, André O. Simões, Joaquina Albán, Charlotte M. Taylor, Alexandre Antonelli, Nina Rønsted & Carla Maldonado - **Advances in morphological and molecular phylogeny of *Ladenbergia* Klotzsch (Cinchoneae: Rubiaceae).**

18:00 – Plenary Lecture of the **Latin American Congress**

19:00 - Conference closing and selection of venue for the VII Conference

Wednesday, October 22

8:00 – Field visit to Abaeté Coastal Sand Dunes Ecological Park

20:00 – Conference Dinner

Thursday and Friday, October 23-24

– Free to join the activities of the **Latin American** and **Brazilian Congress**

Saturday, October 25

– Optional ticketed field trip to the forests of southern Bahia (5 days).

Poster Session (Monday, October 20)

1. Wictor T. C. C. Santos & Letícia R. Lima - **Phanerogamic Flora of the State of Alagoas: the genus *Spermacoce* L. (Rubiaceae)**.

2. Wictor T. C. C. Santos & Letícia R. Lima - **Phanerogamic Flora of the State of Alagoas: the genus *Diodella* Small (Rubiaceae)**.

3. Luciano Margalho, Piero G. Delprete & Milton Groppo - **Preliminary checklist of the neotropical genus *Simira* Aubl. (Rubiaceae)**.

4. Vinicius M. Cotarelli & Jomar G. Jardim - ***Psychotria* (Rubiaceae) in the Caatinga, semiarid region of Brazil**.

5. Elnatan B. Souza, Evelyne M. Marreira & Ellen K. S. Brandão - **Rubiaceae from Ceará state, Brazil: diversity and new records**.

6. Charlotte M. Taylor, Burgund Bassüner, Daniel Cook, Stephen T. Lee, Franklin Riet-Correa, James A. Pfister & Dale R. Gardner - **Detailing the taxonomy and distribution of toxic *Palicourea* (Rubiaceae) species in South America**.

7. Charlotte M. Taylor & Burgund Bassüner - **Some distribution patterns of Neotropical Rubiaceae**.

8. Marina D. Judkevich & Ana M. Gonzalez - **Pistillate and staminate flower morphology and anatomy in dioecious *Cordiera concolor* (Gardenieae-Rubiaceae)**.

9. Filipe T. Leite, Mário L. Garbin & Tatiana T. Carrijo - **Rubiaceae richness in a lowland Atlantic forest remnant at Espírito Santo, Brazil: a preliminary assessment**.

10. Juliana A. Oliveira, Jomar G. Jardim & Rafaela C. Forzza - **Taxonomic revision of *Bradea* Standl. (Rubiaceae: Coussareeae)**.

11. Nállarett Dávila & Luiza Kinoshita - **A new species of *Platycarpum* Hooker (Rubiaceae) from Peruvian Amazon**.

12. Maria Ana Farinaccio, Andressa P. Souza & André O. Simões - **Checklist of the Apocynaceae from the Mato Grosso do Sul State, Brazil**.

13. Maria do Céo R. Pessoa, Maria Regina V. Barbosa, Claes Persson & Alexandre Antonelli- **The genus *Chomelia* (Guettardeae, Rubiaceae) in Brazil**.

14. Keslane S. S. Almeida, Uiara C. S. Silva & Alessandro Rapini - **Phylogenetics of *Allamanda* (Apocynaceae)**.

15. J. D. Vidal Júnior, A. O. Simões, R. Morokowa & I. Koch - **Biogeography of the genus *Rauvolfia* L. (Apocynaceae, Rauvolfioideae)**.

16. Bárbara B. Biazotti, André O. Simões & Sandra M. Carmello-Guerreiro - **Seed morphology and anatomy of Tabernaemontaneae (Apocynaceae, Rauvolfioideae)**.

17. Emília R. Kotovski & André O. Simões - **Flower morphology and anatomy of species of Plumerieae L. (Apocynaceae, Rauvolfioideae)**.

18. Carolina C. M. Freitas, Sandra M. Carmello-Guerreiro & André O. Simões - **Seed morphology and anatomy of Willughbeieae (Apocynaceae, Rauvolfioideae)**.

19. Petra De Block, Steven Janssens, Sylvain Razafimandimbison & Birgitta Bremer - **Dismantling the genus *Tarenna* (Pavetteae) in Africa.**

20. Marcela F. Silveira, Alexandre Antonelli & Luiza S. Kinoshita - **Relationships of *Manettia* Mutis ex L. (Rubiaceae) based on molecular and morphological studies – Preliminary data.**

ABSTRACTS

The abstracts are arranged in alphabetical order on the first author's last name. The name of the presenting author is dashed.

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The Coffee Genome Provides Insight into the Convergent Evolution of Caffeine Biosynthesis

Victor A. Albert ; for the *Coffea canephora* Genome Consortium

Department of Biological Sciences, University at Buffalo, Buffalo, USA 14260

Coffee is a valuable beverage crop due to its characteristic flavor, aroma, and the stimulating effects of caffeine. We generated a high-quality draft genome of the diploid coffee species *Coffea canephora*, which displays a conserved chromosomal gene order among asterid angiosperms, and shows no sign of the whole genome triplication identifed in Solanaceae species such as tomato and hot pepper. Although the coffee genome contains fewer genes than most eudicots (25,574), it includes species-specific gene family expansions, among them N-methyltransferases (NMTs) involved in caffeine production, defense-related genes, and alkaloid and flavonoid enzymes involved in other secondary compound synthesis. For example, indole alkaloids are prominent secondary compounds of the coffee family, Rubiaceae, and its parent order, Gentianales, and gene functions related to indole alkaloid biosynthesis are highly enriched in coffee relative to tomato, grapevine, and Arabidopsis. Through a comparative genomic analysis of the coffee NMTs that are responsible for caffeine production, we demonstrate that these genes expanded through sequential tandem duplications and evolved independently of those from cacao and tea, suggesting that caffeine in eudicots is of polyphyletic origin.

Phylogenetics of *Allamanda* (Apocynaceae)

Keslane S. S. Almeida, Uiara C. S. Silva, Alessandro Rapini

Universidade Estadual de Feira de Santana-UEFS, Departamento de Ciências Biológicas, Laboratório de Sistemática Molecular de Plantas, Feira de Santana, BA, Brazil

Allamanda is a Neotropical genus, occurring from Mexico to Argentina. It consists of 15 species, some of which are popular and widely cultivated as ornamentals because of their showy flowers. We used nuclear (ITS) and plastid (*trnL-F*, *trnS-G*, *rps16* and *rpl16*) sequences to assess phylogenetic relationships in the genus. Ten species of *Allamanda* were sampled and representatives of three other genera of Plumerieae (*Himantanthus*, *Skytanthus* and *Thevetia*) were also included as inner group. *Aspidosperma* (Aspidospermeae), *Condylocarpon* (Alyxiaea), *Hancornia* (Willughbeieae), *Rauvolfia* (Vinceae) and *Tabernaemontana* (Tabernaemontanae) were used as outgroup. Maximum parsimony and Bayesian inference analyses for individual regions and a combined dataset were performed. The monophyly of *Allamanda* is strongly supported in all analyzes and *Himatanthus* emerges as its sister group. Our results also show an initial disjunction between *A. weberbaueri* from Peru, and the other sampled species of *Allamanda* from eastern South America. *Allamanda weberbaueri* and *A. laevis* form a basal grade, suggesting an arboreal *Allamanda* ancestral with smooth fruit from which the most common shrubby habit and spiny capsules are derived. The *Allamanda* core group is still unresolved for most species and the position of *A. schottii* is incongruent between nuclear and plastid data sets. The lack of resolution and the conflict within the genus may be caused by artificial hybridizations, since some of these samples were obtained from cultivated plants. The inclusion of the remaining species of *Allamanda* and more samples of some species may increase the resolution of analyses and improve our knowledge on relationships within *Allamanda*.

Checklist of Rubiaceae of the State of Mato Grosso do Sul, Brasil

Maria Regina V. Barbosa

Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba, 58051-970, João Pessoa, PB, Brazil.

A list of the species of Rubiaceae of the state of Mato Grosso do Sul is presented and comprises 154 species in 51 genera. Compared to the list of species known for the flora of Brazil, Mato Grosso do Sul has about 11% of the species known for the whole country. The most diverse genera are *Borreria* and *Galianthe*, with 16 species each. Eleven species are new occurrences for the state.

The genus *Hoffmannia* Sw. (Rubiaceae) in the State of Veracruz, México

Alma P. Bautista Bello, Gonzalo Castillo Campos

Biodiversidad y Sistemática, Instituto de Ecología A. C., Carretera Antigua a Coatepec No. 351, El Haya, C.P. 91070, Xalapa, Veracruz, Mexico.

Hoffmannia Sw. is one of the largest genera in the family Rubiaceae (Hamelieae), containing ca. 100 species, mostly distributed in mountainous areas of southern Mexico and Central America. The objective of this study was to conduct a taxonomic revision of the genus *Hoffmannia* for Veracruz. We reviewed the material deposited in MEXU, ENCB, XAL, XALU, MO and F herbaria. Considering the morphological complexity of the genus, we integrated data from morphological characters. Analyses of similarity-dissimilarity for the taxa were performed with the UPGMA clustering method. As a result, 15 species were recognized for which *H*. *arqueonervosa* and *H*. *rzedowskiana* are new species, four are new records (*H*. *cuneatissima*, *H*. *phoenicopoda*, *H*. *regalis* and *H*. *wilsonii*) and five are endemic to Veracruz (*H*. *arqueonervosa*, *H*. *minuticarpa*, *H*. *orizabensis*, *H*. *rzedowskiana* and *H*. sp.1). In addition, it was observed that the greatest species diversity is found among 500 - 1500 m above sea level, in deciduous forest, high evergreen forest, and oak forest.

Seed Morphology and Anatomy of Tabernaemontaneae (Apocynaceae, Rauvolfioideae)

Bárbara B. Biazotti, André O. Simões, Sandra M. Carmello-Guerreiro

Universidade Estadual de Campinas, Brazil - Cidade Universitária “Zeferino Vaz”, Distrito de Barão Geraldo, Campinas - SP, 13083-970

Apocynaceae is one of the largest families of angiosperms, with a remarkable variation in morphological traits. The tribal classification of one of its subfamilies, Rauvolfioideae, has been traditionally based on fruit and seed characters. Tabernaemontaneae is the largest tribe of Rauvolfioideae and is currently divided in two subtribes: Ambelaniinae, encompassing species with syncarpous ovaries, baccate fruits and non-arillate seeds, and Tabernaemontaninae, comprising species with apocarpous to hemisyncarpous ovaries, follicular fruits and arillate seeds. This study aims to study the seed morphology and anatomy of eight species of Tabernaemontaneae, four from each subtribe, in order to detect characters with taxonomic significance. Seeds were collected, prepared and analyzed with usual techniques in light microscopy and SEM. All species share the following combination of characters: albuminous seeds with a single integument divided into a single-layered exotesta with partial secondary thickenings and lumen with phenolic compounds, a multistratified, paranquimatose mesotesta and indistinct endotesta. Some characters are diagnostic for subtribes. In Tabernaemontaniinae, seeds are arillate with an elongated hilum and a longitudinal groove, seed coat forming infoldings, exotesta persisting with prismatic to cuboid cells, ruminate endosperm and spatulate embryo. In Ambelaniinae, seeds are non-arillate with a circular or an elliptic hilum, exotesta formed by palisade cells, partially crushed mesotesta, endosperm non-ruminate and linear embryo. Mucilaginous exotestal cells were found only in *Macoubea guianensis* and *Ambelania acida* (Ambelaniinae). Our results show that the viscous, translucent substance covering the seeds of *M. guianensis* is not an aril, but in fact a mucilaginous epidermis.

Phylogenetic Analysis of *Rudgea* Salisb. (Psychotrieae, Rubiaceae) Inferred from rps16 and ITS Sequence Data.

Carla P. Bruniera [1], Paola L. Ferreira [2], Daniela C. Zappi [3], Milton Groppo[2]

(1) Instituto de Biociências, Universidade de São Paulo, São Paulo, Brazil; (2) Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto, Universidade de São Paulo, São Paulo, Brazil; (3) Herbarium, Royal Botanic Gardens, Kew, United Kingdom.

The use of molecular data has lead to a profound revision in the intra-familiar classification of Rubiaceae on the last two decades, and it has become clear that many genera need special attention, including *Rudgea*. Previous Rubiaceae phylogenies have included a limited sample of species of *Rudgea*, considering that this large Neotropical genus encompasses about 150 species distributed from Mexico until Argentina. In the present study were used sequences of rps16 intron and the ITS region to verify the monophyly of the genus and check for internal groups. A total of 184 new sequences of *Rudgea* were produced and analyzed with sequences of other closely related genera. Individual and combined analyses were performed using PAUP 4.0b10 and TNT 1.1 under the parsimony criterion and MrBayes 3.2.2 for Bayesian analysis. Results have showed *Rudgea* as a monophyletic genus with the exclusion of *R. woronovii* Standl., a species more closely related to *Palicourea* and *Psychotria*. This result was already suggested in previous works due to the possession of bifid stipules (vs. stipules never bifid in *Rudgea*). On the other hand, *R. stipulacea* (DC.) Steyerm. appears as sister to all other *Rudgea*, this last group strongly supported and formed by the species of "*Rudgea* sensu stricto". Six large clades with strong support were formed inside "*Rudgea* sensu stricto" with species of each group or clade presenting geographical congruence and morphological features in common that can support an internal division of *Rudgea* and the proposal of an infrageneric classification in a near future.

A Multidisciplinary Study of *Diodia* s.l. (Spermacoceae-Rubiaceae)

Andrea A. Cabaña Fader[1], Beatriz G. Galati[2], Roberto M. Salas[1], Elsa L. Cabral[1]

(1)Instituto de Botánica del Nordeste, FACENA-UNNE. Corrientes, Argentina.
(2) Facultad de Agronomía, UBA. Buenos Aires, Argentina.

Diodia s.l. is one of the most conflictive taxa belonging to the *Spermacoce* clade. For decades, this taxon consisted in species with indehiscent or schizocarpic fruits, though with remarkable morphological variations. Currently, it is considered a polyphyletic group with approximately 120 species named here as *Diodia* s.l. It includes the five species of *Diodia* s.s and all those species described in *Diodia* and transferred to other related genera (*Borreria*, *Diodella*, *Galianthe*, *Mitracarpus* and *Spermacoce*). The aim of this work is to establish the taxonomic status of some entities based on a multidisciplinary approach and determine its possible phylogenetic relationships. We analyzed cytogenetic, morpho-anatomical, palynological, and embryological features of species principally from Americas. In addition, we performed a taxonomic study of the most conflictive and less known taxa of *Diodia* s.l. As the most relevant results of this work, we performed an update of the taxonomic status of 30 names published as *Diodia*. Also, we proposed a new taxonomic circumscription for some species of *Diodia* s.l. supported by pollen and seed morphology. The embryological and cytogenetic analysis yielded very promising results to the taxonomy of *Diodia* s.l. and other closest taxa of the *Spermacoce* clade. Moreover, the fruit was reaffirmed as an important feature in some genera of the group (i.e. *Diodella*).

New Insights into the Generic Circumscription of Helieae (Gentianaceae)

Maria Fernanda Calió, Katherine B. Lepis, José R. Pirani, Lena Struwe

Universidade de São Paulo, Departamento de Botânica, Laboratório de Sistemática Vegetal, São Paulo, SP, Brazil

Helieae is a monophyletic tribe within Gentianaceae. It comprises 23 genera and c. 220 species, all endemic to the Neotropics. An initial phylogeny of Helieae shed light onto the relationships between genera and indicated that traditional generic limits did not correspond to monophyletic groups. In order to obtain a more thorough understanding of generic relationships within the group, we reconstructed a more comprehensive phylogeny of Helieae, by enhancing sampling within the so-called "Symbolanthus-clade". This phylogeny used DNA sequences from one plastid region (matK), two nuclear regions (ITS and 5S-NTS), and 112 morphological characters, which were analyzed separately and in combination using Parsimony and Bayesian approaches. A total of 83 individuals representing 20 genera and 51 species of Helieae were sampled; thirteen species were included in this study solely based on their morphological characters. Morphological characters were further mapped onto the total evidence topology to identify potential synapomorphies of clades and patterns of homoplasy in the morphological dataset. The total evidence topology indicated that *Prepusa* is sister to the remainder of Helieae. Furthermore, the "Macrocarpaea-clade", the "Irlbachia-clade" and the "Symbolanthus-clade" were also recovered. Within the "Symbolanthus-clade", our results confirm that *Chelonanthus* and *Irlbachia* are not monophyletic, and also contest the monophyly of *Calolisianthus* as currently circumscribed. Specifically, two species of *Calolisianthus* group with the type species of *Chelonanthus*, while the other *Calolisianthus* species are more closely related to *Tetrapollinia* and *Symbolanthus*. Moreover, the white-green-flowered *Chelonanthus* species are undoubtedly related to *Helia*. The addition of new characters and taxa led to higher confidence in the relative position of some clades, as well as provided further support for a new generic circumscription of *Calolisianthus*, *Chelonanthus*, *Helia*, and *Symbolanthus*. Even though several morphological characters traditionally used in the taxonomy of the group were shown to be homoplasious, most clades could be diagnosed by a combination of plesiomorphic, homoplasious, and autapomorphic character states.

Rubiaceae Juss. in Camanducaia, Minas Gerais, Mantiqueira Mountain Range, Brazil: Taxonomy and Phytogeographic Aspects

João A. M. Carmo, Luiza S. Kinoshita, André O. Simões

Universidade Estadual de Campinas, Campinas, SP, Brazil

Rubiaceae is a cosmopolitan family, mainly distributed along tropical and subtropical regions throughout the world, and comprises around 620 genera and 13000 species. In Brazil, ca. 120 genera and 1300 species have been recognized. The Atlantic Rain Forest, biome considered to be a hotspot for biodiversity conservation, harbors ca. 600 Rubiaceae species. The Mantiqueira Mountain Range, in which Camanducaia municipality is located, Southern Minas Gerais, exhibits important remnants of this biome. This study aimed to conduct a taxonomic survey on the Rubiaceae family at the southwestern Mantiqueira Mountain Range, at Camanducaia municipality, and to asses phytogeographic aspects of the region on the basis of native species geographic distribution analysis. The floristic survey was based on field expeditions and herbarium material analysis. The Rubiaceae family is represented at Camanducaia municipality by 17 genera and 34 species, two subspecies and two varieties. The geographic distribution analysis of the native species corroborates for a separation of southern and northern Atlantic forests. Within this context, the Camanducaia region performs the function of corridor and refuge of species endemic to the southern Atlantic forest.

Advances in Morphological and Molecular Phylogeny of *Ladenbergia* Klotzsch (Cinchoneae: Rubiaceae)

Eder Chilquillo [1,2], André O. Simões [1], Joaquina Albán [2], Charlotte M. Taylor [3], Alexandre Antonelli [4], Nina Ronsted [5], Carla Maldonado [5,6]

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The genus *Ladenbergia* Klotzsch belongs to the tribe Cinchoneae (Rubiaceae). It is distributed mainly along the Andean cordillera but is also common in the Amazon region. The most recent taxonomic treatment of the genus is 17 years old and in its current circumscription, 36 species are recognized. Monophyly of the genus and a close relationship to *Remijia* DC. has been suggested in previous cladistics analyzes. Nevertheless, these results are poorly supported due to the high number of homoplasies. More recently, molecular analyzes based on both cpDNA and nDNA markers reinforced the hypothesis of monophyly of *Ladenbergia*, but few species were sampled. As such, the main objective of our study is to provide a better understanding on the phylogenetic relationship of species of *Ladenbergia* and related genera, based on a broader taxon sampling and morphological and molecular characters (ITS, rps16, trnL -F). We also try to answer questions such as diversification, and biogeography of the genus. Preliminary results based on 45 morphological characters, which include all species of the genus *Ladenbergia*, confirm the genus monophyly and suggest that it is closer to *Cinchona* rather than *Remijia* based on the position of the inflorescences; similarity in leaf patterns; length of flowers and shape of calyx. These results could be related to the previous molecular data. Also, morphological and geographical evidence suggest that the ancestral area of *Ladenbergia* would be the Brazilian and the Guianas shield. Although some questions are tackled here, additional sampling is still necessary to shed light on the phylogeny of the genus and related groups.

Psychotria (Rubiaceae) in the Caatinga, the Semiarid Region of Brazil

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Psychotria, one of the most numerous genus of Rubiaceae, comprises about 1000 species generally shrubby in habit and occurring in understory of humid forests in Pantropical areas. Caatinga is an semiarid exclusively Brazilian vegetation type, similar to world savannas that has a seasonal climate well defined by a long dry period and short rainy, high temperatures, characterized by a xerophytic vegetation represented by succulent and spine species. The caatinga is divided into nine ecoregions based in clime, geology, rainfall and species distribution. The aim of the work was to investigate the occurrence of *Psychotria* species in this area, and ascertain abut its distribution among the nine ecoregions. The data were obtained at SpeciesLink database, which is a herbarium database of Brazilian plants collections. After that we crossed the data obtained with the Caatinga ecoregion shape file and produced a *Psychotria* species list founded in the studied vegetation. In the crossing process we eliminated from the list the synonyms and undetermined species. We found 97 herbarium specimens and 15 species of *Psychotria* occurring in the caatinga. The ecoregions with major sample and species number were the Chapada Diamantina Complex and the Depressão Sertaneja Meridional. These ecoregions have more humid and high altitude areas than the others, showing the importance of association with humidity and altitude in the genus distribution.

A New Species of *Platycarpum* Humb. & Bonpl. (Rubiaceae) from Peruvian Amazon

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Platycarpum Humb. & Bonpl. is the biggest genus of tribe Henriquezieae Hooker (Ixoroideae), and the last taxonomic revision by Rogers in 1984 recognizes 12 species and six varieties. *Platycarpum* has a differentiated morphology in comparison to the Rubiaceae family. It is characterized by glands in the basal portion of the petiole, a zygomorphic corolla with one or two bearded lobes, stamens inserted on the corolla at different positions, an inferior ovary and capsular fruits with perianth scar at the base of the fruit and seeds lacking endosperm. After the revision of Rogers the occurrence of the genus in Peru was reported in the Catalogue of the flowering plants and gymnosperms of Peru. However it was identified as *P. orinocense* Humboldt & Bonpland, but after a recent revision we now consider this as a new species, *Platycarpum loretensis* N. Dávila & L. Kinoshita sp. nov. This species is morphologically closer to *P. orinocense* Humbolt & Bonpland, which is widely distributed in Venezuela and Colombia, and to *P. duckei* Steyermark, which is endemic to Borba in the Amazonas state - Brazil. Whereas *P. loretensis* presents a limited distribution to some white sand forest and to wetland (peatland and palm swamp) in Loreto (Peru).

Dismantling the Genus Tarenna (Pavetteae) in Africa

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The phylogeny of the large Paleotropical genus *Tarenna* was inferred based on four plastid markers (accD-psA1, rps16, trnT-trnF, petD) and one nuclear marker (ITS). Not surprisingly, *Tarenna* was found to be polyphyletic. In future, the name *Tarenna* should be restricted to Asian and Pacific species, which comprise the type species *T. asiatica*. The continental African and Madagascan species must be excluded from the genus. Most species in continental Africa can be transferred to the hitherto monospecific genus *Cladoceras*. They are all characterized by exotestal cells with wavy cell walls, a character that is absent from *Tarenna* s.s. Other African species, however, might constitute altogether new genera. This is the case for *T. jolinonii*, characterized by e.g. large stipules and exotestal cells with straight cell walls. Another two species, *T. bipindensis* and *T. precidantenna*, do not group with the rest of the continental African species of *Tarenna* but are sister to the genus *Pavetta*. The ca. ten Madagascan *Tarenna* species also form a separate group. Within the Madagascan species morphological variation is large and different flower and pollen types occur. This study evaluates morphological and molecular evidence in order to correctly transfer the former Madagascan and continental African *Tarenna* species to other genera.

Phylogeny and Biogeography of the Tribe Sipaneeae (Rubiaceae)

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According to recent molecular phylogenies, the tribe Sipaneeae is recognized as a separate tribe, and positioned within the subfamily Ixoroideae. The Sipaneeae, as here delimited, include the genera *Chalepophyllum*, *Dendrosipanea*, *Limnosipanea*, *Maguireothamnus*, *Neblinathamnus*, *Neobertiera*, *Pteridocalyx*, *Sipanea*, *Sipaneopsis* and *Steyermarkia* (with a total of about 50 species). Several genera of this group are small shrubs, and the woody habit is shown to be basal in the Sipaneeae. *Sipanea* and *Limnosipanea* were shown to be monophyletic and not sister taxa, indicating that the herbaceous habit evolved at least two times in the tribe. The tribe has its main center of diversity in the Guayana Shield, with 9 genera and 47 species, with a few species in Central America (3 genera and 3 species), and a few species on the Brazilian Shield (2 genera and 5 species). Following these results, three projects are currently undergoing: 1) a complete monographic treatment, with key, generic and specific descriptions, and specimens cited; 2) a complete phylogenetic study including all the genera of the tribe; 3) a biogeographic study that will hopefully indicate the center(s) of origin and the patterns of dispersal in the Neotropics. Field and herbarium study are ongoing, and two new species of *Neobertiera* have been detected, as well as the presence of heterostyly in a few species of *Sipanea*, and in all the species of *Neobertiera*.

Rubiaceae of the Guianas: Progress Towards the Understanding of One of the Floristic Centers of Diversity in South America

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According to the ongoing treatment of the Rubiaceae for the Flora of the Guianas, this family is represented in the region (Guyana, Suriname, French Guiana) by about 80 genera and 470 species. In the Guayana Shield, the Rubiaceae is the third most diversified family, with about 750 species (after the Leguminosae, with 1032 species, and the Orchidaceae, with 1020 species). In addition, it is found in practically all habits (herbs, shrubs, treelets, trees, lianas) and habitats (forests, savannas, tepuis, etc.), and is an important floristic component, both in terms of diversity and frequency. A preliminary assessment is made, in order to compare the local floristic composition with those of surrounding regions (northern South America, Amazon Basin, Central America, Antilles).

Dealing with Dissention in the Ranks: A Formal and Informal Solution for Apocynaceae

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Since the first molecular-based analyses of Apocynaceae were published in 1996, the family has been the object of numerous studies using various molecular markers and targeting different taxonomic levels. Despite this focused activity, the two subfamilies of the traditional Apocynaceae, Rauvolfioideae and Apocynoideae, remain resolutely non-monophyletic – the first because it is a grade, and the second because the taxa of the earlier Asclepiadaceae (Periplocoideae, Secamonoideae and Asclepiadoideae) are all nested within it. Whereas one could solve non-monophyly in Rauvolfioideae by creating a number of new subfamilies, the situation in Apocynoideae is more complex, since the three embedded subfamilies are well defined and monophyletic. Furthermore, Asclepiadoideae is by far the largest subfamily, comprising about 45% of all genera and the great majority of species in the family, and has a well-supported internal structure comprising five tribes and fifteen subtribes. Recognizing subfamilies within subfamilies may be hierarchically offensive, but achieving monophyly by formally reducing the embedded subfamilies to the rank of tribes would create considerably more problems than it would solve. Thus, in order to overcome the stigma of paraphyly in the dissentious Apocynaceae s. str., while at the same time maintaining maximum stability in the classification of the well-behaved asclepiads, a classification combining formal and informal ranks is proposed. Subfamily ranks are abandoned for the genera of Apocynaceae s. str. All other formal ranks are maintained in this part of the family: 11 tribes and 17 subtribes in Rauvolfioids and 9 tribes and 17 subtribes in Apocynoids.

Checklist of the Apocynaceae from the Mato Grosso do Sul State, Brazil

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Apocynaceae is one of the largest and most diversified angiosperm families, widespread in the tropics and subtropics. It comprises about 400 genera and 3700 species, of which 80-95 genera and 750-850 species occur in Brazil. The floristic treatment of the angiosperms from the State of Mato Grosso do Sul published by Dubbs was considered by us as a starting point to produce an updated checklist of Apocynaceae. Our work is mainly based on the examination of the vouchers deposited at the CGMS, MBM, R, RB, SPF, UEC and specimens of Apocynaceae collected in six field excursions in different localities of the Mato Grosso do Sul state. In addition, complementary data were obtained by searching the database from other Brazilian and foreign herbaria available at the speciesLink website. The obtained species list was then compared to the list of species of Apocynaceae available at the “Lista de Espécies da Flora do Brasil” website. Our results represent an important contribution to the knowledge of the diversity of Apocynaceae in the State of Mato Grosso do Sul, and provide useful information for future steps at the BIOTA/MS program. The number of species of Apocynaceae known at the State has raised from 86 to 122. A total of 36 taxa are reported for the first time, and one species new to science was identified. The obtained results strongly suggest that extensive field work is necessary to achieve a better understanding of the biodiversity from the State of Mato Grosso do Sul.

Seed Morphology and Anatomy of Willughbeieae (Apocynaceae, Rauvolfioideae)

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Apocynaceae is one of the largest angiosperm families, with about 375 genera and 5000 species. As currently circumscribed, it comprises five subfamilies, of which Rauvolfioideae is a heterogeneous grade formed by the basalmost lineages in the family. Species of Rauvolfioideae are remarkably variable in terms of fruit and seed morphology, in contrast to the typical follicular fruits with comose seeds from the other subfamilies. Within Rauvolfioideae, species of Willughbeieae have fleshy, baccate fruits with naked seeds. We studied the seed anatomy of four species of Willughbeieae (*Couma rigida*, *Lacmellea panamensis*, *Hancornia speciosa* and *Parahancornia fasciculate*) in order to detect characters with taxonomic and evolutionary relevance. Seeds were sectioned, prepared and analyzed with usual techniques in plant anatomy. Our results support the circumscription of Willughbeieae and recognition of genera within the tribe. All studied seeds are exotesthal with a single layer of cells filled with phenolic compounds, and have copious endosperm. Lipids and proteins are the most abundant storage products on seeds. Lipids can be stored as droplets of fatty acids and total lipids, whereas proteins are stored as crystals in Lacmellea panamensis and as proteic bodies in the remaining species. Parahancornia fasciculata is the only species with a mucilaginous layer at the exothesta, an unusual feature in the family. Preliminary results from our research group show that seeds from species of Willughbeieae and Tabernaemontaneae share a number of features, corroborating the close relationship between these two tribes found in recent phylogenetic studies.

Dispersing Towards Madagascar: Biogeography and Evolution of the Malagasy Endemics of the Spermacoceae Tribe (Rubiaceae)

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Despite the close proximity of the African continent, dispersal of plant lineages towards Madagascar remains intriguing as the composition of the Malagasy flora is rather heterogeneous and shows besides African influences, also floral elements of Indian, Southeast Asian, Australian, and Neotropical descendence. Due to its proportionally large number of Malagasy endemics, the taxonomically troublesome Spermacoceae tribe is an interesting group to investigate the origin and evolution of the herbaceous Rubiaceae endemics on Madagascar. The phylogenetic position of these endemics on Madagascar was inferred using four plastid gene markers. Age estimates were obtained by expanding the Spermacoceae dataset with representatives of all Rubiaceae tribes. This allowed incorporation of multiple fossil-based calibration points from the Rubiaceae fossil record. Despite the high morphological diversity of the herbaceous Spermacoceae endemics on Madagascar, only two colonization events gave rise to their current biodiversity. The first clade contains *Lathraeocarpa*, *Phylohydrax* and *Gomphocalyx*, whereas the second Malagasy clade includes the endemic genera *Astiella*, *Phialiphora*, *Thamnoldenlandia* and *Amphistemon*. The tribe Spermacoceae is estimated to have a Late Eocene origin, and diversified during Oligocene and Miocene. The two Malagasy clades of the tribe originated in the Oligocene and radiated in the Miocene. The origin of the Malagasy Spermacoceae cannot be explained by Gondwanan vicariance but only by means of Cenozoic long distance dispersal events. Interestingly, not only colonization from Africa occurred but also long distance dispersal from the non-adjacent South American continent shaped the current biodiversity of the Spermacoceae tribe on Madagascar.

Colleters in Spermacoceae (Rubiaceae): Distribution and Morpho-anatomy Description

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Colleters are secretory emergencies protecting the development organs of many families of Angiosperms, including Rubiaceae, in which has an uncertain taxonomic value. The distribution and the morpho-anatomy of colleters from 23 species belonging to 10 genera of the Spermacoceae tribe (Rubiaceae) were analyzed in order to state their taxonomic importance. Nodes with leaves, flower buds and flowers (23 spp.), and subterranean buds (4 spp.) were fixed and dehydrated using conventional techniques. The samples were analyzed with optical and scanning electron microscopy. Fresh samples were observed in some species. As result, the colleters are located in: 1) interlobular sinuses of calyx (20 spp.) in apex of fimbriae or stalk of varying complexity, 2) on edge of the stipular sheath (1 sp.) or on the apex of the stipular fimbriae (22 spp.), and 3) at the reduced fimbriae of underground buds (4 spp.). In all species the colleters are conical to tear-shaped. Anatomically they have a parenchymatous axis, not vascularized, which can contain packages of raphides. Surrounding the axis there is a palisade epidermis. According to previous classifications, it corresponds to the standard type. In three species, we observed also that the parenchymatous axis contains chloroplasts. As conclusion, the location and distribution of colleters, and the presence of chloroplasts in the axis are important taxonomic characters to distinguish the analyzed genera of Spermacoceae.

Pistillate and Staminate Flower Morphology and Anatomy in Dioecious *Cordiera concolor* (Gardenieae- Rubiaceae)

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The structure and anatomy of mature unisexual flowers of *Cordiera concolor* (Gardenieae- Rubiaceae) was investigated using scanning electron and light microscopy in order to determinate the organogenetic patterns in both unisexual flowers to contribute to the knowledge of the species. The results show that both types of flowers share: 1) a cupuliform calyx that externally has simple unicellular trichomes and paracytic stomatas, and internally, has 2-3 layers of dendroid colleters that secrete resine, 2) a nectary disc is located around the base of the style and having anomocytic nectarostomatas, 3) a 4-lobed corolla that externally has simple unicellular trichomes and paracytic stomatas, and 4) stamen fused to the corolla for a short staminal filament. The mesophyll in all floral pieces has cells with tannin and cells with druse. The pistillate flowers have an inferior ovary, bilocular with 2-10 ovules per locule. The style has two stigmatic branches, ovate and papillose. The anthers of pistillate flowers possess tetrads surrounded by callose, these tetrads collapse at maturity. The staminate flowers have an underdeveloped inferior ovary with two reduced locules and absent or rudimentary ovules, style with two long, spread stigmatic branches. The anthers in staminate flower produce pollen grains and have longitudinal dehiscence. Therefore, the flowers in this species are structurally perfect but functionally pistillate and staminate respectively.

Island Hopping, Long-distance Dispersals, and Species Radiations in the Western Indian Ocean: a Biogeographic Study of the Coffeeae Alliance

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This study is part of an ongoing project focusing on the diversification of Rubiaceae on the islands of the western Indian Ocean and on Madagascar in particular; a region in which the family is very diverse. Here we investigate the regional radiations of the tribes Alberteae, Bertiereae, Coffeeae, Gardenieae, Octotropideae, and Pavetteae, with the aim of inferring the ancestral areas and divergence times of each dispersal event. The results presented here indicate that these groups mainly colonized Madagascar from eastern Africa, whereas the surrounding island groups of the Comores, Mascarenes, and Seychelles in general where colonized subsequently via Madagascar. Re-colonization of Africa has also occurred several times. Rapid radiation appears to have occurred in some clades, most notably within *Coffea*, *Hyperacanthus*, and the Malagasy Pavetteae complex.

Flower Morphology and Anatomy of Species of Plumerieae L. (Apocynaceae, Rauvolfioideae)

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Plumerieae is one of the most heterogeneous tribes in Apocynaceae, with an uncertain placement within subfamily Rauvolfioideae. Due to the great variation in reproductive organs in species of Plumerieae, circumscription of the tribe has changed significantly. In its most recent classification, three subtribes (Allamandinae, Plumeriinae and Thevetiinae), 10 genera and 60 species are recognized. The present study aims to describe the flower morphology and anatomy from species of Plumerieae, in order to detect character with taxonomic and evolutionary significance. Cross and longitudinal sections of anthetic flowers from 19 species belonging to seven genera of Plumerieae were made and analyzed. Our results show a considerable variation in morphological and anatomical features, corroborating the subtribal and generic classification of the tribe. The presence and organization of secretory cells on the calyx lobes and style-head, morphology and dehiscence of anthers, the presence/absence of supra and infrastaminal appendages, the degree of fusion and position of ovary, style size, morphology of the style-head, the presence/absence of nectaries and organization of idioblasts are the main diagnostic characters to recognize the three subtribes. Anther dehiscence in Allamandiinae is here interpreted as sublatrorse, and not introrse as usual in literature. The morphology and dimensions of the corolla, the presence/absence, shape and organization of supra and infrastaminal appendages, shape and size of the anther apex, and morphology of style-head and nectaries are the main diagnostic characters for generic recognition. A postgenital fusion of the suprastaminal appendages is here reported in *Cerbera mangas* and *Thevetia peruviana* for the first time.

Rubiaceae Richness in a Lowland Atlantic Forest Remnant at Espírito Santo, Brazil: a Preliminary Assessment

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The assessment of Rubiaceae richness in forest remnants subsidize decisions regarding species conservation, management, and provide a basis for ecological studies. We present a preliminary list of a thoroughly assessment of the family richness in a protected reserve (Mata das Flores State Park, Castelo municipality, southern Espírito Santo). The Park is one of the last lowland forest remnants in the region. Field expeditions were made on a weekly basis for 12 months and covered an area of about 140 ha. We identified 26 species belonging to 14 genera and six tribes. Seven species are new records for Espírito Santo. The most representative genera were *Faramea* and *Psychotria* (6 spp.), followed by *Margaritopsis* and *Rudgea* (2 spp.), *Alseis*, *Amaioua*, *Bathysa*, *Carapichea*, *Coffea*, *Cordiera*, *Genipa*, *Geophila*, *Hamelia* and *Randia* with one species each. Shrubs comprised 80% of the species, while 12% were trees, and 8% were herbs. *Carapichea ipecacuanha* (Brot.) L. Andersson, *Psychotria rhytidocarpa* Müll. Arg. and *Rudgea reflexa* Zappi are vulnerable, least concern and in danger, respectively, following different endangered species' lists. The studied forest fragment contains 24.4% and 14.8% of the genera and species, respectively, of Rubiaceae in Espírito Santo. It is noteworthy that there are still 16 unidentified species. Thus, this list will increase considerably. This study shows that local floras have a pivotal role in subsidizing studies concerned in explain the causes of tropical diversity. Moreover, the results call attention to the great importance of lowland forest reserves in the maintenance of species richness. (CNPq / FAPES)

Mapping Diversity and Distribution Using Novel Bioinformatics Tools: Do We Still Need Taxonomists? The tribe Cinchoneae (Rubiaceae) as a Case Study

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Massive digitalization of natural history collections is now leading to a steep accumulation in widely available species distribution data. At the same time, funding for taxonomic research has become scarce, leading to a shortage of taxonomic expertise worldwide. But given the rapid development of computational tools for analyzing biodiversity data, do we need the intervention of taxonomists? We evaluate the impact of using non-cleaned (NC), and manually cleaned (MC) species distribution records to explore biodiversity and distribution. As an example we use the Neotropical plant tribe Cinchoneae (9 genera, 127 species) in the Rubiaceae family. We used “SpeciesGeoCoder”, a new software package to codify the distribution of species into GIS polygons. The cleaning steps for producing a dataset of correctly identified and geo-referenced species led to a reduction of the total of available occurrences, from 3163 in NC to 2559 in MC. However, species diversity remained relatively constant when measuring species occurrence with these two datasets in WWF’s ecoregions: 30 % of the ecoregions are similar, and 51 % differ by only 1-2 species. In contrast, a few ecoregions showed higher diversity when based on the NC dataset, leading to different diversity maps. For those ecoregions, a careful examination of the data points revealed poor accuracy of the georeferences. These results demonstrate that the use of public databases hold a scientific potential for inferring biodiversity patterns, but there are still concerns with data quality which need to be tackled. Bioinformatics tools are extremely helpful, but taxonomic expertise is still crucial and needed to obtain a reliable view of biodiversity patterns.

The Quest for *Cinchona* - a Phylogenetic Tale

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The quest for *Cinchona* or Jesuits´ bark for the treatment of malaria is one of the most exciting tales in human history. *Cinchona* bark is probably the one remedy that has saved more lives and relieved more human suffering than any other remedy in history since its discovery in Peru in the early part of the 17th century. Imperial history, botanical confusion, and great variety in the quantity and composition of about 30 different *Cinchona* alkaloids among some 25 species in the genus *Cinchona* L. (Rubiaceae: Cinchonoideae) and among populations from different areas and habitats of the Northern and Central Andes complicated the search for the best quality of *Cinchona* bark. Is it possible that the plant hunters never found the best species or variety for quinine production? If chemical profiles and phylogeny are correlated, we should be able to use the phylogeny to revisit the quest for *Cinchona* and predict the chemical diversity and content of quinine type alkaloids. In this talk we will present preliminary results based on correlation of a phylogenetic hypothesis of ITS and trnLF sequences for tribe Cinchoneae including over 100 samples, representing about 25 species (20% of the tribe) and 8 of 9 genera with chemical profiles of quinine type alkaloids based on High Pressure Liquid Chromatography. The methodologies developed through this project could pave the way for a theoretical as well as practical use of phylogenies as biochemical and medicinal predictors in plants.

Preliminary Checklist of the Neotropical Genus *Simira* Aubl. (Rubiaceae)

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Rubiaceae is the fourth largest family among the Angiosperms, with approximately 611 genus and more than 13000 species. *Simira* Aubl. (Ixoroideae subfamily, Condamineeae tribe) is a Neotropical genus with ca. de 46 species; of which 16 occur in Brazil. The genus can be found in the Central and Meridional Americas, occurring in the Amazon Rain Forest (terra firme and várzea), Caatinga, Atlantic Coastal Forest and Cerrado (gallery forest and slope forest). The goal of this study is present a preliminary list of the species of *Simira*, part of a bigger project of revision of the genus in the Neotropics. The search of approximately 59 scientific names validly published was made from preliminary records in the MOBOT website (www.tropicos.org), and 54 in the official site of Rubiaceae checklist from KEW (http://apps.kew.org/wcsp/), probably represents ca. 46 species. The information about collected specimens deposited in the main herbaria was take from CRIA website (http://www.splink.org.br/index?lang=pt) and accessing databases from herbaria IAN and MG, with the insertion in database of BRAHMS software (Botanical Research and Herbarium Management System). The preliminary list shows a total of 937 records of *Simira*. The herbaria NY (with 146 exsiccates), RB (140), IAN (77) e MO (67) are the ones with the highest number of specimens of the genus. The most representative countries in number of species are Brazil, with 16, Peru with eight, Venezuela with six and Bolivia and Ecuador with four both. The species *Simira rubescens* (Benth.) Bremek. ex Steyerm., *S. cordifolia* (Hook. f.) Steyerm., *S. ecuadorensis* (Standl.) Steyerm. and *S. macrocrater* (K. Schum.) Steyerm. are the most frequent in South America. The centers of diversity of the genus in Brazil, in number of species are, Caatinga, Cerrado and Mata Atlântica. With these results we planned visits to the herbaria and collections of botanical material in areas of greater diversity for the analysis of specimens to support the taxonomic revision of the genus.

Intertribal and Interspecific Relationships of *Spigelia* (Loganiaceae)

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The primarily Neotropical *Spigelia* is an isolated genus of Loganiaceae, the only member of tribe Spigelieae. *Spigelia* has high diversity in Brazil, with 32 endemic species found in the Caatinga, Cerrado, and Mata Atlântica biomes. Molecular phylogenetic analyses of Loganiaceae have given contradicting results regarding the outgroup of *Spigelia*. Nuclear ribosomal DNA data indicate a close relationship with tribe Loganieae, whereas chloroplast DNA markers show a close relationship to tribe Strychneae. *Spigelia polystachya* of Central and South America, which remains to be sampled, shows floral characteristics similar to *Strychnos*, *Mitreola* and *Mitrasacme*, and may help clarify these possible relationships. There has been sparse sampling of the South American species of *Spigelia* in phylogenetic analyses, but preliminary results find two dwarf species, *S. pygmaea* of Central America and *S. genuflexa* of Brazil, to be ancestral in the genus.

Subterranean Homesick Blues: The Transatlantic Distribution of the Mycoheterotrophic Genus *Voyria* (Gentianaceae)

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Over 100 genera in flowering plants have tropical transatlantic distributions. One of these is the mycoheterotrophic genus *Voyria* (Gentianaceae). *Voyria* is widespread in tropical South America, where it is represented by 18 species. In contrast, only a single species of *Voyria* grows in West and Central Africa. We use a population-level phylogeny (ITS) and a species level-phylogeny based on nuclear (ITS, 18S rDNA) and mitochondrial (atp1, matR) data in which 13 species of *Voyria* are represented to investigate the biogeographic history of this lineage. Population genetic data suggest that the current species delimitation in *Voyria* is accurate. A multi-gene relaxed-clock species-level phylogeny demonstrates that *Voyria* originated in the Neotropics during the Early Eocene but only reached its current transoceanic distribution around the end of the Oligocene. In addition, partial 18S rDNA sequences of the mycorrhizal symbionts of a selection of *Voyria* taxa indicate that *Voyria* is growing on similar arbuscular mycorrhizal fungi on both sides of the Atlantic. These results suggest that the transatlantic distribution of *Voyria* results from a relatively recent long-distance dispersal event. The presence of similar arbuscular mycorrhizal fungi on both sides of the tropical Atlantic may have facilitated this dispersal event.

Contributions to Taxonomy, Palynology and Seed Micromorphology in *Borreria* subsect. *Borreria* of South America

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Borreria G. Mey. belongs to tribe Spermacoceae and includes 100 species in Americas. For its morphological similarity with *Spermacoce* L., the generic status of *Borreria* has been the subject of debate. The African, Australian and Asian species of *Borreria* were relegated as synonyms of *Spermacoce*. Although, for the American taxa we consider maintained both genera. In our opinion, *Borreria* subsect. *Borreria* should not be relegated to synonyms of *Spermacoce*. This subsection includes ca. 50 species and is distinguished by bilateral glomerules, exserted stamens and styles, and capsular fruits with both mericarps dehiscing septicidally from the apex. This work reports preliminary results on the revision of South American *Borreria* subsect. *Borreria* species. We present descriptions and comments related to taxonomy and geographic distribution for each species. In order to contribute to the identity of this group, we studied pollen of 14 species, 9 of which are analyzed for the first time, and the analyses of the internal surface are added. Also, we studied micromorphology seeds of 30 species and the results do not support the division of the subsection in series. As results to the taxonomic revision, we clarify the identity of *Borreria valens*, *B. scabiosoides* and *B.linoides*, reinstate *B. spinosa* and *B. virgata*, and describe seven new species for South America. Also, we designate a lectotype for *B. humifusa*, a neotype for *B. virgata*, an epitype for *B. scabiosoides*, and new synonyms for *B. verticillata* and *B. scabiosoides*.

Historical Biogeography of a Pantropical Clade (Apocynaceae, Rauvolfioideae)

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The ViWiTa is a well-defined clade within the plant family Apocynaceae, with 42 genera and 470 species. It comprises representatives of the three largest tribes within subfamily Rauvolfioideae (Vinceae, Willughbeieae and Tabernaemontaneae) and is distributed mainly in tropical regions of the world. Species from this clade exhibit remarkable morphological variation, ranging from herbs to shrubs and lianas, medium understory trees to giant canopy trees. The fruits are dehiscent or indehiscent, fleshy or dry, and the seeds are naked, winged, ciliate, arillate or comose. The main goal of this study is to understand the temporal and spatial origin and biogeographic evolution of the ViWiTa clade. Molecular age estimates were inferred using a Bayesian approach based on 288 taxa from all genera in ViWiTa, and based on five plastid markers. Ancestral areas were reconstructed using a maximum likelihood approach that implements the dispersal-extinction-cladogenesis model. Dating and ancestral area analyses indicate that the clade probably originated in the early Paleocene (ca. 62 Ma) in Australasia, followed by migration via the Boreotropics from early to middle Eocene, and subsequent colonization events to the Neotropics, Africa and Madagascar. Others dispersal events (either across the sea or facilitated by postulated land bridges) are required to explain disjunctions between Madagascar and Australasia in *Tabernaemontana* and between Australasia and Africa in *Tabernaemontana* and Willughbeieae. Multiple long-distance dispersal events were inferred, such as from Africa to the Neotropics in Willughbeieae, from the Neotropics to Hawaii in Vinceae, and from Madagascar to Australasia in Tabernaemontaneae.

Taxonomic Revision of *Bradea* Standl. (Rubiaceae: Coussareeae)

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Bradea is a small genus endemic to the Brazilian territory and intimately associated to rock outcrops of the Atlantic Rainforest. It has been neglected for a long time due scarce herbarium collections. So far, the protologues were the only available studies. The genus is assigned to Coussareeae based exclusively on morphological characters, since there is no molecular data available. Morphological similarities shared between *Bradea* and the remaining genera in the tribe are linear stipules with marginal colleters, branches with a median costa and corolla violet or blue to white. It is recognized by its 2(-3)-lobed calyx, tetramerous corolla, laterally compressed septicidal capsules and winged seeds. We recognize nine species, five of them being new to science. The Espírito Santo state is the diversity center of the genus. We propose lectotypification of *B. bicornuta*, and *B. kuhlmannii* is considered a synonym of *B. brasiliensis*. All species are considered threatened according to IUCN criteria: *B. brasiliensis* is considered Endangered (EN), and *B. anomala*, *B. bicornuta*, *B. borrerioides* sp. nov., *B. laeterosea* sp. nov., *B. montana*, *B. pubescens* sp. nov., *B. quartzicola* sp. nov. and *B. sessilifolia* sp. nov. are considered Critically Endangered (CR). Despite our collection efforts, *Bradea* is one of the least collected genera in Rubiaceae, with all species represented by less than 10 herbarium specimens. It is noteworthy the absence of data related to the biology of its species. This study emphasizes the importance of taxonomic reviews in order to increase the understanding of the diversity of poorly known genera.

The Genus *Chomelia* (Guettardeae, Rubiaceae) in Brazil

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Chomelia Jacq. is one of the largest genera of the tribe Guettardeae and is among the most diverse Neotropical genera of Rubiaceae. It is estimated that there are from 50 to 76 species, distributed from Central Mexico to Paraguay, the major centers of diversity being Cloudy Andean Forests in the Guyana Highlands and the Brazilian Atlantic Forest. *Chomelia* has never been the subject of a taxonomic revision and its taxonomic position is uncertain. Phylogenetic molecular analysis demonstrates that *Chomelia* is a genus more closely related to *Stenostomum sect*. *Resinanthus*, probably belonging to a sister group. However, only one specimen of the genus, *Chomelia spinosa*, has been included in molecular analysis, therefore the monophyly of the genus has not been tested yet. The most comprehensive work with *Chomelia* were performed by Muller Argovensis who established three sections for *Chomelia* and recognized 20 species in Brazil. Since then, the species of the genus in Brazil were only treated in regional floras or listed in checklists. So far 50 names have been published and 37 species have been recognized in Brazil. The genus is represented in every phytogeographic domain, but mostly in the Atlantic Forest (21 spp.) and in the Cerrado (15 spp.) and 27 species are considered to be endemic to Brazil. The taxonomic revision of the genus in course showed that *Chomelia* is represented by 23 species in Brazil.

Molecular Phylogenetics of the Sister Tribes Psychotrieae and Palicoureeae (Rubiaceae): Implications for their Generic Limits and the Evolution of Schizocarps in *Psychotria* L.

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Palicoureeae and Psychotrieae are sister tribes of about 3100 species of mostly understory shrubs, which represent about 91% of the Psychotrieae alliance and about 24% of the family Rubiaceae as a whole. Members of these groups of plants are distributed pantropically, with Psychotrieae centered in the Paleotropics while Palicoureeae in the Neotropics. They are very important components of various terrestrial ecosystems and their fleshy drupaceous fruits are an important resource for many frugivorous tropical birds and mammals. On the other hand, the generic limits of these tribes have been problematic and this problem is more complicated in Psychotrieae due to the paraphyly the species-rich genus *Psychotria* L., the lack of distinctive characters for recognizing some of the major lineages of the tribe, and the poor or lack of sampling from some biodiversity hotspots. Schizocarpous fruits have been used for recognizing genera in the mostly drupe-bearing Psychotrieae. However, the evolution and taxonomic value of this type of dry fruit have not been addressed based on a broadened sampling of the tribe. We produce a robust phylogeny based on 287 samples from the entire geographic ranges of the sister tribes, with particular emphasis on the Western Indian Ocean region (including Madagascar, the Comores, the Mascarenes, and the Seychelles), and using the Bayesian MCMC method. This phylogeny is used for establishing new generic circumscriptions of the tribes, and allows us to have a better understanding of the evolution of schizocarpous fruits from fleshy drupaceous fruits (or vice versa) in *Psychotria*.

Population Studies in *Minaria* (Apocynaceae): Trying to Understand the Endemism in the Espinhaço Range

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Minaria consists of 21 species, of which 75% are endemic to the Espinhaço Range (eastern Brazil). Species with seeds lacking coma are narrowly distributed, whereas species with comose seeds present a broad range of distributions regardless of their age. An ancestral with comose seeds, endemic to the Espinhaço Range of Minas Gerais, gave rise to the most species-rich clade, comprising species restricted to campos rupestres (rocky fields) and also species occurring in savannas and seasonally dry vegetations. From a population-based approach, two questions were raised: (1) Are there genetic differences between species with approximately the same age and ecological properties, but different ranges of occurrence? (2) May genetic and morphological differentiations in the polymorphic and widely distributed *M. cordata* allow the recognition of infraspecific taxa? To answer the first question, we investigated the genetic diversity and structure of *M. acerosa*, *M. ditassoides* and *M. refractifolia*. The three species presented moderate genetic diversity, which may reflect the gene pool of an ancestral with restricted distribution and suggests a recent, rapid dispersal of this lineage. For the second question, we investigated the infraspecific differentiation of *M. cordata* based on genetic (ISSR) and morphometric data. *Minaria cordata* presented genetic and morphological differentiations and its genetic structure seems to reflect morphology more than geographical proximity of populations. Phylogenetic data suggest that *M. cordata* is recognized by ancestral traits in lineages that are not closely related (simplesiomorphies). Population data support this hypothesis, but also point to a mixture of gene pools after recent expansions.

The Neotropical Spermacoce Clade (Rubiaceae), Results and Future Challenges

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In the Neotropics, the Spermacoce clade is the main group of the tribe Spermacoceae representing mainly herbaceous plants with fimbriate stipules, 1-ovulate carpels and multiaperturate pollen grains. The clade, also named Spermacoceae s.s., forms a monophyletic group deeply nested among genera of the former tribe Hedyotideae. In America, this clade is represented by 22 genera, of which 10 have been revised, four are under revision (*Borreria*, *Diodella*, *Mitracarpus* and *Spermacoce*) and the remaining genera are monospecific. Molecular evidence questions the generic boundaries based mainly on morphological data, for this reason, there are different points of view among specialists about the limits of some genera, especially in the *Spermacoce*-*Borreria* complex. However, there is a clear consensus on the status of other morphologically well-defined genera; some of these are supported by molecular data (i.e. *Crusea*, *Ernodea*, *Mitracarpus*, *Psyllocarpus* and *Richardia*). We restate the relevance of some morphological features to understand the Neotropical genera of the Spermacoce clade. We reject the fruit type as the only support for some genera and add other morphological features to distinguish among them (inflorescence patterns, insertion of stamens, pollen grains, division of stigma, seminal features and ecological data). We proposed a new taxonomic scheme for Neotropical species of *Spermacoce*/*Borreria* complex. Multidisciplinary diagnostic features of each genus are proposed in the light of recent advances. These morphological results are compared with available phylogenies of the tribe. Some geographical areas are showed as an important reservoir of endemic species (Espinhaço Mountain Range, Brazilian Atlantic Forest, Andean dry valleys).

Phanerogamic Flora of the State of Alagoas: the Genus *Diodella* Small (Rubiaceae)

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Rubiaceae contains about 13,100 species, in 611 genera, having its greatest diversity in the Neotropical region. *Diodella* Small is represented by 13 taxa distributed throughout the Americas. Eight species are found in the entire Brazilian territory. Current studies are rare, and focus on transferring species from *Diodia* L. to *Diodella*, as such taxa have morphologic features which are diagnostic of the group. Some features used to recognize the genus are: habit ranging from herbaceous to subarbustive; bristly stipules, sheath joined with petioles; opposite, crossed and sessile leaves; axillary inflorescences, sometimes solitary flowers; flowers with infundiboliform corolla and schizocarps with two indehiscent mericarps, which split when mature and deciduous. This paper's primary goal is to conduct a floristic survey of *Diodella* in the State of Alagoas, Brazil, as part of the project "Flora Fanerogâmica do Estado de Alagoas". This survey is being conducted upon visits to the major herbaria in the Northeast region of Brazil, as well as collection expeditions, to improve the knowledge and circumscription of the taxa, and research on information about the morphology, geographic distribution and preferential habitats of each species. Three species were found in Alagoas: *Diodella apiculata* (Willd.) Delprete, *D. teres* (Walter) Small and *D. radula* (Willd. ex Roem. & Schult.) Delprete. A monograph will be prepared, with detailed descriptions of the taxa found in Alagoas, using the model suggested in the project, in addition to the identification key and comments on the biology, taxonomy and geographic distribution of each species.

Phanerogamic Flora of the State of Alagoas: the Genus *Spermacoce* L. (Rubiaceae)

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Rubiaceae contains about 13,100 species, grouped in 611 genera, having its greatest diversity in the Neotropical region. *Spermacoce* L. is represented by 250 taxa, distributed throughout the Pantropical region, mostly in the Americas. Seventy-six species are found in Brazil, of which 12 are rare. The circumscription of *Spermacoce* currently includes *Borreria* G. Mey. and *Hemidiodia* K. Schum. Some features used to recognize the genus are: small size of the plants; herbaceous habit; bristly stipules, sheath joined with petioles; subsessile leaves; inflorescences in small axillary and/or terminal clusters and capsules often dehiscent, with two seeds. This paper's goal is to conduct a floristic survey on the genus in the State of Alagoas, Brazil, as part of the project "Flora Fanerogâmica do Estado de Alagoas". This survey is being conducted upon visits to the major herbaria in the Northeast region of Brazil and collecting expeditions, to improve the knowledge and circumscription of the taxa, and research on information about the morphology, geographic distribution and preferential habitats of each species. Eight species were found in Alagoas: *Spermacoce capitata* Ruiz & Pav., *S. eryngioides* (Cham. & Schltdl.) Kuntze, *S. latifolia* Aubl., *S. martiana* (Mart.) Kuntze, *S. ocymifolia* Roem. & Schult., *S. ocymoides* Burm. f., *S. scabiosoides* (Cham. & Schltdl.) Kuntze e *S. verticillata* L. A monograph with detailed descriptions of these species will be prepared using the model suggested in the project, with an identification key and comments on the biology, taxonomy and geographic distribution of each taxon.

Relationships of *Manettia* Mutis ex L. (Rubiaceae) Based on Molecular and Morphological Studies – Preliminary Data

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The Neotropical genus *Manettia* Mutis ex L. (Rubiaceae) comprises approximately 80 species of suffruticose vines or climbers, rarely herbs, ranging in distribution from Mexico, Central America, Antilles to South America. The group is composed by five sections recognized in previous systems: *Pyrrhanthos*, *Manettia*, *Lygistum*, *Heterochlora* and *Irwinianthus*. The objective was to test the monophyly of *Manettia* and its sections. This work was based on literature review, herbaria, and collections in different regions of America. 60 species were used for the phylogenetic study obtained from fresh leaves and the dried material. Infrageneric relationships and species-level patterns were investigated in phylogenetic analyses using morphological, molecular (sequences from rbcL, rps16, trnL-F and ITS fragments), and combined data sets. The datasets suggested that *Manettia* is a monophyletic genus, but genetic variation among species was insufficient to reconstruct well-supported relationships within the genus yet. South America has the majority of species with two mainly areas of distribution: Western South America – including Colombia, Western Venezuela, Ecuador, Peru and Bolivia; Eastern tropical South America – including the east coast of Brazil, from Ceara in the north to Sao Paulo in the south, tropical Paraguay. Beside these are two minor areas of distribution: Northern – including eastern Venezuela, Trinidad and Guiana; Temperate South America – including southern Paraguay, Entre Rios, temperate Brazil, Uruguay and northern Argentina.

New Insights in the Systematics, Evolution and Biogeography of the ViWiTa Clade (Apocynaceae): What Have We Learned in the Last Four Years?

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The ViWiTa clade comprises representatives of the three largest tribes in subfamily Rauvolfioideae, Tabernaemontaneae, Vinceae and Willughbeieae. This clade has extensively studied since 2007, and a summary of our ongoing studies was first presented in the last Gentianales conference in 2010. Since then, new results were generated and are here presented. A broad phylogenetic analysis based on 280 taxa, encompassing almost 70% of their recognized species, was performed. A sister relationship between Tabernaemontaneae and Willughbeieae is strongly supported. Fruit and seed anatomical studies shows that species of Tabernaemontaneae and Willughbeieae share a number of traits, which are potential synapomorphies. Willughbeieae is strongly supported as monophyletic, but four of its 18 genera are paraphyletic. *Landolphia* is the most extreme case of paraphylly, and to render it monophyletic eight genera should be included in its synonymy. Molecular dating and ancestral area analyses suggest an Australasian origin of the ViWiTa clade in early Paleocene (ca. 62 Ma), followed by an early diversification of Vinceae and Willughbeieae. Tabernaemontaneae may have diversified later, possibly caused by a higher extinction rate of ancestral lineages from that tribe in Australasia. The Boreotropics was a putative migration route from early to middle Eocene, with subsequent colonization events to Africa, Madagascar and the Neotropics. Other dispersal events, such as long-distance dispersal or postulated land bridges, are required to explain more recent colonizations. Morphological features of reproductive organs, such as the arillate seeds in Tabernaemontaniinae are putative key innovations that triggered the diversification of the ViWiTa clade in the Neotropics.

A Molecular Phylogenetic Study of the Vanguerieae Alliance

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We will present a large-scale phylogeny of the Vanguerieae alliance in the subfamily Ixoroideae of the coffee family (Rubiaceae), a clade comprising the two large tribes Vanguerieae and Ixoreae as well as six small tribes. These smaller tribes are all morphologically distinct and geographically isolated. The alliance also includes the monotypic genus *Glionnetia* whose phylogenetic position has not been possible to resolve in previous studies. In addition, there are four monotypic genera assumed to belong in Vanguerieae, the South African *Eriosemopsis*, the East African *Temnocalyx*, the Australian *Everistia*, and the south east Asian *Perakanthus*. We will include these genera in a phylogenetic analysis for the first time. This study, which adds more molecular data and many more taxa compared to previous studies, aims to resolve the phylogenetic position of these taxa. Placing evolutionarily distinct lineages such as these in the phylogenetic tree is important in order to understand the diversification, historical biogeography and morphological evolution of the group. We will also present results from preliminary molecular dating and historical biogeographic analyses.

Biosystematic Studies on *Borreria* subsect. *Latifoliae* (K. Schum.) Bacigalupo & Cabral (Spermacoceae, Rubiaceae)

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Borreria subsect. *Latifoliae* comprises about 18 American herbs, subshrubs and scandents species. These species are distributed from Mexico to Argentina and grow mainly in gramineous fields with lateritic soils. These species present capsules with longitudinal dehiscence, exserted stamens and style, and a bifid stigma. Nine species of this group are endemic from campos rupestres of Minas Gerais and Rio do Janeiro and Amazonian forest of Pará, Brazil. The taxonomic studies resulted in the description of seven new taxa, new combinations and synonyms proposed and expanded known geographical areas. We also proposed a taxonomic differentiation between two taxa commonly confused, *B. alata* and *B. latifolia*. Morphological and palynological analysis and chromosome data are present for the first time in some taxa. Some species of this group display a peculiar and unusual stamen organization, phenomenon scarcely documented in Spermacoceae and even in Rubiaceae. The pollen morphological study revealed uniformity in form, sculpture and structure of the pollen in most of the taxa. Thought, an endoaperture was observed as an endocingulum. The chromosome numbers are consistent with the basic number reported for the tribe Spermacoceae (x=14), to which we add a new basic number for two species of this group.

Rubiaceae from Ceará State, Brazil: Diversity and New Records

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The Ceará state is placed in Northeastern Brazil. This state is situated in the semiarid region, where the predominant vegetation is composed of caatinga, mainly on inland depressions. However, at altitudes between 800 and 1000 m, there are remnants of altitudinal evergreen forest (Atlantic Forest). The state presents paucity of botanical collections and few studies on the local flora are published or in progress. Considering the above, the aim of this study was to survey the family Rubiaceae in Ceará, to increase our knowledge of the local flora. The study is based on field observations and analysis of herbarium specimens. A total of 102 species and 47 genera were recorded. The Rubioideae is represented with 67 species and 24 genera, while Ixoroideae with 20 species and 14 genera and Cinchonoideae with 15 species and nine genera. The most representative genera are *Borreria* G. Mey. (12) and *Psychotria* L. (9), followed by *Faramea* Aubl. (6), *Mitracarpus* Zucc. ex Schult. & Schult. f. (6) and *Diodella* Small (5). The majority of species occurs in the Atlantic Forest remnants and 10 new records are documented.

Detailing the Taxonomy and Distribution of Toxic *Palicourea* (Rubiaceae) Species in South America

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Native species of *Palicourea* (Rubiaceae) contain monofluoroacetate (MFA), which makes them toxic to animals. These species are found in tropical South America where they are a problem for cattle ranching. Chemical analysis finds MFA regularly present in 8 related species, 4 previously reported and 4 newly identified as toxic. Based on this, taxonomic study, and distribution mapping, results show that the toxic species are widely distributed geographically and in habitat, but the species previously known to be toxic are more common in areas with a lot of human occupation while the new species are found less developed regions. The identification of the toxic species has been difficult due to poor documentation and our limited knowledge of the South American flora, and two of these toxic Palicoureas are undescribed new species that pose particular agricultural management problems because they are unknown to science.

Neotropical Rubiaceae 2014: A Diverse Assemblage

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The Neotropical Rubiaceae include representatives of 26 tribes (8 of them endemic) and ca. 230 genera with ca. 5000 species and are found in 41 different countries and territorial administrations. They are a remarkably diverse group in all aspects, including morphology, ecology, and evolutionary radiations. Species discovery and systematic study are actively underway throughout these Neotropical countries, and collaborations in this research are worldwide. Basic work is advancing well now in floristics, systematics, and the combination of these: biogeography. Work is basically starting now on ecology, chemistry, morphology, development, conservation assessment, and the synthesis of the floras of individual countries and sites into a comprehensive Neotropical body of knowledge: our next challenge.

Some Distribution Patterns of Neotropical Rubiaceae

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Some shared distribution patterns can be seen among native Neotropical Rubiaceae. The distribution of a species, genus, and tribe depend on a variety of factors including its biogeographic history, habitat preference, and genetic factors. We map several tribes and genus distribution patterns of interest for Rubiaceae biogeography, based on individual specimen localities and using data from the TROPICOS® database. Many Rubiaceae are specific in niche or habitat so distribution information can be lost when only a general range is outlined. Some gaps in the maps represent lack of data but some are actual disjunctions. Detailed knowledge of distributions depends on good taxonomic work and exploration. Distribution together with phylogenetic relationships, present-day ecology, and geologic and climatic histories allow us to understand why today's flora, both individual species and the entire assemblage, lives where it does -- which provides the basis for conservation, natural resources management, and climate change predictions.

Systematics of the *Arachnothryx* Complex (Guettardeae)

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Within the tribe Rondeletieae (Rubiaceae) several genera were considered to form the *Rondeletia* complex. Molecular studies are in agreement that this complex is polyphyletic: some genera are placed in the tribe Guettardeae. Nevertheless, there are still conflicts on generic circumscription and uncertain relationships among some of these genera. The aims of this study are to resolve the position of some genera, to provide evidence for the generic circumscription of the taxa formerly belonging in the *Rondeletia* complex currently placed in Guettardeae and to review the species boundaries in *Arachnothryx*. To diagnose the problem and to establish adequate sampling strategies a phylogenetic analysis employing the *trn*L-F and *rps*16 sequences available at GenBank was conducted. The results support the segregation of two generic complexes: the re-defined *Rondeletia* complex (Rondeletieae) and the *Arachnothryx* complex (Guettardeae). A study of pollen morphology was conducted to seek for morphological support of this separation, in which the endoaperture type and nexine continuity were consistent with the DNA results. The phylogenetic analyses allowed us to identify the need to resolve the *Arachnothryx*-*Gonzalagunia* relationships. A preliminary morphologically study allowed us to postulate morphological groups that will be tested in future phylogenetic analyses including also newly generated DNA sequences. At infrageneric level we provide morphological evidence to solve the controversial circumscription of *Arachnothryx buddleioides*, separating it into morphological groups that resulted in the resurrection of some species and in the recognition of new species.

Bacterial Leaf Endophytes in African Rubiaceae

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In Rubiaceae, certain species are closely associated with endophytic leaf bacteria. These endophytes are either found in specialized leaf nodules or are freely distributed among the mesophyll cells. This second non-nodulated type of endosymbiosis is discovered in a few representatives of the Vanguerieae tribe and is especially known from South Africa. The identity of the endophytes is designated as *Burkholderia*, a genus known for its pathogens but also for its plant-associated representatives. Our aim is to further document the *Burkholderia* diversity associated with Rubiaceae host plants and to establish whether the interaction is widespread in sub-Saharan Africa. Many representatives of the Vanguerieae tribe are investigated for the presence of endophytes. Special attention is paid to collect plants from different African regions in order to study the distribution range of the plant-bacteria association. The association is found in five different genera (*Fadogia*, *Fadogiella*, *Globulostylis*, *Rytigynia*, *Vangueria*) and is restricted to three clades. The endophytic bacteria all belong to the genus *Burkholderia*. The association is not obligate for the bacterial partner and is considered a loose and recent interaction, which is demonstrated by the fact that the endophytes can be cultivated and that no coevolution occurs. The geographical distribution of the association is restricted by the distribution range of the host plants and comprises the whole of sub-Saharan Africa.

Biogeography of *Rauvolfia* L. (Apocynaceae, Rauvolfioideae)

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Rauvolfia L. is a Pantropical genus comprising about 70 species distributed throughout the tropics, also being present in several remote islands like Hawaii and French Polynesia. With an estimated age of 34 million years, the genus has a broad distribution range as a result of a great dispersal ability, possibly linked to their association with water bodies and to the fact that its fruits are food source for many birds' species. These features place *Rauvolfia* as a highly interesting group for biogeographic studies. In this study, we reconstructed the history of the occupation of the areas by the genus from its current geographic distribution, coupled with molecular phylogenetic data, aiming to understand how biogeographic processes of dispersal and vicariance have determined distribution patterns of species of *Rauvolfia*. We also produced distribution maps for all valid species of the genus from occurrence data obtained from herbarium sheets and secondary data from other floristic studies. These maps were then combined with phylogenetic reconstruction of group relationships to infer the distribution of the ancestor classes and to locate putative barriers between sister nodes. S-DIVA and VIP softwares were used for the events reconstruction and biogeographic barriers inference, which were analyzed and interpreted within the context of current biogeographical hypotheses. Regarding the geographical barriers, the genus is mainly bounded by climatic differences between close areas and by physical barriers, such as mountain ranges and oceans. Biogeographically, occasional episodes of vicariance were identified, but major clades disjunctions are explained mainly by dispersal events. Vicariance events were detected among species from the Andes mountain range, from the rainforests of South America (Amazon and Atlantic forest), and from east Africa and Southeast Asia. Our data provided evidence that the pattern of current distribution of *Rauvolfia* have resulted from subsequent dispersal events from an ancestral Boreotropical distribution mainly during the Neogene, to Africa, South America, Hawaii and New Caledonia, demonstrating an important role of dispersal events to the diversification of the genus.

Cryptic Character States in Corollas in the Spermacoceae Alliance (Rubioideae, Rubiaceae)

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In several genera of Rubiaceae, flowers with a fenestrated tubular corolla occur. To investigate the homology of corolla splits in Rubiaceae, we studied the development of fenestrated corollas in five species of the Spermacoceae alliance in comparison with *Spermacoce* species without corolla splits. In *Spermacoce*, the tubular corolla consists of a stamen-corolla tube. In the other species studied, the tubular corolla consists of a rudimentary stamen-corolla tube, a corolla tube sensu stricto, and a tube resulting of postgenital fusion of the corolla lobes. In *Paederia* and *Pentodon*, the stamen-corolla tube is limited to an underlying annular intercalary meristem and corolla splits are formed by incomplete fusion of the bases of the corolla lobes. In *Sacosperma* and *Pentas*, corolla splits originate through an active process. We conclude that all tubular corollas studied are early sympetalous, but we can distinguish two types of early sympetaly. In *Spermacoce*, a stamen-corolla tube with epipetalous stamens is developed from a ring primordium. In *Paederia*, *Pentas*, *Pentodon*, and *Sacosperma*, free corolla lobe primordia appear on the collar of a concave floral apex. The corolla lobes are raised by the development of a corolla tube sensu stricto from an underlying meristem in the collar. Fusion of the corolla lobes can also contribute to the formation of tubular corollas. The proportion of stamen-corolla tube, corolla tube sensu stricto, and fusion of corolla lobes differs according to the species. The corolla splits studied constitute two cryptic character states in respectively *Sacosperma*/*Pentas* and *Paederia*/*Pentodon*.

Molecular Identification and Genetic Analysis of a New Cultivar in the Genus *Mussaenda* L. (Rubiaceae)

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A new cultivar with calycophylla adaxially pinkish and abaxially whitish from seeds of *Mussaenda macrophylla* with white calycophylla was identified by screening 24 described SSR markers. One marker generated reliable microsatellite alleles in the new cultivar common with either the female parent or the previously presumed male parent *Mussaenda erythrophylla* with red calycophylla. Analysis of genetic relationships among the new and previously released cultivars using 16 SSR markers and obtaining 177 polymorphic alleles indicated that five cultivars of *Mussaenda philippica*, Donna Aurora, Queen Sirikit, Dona Luz, Dona Evangelina, and Marmalade form one clade. The new cultivar forms the other clade with the female parent. Another clade represents the African species *M. erythrophylla*. SSR marker is efficient in identification of new hybrid and recognition of parents for innovative breeding in *Mussaenda*.