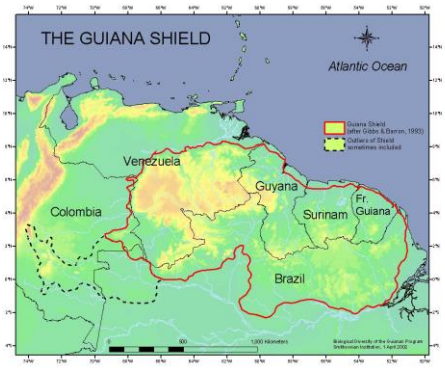
BIOLOGICAL DIVERSITY OF THE GUIANA SHIELD (BDG)

www.mnh.si.edu/biodiversity/bdg

An Overview

The goals of the Biological Diversity of the Guiana Shield (BDG) program are:
to document, study, and preserve the biodiversity of the Guiana Shield,
to provide the opportunity for excellent scientific research, and,
to make information generated by these studies useful for conservation and education.

WHY THE GUIANA SHIELD? The Guiana Shield is a distinct geological unit that underlies the northeastern corner of South America and includes much of the area east and south of the Orinoco River and east and north of the Rio Negro and Rio Amazonas. The area includes Bolívar, Amazonas, and Delta Amacuro states in Venezuela; most of Guyana, Surinam, and French Guiana; parts of northern Brazil; and parts of southeastern Colombia. The area has many unusual ecosystems including the famous tepuis of Sir Arthur Conan Doyle's "The Lost World" and the unique "Greenheart" forests of Guyana, both of which are known to have high diversity; for many groups of organisms the Shield serves as a center of species diversity.



The Shield's igneous-metamorphic basement was laid down in several events from 3.6 to 0.8 billion years ago (Mendoza 1977; Schubert and Huber 1990). This granitic basement is easily observed in the many black "hills" of granite that dot the landscape across the Guiana Shield and is also exposed on some of the mountains and massifs. Between 1.6 and 1 billion years ago, sedimentary covers of sand were successively laid down and cemented during thermal events (Huber 1995). The resulting quartzite and sandstone rocks are known today as the Roraima formation. Some recent work has suggested that the eastern rocks are the oldest (Huber 1995); this would make the Pakaraima Mountains of Guyana and the eastern parts of Venezuela older than the remainder of the Roraima formation. Over the last 200 to 600 million years, intrusions of diabases and granite have penetrated both the granitic basement and sedimentary layers.

The most distinctive features of the Guiana Shield are the *tepui*s, the steep-walled table mountains prominently featured in photos and films. For many groups of organisms the tepuis support a unique flora and fauna. Tepui elements begin to appear in the biota at around 300-1000 meters in elevation, but predominate above 1500-1800 meters. The easternmost peaks reach heights around 2000 meters and include Mt. Ayanganna and Mt. Wokomung in Guyana. The highest tepui, Sierra de la Neblina, exceeds 3000 meters and is located in the western part of the Shield on the border of Venezuela and Brazil. Many other tepuis have summits between 2000 and 2400 meters. A large, mid-elevation, sandy plateau between 400 and 1500 meters, the Gran Sabana, occupies southeastern Venezuela and adjacent parts of Guyana (where it is named the Rupununi Savana) and Brazil. There are also variously-sized areas of lowland white-sand savanna scattered throughout the Guiana Shield (e.g., Berbice Savannas of Guyana).

Only a few parts of the Guiana Shield have well known floras, such as Mount Roraima (Venezuela), the Iwokrama-Mabura Hill area and Kaieteur (Guyana), Tafelberg (Surinam), and

Saül (central French Guiana). Most areas, such as the lowland forests and tepui slopes, are very poorly known. Hollowell et al. (2001) recently published a checklist for about half of the flowering plants of the Guiana Shield (families from A to L). Using this publication and subsequent online updates (up through Plumbaginaceae; www.mnh.si.edu/biodiversity/bdg) as a guide, there are approximately 12,500 species of flowering plants currently known for the Guiana Shield (excluding Brazil and Colombia). In addition, the Venezuelan Guayana includes 682 species of ferns and fern allies (Berry et al. 1995), while there are 629 species in the three Guianas. The estimated overlap of these two areas is 73%, so that the total number of ferns is predicted to be close to 900 species (not including the Brazilian and Colombian parts of the Shield). Thus, a conservative estimate of the total number of vascular plant species (ferns + flowering plants) from the Guiana Shield is 13,500-14,500 species. Berry et al. (1995) calculated that 40% of the plant species found in the Guiana Shield do not occur outside of the area. A close analysis of the flora of Kaieteur Falls, Guyana (Kelloff & Funk, 2004), showed that 43% of the plant species found there are endemic to the Guiana Shield. Consequently, we can estimate that about 6,000 species of vascular plants may be restricted to the Guiana Shield. Considering just the plants of the **Pantepui area** (over 1,500 m elevation), Berry et al. (1995) found that the percentage of endemics increases to 65%. This level of endemism must be one of the highest for non-insular floras and documents the existence of a "Guiana Shield flora" that is separate from other floras such as the Andean, Amazonian, and Brazilian Shield floras.

Tamandua tetradactyla
(Linnaeus, 1758)

The "**Checklist of the Terrestrial Vertebrates** of the Guiana Shield" (Hollowell & Reynolds, eds.) is in final edit; when it is finished similar statistics can be calculated for the terrestrial vertebrates. A draft checklist of the fishes of Guyana exists, and we hope to correct and expand it to include the whole Sheild this coming summer.

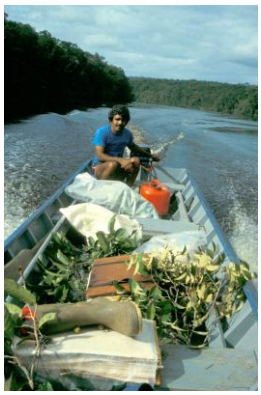
With a few exceptions, such as cities along the Río Orinoco, the Rupununi savanna (Guyana), and the coastal areas of the Guianas, the Guiana Shield has benefited from its isolation and low population density, and much of the vegetation is still relatively undisturbed by human activities. This has lead to its designation as a "tropical wilderness" (Mittermeier et al. 1998). Unfortunately, the pace of disturbance has recently accelerated because of logging by Asian and local companies, **gold and diamond mining**, oil drilling, bauxite mining, dams for hydroelectric power, wildlife trade, burning, grazing, and agriculture. If these trends continue, the Guiana Shield will lose its place as part of one of the three remaining "tropical wilderness" areas in the world.

Efforts to conserve this interesting and unique region vary according to country. Since 1962 Venezuela has set up seven national parks, 29 natural monuments, and two biosphere reserves covering 142,280 km² which comprises almost 31% of the Shield that lies in Venezuela and about 15% of the country. In Guyana the totals are much lower, with only one major national park, the expanded Kaieteur National Park (627 km² or about 3% of the country). Surinam has 12 conservation areas encompassing 20,000 km² (www.stinasu.com); 12% of the country. French Guiana has no designated protected areas but

there are 18 proposed sites that total 6,710 km² and make up 7.5% (Lindeman and Mori 1989). However, an indication on the map of a park or reserve does not mean that the area will actually be protected. As with many countries in the tropics, areas in the Guiana Shield that are designated as parks are often only "paper" parks, and lack the infrastructure and financial backing necessary for effective protection. As a result, parks often host gold mining, hunting, wildlife trade, and other disruptive activities. Currently, Venezuela and Guyana have the most pressure on the diversity of their respective biotas, while French Guiana's environment is probably the least threatened.

Each of the five countries of the Guiana Shield has a different administrative structure and official language(s), and there are a number of border disputes. The borders are generally porous to drug, gold, and wildlife trafficking, and there are serious political and environmental issues in regards to the native peoples of the region. All of these problems will have to be dealt with in order to design and maintain a viable reserve system for the Guiana Shield. The efforts of the BDG program are important as a major part of the process of gaining an understanding of the flora and fauna so that informed decisions can be made on critical areas with a high priority for conservation, and so data can be collected from areas that may ultimately be degraded. Also, because this region was long neglected by biologists, it is often an area of "missing information" for many biological analyses. The BDG program is designed to provide specimens and data to address biodiversity questions across many groups. The assembled information is being used to produce checklists, vegetation maps, floristic and faunistic studies as well as to address the more theoretical aspects of spatial biodiversity models.

ABOUT THE PROGRAM. The "Biological Diversity of the Guiana Shield" (BDG) is a field-oriented program of the National Museum of Natural History that has been operating since 1983 (federally funded since 1987). The goal of the BDG is to "study, document and preserve the biological diversity of the Guiana Shield." Originally confined to botany and Guyana, the least well-known, most biologically diverse of the three Guianas, the program has since been expanded to include faunal studies and field work in the other parts of the Shield (see Appendix A for a full list of collaborators). In Guyana, the BDG operates under the auspices of the University of Guyana (UG). There is a signed *Memorandum of Understanding* with the University of Guyana and with the Guyana EPA. These memoranda stipulate that a set of all collections be deposited in the "Centre for the Study of Biological Diversity" in Guyana and the second set in the NMNH; additional exchange material is sent around the world.



From 1986-1998 the BDG maintained full-time plant collectors in Guyana. These individuals organized **collecting expeditions** (see pictures of an expedition by Richard Spruce – 1849-1863 – on the left and a recent BDG expedition on the right) and assisted with the field work of visiting scientists. Each year approximately six major expeditions were organized, and other expeditions, involving a total of 20-30 visiting scientists, were assisted. The budget cuts of the 1990's made it impossible to continue the practice of full-time field work, and we currently send resident collectors to Guyana for 4-6 months each year or we have a series of targeted expeditions. In recent years we have had

resident collectors for butterflies & moths, ants, birds, and plants. Modern day field work is easier on both ends of the trip (e.g., airplanes) and we collect new types of data (e.g., DNA samples, GPS coordinates) but the major part of field work is essentially the same as it was during the time of Spruce. The scientists and their assistants haul supplies by dugout canoe and by foot, sleep in hammocks or tents, cook over open fires, and live for four to six weeks with frequent rains and constant insect infestations.

From the start of the BDG, all collections made were data based and geo-referenced. This decision, made in the early 1980's, has been central to our operation and the types of data collected expanded over the years. The result is a great legacy of data. In addition, beginning in the early1990's, the BDG began to database specimens held by the US National Herbarium. Two recent grants (Department of Systematic Biology and ADRC) allowed the acceleration of this work, which is now complete for the Guianas (except for a single family where specimens are unavailable). Over 60,000 of our specimens from the three Guianas have been databased and we are well along on our quest to database those from the Venezuelan portion of the Guiana Shield.

In addition to collecting and research, the BDG Program has helped build the infrastructure necessary for housing Guyana's own natural history collections via the construction and enlargement of the "Centre for the Study of Biological Diversity" located on the campus of the University of Guyana; funded by the Royal Bank of Canada and USAID. We also help in the training of students and scientists both in the US and Guyana, assisting them in their research, and establishing or maintaining collections for them to use. We have organized training classes for Amerindian guides, provided lectures to the public, taught short intense taxonomy classes on various groups, and helped organize the first international scientific meeting held in Guyana in recent memory (October 2001).

The BDG program fulfills the goals of the Smithsonian Institution by gathering new information and distributing it to those who use it to produce checklists, floras and faunas of a relatively unknown area, by supplying data for the identification and preservation of biologically diverse areas for conservation activities, by providing specimens that are used in systematic studies both within the institution and throughout the world, by building infrastructure in the host countries, and by providing training for university students and Amerindians.

<u>BDG staff (Washington, D.C.)</u>

V. A. **Funk** is a Curator of Compositae at the US National Herbarium, Senior Research Scientist in the Department of Botany, and Director of BDG. She is responsible for the oversight and direction of the Program and the generation of new research projects. She deals with the few problems that cannot be handled by the Assistant Director and offers advice (sometimes when it is not needed). As director she is responsible for most interactions with other scientists, agencies, and organizations. She spends about ¼-½ time on the program.

C. **Kelloff** is the Assistant Director of BDG. She is in charge of the day to day administration of the Program and the budget. Carol is the first point of contact for all activities, personnel and problems. She has a PhD and conducts research related to BDG issues; she is the expert on the

flora of Kaieteur National Park. She is critical to the management and implementation of the Program and acts as Director when Funk is out of town. She is Funk's full-time assistant but spends 95% of her time with BDG.

T. **Hollowell** (Term appointment) is the Data Manager and Web Master for BDG. He maintains the data bases, coordinates all information flow to and from collectors and collaborators, supervises data-entry contractors, interns, and volunteers, coordinates the checklist projects, is responsible for all efforts involving graphics and GIS technology, and frequently improves the website. He is just about to finish his PhD and he conducts research related to BDG issues; he is an expert on the mangrove ecosystems of Shell Beach, which is proposed as a national park. His efforts are crucial for the reliability of the data bases and to our efforts to make information available to scientists and the public. He acts as Assistant Director when Kelloff is out of town.

Dodge, J., **Brandan,** D., and M. **Sewell** (p/t contractors) – data basing and specimen processing
Hansel, M. (p/t contractor) – data basing, specimen filing and label typing
Skinner, M. (p/t contractor) – off site plant mounting for US

<u>Field biologists associated with BDG</u>

Redden, K. - Karen is a graduate student in systematics at George Washington University. She organizes expeditions into remote areas and trains staff & students. In 2004 she collected ca. 1,860 numbers in three expeditions. In 2005 Redden will collect in Venezuela in collaboration with Venezuelan botanists and Guyanese field assistants. BDG processes and databases her specimens and keeps track of the identifications. In exchange, we get a set for US and all of the duplicate material for exchange. Redden's salary and most of the expenses for her field work are paid by George Washington University and NSF. [Karen is shown with two of our long-time field assistants, Romeo Williams and Claudis Perry (Patamona)].

Clarke, H. David was the last full time collector in Guyana, 1995-1997. He spent 1997-2000 as an SI Postdoctoral fellow and susequently has been an Assistant Professor at University of North Carolina, Asheville. David usually goes on one 6 week field trip to the Guiana Shield each year (with 2-4 undergraduates and many Amerindians). He travels into difficult areas that are unknown to science and specializes in climbing the tepuis of Guyana. He is an expert in the Bean family (Leguminoseae). This past year David collected 1403 numbers in Surinam and Guyana. David's salary is paid by UNCA, and his field expenses are covered by grants and funds raised by students. [David (right) is famous for his difficult field work; here he is with Mark Robbins (birds, Univ. Kansas), Claudis Perry (Patamona) and James (WaiWai).]

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Passiflora candida (Poepp. & Endl.) Mast., from the Wassari Mountains. H.D. Clarke 8520, the first collection of this species in Guyana.

REPORT
Biological Diversity of the Guiana Shield (BDG)
Activities 1 January to 31 December, 2004

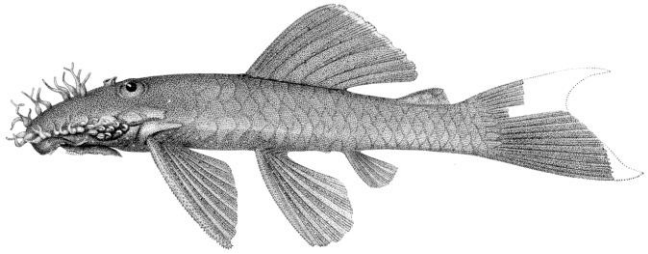
The Biological Diversity of the Guiana Shield Program (BDG) continues to collect, sort, mount, inventory, and file all plant specimens collected by the program. In addition, we assist scientists from other departments in NMNH (Zoology, Entomology, Anthropology), other bureaus at SI (STRI, NZP, NMAH, NASM, CRC), and we collaborate with nearly 100 scientists around the world. In 2004 we awarded six grants for field expeditions and provided logistical support to twelve specialists who traveled to NMNH to identify specimens. Highlights of the year include:

1. Most important is probably the completion of the data basing and bar coding of the plant specimens in the US National Herbarium that were collected in the three Guianas (minus one family we cannot finish because someone has it squirreled away). The total no. of records is 108,845, which consists of 46,125 BDG collections, and 62,720 historical specimens all databased and barcoded by BDG.
2. We helped move and organize the plant and animal collections in the **new addition to the Biodiversity Centre** in Guyana.
3. The "Phytogeography of the Kaieteur Falls, Potaro Plateau, Guyana; floral distributions and affinities" (Kelloff & Funk, 2004), Smithsonian Plant Collections, Guyana: 1990-1991, Tim McDowell (Hollowell et al., 2004) were published.
4. The "Checklist of the Terrestrial Vertebrates of the Guiana Shield" is in final edit.

The program's databases now contain 108,845 plant records and 10,439 fish records. Bird, Mammal, Herpetofauna, and Lepidoptera records, although supported by BDG, are maintained by the respective units here at NMNH. In 2004 we focused on reducing our plant and animal specimen backlog. Various specialists were invited to identify specimens in their area of expertise. Tactics for reducing the plant backlog have been to sort the collections with less than a case of specimens to the family level and to identify the specimens in-house. The backlog of specimens has been reduced from over 30 to 19 cases. The bulk of the plant backlog is attributed to our last two resident collectors (Henkel and Clarke) and to recent collectors who continue to gather plant specimens in the Guianas and Venezuela, often using their own funds. Contract money was made available to identify previously collected Lepidoptera specimens and to sort and identify ant specimens.

In the coming year our collecting activities with continue to expand within the Guiana Shield area increasing our knowledge in this region. In the summer/fall of 2005 we are sending three expeditions to French Guiana: ants, spiders, and birds. Each of these trips will focus on 3-5 areas where we do not have sufficient collections of these organisms but where we do have data on plants. These trips will provide information for comparison of diversity patterns among these groups. In addition, we plan to collaborate on an expedition to

Surinam (ants in collaboration with CI). We have an invitation to start a collecting program in terrestrial gastropods, but that is dependent on funding. All of the collectors who work through the BDG are required to process their collections as quickly as is reasonably possible and to provide agreed upon specimens and copies of reports and publications for the host country, as well as training for students and public lectures. We plan on having an intern work on the checklist of the **fishes** of the Guiana Shield, something we can do now that the new book on South American Fishes has been published (pictured is a catfish endemic to the Guiana Shield). Finally, one NSF proposal that we were included in was turned down last year and two NSF proposals that include field work in the Guiana Shield area in collaboration with BDG should be submitted this year.

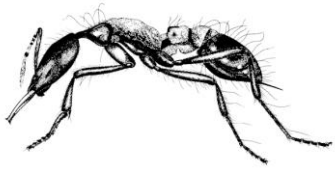


Ancistrus lithurgicus Eigenmann 1912.

Specimen work and Databases.

Lepidoptera To date **8235** lepidoptera specimens have been barcoded, databased, and sorted to family, **1800** microlepidoptera have been pinned, identified and barcoded and are ready for data basing; approximately **3000** microlepidoptera are pinned and waiting for identification. After this year (2005) all Lepidoptera collected in Guyana under the BDG Program will have been processed, databased, and identified (to species where possible).

Ants BDG to assisted in the processing of the nearly **75,000** specimens collected in leaf-litter during 2002. The results of the sorting to date, has produced **25,927** worker specimens from **44 genera** and **230 species**. This material is being databased as processing proceeds.



Strumigenys

Plants Specimens determined: **1,913**; specimens sent as gifts/loans for determination: **1,055** (this count does not include determinations from curators and specialist at the U.S. National Herbarium); duplicates sent out as exchange: **2,480** and **3,513** returned to the host institution. Approximately **3,309** single (new determinations) and ca. **9,811** duplicate labels have been prepared. **1,773** sheets (new mounted specimens) have been barcoded and inserted into the U.S. National Herbarium. **13,023** sheets (historical collections from the U.S. National Herbarium) have been inventoried and barcoded. Total plant specimens collected for 2004: approximately **3,263** (ca. **16,416** sheets). The BDG Program continues to barcode and database US plant specimens from the *Venezuelan Guayana* area. To date 105, or about 46%, of the families have been processed. Based on funding, the expected completion of this project is 2006.

Expeditions (Surinam): Clarke plant number series: (11036 – 11384) Central Suriname Nature Reserve, with J. Rhodes and the CI RAP team, 22 February – 22 March; 349 numbers, 2,094 sheets.

Expeditions (Guyana): Clarke plant number series: (11385 - 12438) Mt. Maringma (2110 m) Ataro River, with students Erin Tripp, Stephen Stern, Josh Kelly, as well as Claudius Perry (Patamona), Diana Gittens (Guyanese counterpart), 1 June – 12 July 2004: 1,054 numbers;

3,162 sheets.

Redden plant number series: (1455 - 3193) Imbaimadai, Pakaraima Mts, Mazaruni River, Marshall Falls, Gunns Landing with M. Lyle, Romeo Williams, Claudius Perry, C. Paul (Guyanese counterpart), 20 January – 4 May 2004: 1,739 numbers, 10,434 sheets

Redden plant number series: (3194 - 3314) Mazaruni River, with Romeo Williams, R.S. Williams; L. Williams; E. Boodram (Guyanese counterpart), 28 September – 18 October 2004: 121 numbers, 726 sheets.

Specimens returned to Guyana:

3,513 **plant** specimens (BDG)

280 **fungi** specimens (Henkel)

11 species (numerous individuals) of **ants; 3** holotypes of *Acropyga* and **2** holotypes of Mealybug species

163 specimens of Noctuidae and Lycaenidae (**moths and butterflies**)

120 **fish** collections sent to NMNH for identification

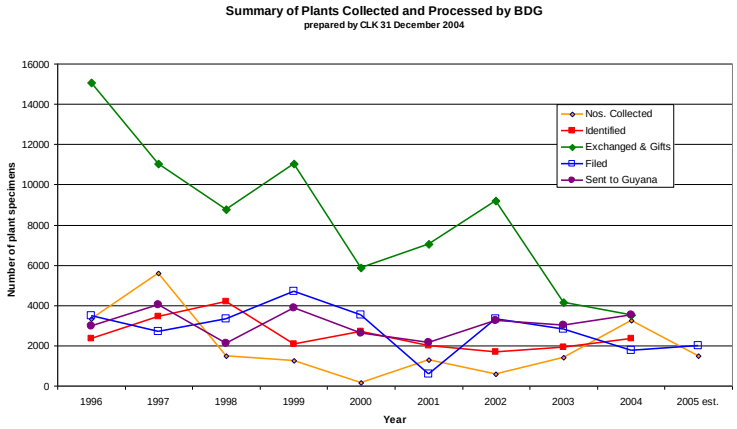


Figure 1: Summary of plants collected and processed by BDG

Post-Doctorial Fellowship:

The BDG and the Department of Entomology co-sponsored Dr. John LaPolla as a post-doctorial fellow to work on the ant collections from the Guiana Shield beginning in October.

Other Activities:

1) Two *publications central to BDG activities* were produced: Phytogeography of the Kaieteur Falls, Potaro Plateau, Guyana; floral distributions and affinities" (Kelloff & Funk, 2004), and Smithsonian Plant Collections, Guyana: 1990-1991, Tim McDowell (Hollowell et al., 2004).

2) The *Checklist of the Terrestrial Vertebrates of the Guiana Shield* (Hollowell & Reynolds, eds.) is in final edit. This is the result of a collaboration of specialists from Smithsonian, the Royal Ontario Musem, the Museo de Historia Natural La Salle, Caracas, Venezuela, the Museo Paraense Emílio Goeldi, Belém, Brazil, and the University of Guyana.

3) In FY04 Phillip DaSilva, Dean, Faculty of Natural Science, University of Guyana was brought to NMNH to work on his *mangrove research*.

4) Kelloff assisted the Centre for the Study of Biological Diversity (CSBD), Guyana, with developing the *new area for wet collections*. With help from UG students and staff she painted, built shelving units, moved the fish collections into the new space (18 shelving units, ca. 500 jars), and moved the field collected buckets of fish into the new prep room (ca. 20 5-gal. buckets and 2 45-gal drums).

5) The mounting of plant specimens for the Guyana National Herbarium continues at the Centre for the Study of Biological Diversity (CSBD, Guyana). UG pays for the mounters but BDG supplies all mounting materials. Currently the Guyana National Herbarium

has about *41,000 mounted and filed specimens*. This is the largest and best maintained collection in the country.
6) Kelloff, with help from UG students and staff, *cleaned up the herbarium*. They had the herbarium cases painted, locks replaced, and countertops fitted in the Guyana National Herbarium (CSBD). They cleaned out old storage areas and removed broken cases, furniture, and cardboard boxes. Kelloff processed 350 fungi collections and filed them in the GNH.
7) H. Carnvali (CICY) visited US to work on unidentified *Orchidaceae* (plant) specimens for the BDG Program and other botany staff.
8) At the *Botany 2004 meeting* in Snowbird, Utah, BDG was well represented. Kelloff presented a paper on Kaieteur National Park, Guyana; M. Strong presented one on the species of *Rhychospora* in the Guianas; Funk presented a poster co-authored with T. Hollowell, K. Richardson, and S. Ferrier on the Survey Gap Coding method.
9) Hollowell presented a *talk at NZP* on "GIS as a Biodiversity Collections Tool in the Guiana Shield" as part of a session organized by the National Zoo's Amazon GIS team for the Inter-American Development Bank's (IDB) Environment Week meetings in the Washington area.
10) Clarke and a few of his students visited US and *identified general collections* from plant families collected by the Clarke expeditions.
11) Redden (George Washington U.) *identified Fabaceae* (beans) family for the BDG Program from the Redden / Lyle expedition.
12) M. Sewell identified Aquifoliaceae.

13) Hollowell and E. Farr met with the *staff from CRIA* (Sao Paulo, Brazil) to discuss the development of a web-based format for collection data, 22-26 June 2004. During their trip they made presentations to students and faculty at the University of Sao Paulo, Campinas, and upon their return they presented their findings to staff at NMNH.
14) A *container of supplies*, material, and specimen shelving/herbarium cases was sent to the Guyana. This shipment contained: 25 herbarium cases; 13 boxes of *National Geographic* (complete set: 1960-2003); 32 boxes of *Biological Abstracts*; 10 boxes of other journals and books donated from the NMNH Library; 1 box of reprint storage boxes; 2 boxes of "genus" covers for herbarium specimens; 7 wooded glass slide storage units; 14 gray metal shelving units (includes: 70 shelves, 56 uprights, and hardware); and 12 herbarium bulky fruit boxes. All the material in the container was donated by scientists or administrative units at NMNH.
15) Kelloff gave an invited talk on the flora and fauna of Kaieteur National Park to the "Friends of Kaieteur" during her November visit to Guyana.

Collaborations
1) *USAID*: USAID provided the funding for the building extension of the Centre for the Study of Biological Diversity, University of Guyana. This expansion has doubled the collection space of the Centre allowing for at least another 10 - 15 years of growth.
2) *Flora of the Guianas*: The BDG is one of the major sources of recent collections relied on by specialists preparing family treatments for the Flora of the Guianas project. The Flora of the Guianas project, which started in 1984, aims at publishing treatments of plant families occurring in the region. It is a cooperative project involving organizations focusing on systematic botany including Berlin, Cayenne (IRD), Georgetown (Guyana), Kew Gardens, New York Botanical

Garden, Paramaribo, Paris, Utrecht, and the US National Herbarium (Smithsonian). The Editorial Office in charge of publication is housed at the NHN-Utrecht and the volumes are published by Kew. Larry Skog serves as the BDG representative to the Flora project and he attended the annual meeting.

3) *Preliminary Checklist of the Plants of the Guiana Shield*: This checklist is the product of a collaboration between the Biological Diversity of the Guiana Shield Program and the Flora of the Venezuelan Guayana Project (Missouri Botanical Garden - MO). The database for the *Checklist of the Plants of the Guianas* (Boggan *et al*., 1992, 1997) and the database drawn from treatments published in the *Flora of the Venezuelan Guayana* (Steyermark, Berry, and Holst, 1995 – 2003) were used to produce a preliminary combined checklist for all flowering plant families from Acanthaceae through Lythraceae. The BDG Program has currently completed and placed on the web all families through Plumbaginaceae. The last two volumes will be added when they are available, probably during 2005 or early 2006.

4) *Public Service*: Father Charles L. Roland takes care of an orphanage in Imbaimadai, a remote region of Guyana. Because of it isolation and the difficulties of getting anything to this area, the children of the orphanage are sometimes forgotten. The Biological Diversity of the Guiana Shield Program has facilitated the collection of food, clothes, toys, and books (ca. 15 boxes) and have sent them to Imbaimadai for the children of the orphanage and the people of Father Roland's parish that were in need. Our efforts were well received and as Father Roland writes "Those gifts have meant so much to us, as the children here never receive any gifts".

5) *Teaching/Training*: Fifteen students from the University of Guyana participated in a special three-day course in bird taxonomy and taxidermy as part of the collaboration between UG and the Smithsonian Institution's Biological Diversity of the Guiana Shield Program.

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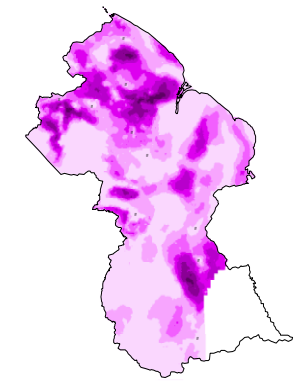

Figure 2: 10 recommended plant collecting sites based on past collections and environmental factors (Funk, Richardson & Ferrier, in press).

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ORIGINAL ARTICLE

Phytogeography of the Kaieteur Falls, Potaro Plateau, Guyana: floral distributions and affinities

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ABSTRACT

Aim The plant diversity of one location on the Guiana Shield, Kaieteur National Park in Guyana, is used to examine the various hypothesized origins of the flora and to evaluate which may best explain the current plant distributions.

Location Kaieteur National Park is located on eastern edge of the Potaro Plateau in central Guyana, South America. The species examined have distributions that vary from local to global.

Methods The distribution patterns of the families, genera and species known from Kaieteur are examined using generalized distribution patterns.

Results Data on distribution patterns, elevation and habitat were gathered from 131 flowering plant families, 517 genera and 1227 species. These plants represent all taxa that are currently known to occur in the area of the original Kaieteur National Park. Families tend to have cosmopolitan or pantropical distribution, genera are mostly neotropical and at the species level, most species are restricted to the Guiana Shield (c. 40%), northern South America (69%) or neotropical (96%) in distribution, each level inclusive of the previous.

Conclusions The flora at the study site in Kaieteur National Park has its strongest affinity with the Guiana Shield; 42.1% of the species have a distribution that corresponds with the Shield or is more restricted within the Shield. There is a distinct flora on the Guiana Shield and its affinities lie with the flora of northern South American and beyond that, the neotropics. The flora is not closely affiliated with the floras of the Brazilian Shield, the Amazon, the Andes, the eastern coastal forests of Brazil, southern South America, or Africa as has been previous suggested.

Keywords

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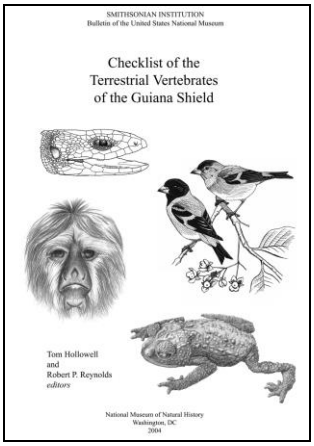
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Checklist of the Terrestrial Vertebrates of the Guiana Shield

Tom Hollowell and Robert P. Reynolds *editors*

National Museum of Natural History
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Norantea guianensis Aubl. (Marcgraviaceae).