

**JRS BIODIVERSITY FOUNDATION
PROPOSAL SUBMISSION: Request for Final Proposal - Round 4**

TITLE

From the tropical forest to you - applied informatics routed through the rural brain.

GENERAL INFORMATION

Status	DRAFT
Date Created	1/16/2011
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Total Amount Requested	See Budget Worksheet below
Duration	2 Years

Description of Concept

It has been demonstrated that tropical rural parataxonomists (cf. Janzen and Hallwachs 1992a, 1992b, Janzen et al 1993, Janzen 2004, Janzen and Hallwachs 2011) can gather high-quality specimens and associated collateral information in biodiversity inventory of large complex wild areas (Janzen et al 2009). The Costa Rican example in Area de Conservacion Guanacaste (ACG) was pioneered with Victorian notebooks and methods, and 29 parataxonomists and 4 closely associated INBio curators, and along with INBio (Costa Rica's national biodiversity institute) has gradually -- piecemeal and heterogeneously -- taken on some aspects of modern computerization of information flow and processing (e.g., Janzen and Hallwachs 2011). However, **to be fully functional, and to be quality-exportable to other national svstems seeking to internetize their**

biodiversity, the ACG example of parataxonomists as biodiversity information gatherers needs an explicitly computerized on-site overhauling, re-thinking, and upgrading.

ELEMENTS

A. General Statement of the problem(s) which funding is sought. (include statistical information to support problem description and identify target population).

It has been demonstrated that tropical rural parataxonomists (cf. Janzen and Hallwachs 1992, Janzen et al 1993, Janzen 2004, Janzen and Hallwachs 2011) can gather high-quality specimens and associated collateral information in biodiversity inventory of large complex wild areas (Janzen et al 2009). The Costa Rican example in Area de Conservacion Guanacaste (ACG) was pioneered with Victorian notebooks and methods, and 29 parataxonomists and 4 closely associated INBio curators, and along with INBio (Costa Rica's national biodiversity institute) has gradually -- piece-meal and heterogeneously -- taken on some aspects of modern computerization of information flow and processing (e.g., Janzen and Hallwachs 2011). However, **to be fully functional, and to be quality-exportable to other national systems seeking to internetize their biodiversity, the ACG example of parataxonomists as biodiversity information gatherers needs an explicitly computerized on-site overhauling, re-thinking, and upgrading.**

B. Statement of the goal(s) of the project and how achieving them will address the issue described above.

Area de Conservacion Guanacaste (ACG) has pioneered, in collaboration with Costa Rica's INBio, the invention of the "parataxonomist" from rural personnel with minimal formal education (cf. Janzen 1992-1993, 2004, 1999, Janzen et al 2009, Janzen and Hallwachs 2011). 29 ACG parataxonomists and 4 INBio curators (former parataxonomists) conduct intense biodiversity inventory of ACG. **The proposal goal** is to transparently internetize the initial biodiversity information gathering process by these 33 people as high-quality input into the information flow to processors/users such as ATTA at INBio, NBIS of the Republic of Benin, GBIF, EOL, BOA, BOLD, and <http://janzen.bio.upenn.edu/caterpillars/database.lasso> We will 1) replace antiquated laptops, digital cameras, and applications for the 29 parataxonomists at 12 ACG biological stations and the 4 INBio/ACG curators, 2) employ a FTE Costa Rican web site manager to integrate project biodiversity activity with the main ACG web site with main links to INBio data management, 3) coordinate the entire within-ACG operation by 1/2 FTE Felipe Chavarria, the current information and parataxonomist facilitator and coordinator, 4) conduct three on-site workshops among the parataxonomists and INBio curators (and visitors to the project), 5) salary four INBio curators as the

link between ACG and INBio, and 6) be available to any and all kinds of visitors.

C. Describe the applicant organization and how the proposed project relates to its mission.

The Guanacaste Dry Forest Conservation Fund (GDFCF) is the US-based 501.c.3 for ACG. GDFCF mission: any action that will optimize the chance of ACG biodiversity surviving indefinitely through non-damaging biodiversity development. Finding, knowing and making available (= internetization) ACG wild biodiversity constructs an essential platform for non-damaging biodiversity development. Doing this transparently with national/local human personnel provides a highly viable methodology/example for anyone hoping to conserve tropical wild biodiversity.

D. Describe the specific steps to solve the problem(s) and identify the activities will you do; when will you begin and complete each; who will do the tasks; and where each will be done.

ACG Lepidoptera, food plants and parasitoid inventory is a major GDFCF/ACG 30-year project in biodiversity development. Janzen and Hallwachs, the PIs for the project, will conduct all project oversight and much of the technical detail.

Purchase of laptops, digital cameras and related. Sept-Dec 2011 in US, for delivery and beginning one-on-one training Oct 2012 and January 2012; DHJ & WH will purchase and deliver in late October/January to stations; major January 2012 workshop, two followup workshops at six month intervals throughout remaining two years. The ACG biodiversity inventory will remain Canon-based, Apple-based, and FileMaker Pro-based due to both the current high level of individual proficiency by the parataxonomists in these protocols and due to their strong robustness under field conditions with non-university backgrounds.

Immediately locate and hire, in coordination with INBio information management, the ACG web site and field DB integration Costa Rican, and put him/her to planning and beginning execution, for intense all-persons workshop in January 2012; periodic follow-up electronically and in mini-workshops throughout remaining two years. This person will be largely based at ACG with periodic sessions at INBio, and be in continual feedback loops with individual parataxonomists and curators.

Immediately begin the project coordinator (Felipe Chavarria) circulating among the dispersed parataxonomists and INBio curators at INBio, explaining, planning and their personalized one-on-one upgrading, with intense culmination in January 2012 major project workshop, and then at least two follow-up major workshops at six month intervals. The project PIs will be full-time participants in all of the major workshops, and continually part of the daily feedback loops on data and information management quality and quantity (as they are at present).

Minor funds will be spent to facilitate carrying out both the one-on-one tutorial and fine-tuning, and make the small purchases necessary for the workshops and biological station minor equipment upgrades, throughout the project two year duration.

Sub-project workshop in August 2011 at INBio with the 4 ACG (and INBio) curators to plan their integration with INBio information management vis a vis the field parataxonomist team, and plan the ways that they can support (primarily at INBio) being transparent to visitors from other projects (especially those funded by JRS) and who are themselves exploring computerized biodiversity information management at the data source. This will be followed by their intense participation in the January 2012 ACG workshop, and then in two subsequent major workshops at least in mid 2012 and the first half of 2013.

E. Provide a summary of the methods and design of the project, including an overview of the biological elements, and the geographical, and informatics components.

The primary method of the project is for the core facilitation staff (pro bono DHJ and WH, salaried Chavarria and the web site person) to work individually with each of the parataxonomists (based in ACG) and the 4 INBio/ACG curators (based in San Jose) to bring them and their data management up to fully producing internet-friendly specimens and collateral data, given the laptop and digital information currently and budget-wise available (and taking into account the rough and rustic field conditions under which they work). This individual attention to computerization and computer-friendlization of data/specimens will be intensely punctuated by three several-day workshops (January 2012, August 2012 and during the first half of 2013).

The primary biological circumstances are that the 29 parataxonomists are daily (365) finding and rearing caterpillars in the field in the vicinity of their respective biological stations. The resultant information is databased on-site in real time, and the specimens processed as well (field-identified, sorted, labeled, frozen, preserved in alcohol, delivered, etc.). These specimens and information then pass through the clearing center at Estacion Biologica Santa Rosa, where they are re-checked and resorted. There is direct computerized feedback to the parataxonomists – straightening out taxonomy, asking for repeats and doublechecks, changing search emphasis and microlocalities, and rewarding for jobs well done. Positive feedback and maximum job security has been a powerful tool in generating high-quality inventory and data management from parataxonomists.

A major portion of the ACG inventory specimen and data stream will flow into the four INBio curators (each specialized in a taxonomic subset: Isidro Chacon, butterflies; Jenny Phillips micromoths; Bernardo Espinoza, macromoths; Ronald Zuñiga, parasitoids) for further processing into the INBio collections and datapool. Simultaneously this data and specimen management process will be duplicated at the University of Pennsylvania in the handling of the other portions of the ACG inventory specimen and data stream (today, nearly the entire specimen and data stream is into the UP clearing center rather than INBio).

The on-site ACG parataxonomist activities will be internet-transparent through explanatory pages (with images) and the INBio curator activities will be as well, and of course equally available to any visitors from anywhere.

It should be mentioned that a major element of specimen/data management today is not only what may best be described as “Victorian science for current causes”, but also a healthy dose of DNA barcoding as value-added information processing of the specimens themselves (Janzen et al 2009).

F. Explain barriers you believe you may encounter and how you plan to overcome them.

There will be a language barrier for visitors from non-Spanish-speaking countries. However, all 4 INBio/ACG curators are bilingual English-Spanish, as is Felipe Chavarria (project coordinator), one parataxonomist (Calixto Moraga), and the PIs DHJ and WH. All involved are, however, also very accustomed to be hosts to English-speaking visitors, and explaining things by example (most important) and much sign-language salted with vocabulary in common. Visitors from non-Spanish and non-English speaking countries will need, however, to be accompanied by at least one person who is appropriately bilingual in English and that language.

The web site and all information transmission will be in English, and likely with major sections available in Spanish as well.

The only other anticipated barrier is that it is always possible that a key piece of equipment (laptop, digital camera, GPS unit) is stolen or lost to an environmental mishap.

All persons except the new person for web site development and coordination with field data are intimately familiar with the ACG inventory and biodiversity inventory as has been irregularly developed during the past 32 years (see Figure 2 of the preproposal). The new person will be chosen from the deep human resource pool of highly computer-literate and web-literate Costa Ricans, and with the guidance and collaboration of INBio IT personnel who are highly familiar with this human resource pool (specifically, with Maria Auxilliadora Mora, the current director of INBio IT resources), and with the highly computer-literate director of ACG (Alejandro Masis).

G. Tell us if any aspects of your work are new or innovative which might advance the field of biodiversity.

The field of biodiversity has been far too long based largely on the academic community visiting conserved (and unconserved) wildlands as source areas for specimens and information, and with little or no direct social involvement (and information return) with the neighboring societies in which the wildlands are embedded. The development of career resident national parataxonomists as major and integral biodiversity management teams for a large conserved wildland has germinated in ACG and elsewhere (e.g., ACG references cited above and in Papua New Guinea – Basset et al 2004, Sheil and Lawrence 2004). While it is often viewed fearfully by the academic and well-educated communities as an invasion of their hegemonies, in fact it is a harmless (to them) and intellectually rich way of moving wildland neighbors and residents into minimal bioliteracy (along with all the benefits of employment and direct control).

This JSR project is aimed at greatly improving this process for one particular tropical site, both for its direct value to the non-damaging biodiversity development of that site, and as a transparent demonstration of what is possible to do with the mix of the raw ingredients of wild free-living conserved biodiversity with current social “developed world” abilities to process, manage and deliver the raw and processed materials for social bioliteracy. And to do it in a world where internetization of everything is merging social and economic classes in the palm of your hand and in rustic field circumstances.

H. Provide a timeline for the work and identify when key milestones will be achieved.

The project will begin when funds are available (assumed to be August 2011), and be continually in motion, with three major workshops (January 2012, August 2012, early 2013) punctuating the continuous one-on-one daily use of computerization, data entry and data management, and feedback from both the 4 INBio curators and the project web site manager, as well as the PIs. The project products – specimens, databases, protocols, within-project communication through email – will be available as examples to anyone at any time.

There are no key milestones, but rather it is expected that data information flow and quality will steadily improve throughout the two years of the project, and will be steadily monitored by the processing and use of the specimens and data that flow into the INBio IT system, the

University of Pennsylvania web site, and the (to be strongly improved) ACG web site. Each of the three major workshops will be an intense training and feedback event for all project participants (as well as for any visitors who care to participate).

I. Identify how the data, methods, and systems will be actively shared by you with others working in the field and beyond.

All data and protocols will be available to the entire world at all times through the web-available databases, just as they are today in a more irregular way. Database field content needs to be double-checked for quality control before public availability, a process that has tended to be 3-6 months for some classes of information. The entire ACG inventory process cannot yet be based on cloud-sourced applications and databases (and storage) due to the absence of internet or wireless internet at many of the field stations. The entire inventory project currently needs to be laptop based. Any other projects that wish to site-visit ACG and INBio (and especially, visit the three major ACG workshops) will be very welcome (taking in mind the language caveat described earlier). The project will also write scientific papers describing its activity (e.g., Janzen et al 2009, 2011).

J. Explain the evaluation strategy to assess the short-term and long-term impact and effectiveness of the proposed work.

This project “effectiveness” will be simply measured by a) the ACG parataxonomists doing better and more self-sufficient inventory work for and in ACG, b) INBio being a quality recipient of ACG inventory specimens that subsequently show up in the INBio information distribution for Costa Rica to the world, and c) by the degree to which anyone who cares notices that other projects have used ACG parataxonomist and INBio curator protocols in their own national biodiversity monitoring and inventory work. And of course if they do not, there is a lot more awry than inattention to the parataxonomists and their inventory activities. It has been the Costa Rican (and INBio and ACG) experience that a straightforward, transparent and good working example does more “learning and information transfer” than multiple preaching and paper writing, though a project such as this, and one such as INBio, obviously require a certain level of international preaching at symposia and conferences, and paper writing (such as the PIs are today routinely doing for DNA barcoding).

The real measure of impact on the parataxonomists and curators of the project is in increased quality of their work, and the real measure of impact of the project is whether its methods and protocols are “borrowed” by other projects, and whether the parataxonomists and curators are proficient at showing/explaining what they do. The latter can only be measured by direct observation by the PIs and others, and commentary from other projects.

K. Identify other organizations and Principal Investigators with whom you may collaborate and the nature of the agreement.

ACG collaborates with INBio. Since INBio also has a JRS project to assist Benin in its national biodiversity information management, there will be ACG-INBio-Benin interactions. ACG and INBio are already strong synergists with major museums and the dispersed taxasphere members (we all exchange data and specimens), and with iBOL, the international effort to

DNA barcode the world (<http://ibol.org/>). This project should greatly increase the quality of the IT flows to iBOL from not only Costa Rica but also from other national participants in iBOL.

L. Identify opportunities to leverage other funding for the proposed project or other related work beyond it.

The total ACG Lepidoptera-food plant-parasitoid inventory costs ~ \$500,000/yr. This JRS project will greatly improve the quality of data flow and data use, raising the chances of continued funding from multiple sources. Continued funding of the ACG inventory not only improves ACG conservation management, but also continues the ACG global efforts to be a conservation example of conservation through understanding its own biodiversity. This may increase society-wide willingness to keep some large wildland areas by funding them and otherwise supporting their existence.

M. Describe ways your work will provide a better understanding of biodiversity for the general public.

Put most simply, biodiversity inventory of a large conserved wildland is the act of setting up that biodiversity for use by all sectors of society. That "use" is practicing real bioliteracy, just as reading and literacy increase the interest by society in books and the written word. Internetization of the inventory makes the biodiversity information in those "books" oh so much more available to the general public. While such reading and use is variously available today in a Victorian manner, full internetization of the process removes much of the "use impediment". It also greatly increases the chance that the actual data harvesters and first processors – the parataxonomists and the INBio curators – can harvest in a manner that facilitates the users, without their products having to spend centuries in ivory tower deposits before becoming available.

N. Describe how your work may positively impact public policy for the benefit of biodiversity.

As mentioned above, it is an awfully hard sell to ask public policy to protect a wild biodiversity that it cannot find, "read", use, understand, and know. That is like asking an illiterate person to save books instead of burning them as firewood. By improving the availability of biodiversity information, and its actual dissemination, we increase the likelihood that public policy will include laws, rules, regulations and traditions/habits that will lead to it being conserved. By doing it with local resident national biodiversity managers, we greatly increase the chances that the use will be permanent and habitual.

O. Describe biodiversity education and training that may be offered, to whom and how it will be provided, and at what level.

This project is biodiversity training for the ACG 29 parataxonomists and four INBio curators. ACG inventory information is available to the ACG Programa de Educacion Biologica - 2,500 4th - 6th grade students per year (52+ schools). They use the web site. INBio is constantly conducting

educational information distribution (school courses, public talks, biodiversity books). All of this information feeds into EOL, GBIF, BOLD, and the ACG and INBio web sites for public education and training. Biodiversity information is provided from these sources at and to all levels.

Aside from these more traditional protocols, all of the ACG and INBio biodiversity information is daily used globally. A recent case is that Butterflies of America (<http://butterfliesofamerica.com/>) is posting the entire set of ACG adult and caterpillar butterfly images (about 700 species) (the ACG inventory has just passed 100,000+ images to them). Examples are available at

http://butterfliesofamerica.com/jemadia_pseudognetus_immatures1.htm and at http://butterfliesofamerica.com/jemadia_pseudognetus_specimens2.htm. These same images (adults reared by the parataxonomists and caterpillars found by the parataxonomists) are available, along with many more, on the UPenn web site.

BUDGET

	Year 1	Year 2	Do Not Use	TOTAL
Project Management	\$0	\$0	\$0	\$0
Equipment	\$24,000	\$24,000	\$0	\$48,000
Hardware	\$0	\$0	\$0	\$0
Software	\$9,000	\$9,000	\$0	\$18,000
Travel - local	\$0	\$0	\$0	\$0
Travel - international	\$0	\$0	\$0	\$0
Meeting expense	\$4,000	\$4,000	\$0	\$8,000
Staff development	\$50,000	\$50,000	\$0	\$100,000
Publication	\$0	\$0	\$0	\$0
Education & training	\$13,000	\$13,000	\$0	\$26,000
Public policy impact	\$0	\$0	\$0	\$0
Subcontracting to collaborators	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0
Overhead (15% max)	\$0	\$0	\$0	\$0
TOTAL	\$100,000	\$100,000	\$0	\$200,000

Budget Notes:

1. \$24,000/year : replace antiquated laptops and backup devices, obsolete digital cameras, applications and accessories for the 29 parataxonomists at the 12 ACG biological stations mapped in Figure 1 of the pre-proposal, and for the 4 INBio curators. 2. \$9,000/year to employ and guide a FTE Costa Rican web site and DB manager to fully integrate all of the project biodiversity gathering activity with the main ACG web site (<http://www.acguanacaste.ac.cr/>) , with main links to INBio data management and fully understood by project participants. 3. \$13,000/year to fully coordinate the entire

within-ACG operation, coordination to be conducted by 1/2 FTE Felipe Chavarria, the current information facilitator, accountant and general trouble-shooter for all ACG parataxonomist computer-related activity. 4. \$4,000/year to fund the many miscellaneous small costs associated with numerous on-site, and some within-INBio, workshops among the parataxonomists and INBio curators, and their interaction with visitors to the project. 5. \$50,000/year to salary the four INBio curators who are both the link between ACG and INBio, and integral components of the data management as it comes from the field to INBio or any other repository. NOTE: There is no overhead, and all participation by the PIs and parataxonomists is pro bono to this project.

ATTACHMENTS

NAME	TYPE	SIZE
References References JRS proposal GDFCF doc.x	.docx	127606

CLICK ON ATTACHMENT NAME TO OPEN