

Biological Diversity of the Guiana Shield (BDG)
Research Activities and Investigations in 2013
(prepared: 25 February 2014)

1. **Research Activities & Investigations** in 2013

Provide a brief description in plain English (not to exceed 200 words) of the scientific research activities and investigations undertaken during Calendar Year 2013 including primary research questions. Add separately the country of field locations visited and research visits. If research related, include specific collection-based efforts.

A postdoctoral Fellow, Mauricio Diazgranados, was hired to analyze the BDG data, beginning with plants. It took 9 months before we had our first results (2 mo. to prepare the data, 4 mo. to upload it into EMu, and 3 mo. to analyze it). We plan on having the first paper submitted soon and several other papers will follow in FY2014-2015. One six-week plant collecting expedition was co-sponsored with the National Geographic Society to an unexplored tepui in Guyana resulting in ~1000 numbers, all with leaf material in silica gel. One entomology expedition went to Karanambu & Ceiba, Guyana to collect Odonates, Cockroaches and termites. Over 1500 cockroaches from several bush-islands in the savannah were collected; over 80% of the species are new to science. They also found remarkable *Syntermes* (termite) specimens. At least 16 (53 in the last 3 years) peer-reviewed publications related to the Shield were published. Notable are a monograph by Acevedo (2012) on the Sapindaceae, a series of papers on new Ectomycorrhizal fungi, and the long awaited book on *Amphibians and Reptiles of Guyana, South America* (Dec 2012).

Primary Research Questions Addressed:

The BDG Program continues to operate on a number of levels to increase our knowledge of biodiversity of the Guiana Shield area of South America such as gathering and studying organisms and publishing papers. Our work incorporates researchers from within SI as well as collaborators worldwide. The BDG program is in its last three years of operation and as we prepare to shut down we continue to assist those who continue to collect and document the species of this very rich and unique area, process the backlog of plant material at SI so that it can be incorporated into the US National Herbarium for visiting researchers to study and the continue publishing papers from the data gathered over the last 30 years. The primary research question has been to study the non-directional species variation in plant community structure among a set of sample units with habitats and ecological niches which will be presented in at least two papers in the coming year. We also examine rates of speciation, patterns of diversification, and historical connections with Africa.

Field locations Visited:

Countries: Guyana

Research Visits:

Countries: Paris, French Guiana, England, the Netherlands (herbarium visits).

Collections-based Efforts: Guyana, about 2000 collections in 2013.

Collections. >150,000 BDG records were successfully converted to NH's EMu database. Because these specimens were already identified, mounted, barcoded, and filed by BDG, the major task was converting the data from Access to Emu (contractor from IT). It took four months and created a substantial delay in our schedule. The specimens from the 2012 expedition have all been sent to colleagues for identification. In addition, the regular flow of specimens for identification and exchange was maintained.

The goal of the BDG Program is to have, by the end of FY2016, 95% of our collections processed, mounted, and filed into the US National Herbarium leaving only very problematic numbers and nothing in storage.

2. **Research Achievements & Discoveries** in 2013

Provide a brief description in plain English (not to exceed 200 words) of the research achievements and discoveries. This should be a description NOT a list of publications. There will be a more complete explanation of this next year.

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3. **Upcoming Research Activities & Investigations** for 2014

Provide a brief description in plain English (not to exceed 200 words) of the scientific research activities and investigations to be undertaken during the upcoming calendar year including primary research questions, field locations, research visits, and collection-based efforts.

The Future. Our efforts in the next 2.5 years will take several paths: publishing synthesis papers, cleaning up the backlog, making the data available on line, and creating a phased shut down of BDG. But, first we want to synthesize the data that we have collected over the last 30 years.

FY2014 Goals

1. to use BDG plant data to study the non-directional species variation in community structure among a set of sample units within habitats and ecological niches, publish one paper and submit 1-3 others;
2. to publish two volumes of the BDG collector series;
3. to finish 33% of the plant backlog; and
4. to produce a proposal for 2 years of funding to complete research and implement a phased shut down.
5. To provide logistical (and financial) support to the joint plant-bird expeditions to Mt. Ayanganna, Guyana in March 2014.

Publication in Preparation:

Diazgranados, M. & V. Funk. Patterns of plant species richness and turnover in the Guiana Shield. To be submitted to *Journal of Biogeography*.

Diazgranados, M., V. Funk & C. L. Kelloff. 2013. Spatial patterns of biota in the Guiana Shield. *Smithsonian Contributions*. [Focused on presenting distribution maps per taxa]

Diazgranados, M. & V. Funk. 2013. Understanding the plant distributions in the Guiana Shield. *Frontiers of Biogeography*. [Focused on explaining patterns of distribution per family in relationship with environmental factors]

Diazgranados, M. & V. Funk. Origin and biogeography of the flora of the Guiana Shield. *Journal of Biogeography*. [Focused on comparing the flora of the Guiana Shield with all the floras worldwide]

Primary Research Questions to be Addressed:

See above

Anticipated Field location Visits:

Countries: the Guiana Shield

Upcoming Research Visits:

Countries: A few herbaria in Europe and South America.

Collections-based Goals:

Continue processing the backlog of plant specimens stored at MSC. Convert and/or enter all US National Herbarium specimens into EMu.

4. **Taxonomic Contributions** in 2013

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Provide a list of all new species described/published in calendar year 2013 through your Program/Initiative, including the complete publication citation.

New Species Described (representative list)

- *Sobralia pakaraimense* (Orchidaceae)
- *Meredithblackwellia eburnean* (Kriegeriaceae) – new fungal genus and family
- *Xerocomus cyaneibrunnescens* (Boletales, Basidiomycota)
- *Xerocomus potaroensis* (Boletales, Basidiomycota)
- *Xerocomus parvogracilis* (Boletales, Basidiomycota)
- *Clavulina guyanensis* (Clavulinaceae, Cantharellales, Basidiomycota)
- *Clavulina pakaraimensis* (Clavulinaceae, Cantharellales, Basidiomycota)
- *Clavulina rosiramea* (Clavulinaceae, Cantharellales, Basidiomycota)
- *Lactifluus subiculatus* (Russulaceae, Basidiomycota)
- *Russula myrmecobroma* (Russulaceae, Basidiomycota)
- *Russula paxilliformis* (Russulaceae, Basidiomycota)
- *Russula gelatinivelata* (Russulaceae, Basidiomycota)
- *Planinasus aenigmaticus* (Diptera, Periscolididae)
- *Planinasus neotropicus* (Diptera, Periscolididae)
- *Planinasus kotrbae* (Diptera, Periscolididae)
- *Planinasus miradorus* (Diptera, Periscolididae)
- *Planinasus tobagoensis* (Diptera, Periscolididae)
- *Planinasus xanthops* (Diptera, Periscolididae)
- *Planinasus argentifacies* (Diptera, Periscolididae)
- *Planinasus insulanus* (Diptera, Periscolididae)
- *Planinasus nigratarsus* (Diptera, Periscolididae)
- *Planinasus obscuripennis* (Diptera, Periscolididae)
- *Tatia carolae* (Siluriformes: Auchenipteridae)
- *Tatia marthae* (Siluriformes: Auchenipteridae)

New Genera:

- *Christopheria* J. F. Smith & J. L. Clark (Gesneriaceae)
- *Lesia* J. L. Clark & J. F. Smith (Gesneriaceae)
- *Pachycaulos* J. L. Clark & J. F. Smith (Gesneriaceae)

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Complete publication citation.

- Baranow, P. & D.L. Szlachetko (2013). *Sobralia pakaraimense* (Orchidaceae), a new species from Guyana. *Ann. Bot. Fennici* 50: 347-350.
- Cole, C.J., Carol R. Townsend, Robert P. Reynolds, Ross D. MacCulloch, and Amy Lathrop. (2012). Amphibians and Reptiles of Guyana, South America: An Annotated and Illustrated Checklist with Keys. *The Bulletin of the American Museum of Natural History* 125 (4).
- Henkel, T.W., M.C. Aime, M. Chin, S.L. Miller, R. Vilgalys, M.E. Smith. (2012). Ectomycorrhizal fungal sporocarp diversity and discovery of new taxa in *Dicymbe* monodominant forests of the Guiana Shield. *Biodiversity and Conservation* 21: 2195-2220. doi: 10.1007/s10531-011-0166-1
- Husbands, D.R., T.W. Henkel, G. Bonito, R. Vilgalys, M.E. Smith. 2012. New species of *Xerocomus* (Boletales) from the Guiana Shield, with notes on their mycorrhizal status and fruiting occurrence. *Mycological Progress* doi: 10.3852/12-146.
- Mathis, Wayne N., Alessandra Rung, Marion Kotrba. 2012. A Revision of the Genus *Planinasus* Cresson (Diptera: Perisclididae). *Zookeys*. 225: 1–83. doi: 10.3897/zookeys.225.3721
- Miller, Steven L., M.C. Aime, and T.W. Henkel. 2012. Russulaceae of the Pakaraima Mountains of Guyana II. New species of *Russula* and *Lactarius*. *Mycotaxon* 121: 233-253.
- Smith, J.F., and J.L. Clark. (2013). Review. Molecular Phylogenetic Analyses Reveal Undiscovered Monospecific Genera in Episcieae (Gesneriaceae). *Systematic Botany* 38(2):451-463. doi: <http://dx.doi.org/10.1600/036364413X666723>
- Toome, M., R.W. Robertson, & C. A. Aimes. (2013). *Meredithblackwellia eburnea* gen. et sp. nov., Kriegeriaceae fam. nov. and Kriegeriales ord. nov. Toward resolving higher level classification in Microbotryomycetes. *Mycologia* 105(2): 486-495.
- Uehling, J.K. T.W. Henkel, M.C. Aime, R. Vilgalys, M.E. Smith ME. 2012. New species and distribution records for *Clavulina* (Cantharellales, Basidiomycota) from the Guiana Shield, with a key to the lowland Neotropical taxa. *Fungal Biology* doi: 10.1016/j.funbio.2012.09.004
- Vari, R.P. & Ferraris, C.J. Jr. 2013. Two New Species of the Catfish Genus *Tatia* (Siluriformes: Auchenipteridae) from the Guiana Shield and a Reevaluation of the Limits of the Genus. *Copeia* 3: 396-402.

Publications

- *Include only those outside the SI system, and therefore not entered in the SI Library database.*
- Acevedo-Rodríguez, P. (2012) Sapindaceae. In: S. Mota de Oliveira (ed.), *Flora of the Guianas*. Fasc. 29. Richmond, Surrey, Royal Botanic Gardens, Kew.
- Barneby, R. C., J. W. Grimes and O. Poncy (2011). Leguminosae subfamily Mimosoideae (taxonomic update by G. P. Lewis). In: M. J. Jansen-Jacobs, *Flora of the Guianas, series A: Phanerogams* Fasc. 28: 1-384.
- Baranow, P. & D.L. Szlachetko (2013). *Sobralia pakaraimense* (Orchidaceae), a new species from Guyana. *Ann. Bot. Fennici* 50: 347-350.
- Clark, J. L., M.M. Funke, A.M. Duffy, J.F. Smith. (2012). Phylogeny of a Neotropical Clade in the Gesneriaceae: More Tales of Convergent Evolution. *International Journal of Plant Sciences*, 173(8), 894-916. <http://dx.doi.org/10.1086/667229>

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- Cole, C.J., Carol R. Townsend, Robert P. Reynolds, Ross D. MacCulloch, and Amy Lathrop. (2012). Amphibians and Reptiles of Guyana, South America: An Annotated and Illustrated Checklist with Keys. *The Bulletin of the American Museum of Natural History* 125 (4).
- Gotzek, D., Brady, S.G., Kallal, R.J., and LaPolla, J.S. (2012). The Importance of Using Multiple Approaches for Identifying Emerging Invasive Species: The Case of the Raspberry Crazy Ant in the United States. *PLoS ONE* doi: 10.1371/journal.pone.0045314
- Henkel, T.W., M.C. Aime, M. Chin, S.L. Miller, R. Vilgalys, M.E. Smith. (2012). Ectomycorrhizal fungal sporocarp diversity and discovery of new taxa in *Dicymbe* monodominant forests of the Guiana Shield. *Biodiversity and Conservation* 21: 2195-2220. doi: 10.1007/s10531-011-0166-1
- Husbands, D.R., T.W. Henkel, G. Bonito, R. Vilgalys, M.E. Smith. 2012. New species of *Xerocomus* (Boletales) from the Guiana Shield, with notes on their mycorrhizal status and fruiting occurrence. *Mycological Progress* doi: 10.3852/12-146.
- LaPolla, J.S., Brady, S.G., Shattuck, S.O. (accepted) Monograph of *Nylanderia* (Hymenoptera: Formicidae) of the world: An introduction to the systematics and biology of the genus. *Zootaxa*
- Mathis, Wayne N., Alessandra Rung, Marion Kotrba. 2012. A Revision of the Genus *Planinasus* Cresson (Diptera: Periscolididae). *Zookeys*. 225: 1–83. doi: 10.3897/zookeys.225.3721
- Miller, Steven L., M.C. Aime, and T.W. Henkel. 2012. Russulaceae of the Pakaraima Mountains of Guyana II. New species of *Russula* and *Lactarius*. *Mycotaxon* 121: 233-253.
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- Smith, M.E., T.W. Henkel, J.K. Uehling, A.K. Fremier, H.D. Clarke, R. Vilgalys. (2013). The Ectomycorrhizal Fungal Community in a Neotropical Forest Dominated by the Endemic Dipterocarp Pakaraimaea dipterocarpacea *PLoS* 8(1): e55160. doi: 10.1371/journal.pone.0055160.
- Toome, M., R.W. Robertson, & C. A. Aimes. (2013). *Meredithblackwellia eburnea* gen. et sp. nov., Kriegeriaceae fam. nov. and Kriegeriales ord. nov. Toward resolving higher level classification in Microbotryomycetes. *Mycologia* 105(2): 486-495.
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Grants & Awards

- *Include only those NOT administered through the Smithsonian.*
National Geographic Grant - \$16,000
Private Grant (through the Bird Division, Mt. Ayanganna Expedition)

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Academics & Students

- *Include only those NOT officially registered through the Smithsonian.*

Outreach. One Guyanese collaborator was brought to the Smithsonian. Talks were presented and interns were hosted including one from UDC (Historically Black Public University). Quite a few tours of the BDG operation at MSC and NH-Botany were given at the request of the Directors Office and Smithsonian Associates. One PhD student graduated and one postdoctoral Fellow was mentored. A plan for the next three years has been agreed upon and the first steps have been initiated. The BDG sponsored a visit to NH by Raquel Thomas-Caesar, Director, Resource Management and Training, Iwokrama Reserve, Guyana . Christian Feuillet (SI-Research Associate) as acting SI Representative and Philip DaSilva (Guyanese Representative) were sponsored by BDG to attend the Flora of the Guianas Advisory Board meeting, 22-23 October 2012 in Leiden, Netherlands. Most importantly, we want to insure that all our work and the work of our colleagues is left in excellent condition and is freely available on the web. This includes images and specimens records. Our specimen data are now in EMu and we will work on uploading our other information as time and money permit.