

A PROPOSAL TO THE OURC/BAKER COMMITTEE

TITLE OF PROJECT: Completing two collaborative Latin American violet projectsNAME OF APPLICANT: Harvey E. Ballard, Jr.STATUS: Asst. Prof. Assoc. Prof. Prof. AdministratorDEPARTMENT: Environmental & Plant BiologyE-MAIL ADDRESS: ballardh@ohio.eduRE-SUBMISSION: YES (Original Submission Date _____)
 NOBUDGET: Total Request \$3,000
(May not exceed \$15,000)

IRB AND IACUC APPROVAL:

To ensure that the University is in compliance with all federal regulations, complete the checklist below. Note: your proposal can be approved prior to IRB or IACUC approval, but funding will be withheld until notification of approval or exemption.

Yes	No	Office of Research Compliance	Policy #
	X	Human Subjects in Research (including surveys, interviews, educational interventions): Institutional Review Board (IRB) Approval #: Expiration Date:	19.052
	X	Animal Species: Institutional Animal Care & Use Committee (IACUC) Approval #: Expiration Date:	19.049

SIGNATURES

Applicant's Signature		Chair/Director's Signature	
Signature	<i>Harvey Ballard</i>	Signature	<i>Allan M. Showalter</i>
Name	Harvey E. Ballard, Jr.	Name	Allan M. Showalter
Dept/School	Environmental/Plant Bio	Unit	Environmental/Plant Bio
Date	1/30/23	Date	1/30/23
Dean's Signature			
Name	Sarah Poggione	Signature	<i>Sarah Poggione</i>
College	Arts & Sciences	Date	1-30-2023

■ **Optional:**

If selected for funding, I give permission to the Office of the Vice President for Research and Creative Activity to use my proposal as an example during training and workshop exercises.

Signature: *Harvey Ballard* Date: 1 February, 2023

OURC/Baker Fund Proposal Checklist

Applicants **must** complete and sign the checklist. The checklist should be included as the second page of the application (following the cover page).

■ Cover page	use Baker form
■ Checklist	use Baker form
■ Abstract*	1 double-spaced page
■ Introduction (<i>for continuations or resubmissions only</i>)*	1 double-spaced page
■ Discussion	10 double-spaced pages
■ Durable Impacts & Sustainability*	1 double-spaced page
■ Glossary/Definition of Terms* (<i>not required</i>)	2 double-spaced pages
■ Bibliography (<i>not required</i>)	3 pages
■ Biographical Information (<i>applicant(s) and key personnel</i>)	3 pages per person
■ Other Support (<i>applicant(s) and key personnel</i>)	1 page per person
■ Budget and Justification	no limit specified
■ Appended Materials	10 pages; no more than 10 minutes of footage
<input type="checkbox"/> Recommended Reviewers	5 required
■ Electronic copy of proposal	Single Acrobat file, containing entire proposal and required signatures

* These sections should be written in language understandable by an informed layperson to assist the committee in its review.

****Please note: The committee has the right to return without review any proposals that do not conform to these format requirements.****

Applicant signature: Harvey Ballard

3. ABSTRACT

The Violet family (Violaceae) is one of many plant families with origins in the tropics and descendants in the temperate region. Recent studies have shown that the family arose in the New World tropics, where 17 of 26 violet genera (species groups) are confined. Violets of the New World tropics have received limited study by specialists. A few broader country-level checklists have been published for Middle America (Mexico, Central America and the West Indies) and certain countries in South America, and a few floristic treatments including violets have been published, but no broader regional treatments by specialists have been completed. The PI has conducted taxonomic and evolutionary research on violets around the world, much of it on Latin American violets, since 1992. Violet specialist Juliana Paula-Souza in Brazil, new violet specialist Saul Hoyos-Gómez in Colombia, and the PI have been invited to submit taxonomic treatments characterizing violet diversity (with the PI as project leader) to the “Flora Mesoamericana” and “Flora of the Guianas” series by the end of 2023. The three have compiled an authoritative specimen-based species checklist for the regions, initiated studies on four new genera and nine species to describe, and have more than 60% of the descriptions partly or completely finished for the projects. Separate from the two flora treatments, the PI and collaborators will complete previously initiated taxonomic studies of violets for northern Mexico and the West Indies, will complete and submit a manuscript describing four new genera and nine new species, and will incorporate all of this information into a new “Latin American violets” website. The PI seeks funds to visit key herbaria (plant museums) to acquire remaining materials and data to complete descriptions, coordinate assembly of manuscripts, and create the website.

5. DISCUSSION

A. Specific Aims

- Complete and submit manuscript(s) to publish four new **genera**, nine new species, and two new **nomenclatural combinations** by August, 2023.
- Complete and submit **taxonomic treatments** of Violaceae to the “Flora Mesoamericana” and “Flora of the Guianas” projects by December, 2023.
- Complete studies for Violaceae of northern Mexico and the West Indies in 2023, manuscript for Violaceae of Middle America to be submitted in late 2024.
- Create a new “Latin American Violaceae” website in late 2023 using frequently accessed “Violets of the Great Plains and Eastern North America” website by the PI as a model, populating it with above information through 2024.

B. Significance

The Violet family (Violaceae). The Violet **family** (Violaceae) is a moderate-sized group consisting of 26 accepted genera and approximately 1,000 published species, with five additional new genera and at least 70 new species still awaiting description (Wahlert, 2010; Wahlert and Ballard, 2012; Ballard Jr. and Zmarzty, 2014; Ballard Jr. et al., 2014; Paula-Souza and Ballard, 2014; Wahlert et al., 2014, 2015, 2018; Marcussen et al., 2022; Zmarzty and Ballard, 2023; Ballard, unpublished data). Although naturalists and botanists in temperate regions are familiar with the common herbaceous genus *Viola* with its purple, yellow or white bilaterally symmetrical flowers, *Viola* is quite unlike most of the family. Nearly all other genera are trees, shrubs or vines, and the flowers of many genera are radially symmetrical and often pale and much less conspicuous. Early classifications of the Violet family based on **morphology** alone

placed genera into two major groups, “violoid” for those with bilaterally symmetrical flowers bearing a conspicuous basal swelling or nectar spur at the base of one petal (for example, *Hybanthus* and similar groups, and *Viola*), and “rinoreoid” for those with radially symmetrical flowers lacking a basal swelling or spur (for example, *Rinorea*). Genera in the family also exhibit substantial diversity in fruit and seed type (some produce capsules, some produce berries, one genus produces a nut).

At the genus level, diversity in the family is almost wholly confined to the tropics, with 23 of the 26 described and accepted genera predominately or exclusively in tropical regions. Moreover, seventeen of the 26 genera are restricted to the New World tropics. Recent **molecular phylogenetic** studies (Tokuoka, 2008; Paula-Souza, 2009; Wahlert et al., 2014) have revealed that all of the most primitive genera, and genera in the most closely related families to the Violaceae, are Neotropical, suggesting that the Violet family originated in the New World tropics. These studies also demonstrated that the evolution of the “violoid” flower form evolved several times from more primitive “rinoreoid” ancestors, and most importantly that the second and third largest genera, *Rinorea* and *Hybanthus*, respectively, were polyphyletic—they consisted of artificial assemblages of superficially similar groups scattered across the family with no close relationship, most of which required further study and description as new genera. The PI, former graduate students Ben Flicker and Greg Wahlert, and international collaborators Juliana Paula-Souza in Brazil and Saul Hoyos-Goméz in Colombia have been working for nearly a decade to complete the process of “dismantling” *Hybanthus* and *Rinorea* by describing new segregate genera (Paula-Souza and Ballard, 2014; Flicker and Ballard Jr., 2015; Wahlert et al., 2015, 2018). Five additional new genera need description to complete the process; four will be described during the proposed research.

Taxonomic history of Violaceae in Middle America and the Guianas. This overview focuses on broader country-level or regional publications and smaller taxonomic contributions in Middle America and the Guianas region, especially since 1950. Literature concerning violet diversity and geographic distributions for Latin America is rather spotty, much of it dates before the 1950s, and literature consists mostly of **checklists** and some floristic treatments largely generated by non-specialists. Regarding Mexico and Central America, several checklists have been produced for Mexico, including one for the entire country (Villaseñor, 2016), and others for the Valle de Mexico (Calderon de Rzedowski, 1985), Sierra de Manantlan (Ballard Jr., 1995), and the Los Tuxtlas area and Veracruz state (Ballard Jr., 1994a; IbarraManriquez and Colin, 1996). Taxonomic treatments of violets have been published for the Baja region (Ballard Jr., 1994b) and a substantial area of western Mexico (McVaugh, 2001). An older taxonomic treatment of the Violaceae was completed for Guatemala in 1961 (Standley and Williams, 1961), and a more recent checklist was published for Belize in 2000 (Balick et al., 2000). A relatively recent treatment of the Violaceae for Nicaragua (Todzia, 2001), a recent taxonomic treatment for Costa Rica (Ballard Jr., 2015), an older treatment for Violaceae of Panama (Robyns, 1967), and a new catalogue for plants of Panama (Correa A et al., 2004) were published. No floristic information is available for El Salvador or Honduras.

A few relatively recent floras have been published for individual island groups and countries in the West Indies, including the Bahamas (Correll and Correll, 1982) and St. John (Acevedo-Rodríguez et al., 1996). Many families of five orders were treated in an initial flora for Hispaniola (Liogier, 1981). The Berlin-Dahlem Museum and Botanical Garden in Berlin maintains the “Flora of Cuba” project.

The vegetation of individual countries and regions of South America have received a substantial amount of attention, more so in the last 50 years. The Guianas region (Guyana, Surinam and French Guiana) has long been a focus of field and **herbarium** research by numerous botanists and many institutions in Europe, North America and northern South America (see the next section). An earlier taxonomic treatment of the Violaceae was published in the flora for French Guiana (Lemée, 1953). The second edition of a complete checklist for the Guianas region (Boggan et al., 1997) and a new field guide to the lianas (Hoffman et al., 2017) in that region have been published. A new species of *Paypayrola* was also recently described from eastern Venezuela (Aymard-C. et al., 2014). A complete flora of the Venezuelan Guayana, the region immediately west of the Guianas region, has been published, including a treatment of the Violaceae (Fernández V., 1995); and a floristic checklist was published for Guiana shield encompassing both of the above region (Fernández V., 2007).

Independent of the above flora-based pursuits, several taxonomic studies of Violaceae and descriptions of new genera or species in the above regions have been accomplished in recent decades. Most have been conducted by the PI, students and collaborators, including Hoyos-Gómez and Paula-Souza. These include studies of “violoid” groups (Paula-Souza, 2009), *Bribria* (Wahlert et al., 2018), *Calyptrion* [formerly *Corynostylis*] (Paula-Souza and Pirani, 2014), *Hekkingia* (Munzinger and Ballard, 2003), *Hybanthus* and its segregate genus *Pombalia* (Todzia, 1989; Ballard et al., 1997; Paula-Souza, 2002; Paula-Souza, 2011; Paula-Souza and Ballard, 2014), *Ixchelia* (Wahlert et al., 2015; Guzmán et al., 2019), *Paypayrola* (Aymard-C. et al., 2014; Ballard, 2022), *Rinorea* and “rinoreoid” groups (Hoyos-Gómez, 2015), and *Viola* (Ballard Jr., 1993; Ballard et al., 2001).

The “Flora Mesoamericana” and “Flora of the Guianas” projects. The fundamental bases on which floristic and taxonomic research rest are observations, study materials and specimens acquired during fieldwork by individual researchers (where possible), and especially the cumulative collections of plant specimens made by naturalists and botanists for centuries that are housed in herbaria at botanical gardens or colleges and universities. Herbarium collections encompass over 300 million plant specimens at more than 4,000 herbaria in 165 countries worldwide and provide an unparalleled opportunity to delineate species and higher-level groups; interpret taxon relationships; document rangewide variation and geographic distributions of plant species; examine rare or extinct species not accessible by fieldwork; and infer responses to climate change. Products from studies to characterize plant diversity can take two general forms, a flora (focused on all the plants of a geographic region) or a taxonomic treatment (focused on a particular plant group). Many institutions with large herbaria spearhead flora projects in certain regions and engage several to many botanists to participate, adding numerous collections representing the plants of that region to their collections. Individual botanists who specialize in **taxonomy**, including staff of the above herbaria, usually work with and become specialists in one or more plant groups (for instance, the Violet family in the case of the PI and collaborators). The family treatments in regional floras are often completed by a non-specialist (where a specialist is not available), while taxonomic treatments of a group for flora projects are often accomplished by a specialist. Taxonomic treatments authored by specialists typically have significantly more accuracy and provide greater detail about the taxa recognized; such treatments also frequently include new genera and/or species recognized as distinct by the specialist during their studies.

Latin American plants are the focus of several country-level flora projects and a few regional flora projects. The largest flora project focused on Middle America is the “Flora Mesoamericana” series, initiated by the Missouri Botanical Garden in 1994 in collaboration with the National Autonomous University of Mexico in Mexico City, Natural History Museum in London, and numerous specialists; it is currently coordinated by Dr. Gordon McPherson. Three of 11 anticipated volumes have been published. The series stagnated for some years, but has recently been rejuvenated, and the editorial committee has identified authors for many new plant family treatments to accelerate publication of future volumes. The PI, Paula-Souza and Hoyos-Gómez have been invited as co-authors of the Violet family treatment with a manuscript submission deadline of December 2023. The “Flora Mesoamericana” region includes the southeasternmost Mexican states and all countries in Central America. The format of this flora project has all text in Spanish, shorter **keys** and descriptions, and no figures or distribution maps. Each volume usually includes many families. The project has some substantial web-based information.

The “Flora of the Guianas” series is one of many smaller South American flora projects involving nine international institutions in Europe, North America and the Guianas, the main North American institutions being the Natural History Museum of the Smithsonian Institution (with all specimens imaged and available online) and the New York Botanical Garden. The project began in 1984. Approximately two dozen family treatments out of a few hundred have been published. This series has also stagnated somewhat in recent years but has gradually been rejuvenated. The PI, Paula-Souza and Hoyos-Gómez have been invited as co-authors of the Violet family treatment for this flora project, also with a manuscript submission deadline of December 2023. The format for this flora project is of a traditional monograph in English, with

full keys and comprehensive descriptions, figures and geographic distribution maps, with each monograph published as a separate issue (“fascicle”). The project has a sophisticated parallel online flora including essentially all the same data as the published issues, and final manuscript submissions are now formatted as part of the electronic flora, then published in print to make the flora more accessible and easily updated.

Dissemination of results. Results will be made public in diverse ways. Treatments of the Violaceae for the “Flora Mesoamericana” and “Flora of the Guianas” projects will be completed and submitted as manuscripts to the appropriate editorial committees by December, 2023. A broader treatment of Violaceae for Middle America will be completed and submitted as a manuscript (possibly to “Systematic Botany Monographs”) following the OURC/Baker granting period in late 2024. A new “Violets of Latin America” website will be created in late 2023 and will gradually be populated with information generated by the proposed research through 2024.

Broader impacts. The proposed research will provide the remaining information needed to publish four new violet genera (greatly advancing family-level research goals) and nine new species. Completion of taxonomic treatments for the two flora projects will provide an essential departure point for future studies of Latin American violets and represents the first major regional treatments of the Violet family in Latin America by specialists. Expanding “Flora Mesoamericana” research to include taxa in northern Mexico and the West Indies (for which all three collaborators already have a great deal of accumulated data) will complete studies for the entire “Middle America” region. Incorporating results into a “Violaceae of Latin America” website will accelerate knowledge transfer about the Violet family to other botanists and naturalists. Finally, the proposed research will provide the PI an outstanding opportunity to continue mentorship and help advance the careers of two highly talented young violet specialists.

C. Preliminary Studies of Applicant [and collaborators].

The PI, Paula-Souza and Hoyos-Gómez have already prepared an authoritative, specimen-based composite checklist for the “Flora of the Guianas” and “Flora Mesoamericana” regions, as well as northern Mexico and the West Indies (see Appended Materials). Through their own research and available publications, the three have 60 taxon descriptions completed and 15 partly done out of 89 needed for the “Flora of the Guianas” and “Flora Mesoamericana” projects combined, and 70 descriptions completed and 22 partly done out of 126 needed for all three projects. The PI has a BRAHMS database with 5,243 records from examined and confirmed specimens of Violaceae in Middle America and the Guianas, from the herbaria A, AMES, ARIZ, ASU, B, BHO, BM, BR, C, CAS, CAY, CHAPA, CIIDIR, CM, CR, DS, DUKE, ENCB, F, G, GH, GOET, H, HAL, HBG, IBUG, IEB, IJ, ILL, INB, JB, K, LL, M, MEXU, MICH, MO, MSC, NY, P, PENN, PH, PMA, POM, PR, RSA, S, SMU, TAES, TENN, TEX, U, UC, US, W, WIS, XAL, Z and ZEA (acronyms follow (Thiers, 2023)). Paula-Souza has several thousand specimen records of “violoid” genera in a database for Middle and South American Violaceae, while Hoyos-Gómez has well over a thousand specimen records in a database for Latin American *Rinorea* and other “rinoreoid” genera. The three databases are heavily complementary and together provide uniform specimen and taxon coverage for most violet taxa in Middle America and the Guianas. The PI and Paula-Souza have extensive experience in preparing taxonomic treatments, and the PI is a satisfactory illustrator and graphics designer for such publications. All three collaborators have excellent laboratory/herbarium resources to conduct the research needed to accomplish the projects and manuscripts. In 2020, the PI devoted much of the year to learn website design and HTML programming, and created the widely accessed and electronic device-friendly “Violets of the Great Plains and Eastern North America

website (<https://people.ohio.edu/ballardh/vgpena/>). During the later stages of the proposed research, the PI will adapt the website format to create a new “Latin American violets” website. Information resulting from the proposed research will be incorporated into the new website beginning in 2024.

D. Methods

Herbarium studies. Funds from the OURC/Baker grant award will support two weeks of research at the Missouri Botanical Garden (with the most extensive collections of Violaceae for Middle America and the Guianas) and the New York Botanical Garden (with the second most extensive collections). First priority will be placed on drafting descriptions of the new genera and species and acquiring information and materials to complete the manuscript of new taxa. Habit and individual structures of representative specimens will be photographed (small structures will be imaged using a USB microscope) for all species lacking a description, and descriptions will be drafted at the herbaria. Where possible, herbarium sheets will also be imaged at high resolution for new taxa using herbarium imaging facilities to facilitate illustration. Additional literature will be acquired at the outstanding herbarium libraries.

Databasing. Downloads of specimen data from Paula-Souza and Hoyos-Gómez will be adapted and uploaded into the PI’s extensive BRAHMS herbarium specimen database, and new specimens (including type specimens) will be added to this composite database as needed.

Illustrations. Plates of grayscale images or line drawings will be created using images from herbarium specimens. The PI uses a Wacom electronic tablet with Adobe Photoshop and Adobe Illustrator with images to produce both types of figures.

Geographic distributions. Geographic data (latlong coordinates) entered during databasing in BRAHMS will be exported Diva-GIS software to create distribution maps using available ArcView or project-specific shapefile templates.

Timeline. Below is a table of proposed activities (mostly) for the granting period of May 2023-April 2024.

[Jan-Apr 2023]	Online meetings between PI and collaborators to develop detailed plan of actions and available data for each project; checklists of taxa completed—DONE; travel plans arranged for PI to visit MO and NY
May-Jun	PI visits MO and NY, drafts genus and species keys, and descriptions still needed, acquires images for illustrations or plates; online meetings to coordinate aggregation of data and text
July-Aug	Specimen data collated into one database for each project to generate specimen lists and create maps; plant figures and maps created; online meetings to coordinate and review specimen lists, plant figures and maps; online meetings to coordinate manuscript preparation; research completed and manuscripts submitted to describe new genera and species in August
Sep-Dec	Assembly of manuscripts for “Flora Mesoamericana” and “Flora of the Guianas” ; create new “Latin American Violets” website; online meetings to coordinate manuscript assembly; manuscripts submitted in December
Jan-Apr 2024	Incorporation of information into “Latin American Violets” website continues through 2024

E. Collaborations

The proposed collaboration is an extension of previous, highly productive collaborative research between the PI, renowned Latin American “violoid” violet expert Juliana Paula-Souza in Brazil and emerging “rinoreoid” violet expert Saul Hoyos-Gómez in Colombia. Together, the trio is particularly well positioned by their expertise and cumulative research data to complete taxonomic treatments of the Violaceae for the “Flora Mesoamericana” and “Flora of the Guianas” series with a concerted effort in 2023. This will require the PI to visit two key herbaria to finish acquisition of materials and information, to draft descriptions and produce illustrations or plates as needed, and to lead assembly of the manuscripts.

6. DURABLE IMPACT AND SUSTAINABILITY

The PI has been conducting taxonomic and evolutionary research on violets for over 45 years, focusing much of his time on New World violets and the rest on clarifying limits and relationships of genera in the family worldwide. His mid-term goals are to complete projects with Latin American violets and to eventually switch his main effort to finish studies on North American violets. The PI and collaborators Juliana Paula-Souza and Saul Hoyos-Gómez have visited many herbaria (or taken loans of specimens for particular groups or species) individually and together, examining and databasing thousands of specimens of Latin American violets. In the process, they have produced a substantial number of descriptions for genera and species of Latin American violets. Individually and together, and with other collaborators, they have published much of the taxonomic and evolutionary literature concerning Latin American violets in recent decades. They represent an ideal team to advance knowledge of violet taxonomy by preparing taxonomic treatments for the “Flora of Mesoamericana” and “Flora of the Guianas”, and shortly afterward, for the Violets of Middle America. The proposed research will also yield one or more manuscripts for most of the remaining undescribed genera in the Violet family. All of this information will be incorporated into a new, easily updated and expanded “Violets of Latin America” website, which will greatly enhance and expedite knowledge transfer.

Completion of the above-mentioned research will finish current taxonomic work on Violaceae in Middle America. Furthermore, products from the proposed research will serve Paula-Souza, Hoyos-Gómez and others as a valuable nucleus from which treatments for violets of other South American countries and regions can readily be produced. Eventually, a treatment of Violaceae for the “Flora Neotropica” series (from the middle of Mexico to the middle of Paraguay), and even a violet flora for the whole of Latin America, would be attainable.

7. GLOSSARY OR DEFINITION OF TERMS

Checklist—A list of taxa, sometimes with brief additional ecological or geographic information.

Family—A group consisting of one or more **genera**

Flora—A publication presenting details on the diversity of a set of organisms inhabiting a geographic region. A floristic checklist often provides little more than the names of the taxa confirmed for the region, while some floras encompass comprehensive taxonomic treatments (often in multiple volumes) for all of the taxa. Examples of the latter are the “Flora Mesoamericana” and “Flora of the Guianas” series.

Genus, genera—A group (groups) of species.

Herbarium (plural, herbaria)—A plant museum of dried, pressed and labeled specimens contributed by numerous naturalists and botanists. A critical resource for taxonomic studies.

Key—In taxonomic studies, a (dichotomous) key is a textual device for identifying an unknown taxon using **morphological** traits in a nested series of pairwise choices.

Molecular phylogenetics—A broad methodology employing molecular (genetic) markers to determine relationships among **taxa**.

Morphology, morphological—Referring to physical traits of an organism.

Nomenclatural combination—A new name published at a different rank from the original name; for example, raising a variety to species rank requires publication of a new nomenclatural combination citing the original publication.

Taxon (plural, taxa)—A generalized term for one or more individuals, populations, species, genera, etc.

Taxonomic treatment—Publication characterizing details of the **morphology**, ecology and geographic distribution of **taxa** in a particular group (for example, a genus or family), in a

region or over the whole range of the group. A taxonomic treatment commonly include keys for identification, an an account for each taxon with a detailed **morphological** description, a summary of ecology, figures showing plant habit and structures, a geographic distribution map, and representative lists of **herbarium** specimens examined. When a whole lineage is studied, the published product is commonly called a monograph. The “Flora Mesoamericana” series is unusual, in that descriptions are substantially abbreviated, and figures and maps and specimen lists are excluded, because it is the focus of over 20,000 plant species.

Taxonomy, taxonomic—An area of science that focuses on delineating distinct **taxa** worthy of formal recognition based on available information (usually morphological) and providing correct names for accepted taxa under an internationally accepted set of conventions.

8. BIBLIOGRAPHY

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- Zmarzty, S., and H. Ballard. 2023. Violaceae. The Kew temperate plant families identification handbook, Royal Botanic Gardens, Kew, England.

9. BIOGRAPHICAL INFORMATION: Harvey Eugene Ballard, Jr., PhD, PI (University of Wisconsin-Madison, 1996)

Department of Environmental & Plant Biology, 315 Porter Hall, Ohio University, Athens, OH 45701-2979, USA; office phone: (740) 593-4659; email: ballardh@ohio.edu

Professional Positions:

Professor, Ohio University, 2017-present; Associate Professor, Ohio University, 2003-2017;
Assistant Professor, Ohio University, 1997-2003
Director, Floyd Bartley Herbarium, Ohio University, 2011-present
Adjunct Faculty, Department of Horticulture and Crop Science, Ohio State University, 2009-present
Postdoctoral Researcher, Department of Horticulture, University of Wisconsin-Madison and USDA-Agricultural Research Service, 1996 - 1997
Preserve Design Ecologist, The Nature Conservancy-Michigan Chapter, 1986-1992
Assistant Data Manager and Field Botanist, Michigan Natural Features Inventory, 1985-1986
Herbarium Computerization Technician, Gove Associates, 1980-1981
Field Botanist, Michigan Nature Association, 1979-1985

Professional Service Roles:

Program Director, American Society of Plant Taxonomist, 2013-2022
Secretary/Treasurer, Systematics Section, Botanical Society of America, 2013-2022
Field Trip Coordinator, Botanical Society of America, 2012-2013
Appointed Member, Ohio Rare Plant Technical Advisory Committee, 2012-present
Member and Midwest Representative, Virtual US Herbarium Database Network, 2009-present
Member, Ohio Flora Committee, 2006-present
Research Associate, Missouri Botanical Garden, 1995-present
Research Associate, Carnegie Museum, 1994-present

Publications (last five years; grad students underlined>:

- Zmarzty, S. and H. E. Ballard. 2023. Violaceae in “The Kew Temperate Plant Families Identification Handbook”. Royal Botanic Gardens, Kew, London, England, in press. [to be published February 2023]
- Ballard, Jr., H. E. 2023. Taxonomic treatment of the Violets (Violaceae) of the northeastern United States and adjacent Canada. *Torrey Botanical Society Monographs*, in press. [to be published March 2023]
- Ballard Jr., H. E. 2022. Second eastern United States record of *Viola epipsila* Ledeb. subsp. *repens* W.Becker (Violaceae), *Great Lakes Botanist* 61: 53-57.
- González, P., D. B. Montesinos-Tubée, J. M. Watson, A. Cano, H. Trinidad, E. Navarro, H. Jans, M. Sheader, H. E. Ballard, and A. R. Flores. 2022. *Viola ornata* and *Viola longibracteolata* (Violaceae, subgen. *Neoandinium*), two rare, new rosulate species from southern Peru. *Phytotaxa* 571(1): 052-064. [<https://doi.org/10.11646/phytotaxa.571.1.4>]
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- Ballard Jr., H. E. 2022. A new *Paypayrola* (Violaceae) from Panama, with provisional species complexes. *Phytotaxa* 542(3): 283-292.

- Lattier, J. D., H. E. Ballard, Jr., M. Kramer, and M. R. Pooler. 2022. Genome size, ploidy levels, and genetic diversity of *Corylopsis* germplasm collections. Genetic Resources and Crop Evolution [https://doi.org/10.1007/s10722-022-01371-0].
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- Sternberger, A. L., A. V. S. Ruhil, D. M. Rosenthal, H. E. Ballard, and S. E. Wyatt. 2020. Environmental impact on the temporal production of chasmogamous and cleistogamous flowers in the mixed breeding system of *Viola pubescens*. PLoS One 15(3): e0229726. [https://doi.org/10.1371/journal.pone.0229726]
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- Svoboda, H. T. and H. E. Ballard, Jr. 2018. Phenetic and cladistic studies help clarify species assemblages in *Passiflora* section *Dysosmia* (Passifloraceae). Brittonia 70: 15-24.

Scientific Meeting Presentations (last five years; grad students underlined, undergrads italicized):

- Augustine, N.* and Ballard, Jr., H. E. 2022. Spore sizes reveal ploidy levels in known and new Great Lakes Bog Clubmosses (*Lycopodiella*, Lycopodiaceae). Botany 2022, Anchorage, AK.
- Burwell, R. and Ballard, Jr., H. E. 2022. The murky species delimitation of decaploid coastal plain violets. Botany 2022, Anchorage, AK.
- Lockhart, S. and Ballard, Jr., H. E. 2022. Reproductive contributions of chasmogamous and cleistogamous flowers in four mixed-breeding violets in Ohio. Botany 2022, Anchorage, AK.*
- Ballard, Jr., H. E. 2022. Delimiting taxa in three species complexes of *Viola* (Violaceae) in eastern North America. Botany 2022, Anchorage, AK.

- Ballard, Jr., H. E. 2021. Far-reaching taxonomic and evolutionary implications of Ezra Brainerd's violet research. Botany 2021 Virtual.
- Ballard, Jr., H. E. 2020. Violets (Violaceae) of the Great Plains and eastern North America: An overview, and a new website. Botany 2020 Virtual.
- Sternberger, A. L., M. Bowman, C. P. S. Kruse, K. E. Childs, H. E. Ballard, Jr., and S. E. Wyatt. 2019. Transcriptomics identifies modules of differentially expressed genes and novel cyclotides in *Viola pubescens*. Plant Biology 2019, American Society of Plant Biologists, San Jose, CA.
- Kalfas, B., A. L. Sternberger, H. E. Ballard, Jr., and S. E. Wyatt. 2019. Investigating floral transition and optimizing germination in *Viola pubescens*. Plant Biology 2019, American Society of Plant Biologists, San Jose, CA.*
- Ballard, Jr., H. E. 2019. Delineating evolutionary species & defining species groups in the Acaulescent Blue violets (*Viola* subsect. *Boreali-Americanae*). Botany 2019, Tucson, AZ.
- Burwell, R. and H. E. Ballard. 2019. Preliminary integrative taxonomic investigations on the Affinis and Edulis species groups of Coastal Plain violets (*Viola*). Botany 2019, Tucson, AZ.*
- Chilson, N. and H. E. Ballard. 2019. Three from one: A taxonomic study of the Threepart Violet (*Viola tripartita*). Botany 2019, Tucson, AZ.*
- Ballard, Jr., H. E. 2019. The status of violet (Violaceae) taxonomy in the southeastern U.S. flora. Association of Southeastern Biologists/Southern Appalachian Botanical Society, Memphis, TN.
- Sternberger, A. L., M. Bowman, C. P. S. Kruse, K. E. Childs, H. E. Ballard, Jr., and S. E. Wyatt. 2018. Investigating the environmental and genetic mechanisms involved in the mixed breeding system of the North American violet, *Viola pubescens*. Plant Biology 2018, American Society of Plant Biologists, Montreal, Canada.
- Ballard, Jr., H. E. 2018. Integrative taxonomic studies of the Salad Violet (*Viola edulis*) species group. Botany 2018, Rochester, MN.
- Greff, A. and H. E. Ballard, Jr. 2018. Integrative taxonomic studies of the *Viola edulis* complex. Association of Southeastern Biologists/Southern Appalachian Botanical Society, Myrtle Beach, SC.*
- Hastings, J. and H. E. Ballard, Jr. 2018. Niche separation of Virginia populations of the *Viola subsinuata* complex supports recognition of four morphospecies. Association of Southeastern Biologists/Southern Appalachian Botanical Society, Myrtle Beach, SC.
- Sitepu, B. and H. E. Ballard, Jr. 2018. Novel morphologies in the *Allium tricoccum* (Wild Ramps) complex and their systematic impact. Association of Southeastern Biologists/Southern Appalachian Botanical Society, Myrtle Beach, SC.

BIOGRAPHICAL INFORMATION: Juliana de Paula-Souza, PhD (Universidade de São Paulo, 2009)

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Professional Positions:

Vascular Plants Curator, Herbário FLOR, Universidade Federal de Santa Catarina, 2020-present
 Professor, Universidade Federal de Santa Catarina, 2019-present
 Professor, Universidade Federal de São João del Rei, 2014-2019
 Postdoctoral Researcher, Instituto de Biociências, Universidade de São Paulo [visited Department of Environmental & Plant Biology, Ohio University for 6 months], 2013-2014
 Postdoctoral Researcher, Instituto de Biociências, Universidade de São Paulo, 2012-2013
 Postdoctoral Researcher, Departamento de Farmácia/Museu de História Natural, Universidade Federal de Minas Gerais, 2009-2011

Publications (last five years):

- Siqueira, M.V.B.M.; Silverio, G.H.; Carlos, J.S.; Toledo, J.A.M.; Silva, C.J.; Paula-Souza, J. Phenotypic plasticity in *Copaifera langsdorffii* Desf. in different forest fragments in São Paulo state, Brazil. *Anais da Academia Brasileira de Ciências* (in press).
- Alves-Araújo, A.; Paula-Souza, J.; et al. 2022. Floristic survey of vascular plants of a poorly known area in the Brazilian Atlantic Forest (Flona do Rio Preto, Espírito Santo). *Biodiversity Data Journal* 10: 1–21. [10.3897/bdj.10.e75910](https://doi.org/10.3897/bdj.10.e75910)
- Barros, J.C.; Scopel, M.; Paula-Souza, J.; Brandão, M.G.L. 2022. Ensinando sobre plantas medicinais na escola. *Revista A Flora* 6: 7–8.
- Fernando-Bobey, A.; Pinto, M.E.F.; Almeida, L.C.; Souza, B.M.; Dias, N.B.; Paula-Souza, J.; Cilli, E.M.; Lopes, N.P.; Costa-Lotufo, L.V.; Palma, M.S.; Bolzani, V.S. 2022. Cytotoxic Cyclotides from *Anchietea pyrifolia*, a South American Plant Species. *Journal of Natural Products* 85: 2127–2134. [10.1021/acs.jnatprod.1c01129](https://doi.org/10.1021/acs.jnatprod.1c01129)
- Giacomin, L.L.; Hoyos-Gómez, S.E.; Paula-Souza, J.; et al. 2022. Catálogo de Plantas das Unidades de Conservação do Brasil - Lista de espécies de plantas vasculares da Floresta Nacional do Tapajós. https://catalogo-ucs-brasil.jbrj.gov.br/descr_areas.php?area=FlonaTapajos (accessed 25 January 2023)
- Lima, A.G.; Paula-Souza, J.; Ringelberg, J.; Simon, M.F.; Queiroz, L.P.; Borges, L.M.; Mansano, V.F.; Souza, V.C.; Scalon, V.R. 2022. New Segregates from the Neotropical Genus *Stryphnodendron* (Leguminosae, Caesalpinioideae, mimosoid clade). *PhytoKeys* 205: 203–237. [10.3897/phytokeys.205.82220](https://doi.org/10.3897/phytokeys.205.82220)
- Pastore, J.; Trovó, M.; Mota, M.; Antar, G.; Maruyama, A.S.C.; Paula-Souza, J. 2022. Recommendations for typification of Vellozo's names from Cunha, São Paulo (Brazil): Eriocaulaceae, Polygalaceae, and Violaceae. *Brittonia* 74: 1–12. [10.1007/s12228-022-09726-8](https://doi.org/10.1007/s12228-022-09726-8)
- Paula-Souza, J.; Lima, A.G.; Costa, J.A.S.; Queiroz, L.P. 2022. A step out of the chaos – a nomenclatural revision of New World *Copaifera* L. (Fabaceae, Detarieae). *Annals of The Missouri Botanical Garden* 107: 467–479. [10.3417/2022784](https://doi.org/10.3417/2022784)

- Sartorelli, P.A.R.; Catenacci, F.S.; Paula-Souza, J.; Benedito, A.L.D. 2022. Guia de arborização urbana de São Luís do Maranhão - espécies, plantio e poda. São Paulo: Carla Giovana Rodrigues Sartorel/MARRUAH! Editora. 103p.
- Scalon, V.R.; Paula-Souza, J.; Lima, A.G.; Souza, V.C. 2022. A synopsis of the genus *Stryphnodendron* (Fabaceae, Caesalpinioideae, mimosoid clade). *Phytotaxa* 544: 227–279. [10.11646/phytotaxa.544.3.1](https://doi.org/10.11646/phytotaxa.544.3.1)
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- Carrijo, T.T.; Hoyos-Gómez, S.E.; Paula-Souza, J.; et al. 2021. Catálogo de Plantas das Unidades de Conservação do Brasil - Listade espécies de plantas terrestres da Flona do Rio Preto. <https://catalogo-ucs-brasil.jbrj.gov.br/checklist.php?area=RioPreto> (accessed 25 January 2023)
- Lima, D.F.; Paula-Souza, J.; et al. 2021. Catálogo de Plantas das Unidades de Conservação do Brasil - Lista de espécies de plantas terrestres do Parque Nacional de São Joaquim. https://catalogo-ucs-brasil.jbrj.gov.br/desc_areas.php?area=SaoJoaquim (accessed 25 January 2023)
- Maruyama, A.; Lima, A.G.; Paula-Souza, J.; Costa, J.A.S. 2021. On the distribution of two species of *Copaifera* L. (Leguminosae) from the Brazilian Cerrado, and the first record of *C. malmei* Harms in São Paulo state, Brazil. *Check List, Journal of Species List and Distribution* 17: 253–260. [10.15560/17.1.253](https://doi.org/10.15560/17.1.253)
- Mügge, F.L.B.; Prates, S.M.S.; Paula-Souza, J.; Brandão, M.G.L. 2021. Bioactive Potential of Brazilian Plants Used as Food with Emphasis on Leaves and Roots. Pp. 65–87 in: *Ethnobiology.1* ed. Cham, Switzerland: Springer International Publishing. [10.1007/978-3-030-69139-4_5](https://doi.org/10.1007/978-3-030-69139-4_5)
- Lima, A.G.; Paula-Souza, J.; Scalon, V.R.; Souza, V.C. 2021. *Stryphnodendron flavotomentosum* (Leguminosae, Caesalpinioideae, mimosoid clade), a New Species from the Atlantic Forest, Brazil. *Systematic Botany* 46: 70–74. [10.1600/036364421x16128061189431](https://doi.org/10.1600/036364421x16128061189431)
- Paula-Souza, J. 2021. Guide to the Genera of Lianas and Climbing Plants in the Neotropics: Violaceae. <https://naturalhistory.si.edu/sites/default/files/media/file/violaceae.pdf> (accessed 25 January 2023)
- Paula-Souza, J.; Lima, A.G.; Souza, V.C. 2021. The violets of the Brazilian Savanna: A revision of the *Pombalia lanata* complex (Violaceae), with the description of two new species. *Edinburgh Journal of Botany* 78: 1–232. [10.24823/EJB.2021.357](https://doi.org/10.24823/EJB.2021.357)
- Amorim, E.; Fernandez, E.; Crispim, G.; Martinelli, G.; Paula-Souza, J. 2020. *Rinorea longistipulata*. The IUCN Red List of Threatened Species. p.T35985A17612628. [10.2305/iucn.uk.2020-3.rlts.t35985a176126280.pt](https://doi.org/10.2305/iucn.uk.2020-3.rlts.t35985a176126280.pt)
- Lima, A.G.; Souza, V.C.; Paula-Souza, J.; Scalon, V.R. 2020. Flora do Brasil Online 2020: *Stryphnodendron* (Fabaceae). <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB23174>. (accessed 25 January 2023)
- Mattar, E.P.L.; Matrangolo, W.J.R.; Brasileiro, B.P.; Frade Jr., E.F.; Albuquerque, T.A.; Oliveira, J.R.; Paula-Souza, J.; Dias, D.C.F.S. 2020. Terra Ronca State Park: A potential natural *Cratylia argentea* (Desv.) Kuntze conservation area in Goiás, Brazil. *Tropical Grasslands – Forrajes Tropicales* 8: 280–288. [10.17138/TGFT\(8\)280-288](https://doi.org/10.17138/TGFT(8)280-288)
- Paula-Souza, J.; Hoyos-Gómez, S.E.; Oliveira, J.F.C. 2020. Flora do Brasil Online 2020: Violaceae. <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB247> (accessed 25 January 2023)

- Prates, S.M.; Mügge, F.L.B.; Paula-Souza, J.; Brandão, M.G.L. 2020. Potencial econômico das plantas usuais dos Brasileiros: espécies da Bacia do Rio Pandeiros. *Revista A Flora* 1: 8–12.
- Ribeiro, J.P.O.; Paula-Souza, J.; Silva, C.J. 2020. Morfoanatomia de órgãos vegetativos de duas espécies de *Cattleya* (Orchidaceae) nativas do Brasil. *Rodriguésia* 71: 1–13. [10.1590/2175-7860202071034](https://doi.org/10.1590/2175-7860202071034)
- Souza, V.C.; Lima, A.G.; Paula-Souza, J. 2020. Flora do Brasil Online 2020: Tropaeolaceae. <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB239> (accessed 25 January 2023)
- Teixeira, N.; Mello, J.C.S.; Fronza, P.; Batista, L.F.; Paula-Souza, J.; Brandão, M.G.L. 2019. Edible fruits from Brazilian biodiversity: A review on their sensorial characteristics versus bioactivity as tool to select research. *Food Research International* 19: 325–348. [10.1016/j.foodres.2019.01.058](https://doi.org/10.1016/j.foodres.2019.01.058)
- Fraga, C.N.; Paula-Souza, J.; et al. 2019. Lista da fauna e flora ameaçadas de extinção no estado do Espírito Santo. Pp. 342–419 in: Fauna e flora ameaçadas de extinção no estado do Espírito Santo. 1 ed. Santa Teresa: Instituto Nacional da Mata Atlântica.

Scientific Meeting Presentations (last four years):

- Brandão, M.G.L.; Costa, A.A.P.; Paula-Souza, J.; Ricardo, L.M.; Mügge, F.L.B. 2022. Dataplant – Base de dados bibliográfica sobre uso das plantas brasileiras. 13o Mestres e Conselheiros. Belo Horizonte, MG.
- Pires, A.L.S.; Nascimento, M.E.P.; Queiroz, S.A.S.; Paula-Souza, J.; Bolzani, V. 2022. Circular miniproteins from *Pombalia atropurpurea*. 45ª Reunião Anual da Sociedade Brasileira de Química. Maceió, AL.
- Raddi, R.; Brandão, M.G.L.; Paula-Souza, J. 2022. Medicinal plants from Brazil: the contribution of Giuseppe Raddi. 70th International Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research (GA). Thessaloniki, Greece.
- Mancio, J.S.; Alcantara, S.F.; Paula-Souza, J. 2020. Complementação à Flora de Santa Catarina: Violaceae. Simpósio Digital de Sistemática e Evolução de Plantas. (Online).
- Franca, A.C.F.; Delfini, C.; Carvalho, D.A.C.A.; Silva, C.J.; Paula-Souza, J. 2019. Padrões de distribuição de estômatos, células buliformes e incolores nas epidermes adaxial e abaxial em folhas de espécies de *Axonopus* P.Beauv. (Poaceae, Panicoideae). 71o Reunião Anual da SBPC, Campo Grande, MS.
- Marcelino, R.A.G.; Paula-Souza, J. 2019. Bancos de dados virtuais como ferramenta para acessar a biodiversidade vegetal: potencialidades de usadas plantas coletadas no Vale do Rio Jequitaiá – MG. 1o Simpósio Regional Sudeste de Farmacognosia/25o Seminário Mineiro de Plantas Mediciniais. Tiradentes, MG.
- Paula-Souza, J. 2019. A contemporaneidade do tiradentino frei José Mariano da Conceição Vellozo, o primeiro botânico brasileiro. 1o Simpósio Regional Sudeste de Farmacognosia/25o Seminário Mineiro de Plantas Mediciniais, Tiradentes, MG.
- Paula-Souza, J.; Pinto, L.H.R.; Brandão, M.G.L. 2019. Trazendo as plantas medicinais da Flora Fluminensis para a Botânica do século XXI – a importância de Vellozo para a taxonomia no Brasil. 1o Simpósio Regional Sudeste de Farmacognosia/25o Seminário Mineiro de Plantas Mediciniais. Tiradentes, MG.
- Silva, I.H.F.; Trajano, T.F.; Paula-Souza, J. 2019. Plantas ornamentais do Cerrado: Valorização da flora local de Fortuna de Minas – MG. XI Congresso Brasileiro de Agroecologia, Aracaju, SE.

BIOGRAPHICAL INFORMATION: Saul Hoyos-Gómez, PhD in progress (Universidad de Antioquia)

Universidad de Antioquia, Departamento de Biología, Calle 67 No. 53-108, Bloque 2-411, Herbarium. Medellín, Colombia; office phone: (57)2195614; email: saulhoyos@gmail.com

Professional Positions:

University of Antioquia, PhD. Candidate, 2017-2023

University Foundation of Area Andina, Specialist in Environmental Management, 2016

University of Missouri, Saint Louis, Master in Ecology, Evolution and Systematics, 2011

Universidad Nacional de Colombia, Bogotá, Biology (graduate), 2006

Publications (last five years):

Sanín MJ, Borchsenius F, Paris M, Carvalho-Madrugal S, Gómez Hoyos AC, Cardona A, Arcila Marín N, Ospina Y, Hoyos-Gómez SE, Manrique HF and Bernal R (2022) The Tracking of Moist Habitats Allowed Aiphanes (Arecaceae) to Cover the Elevation Gradient of the Northern Andes. *Front. Plant Sci.* 13:881879. doi: 10.3389/fpls.2022.881879

Alves-Araújo, A.; Paula-Souza, J.; et al. 2022. Floristic survey of vascular plants of a poorly known area in the Brazilian Atlantic Forest (Flona do Rio Preto, Espírito Santo). *Biodiversity Data Journal* 10: 1–21. 10.3897/bdj.10.e75910

Giacomin, L.L.; Hoyos-Gómez, S.E.; Paula-Souza, J.; et al. 2022. Catálogo de Plantas das Unidades de Conservação do Brasil - Lista de espécies de plantas vasculares da Floresta Nacional do Tapajós. https://catalogo-ucs-brasil.jbrj.gov.br/descr_areas.php?area=FlonaTapajos (accessed 25 January 2023)

Brazil Flora Group. 2021. Brazilian Flora 2020: Leveraging the power of a collaborative scientific network. *Taxon* 71: 1–21. 10.1002/tax.12640

Carrijo, T.T.; Hoyos-Gómez, S.E.; Paula-Souza, J.; et al. 2021. Catálogo de Plantas das Unidades de Conservação do Brasil - Listade espécies de plantas terrestres da Flona do Rio Preto. <https://catalogo-ucs-brasil.jbrj.gov.br/checklist.php?area=RioPreto> (accessed 25 January 2023)

Paula-Souza, J.; Hoyos-Gómez, S.E.; Oliveira, J.F.C. 2020. Flora do Brasil Online 2020: Violaceae. <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB247> (accessed 25 January 2023)

Cogollo-Pacheco, Á., Hoyos-Gómez, S. E., Serna-González, M. (2019). Una nueva especie y otros registros de Magnoliaceae para Colombia. *Brittonia*, 71(1), 32-38. <https://doi.org/10.1007/s12228-018-9554-0>

R. Bernal, F. Borchsenius, S. E. Hoyos-Gómez, H. F. Manrique & M. J. Sanín. 2019. A revision of the *Aiphanes parvifolia* complex (Arecaceae). *Phytotaxa* 411 (4): 275–292

Hoyos-Gómez S.E. & Bernal R. 2018. Rheophytes of the Samana Norte River, Colombia: A Hydroelectric Project Threatens an Endemic Flora. *Tropical Conservation Science* Volume 11: 1–13.

Scientific Meetings (last four years):

- 2020. January 15th. Extreme Botany. University of California, Santa Barbara, USA. Lecture.
- 2019. September. Extreme Botany. Missouri Botanical Garden, Saint Louis, Missouri, USA. Lecture.

- 2019. October 18th. Extreme Botany. Field Museum. Chicago, USA. Lecture.
- 2019. October 24th. Extreme Botany. Smithsonian, USA. Lecture.
- 2019. November 22nd. Extreme Botany. Ohio University, USA. Lecture.
- 2019. 66th Annual Systematics Symposium, Missouri Botanical Garden, Saint Louis, Missouri, USA. Poster.

10. OTHER SUPPORT

A. Previous University Funding

- 2022—Faculty Support Program, “Funding for new pipette set”; \$800
[purchased a new pipette set to replace very old nonfunctional set]
- 2022—OURC Discretionary Fund, “Funding for new pipette set”; \$350
[ditto above]
- 2022—Ohio University Research Committee (OURC), “Integrating flow cytometry and genotyping-by-sequencing with traditional methods for species discovery and species/hybrid delimitation in Great Lakes Bog Clubmosses”; \$1,500 [supplement]
[Poster: *Augustine, N.* and Ballard, Jr., H. E. 2022. Spore sizes reveal ploidy levels in known and new Great Lakes Bog Clubmosses (*Lycopodiella*, Lycopodiaceae). Botany 2022, Anchorage, AK; analysis of genotyping-by-sequencing data set has begun; first of four manuscripts largely drafted]
- 2021/22—Ohio University Research Committee (OURC), “Integrating flow cytometry and genotyping-by-sequencing with traditional methods for species discovery and species/hybrid delimitation in Great Lakes Bog Clubmosses”; \$8,000
[ditto]

B. External Funding

- 2022/23—USDA National Arboretum, “Funds for plant biology internships”; \$16,500
- 2021/22—USDA National Arboretum, “Funds for plant biology internships”; \$16,500
- 2020/21—USDA National Arboretum, “Funds for plant biology internships”; \$16,500
- 2020/21—Michigan Botanical Foundation, “Species discovery and species/hybrid delimitation in Great Lakes Bog Clubmosses: Expanding Michigan field studies”; \$1,500
[leveraged OURC grant award]
- 2020/21—Clarence R. and Florence N. Hanes Fund, “Species discovery and species/hybrid delimitation in Great Lakes Bog Clubmosses (*Lycopodiella*): Field studies in southwestern Michigan”; \$1,870
[ditto above]
- 2019/22—Pennsylvania Department of Natural Resources grant to Penn State University (subaward to OU), “Undergraduate Assistant for microsatellite marker development in Ramps”; \$3,000
[microsatellite data set just completed, now analyzing genetic data with collaborators]

11. BUDGET AND JUSTIFICATION

The funding requested will be applied to travel to visit two key herbaria with known extensive and critical collections of Latin American violet specimens. Missouri Botanical Garden directs the “Flora Mesoamericana” project as well as other flora projects in Latin America, and it has many thousands of Latin American herbarium specimens (perhaps the best collection in the New World outside of Latin America. New York Botanical Garden (the largest herbarium in the western hemisphere) also has many thousands of specimens of violets in both project regions and directs flora projects elsewhere in Latin America. The Missouri Botanical Garden is a particularly convenient and cost-efficient “home base” at which to obtain additional study materials for new genera and species, draft keys and descriptions, image specimens for illustrations, and accomplish some of the initial manuscript assembly.

Item	Unit Cost	Units	Subtotal	OURC/ Baker	PI
<i>Trip 1 (New York Bot Garden, May 12-21)</i>					
Go Bus to/from CMH Airport	\$26 r.t.	1	\$26	\$26	
Airfare	\$480	1	\$480	\$480	
Ground transportation (commuter train, bus)	\$80	1	\$80	\$80	
Accommodations	\$50/night	9 nights	\$450	\$450	
Food	\$35/day	10 days	\$350	\$350	
<i>Subtotal</i>			<i>\$1,386</i>		
<i>Trip 2 (Missouri Bot Garden, June 19-July 3)</i>					
Rental car	\$775	1	\$775	\$775	
Gas (\$3.50x 1,100 mi, 30 mi/gal)	\$130	1	\$130	\$130	
Accommodations	\$35/night	14 nights	\$490	\$490	
Food	\$35/day	15 days	\$525	\$219	\$306
<i>Subtotal</i>			<i>\$2,000</i>		
TOTAL			\$3,386	\$3,000	\$306

Justification: Although it would be somewhat cheaper to fly to St. Louis to visit Missouri Botanical Garden, the Garden researcher apartments (around the corner from the herbarium building) are more than a mile walk to the nearest supermarket and restaurants, and public transit is not very accessible for a pedestrian in the Garden area. It is easier, safer and more convenient to rent a car and drive to St. Louis, and to have it available. There is no car rental agency in Athens, so a trip to Enterprise Car Rental in Lancaster is necessary. Pickups and dropoffs are best arranged for weekdays, hence the Monday-to-Monday schedule. The cost of a midsize sedan (e.g., Toyota Corolla) from the Enterprise website is budgeted. Gas cost was calculated by current gas prices in the area and from the lowest mileage from the PI’s own Toyota Corolla, and roundtrip miles from Athens to/from the Missouri Botanical Garden and vicinity were estimated from GoogleMaps. The airfare for New York City is a median price taken from Concur for decent flight times. Ground transportation in New York City is budgeted from costs incurred during a trip to NYBG herbarium in summer 2022. Both Missouri Botanical Garden and New

York Botanical Garden maintain researcher apartment accommodations for such visits; apartments are very inexpensive, fully equipped, and conveniently located to the herbarium. The PI has already reserved accommodations at both researcher apartments for the time periods indicated in the table above. For food, during previous visits it has been most efficient in terms of energy, cost and time to buy groceries at a nearby supermarket and make meals for breakfast and lunch, and to eat supper at local restaurants. Costs budgeted for food are taken from expenses incurred during summer 2022 trips to both herbaria.

COSTS OF THE PROPOSED RESEARCH AND FUNDING SOURCES

The PI has no other funding sources for the proposed research. He will cover the overage in expenses out-of-pocket.

12. APPENDED MATERIALS

Appendix 1. Checklist of Violaceae for northern Mexico and the West Indies, Flora Mesoamerica region and Flora of the Guianas region, showing status of descriptions; partially completed descriptions in parentheses, initials of PI and collaborators or X for others indicating authorship of descriptions; * = introduced species; boldface indicates a new taxon or new combination to be published; taxa in yellow require further study or confirmation of records.

Taxon	N Mex./ WI	Mesoam.	Guianas	Descripti on
<i>Amphirrhox longifolia</i> (A.St.-Hil.) Spreng.				JPS
<i>Amphirrhox surinamensis</i> Eichler [good species?]				
<i>Bribria crenata</i> (S.F.Blake) Wahlert & H.E.Ballard				HB
<i>Calyptrion arboreum</i> (L.) Paula-Souza				X
<i>Calyptrion carthagenense</i> (H.Karst.) Paula-Souza [confirm record]				
<i>Fusispermum laxiflorum</i> Hekking				X
<i>Gloeospermum blakeanum</i> (Standl.) Hekking				X
<i>Gloeospermum boreale</i> C.V.Morton				HB
<i>Gloeospermum dichotomum</i> (Rusby) Melch.				
<i>Gloeospermum pauciflorum</i> Hekking				X
<i>Gloeospermum portobelense</i> A. Robyns				X
<i>Gloeospermum sphaerocarpum</i> Triana & Planch.				
<i>Hekkingia bordenavei</i> Munzinger & H.E.Ballard				X
<i>Hybanthus havanensis</i> Jacq.				
<i>Hybanthus urbanianus</i> Melch.				
<i>Hybanthus yucatanensis</i> Millsp.				X
<i>Ixchelia kochii</i> Cuevas				X
<i>Ixchelia mexicana</i> (Ging. ex DC.) H.E.Ballard & Wahlert				(HB)
<i>Ixchelia "panamensis"</i> H.E.Ballard ined.				(HB)
<i>Ixchelia uxpanapana</i> (T.Wendt) Wahlert & H.E.Ballard				(HB)
<i>Leonia cymosa</i> Mart. [confirm record]				(X)
<i>Leonia glycyarpa</i> Ruiz & Pav.				(X)
<i>Leonia racemosa</i> Mart.				(X)
<i>Mayanaea caudata</i> (Lundell) Lundell				
"<i>Mexion</i>" <i>fruticulosus</i> (Benth.) Paula-Souza & H.E.Ballard ined.				

“Mexion” serrulatus (Standl.) Paula-Souza & H.E.Ballard ined.

Noisettia orchidiflora (Rudge) Ging.

Orthion guatemalense Lundell

Orthion malpighiifolium (Standl.) Standl. & Steyerl.

Orthion montanum Lundell

Orthion oblanceolatum Lundell

Orthion subsessile (Standl.) Standl. & Steyerl.

Orthion veracruzense Lundell

Paypayrola “Brazil-Surinam” [possibly a new species]

Paypayrola confertiflora Tul.

Paypayrola grandiflora Tul.

Paypayrola guianensis Aubl.

Paypayrola hulkiana Pulle

Paypayrola longifolia Tul.

Paypayrola panamensis H.E.Ballard

***Pombalia* “baja” H.E.Ballard ined.**

Pombalia attenuata (Humb. & Bonpl. ex Willd.) Paula-Souza

Pombalia brevis (Dowell) Paula-Souza

Pombalia calceolaria (L.) Paula-Souza

Pombalia glabra (Dowell) Paula-Souza

Pombalia linearifolia (Vahl) Paula-Souza

Pombalia oppositifolia (L.) Paula-Souza

Pombalia parviflora (L.f.) Paula-Souza*

Pombalia pennellii (C.V.Morton) H.E.Ballard & Paula-Souza ined.

Pombalia potosina (C.V.Morton) Paula-Souza

Pombalia prunifolia (Humb. & Bonpl. ex Willd.) Paula-Souza

Pombalia sylvicola (Standl. & Steyerl.) H.E.Ballard & Paula-Souza

Pombalia verbenacea (Kunth) H.E.Ballard & Paula-Souza

Pombalia verticillata (Ortega) Paula-Souza

Pombalia wrightii (Urb.) H.E.Ballard & Paula-Souza

JPS

HB

HB

HB

HB

HB

HB

HB

(JPS)

(JPS)

JPS

(JPS)

(JPS)

JPS

JPS

(JPS)

(JPS)

JPS

(JPS)

(JPS)

(JPS)

“Prismenastiles” denticulatus (H.E.Ballard, Wetter & N.Zamora) H.E.Ballard & Paula-Souza ined.			HB
“Prismenastiles” guanacastensis (Standl.) H.E.Ballard & Paula-Souza ined.			
“Pustularia” “belizensis” Paula-Souza ined.			(JPS)
“Pustularia” galeottii (Turcz.) Paula-Souza ined.			(JPS)
“Pustularia” thiemei (Donn.Sm.) Paula-Souza ined.			(JPS)
<i>Rinorea amapensis</i> Hekking			X
<i>Rinorea andersonii</i> (Sandwith ex Hekking) Hoyos-Gómez ined. [confirm record]			X
<i>Rinorea bahiensis</i> (Morice) Kuntze			X
<i>Rinorea brachythrix</i> S. F. Blake			X
<i>Rinorea brevipes</i> (Benth.) S. F. Blake			X
<i>Rinorea callejasii</i> Hoyos-Gómez ined.			SHG
<i>Rinorea dasyadena</i> A. Robyns			X
<i>Rinorea deflexiflora</i> Bartlett			X
<i>Rinorea endotricha</i> Sandwith			X
<i>Rinorea falcata</i> (Mart. ex Eichler) Kuntze			X
<i>Rinorea flavescens</i> (Aubl.) Kuntze			X
<i>Rinorea guatemalensis</i> (S.Watson) Bartlett			X
<i>Rinorea guianensis</i> Aubl. [species complex]			X
<i>Rinorea hirsuta</i> Hekking			X
<i>Rinorea hummelii</i> Sprague			X
<i>Rinorea lindeniana</i> (Tul.) Kuntze var. <i>lindeniana</i>			X
<i>Rinorea lindeniana</i> (var. <i>fernandeziana</i>) Hekking [raise to species rank?]			X
<i>Rinorea macrocarpa</i> (Mart. ex Eichler) Kuntze			X
<i>Rinorea melanodonta</i> S.F.Blake			X
<i>Rinorea neglecta</i> Sandwith			X
<i>Rinorea paniculata</i> (Mart.) Kuntze			X
<i>Rinorea pectino-squamata</i> Hekking			X
<i>Rinorea pubiflora</i> (Benth.) Sprague & Sandwith			X
<i>Rinorea racemosa</i> (Mart.) Kuntze			X
<i>Rinorea riana</i> Kuntze			X
<i>Rinorea scandens</i> Ule			X
<i>Rinorea</i> sp nov. from Honduras (& Nicaragua?)			

Rinorea sprucei (Eichler) Kuntze [confirm record]			X
<i>Rinorea squamata</i> S. F. Blake			X
<i>Rinorea sylvatica</i> (Seem.) Kuntze			X
<i>Rinorea zygomorpha</i> H.E.Ballard & Wahlert			HB
<i>Rinoreocarpus ulei</i> (Melch.) Ducke			X
<i>Viola aurea</i> Kellogg subsp. <i>aurea</i>			
<i>Viola barroetana</i> Schaffn. ex Hemsl.			
<i>Viola beamanii</i> Calderón			HB
<i>Viola coahuilensis</i> H.E.Ballard ined.			(HB)
<i>Viola cochranii</i> H.E.Ballard			HB
<i>Viola cucullata</i> Aiton??			
<i>Viola flagelliformis</i> Hemsl.			
<i>Viola galeanaensis</i> M.S.Baker			
<i>Viola grahamii</i> Benth.			
<i>Viola guatemalensis</i> W.Becker			HB
<i>Viola hemsleyana</i> Calderón			HB
<i>Viola hookeriana</i> Kunth			
<i>Viola humilis</i> Kunth			
<i>Viola jalapaënsis</i> W.Becker			
<i>Viola minuscula</i> Greene			HB
<i>Viola nannei</i> Pol.			HB
<i>Viola nubicola</i> H.E.Ballard ined.			(HB)
<i>Viola nuevo-leonensis</i> W.Becker			HB
<i>Viola odorata</i> L.*			HB
<i>Viola oxyodontis</i> H.E.Ballard			HB
<i>Viola painteri</i> Rose & House			
<i>Viola patrinii</i> DC.*			HB
<i>Viola pedunculata</i> Torr. & A.Gray var. <i>pedunculata</i>			
<i>Viola percrenulata</i> H.E.Ballard ined.			(HB)
<i>Viola philippica</i> Cav.*			
<i>Viola purpurea</i> Kellogg subsp. <i>purpurea</i>			
<i>Viola rugulosa</i> Greene			HB
<i>Viola scandens</i> Willd. ex Humb. & Bonpl. var. <i>scandens</i>			HB
<i>Viola sororia</i> [Mexico variant] [probably a new species]			
<i>Viola stipularis</i> Sw.			HB
<i>Viola tricolor</i> L.*			
<i>Viola umbraticola</i> Kunth			
<i>Viola undulimbata</i> H.E.Ballard ined.			

[New genus] <i>hespericlivus</i> (H.E.Ballard, Wetter & N.Zamora) Paula-Souza & H.E.Ballard ined.				HB
[New genus] <i>jefensis</i> (Todzia) Paula-Souza & H.E.Ballard ined.				(JPS)
TOTAL PER REGION	37 spp.	63 spp.	39 spp.	

60 taxon descriptions complete and 15 partly done of 89 for FG & FM projects combined; 70 descriptions complete and 22 partly done of 126 for all three projects.

RE: Violaceae Flora Mesoamericana

You forwarded this message on Fri 10/22/2021 10:29 AM
 You forwarded this message on Fri 10/22/2021 10:29 AM
 Carmen Ulloa <carmen.ulloa@mobot.org>
 Ballard, Harvey
 Héctor Manuel Hernández Macías <hmhm@ib.unam.mx>

Thanks very much Harvey!

It will be great to have Juliana and Saúl on board. I remember Saúl very well when he was a grad student here! We have been in touch on/off.
 A few years ago Eduardo Tomaz was interested in a Gloeospermum? I do not know if he prepared a treatment? I do not have anything.
 In any case, I will leave you to coordinate participation of others. In preparing the treatment I will suggest you follow a recent treatment. I am attaching a sample. There are other published treatments on line as well.
 I am also attaching the guidelines, a little technical.
 As you progress, please let me know if there is anything I can help with.
 We are wrapping up the orchid volume, 2300 spp., and on to the next volume.

Saludos!
 Thanks,
 --Carmen

* * * * *

Carmen Ulloa Ulloa, Ph.D. | Curator, Science & Conservation | Missouri Botanical Garden

From: Ballard, Harvey [mailto:ballardh@ohio.edu]
Sent: Friday, October 22, 2021 6:33 AM
To: Carmen Ulloa <carmen.ulloa@mobot.org>
Subject: Re: Violaceae Flora Mesoamericana

Greetings, Carmen!

I would absolutely want to contribute the Violaceae treatment, but not by myself. I have just emailed two other brilliant Violaceae experts and dear friends, Juliana Paula-Souza in Brazil (who works on hybanthoid and violoid violdets) and Saul Hoyos in Colombia (who works on rinoreoid violets) to ask if they would collaborate and coauthor with me on this treatment. It would be an ideal merger of our diverse expertise and would make the treatment production more efficient.

I expect to hear from them shortly. Could you tentatively put down the three of us? I would be happy to serve as the lead authors and coordinator.

Best,

Harvey

From: Carmen Ulloa <carmen.ulloa@mobot.org>

Sent: Monday, October 18, 2021 5:30 PM

To: Ballard, Harvey <ballardh@ohio.edu>

Subject: Violaceae Flora Mesoamericana

Dear Harvey,

Gerrit Davidse has retired and I am in charge of the Flora Mesoamericana project at MO, and Dr. Héctor Hernández is in MEXU. I am writing as we are planning contributions for volume 3(2) where the Violaceae will be included. We anticipate starting edition of this volume in 2023.

I would like to ask if it would possible to receive your contribution by mid-2023. It will be very nice to have you as an expert contributing this family.

Hope you all is well with you!

Best wishes,

--Carmen

* * * * *

Carmen Ulloa Ulloa, Ph.D. | Curator | Science & Conservation Division |Missouri Botanical Garden

From: Torke, Benjamin <btorke@nybg.org>

Sent: Thursday, September 16, 2021 7:50 AM

To: Ballard, Harvey <ballardh@ohio.edu>

Cc: Juliana Paula-Souza <jupsouza@gmail.com>; Saul Hoyos <saulhoyos@gmail.com>; rinorea@gmail.com <rinorea@gmail.com>

Subject: Re: treatment of Violaceae for Flora of the Guianas

Hi Harvey, Juliana, and Saul,

That's great news! This sounds like a great way to continue your collaborations, and the treatment would mark a significant advancement of the FoG. I am cc-ing Sylvia Mota de

Oliveria, who edits FoG from Naturalis. Sylvia keeps track of treatment commitments and can answer questions about manuscript preparation.

Sylvia, Harvey is recommitting to lead the treatment of Violaceae in partnership with Juliana and Saul, with a target date for completion of June 2023.

All the best,

Ben

From: Ballard, Harvey <ballardh@ohio.edu>
Sent: Thursday, September 16, 2021 7:19 AM
To: Torke, Benjamin <btorke@nybg.org>
Cc: Juliana Paula-Souza <jupsouza@gmail.com>; Saul Hoyos <saulhoyos@gmail.com>; Greg Wahlert <rinorea@gmail.com>
Subject: Re: treatment of Violaceae for Flora of the Guianas

Hi again, Ben,

Given enthusiastic responses from Juliana and Saul, and no mention of them anxious to take the lead on this, I propose that you put down myself, Juliana Paula-Souza and Saul Hoyos as authors/contributors of the Violaceae treatment for the "Flora of the Guianas" project. I will volunteer to take the lead on this, but we will all work together (of course) to complete the treatment.

I have full-time responsibilities through this year and deep into next year with other projects, so I would like to postpone submission of the treatment until late next year, possibly December 2022, or even June or December 2023. We should have ample time to examine some of the many collections available as part of the research. I should not speak for the others, as they may have the opportunity to finish their part earlier. If I see a window to complete my part earlier, I will take it.

Let me know what you think.

Best,
 Harvey

From: Torke, Benjamin <btorke@nybg.org>
Sent: Tuesday, September 14, 2021 9:47 AM
To: Ballard, Harvey <ballardh@ohio.edu>
Subject: treatment of Violaceae for Flora of the Guianas

Hi Harvey,

I hope you are well. How are things at OU? We are finally getting back to a degree of normalcy here at NYBG.

I wanted to ask you about your interest in the Flora of the Guianas. I serve as the NYBG representative on the board for the Flora of the Guianas (FoG) project, a multi-institutional consortium whose goal (as you probably know) is to provide taxonomic treatments for all plants occurring in the territories of French Guiana, Suriname, and Guyana. Until recently, volumes of FoG were published by Kew Publishing, but they ended their publishing commitment for FoG a couple of years ago, and since then we have been able to get volumes out through the Natural History Museum Paris and are currently exploring other possibilities.

We have a meeting of the FoG board later this week, and I am writing to ask whether or not you might have an interest at some point in doing the treatment of Violaceae for FoG. More information about the FoG project (including sample electronic versions of previous treatments and the instructions for authors) can be found at: <http://portal.cybertaxonomy.org/flora-guianas/node/7>

Sylvia Mota de Oliveira at Naturalis is the main editor (sylvia.motadeoliveira@naturalis.nl) and could answer other questions that you might have.

A commitment to do a treatment would put you on our list, set a tentative target date for completion of the treatment, and allow us to inform others who may express interest.

Thanks in advance for thinking about it and letting me know when you can.

All the best,

Ben
Benjamin M. Torke, Ph.D.
Associate Curator, Institute of Systematic Botany
Editor-in-Chief of Brittonia
New York Botanical Garden
2900 Southern Boulevard
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email for all other correspondence: btorke@nybg.org
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Re: 2023 Latin American violet treatments-planning & ideas
Juliana de Paula-Souza
Ballard, Harvey

Saul Hoyos <saulhoyos@gmail.com>

Use caution with links and attachments.

Dear Harvey and Saul,

I wish you a very happy and prosperous 2023 too!

I reaffirm my interest in our ever-productive collaboration with the Violaceae, and I'm fully committed with the next projects of Flora Mesoamericana and Flora of the Guianas.

We'll keep in touch,

With best regards,

Juliana

Re: 2023 Latin American violet treatments-planning & ideas

Saul Ernesto Hoyos Gomez

Ballard, Harvey

Juliana Paula-Souza <jupsouza@gmail.com>

Use caution with links and attachments.

Dear Juliana and Harvey,

Happy new year for you too.

Hope you guys a year full of goals and achievements.

As I mentioned before, I am very excited to continue working with you in the Violet world, so just let me know how to proceed and I will.

We could probably have a zoom meeting to organize details if you think so, just let me know the schedule.

Abrazos.

S.