

## BIOLOGICAL DIVERSITY OF THE GUIANA SHIELD PROGRAM (BDG) - FY 2011 SUMMARY REPORT

**The goals for BDG during FY 2011** included determining methods for analyzing 25 years worth of data from across the Guiana Shield, conducting expeditions in the Shield area focusing on poorly studied areas and organisms, training US and Guyanese students, and increasing our public outreach and data availability.

**Overall Narrative Summary for 2011** - The main goal of the Biological Diversity of the Guiana Shield Program (BDG) is to document, understand, and conserve the biological diversity of the Guiana Shield area (the Shield). In line with that goal BDG hosted a workshop for 25 scientists from the USA and the Shield area to examine research potential across the Shield. In Guyana, three Entomological expeditions were funded, the library at the Center was moved, and two of our collaborators were brought to the US for meetings. We also presented talks, trained several interns from UDC (Historic Black College), worked with NH Exhibits, and used Facebook to crowd source fish identifications. During FY2011 BDG along with its NH collaborators published 17 papers related to the Shield. Our full report (Jan 2012) will include the many papers from our collaborators outside of NH as well as other information.

**Research and Collections:** An Ecological Niche Modeling (ENM) workshop sponsored by BDG focused on the Shield area (NMNH, 1-3 Oct 2010). The workshop brought together 25 scientists from Royal Ontario Museum, University of Guyana, Rutgers University, City College-New York, Auburn University, University of Mississippi, USDA and staff from NMNH (Entomology, VZ, and Botany) to evaluate the level of knowledge of the biodiversity of the Guiana Shield and to use our data to address question such as What are the best methods to use for ENM using BDG data? Can the distributions of species be accurately estimated with the data we have at hand? Can bird and mammal data that we have access to be used for niche modeling? Would a reasonable level of collecting or databasing of specimens bring together enough data to include fish, reptiles and amphibians? What can reasonably be expected from entomological data?, and How can we interface with the Global Genome project?. Most of the participants were interested in combining ENM and phylogenies to better understand the origin and distribution of clades or to study gene flow among populations in the mountains of the Shield.

The ENM for the plant data (most complete) is focused on a pilot program involving two clades, one of Compositae and the other of Leguminosae. Currently we have final models for four Compositae species from a genus from the tepuis and eleven legume species from lower elevation areas. We are analyzing these to determine the next step and how to present the results as well as how to utilize them to guide field work. We are experiencing some problems with the scale of the environmental data and we are investigating other options. We expect to have one paper finished in the next few months.

An expedition to the Cuyuni River to collect fish was organized by Dr. Rich Vari (VZ) and led by his colleague Dr. Biran Sidlauskas (Oregon State Univ) and his students as well as staff from the Royal Ontario Museum, and Guyanese counterparts. The expedition resulted in 5,213 individual fishes in ca. 176 species. The collection was dominated by Siluriformes (catfish) and Characidae (tetras) and indicated that the sediment load in the river, a result of dredge mining for gold, has resulted in the loss of large groups of fishes depended upon the presence of aquatic vegetation. The team also did a report on water quality that was used by Conservation International and caused quite a stir in Guyana. The team gave talks at the University of Guyana and at Amerindian Villages along the Cuyuni River. Unique to this expedition, however, was the method upon which they acquired identifications for the export permit. Turning to the social

network and colleagues worldwide images of fish were posted to Facebook and within 24 hours 90% of the fish had a preliminary identification (see BDG website for link). This story made the Facebook blog and generated 11,000 hits on the Smithsonian Science site overnight.

Dr. Wayne Mathis, Entomology, concluded fieldwork in Guyana with an expedition to the Rupununi savanna area to collect shore flies (Diptera: Ephydriidae) in the genus *Typopsilopa*. This expedition was instrumental in the completion of his monograph of this group.

Dr. Jessica Ware and several of her students (Rutgers University), conducted field work in Guyana in July-August. Dr. Ware studies the evolution of behavioral and physiological adaptations that occur in dragonflies and Dictyoptera, particularly termites. Dr. Ware returned at the end of August and initial reports are good. Details of her trip are not yet available but will be included in our January report. Dr. Ware plans to return to Guyana in January 2012.

Smithsonian's Department of Entomology along with their colleagues in USDA are planning a Hymenoptera expedition to Guyana. The trip includes staff from NMNH, USDA and faculty and students from Towson University and the University of Maryland. The purpose of this project is to collect hymenopterans (ants, bees, and wasps) in the pristine rainforest of the Conservation International (CI) Concession in southern Guyana, perhaps one of the most under sampled areas of Guyana. General insect collections from this remote area will greatly increase our knowledge of the insect fauna of Guyana and the biodiversity of the region. It was scheduled for May but was postponed until Nov.

The NGS grant obtained in 2011 will fund a plant expedition in 2012 to an unnamed tepui, one of the last unvisited (by collectors) tepuis in Guyana. In the planning stage are additional work by Dr. Ware and the Hymenoptera group.

**Specimen Handling:** This year BDG processed and shipped over 2970 plant specimens that included Hoffman's collection from Suriname and the Redden/Wurdack Guyana expedition and specimens sent out on exchanged. The University of Guyana has a backlog of specimens and has requested that BDG hold shipment until they are ready. We have ca. 2500 plant specimens ready to be shipped to Guyana.

**Broader Impacts:** The use of Facebook to tap into the world's collective knowledge has expanded what fieldwork can do. The reports on the water quality have attracted interest from Conservation International – Guyana showing how fieldwork can interface with other organizations.

In July 2011 Exhibits launched "More than Meets the Eye", that can be found in the First Floor, Special Exhibits Gallery. This exhibit explores the world beyond what visitors see. A video entitled "Knowing where to look: finding new species in the digital age" highlights the BDG program. A copy of this video is available on the BDG website. Other recent outreach efforts available on our website include the development in 2010 of a method using Google Earth to display information from expeditions into unknown areas including collection locality and images from the field.

In 2010 BDG purchased shelving for the CSBD at UG. During 2011 Kelloff traveled to Guyana, designed the layout in the new library space, set up the shelves, organized the books and journals and fumigated them, and met with UG's Head Librarian and her staff to begin the process of cataloging and shelving the literature.

Funk and Kelloff continue to assist CSBD to define and achieve its goals. Earlier this summer a conference call with staff from UG, CSBD, Guyana EPA, and BDG staff discussed the role of CSBD in housing data, specimens and literature on biodiversity, the regional extent of the Guiana Shield, and how the Government could interact with CSBD to fulfill its mandates.

List of publications by NH staff and Research Associates for FY2011

- Aime, A.C., Largent, D.L., Henkel, T.W., Baroni, T.J. 2010 The Entomataceae of the Pakaraima Mountains of Guyana IV: New species of *Calliderma*, *Paraeccilia* and *Trichopilus*. *Mycologia* 102 (3): 633-649.
- Barrio-Amorós, C.L., J.C. Señaris, R. D. MacCulloch, A. Lathrop, J.M. Guayasamin and W.E. Duellman. 2011. Distribution, vocalization and taxonomic status of *Hypsiboas roraima* and *H. angelicus* (Amphibia: Anura: Hylidae). *Papéis Avulsos de Zoologia* 51: 21–28.
- Feuillet C. 2010. Folia taxonomica 18. *Passiflora jussieui*, a new species in *Passiflora* subgenus *Astrophea* (Passifloraceae). *J. Bot. Res. Inst. Texas* 4(2): 609-614.
- Feuillet C. 2010. Folia taxonomica 19. Typifications in *Dilkea* (Passifloraceae). *J. Bot. Res. Inst. Texas* 4(2): 615-617.
- Fulgenzi, T.D., R.E. Halling, T.W. Henkel. 2010. *Fistulinella cinereoalba* sp. nov. and new distribution records for *Austroboletus* from Guyana. *Mycologia* 102(1): 224-232.
- Gotzek, D., Brady, S.G., Kallal, R.J., and LaPolla, J.S. (Accepted) Identification of the invasive Raspberry Crazy Ant as *Nylanderia pubens* using molecular and morphometric data. PLoS ONE
- Henkel, T.W. M.C Aime, J.K. Uehling, and M.E. Smith. 2011. New species and distribution records for *Clavulina* (Cantharellales, Basidiomycota) from the Guiana Shield. *Mycologia* 103: 883-894.
- Henkel, T.W., M.E. Smith, M.C. Aime. 2010. *Guyanagaster*, a new wood-decaying sequestrate fungal related to *Armillaria* (Physalacriaceae, Agaricales, Basidiomycota). *American Journal of Botany* 97(9): 1474-1484.
- Hinchliff, C.E., S. Peterson, and E.H. Roalson 2010. *Eleocharis endounifascis*: A new species of *Eleocharis* subgenus *Limnochloa* (Cyperaceae) from northern South America. *Phytotaxa* 7: 19-24.
- Kelloff, C.L., S.N. Alexander, H.D. Clarke, & V.A. Funk. 2011. Smithsonian Plant Collections, Guyana: 1995-2004, H. David Clarke. *Smithsonian Contribution to Botany* 97: viii-307.
- LaPolla, J.S., Brady, S.G., Shattuck, S.O. 2011. Monograph of *Nylanderia* (Hymenoptera: Formicidae) of the world: An introduction to the systematics and biology of the genus. *Zootaxa* 3110: 1-9.
- LaPolla, J.S., Kallal, Brady, S.G. 2012..A new ant genus from the Greater Antilles and Central America, *Zatania* (Hymenoptera: Formicidae), exemplifies the utility of male and molecular character systems. *Systematic Entomology* 37(1): 200-214.
- Redden, K.M. (Submitted). A Monograph of *Elizabetha*, *Paloue*, and *Heterostemon* (Leguminosae). *Smithsonian Contribution to Botany*

- Redden, K.M., P.S. Herendeen, K.J. Wurdack, A. Bruneau. 2010. Phylogenetic relationships of the Northeastern South American *Brownea* Clade of Tribe Detarieae (Leguminosae: Caesalpinioideae) based on morphology and molecular data. *Systematic Botany* 35(3): 524-533.
- Rung, A. & W. N. Mathis. 2011. A revision of the genus *Aulacigaster* Macquart (diptera: Aulacigastridae). *Smithsonian Contributions to Zoology* 633: 1-132
- Sosa-Calvo, J., T.R. Schultz, and J.S. LaPolla 2010. A review of the dacetine ants of Guyana (Hymenoptera: Formicidae). *Journal of Hymenoptera Research* 19: 12-43.