CEPF SMALL GRANT FINAL PROJECT COMPLETION REPORT

Organization Legal Name:	The Field Museum of Natural History
Project Title:	An Overlooked Flora of the Fijian Islands: Diversity and Implications for Conservation.
Date of Report:	June 1, 2012
Report Author and Contact Information	Dr. Matt von Konrat, ph. 1-312-665-7864, email: mvonkonrat@fieldmuseum.org

CEPF Region: Polynesia-Micronesia Hotspot

Strategic Direction: The CEPF project funded is part of a larger, ongoing effort investigating the biodiversity of spore-producing organisms in Fiji, as well as more broadly in the South Pacific. The organisms targeted include bryophytes (mosses, liverworts and hornworts), ferns and lycophytes, as well as lichenised fungi. Only scant data exist for these organisms compared to many animal and seed plant groups of the region. Yet, these organisms are considered to be of great biological and ecological significance. Bryophytes, ferns and lycophytes, as well as lichenised fungi form an important and conspicuous component of the vegetation in many regions of the world, including the Pacific islands. The small size of these organisms, especially bryophytes and lichenised fungi, also enables them to respond rapidly to environmental and ecological change offering them great utility in conservation science. Specifically, the CEPF funded component has implications and application to several of the strategic directions, but the single-most significant with highest impact is: *No. 2, Strengthen the conservation status and management of 60 key biodiversity areas* in the South Pacific region.

Grant Amount: $19,897.50

Project Dates: July 2012 to May 31, 2012

Implementation Partners for this Project (please explain the level of involvement for each partner):

Critical to the entire field CEPF funded program in 2011 was the logistical support, advice and insight provided by staff from the Regional Herbarium of the South Pacific (based in Suva, University of the South Pacific), especially Marika Tuiwawa and Alivereti Naikatini. The dedication and commitment by Marika Tuiwawa and Alivereti Naikatini ensured the success of the fieldwork program. The CEPF funded project helped cement a long-term collaboration with Suva herbarium, as well as help forge new collaborations with students, and potential partners, e.g., representatives of the Waisali Dakua National Trust Forest Reserve and the Kadavu Yaubula Management Support Team (KYMST). The Field Museum is also hosting a Fijian student in July, 2012, to develop educational materials and guides to several of our host villages, e.g., Nabukelevu-i-ra village (Nabukelevu District, Kadavu Province, Kadavu Island); Namosi village (Namosi District, Namosi Province, Viti Levu Island); Nadakuni village (Waidina District, Naitasiri Province, Viti Levu Island).

Support from villages and local guides were essential, and we hope we may be able to foster long-term engagement and offer further education materials in 2012.

A total of 16 researchers representing eight institutions from seven countries participated directly with the CEPF funded fieldwork in 2011. This network represented the first ever multinational and multi-institutional investigation of these organisms, in partnership with colleagues in Fiji, in the history of botanical exploration in Fiji.

Partnering individuals (in alphabetical order) and their respective institutions included John Braggins (Auckland War Memorial Museum); Laura Briscoe (The Field Museum, Chicago, U.S.A.); Elizabeth Brown (Royal Botancial Gardens, Sydney, Australia); Patrick Brownsey (Te Papa Museum, Wellington, Aotearoa/New Zealand); Allan Fife (Landcare Research, Lincoln,

Aotearoa/New Zealand); Senilolia Heilala (University of the South Pacific, Suva, Fiji); Thorsten Lumbsch (The Field Museum, Chicago, U.S.A.); Alivereti Naikatini (University of the South Pacific, Suva, Fiji); Khwanruan Papong (Mahasarakham University, Khamrieng, Thailand); Leon Perrie (Te Papa Museum, Wellington, Aotearoa/New Zealand); Tamás Pócs (Eszterházy College, Eger, Hungary); Matt Renner (Royal Botanical Gardens, Sydney, Australia); Andrea Sass (Eszterházy College, Eger, Hungary); Lars Söderström (Norwegian University of Science and Technology, Trondheim, Norway); Mereia Tabua (University of the South Pacific, Suva, Fiji); and Marika Tuiwawa (University of the South Pacific, Suva, Fiji). Te Papa Museum also provided matching funds to aid in cost sharing of this large expedition; Landcare Research also provided a small amount of financial support for Allan Fife. Several participants are members of the IUCN Species Survival Commission Bryophyte Specialist Group, and the project is fostering a partnership with the IUCN Regional Office for Oceania; this is the next phase of our ongoing, broader program in the region.

Conservation Impacts

Please explain/describe how your project has contributed to the implementation of the CEPF ecosystem profile.

The CEPF funding was originally requested for the *key biodiversity areas* (BDA's) of Sovi Basin and Korobosabasaga Range (Site No. 81) and Voma/Namosi Highlands (Site No. 87). Fieldwork was carried out in those areas in 2011, and the international team is currently collating data, processing and examining herbarium specimens. Because bryophytes are generally very small, identification requires detailed microscopic studies and is time intensive. This is an ongoing effort, which will be completed by the end of 2012. The CEPF project is part of a broader program led by von Konrat, who has leveraged funds to also botanically explore five additional *key biodiversity areas* in Fiji identified by CEPF. This has been of a tremendous cost benefit to the CEPF project. These include Taveuni (Site No. 82); Nabukelevu/Mt Washington (Site No. 71); Waisali Dakua National Trust Forest Reserve (Site No. 92); Tomaniivi-Wabu Nature and Forest Reserve complex (Site No. 83); and Nausori Highlands (Site No. 77). Throughout all these *key biodiversity areas* we have been able to produce baseline data and information about the organisms that has never been produced before. This data will be used to inform conservation management, conservation science, and species protection programs centered on these BDA's, as well as to provide general information about bryophytes and lichens that is highly useful for the management of other Fijian priority areas. Project participants are currently assessing the applications and implications for many of the CEPF Investment Strategies. The baseline data and its application will immediately aid in strengthening the conservation status and management of key biodiversity areas as well as existing protected areas (2.0). In particular, we are documenting several rare and/or endangered species. We have leveraged funds to hold and informed workshop to provide critical evaluation of threatened taxa in 2012/2013. The project is actively working across institutional and political boundaries toward achieving the shared conservation goals described in the ecosystem profile (4.1). In particular, we have discussed with Suva herbarium a strategy to return specimens and provide collection data as well as repatriate historical specimens that have been collected in Fiji. In order to help achieve this we have two Fijian students visiting the Field Museum in July and December 2012. Finally, there is potential application to developing and implementing species recovery plans (3.1), should data be obtained from our project and increased knowledge warrant such plans.

Please summarize the overall results/impact of your project against the expected results detailed in the approved proposal.

Specifically, the proposed project has worked towards providing fundamental baseline data and information that will have direct application to conservation, both in the two BDA's that was funded by CEPF as well as an additional five BDA's that have been explored throughout the tenure of the broader project. This baseline data is essential prior to any formal evaluation of IUCN Redlists; we have secured funding from an international partner to conduct a workshop with

Fijian collaborators and partners to prepare a preliminary assessment in 2012/2013. The collections from the fieldwork have already expanded the first-ever comprehensive checklist that was published in 2011. Details are provided below. Importantly, we have gone to great lengths throughout the broader project, as well as the CEPF funded program to help build the capacity of local scientists and land managers to increase their knowledge about this overlooked and poorly understood group of organisms, and to express how critical these organisms are in helping manage priority landscapes. It was essential to underscore the ecological significance of these organisms, e.g., the water retention ability, the fact that bryophytes and lichens play a significant role in the global carbon budget and CO_2 exchange, plant succession, and nutrient cycling. And as such, they have been used as indicators of past climate change, to validate climate models, and as early indicators of global warming.

Please provide the following information where relevant:

Hectares Protected: n/a
Species Conserved: This is actively being investigated.
Corridors Created: n/a

Describe the success or challenges of the project toward achieving its short-term and long-term impact objectives.
The successes of the project far exceeded our original expectations. In a large part, this was due to the excellent coordination and logistical support by colleagues at the University of the South Pacific as documented above. Working towards our objectives would not have been possible without the consultation and guidance by guides and wildlife experts/enthusiasts from local villages, who helped target and identify specific ecological niches that we were interested in. We have also fostered a long-term relationship with Mereia Tabua, who has since started her Masters of Science degree in bryophytes. This relationship will greatly aid the projects overall objectives. Similarly, we have cemented a sustainable relationship with Senelolia Heilala who also has a CEPF grant; we have helped her devise a methodology for the monitoring of bryophytes as well as facilitating identification of collected materials from her project. A major challenge, as with any fieldwork program is the weather, which is always outside ones control. Storms and heavy rain made it prohibitive to have adequate time at some critical mountain cloud forest sites. Because the target organisms are small and require a hands lens in the field, such conditions make it extremely challenging to effectively collect and search for these enigmatic organisms. Despite this, participants have amassed a wealth of new information about these areas, and have underscored the need such areas need to be revisited, e.g., Mt. Voma and Mt. Nabukelevu (Viti Levu).

Were there any unexpected impacts (positive or negative)?
A very unexpected positive impact was the development and fostering of a Master of Science student at the University of the South Pacific. This will have important long-term implications if we can foster Mereia Tabua's interest in bryology; there is a real potential for her to become a regional expert for the South Pacific bryophyte flora. A positive impact that many participants took away with them was the incredible generosity and support provided by many villages, particularly Nabukelevu-i-ra village (Nabukelevu District, Kadavu Province, Kadavu Island) as well as individuals like Ratu Kaminieli Nabalarua, Cooridnator Kadavu Yaubula Management Support Team (KYMST) whose family opened their home to 18 guests!

Lessons Learned

Describe any lessons learned during the design and implementation of the project, as well as any related to organizational development and capacity building. Consider lessons that would inform projects designed or implemented by your organization or others, as well as lessons that might be considered by the global conservation community.

It is clear that a greater amount of time is needed to pursue fieldwork at some high-elevated areas. This could be achieved in the future by camping closer to the targeted peaks, thus allowing a greater amount of time at the targeted area. Local guides were excellent in their navigation to the various sites; having knowledgeable guides is key to accessing some remote areas. Weather is always an impediment. Extra time has to be factored in for future attempts to areas that are remotely accessible. The Rapid Colour Guides that were produced were popular, but we need to produce a greater number to distribute to various parties and always need to be on hand for distribution. This past visit in 2011 we noticed many villages have a community noticeboard - this would be an ideal medium to help promote the project and similar activities. In July 2012, when we bring over two Fijian students as part of a capacity building program, we will produce posters outling the CEPF project and help raise the awareness of this group of plants. Contingency planning is also absolutely essential, as briefly discussed below.

Project Design Process: (aspects of the project design that contributed to its success/shortcomings)

Careful coordination and planning with Suva herbarium was critical and fundamental to the success of the project. This allowed for very effective collecting and exploration. Alivereti Naikatini (University of the South Pacific) provided tireless support, engaged us with the cultural significance of customs such as the sevu sevu and explaining our research. The drying of plant material, especially with such a large party of over a dozen participants, was a major challenge. The Suva herbarium has many activities and caters for many research programs, extending beyond botanical research. Space is therefore a premium. Tropical conditions also make drying plant specimens a challenge. In future efforts, we will develop a collapsible drying facility that can be used by other botanists as well. This is essential for any future large party field program. Such a facility was designed for similar expeditions in southern Chile where drying plant material was challenging.

Project Implementation: (aspects of the project execution that contributed to its success/shortcomings)

Although the overall field work program was a major success, as reported in detail below, future efforts will be more successful if we allow more time for contingency planning and foul weather. This can be achieved with some minor adjustments in planning. Smaller teams are required to make logistical support easier in some areas that require a moderate hike to suitable habitats. Planning for extra days in the future will be needed to access high cloud forest and mountain peaks, and camping closer to the targeted sites will greatly help in future endeavours. Allowing for contingency planning is absolutely essential, which we successfully were able to do. For example, a funeral followed by a wedding in quick succession meant we were unable to have access to a BDA site. However, a back-up alternative to do another BDA was quickly devised.

Other lessons learned relevant to conservation community:

With enigmatic organisms baseline data is essential to even begin assessing conservation implications. It is abundantly clear there remain many under explored habitats and sites. As reported below, participants have discovered even some very common broadly distributed South Pacific species that had previously never been recorded before in Fiji. Visiting areas beyond the known localities for seemingly rare species is critical. For example, on Vanua Levu a liverwort taxon was only known from the type locality (a single collection from a single location). However, in subsequent searches the taxon was found in several nearby sites. Thus the organism has a greater distribution than what we were to expect. In our efforts to begin preliminary conservation status assessment to the target research organisms the gathering of this baseline knowledge is fundamental.

ADDITIONAL FUNDING

Provide details of any additional donors who supported this project and any funding secured for the project as a result of the CEPF grant or success of the project.

Donor	Type of Funding*	Amount	Notes
Warwick Foundation	A	$5,000 USD	Supported the CEPF project
Anonymous donor	A	$5,000 USD	Supported the CEPF project
National Science Foundation	B	$17,000 USD for field work, and other funds for lab costs	Broader studies in South Pacific, including Fiji.
Mohamed bin Zayed Species Conservation Fund	B	$15,000	Broader studies in South Pacific, including Fiji; hosting a workshop in Fiji for conservation of liverworts.
Negaunee Foundation	B	$25,000	Broader studies in South Pacific.

Additional funding should be reported using the following categories:

A *Project co-financing (Other donors contribute to the direct costs of this CEPF project)*

B *Grantee and Partner leveraging (Other donors contribute to your organization or a partner organization as a direct result of successes with this CEPF project.)*

C *Regional/Portfolio leveraging (Other donors make large investments in a region because of CEPF investment or successes related to this project.)*

Sustainability/Replicability

Summarize the success or challenge in achieving planned sustainability or replicability of project components or results.

There are many features of the project that will have a long-lasting influence and impact. Notably, we have implemented a strategy with Suva herbarium to increase access to the Museum collections as conservation and research resources, digitized images of herbarium specimens and of living plants. The CEPF funded project represents a broader long-term commitment in the investigation of bryophytes and lichens from Fiji. It is in this capacity that the project or components of the project are guaranteed to continue long term. In July and December of 2012, two Fijian students will also help in the repatriation of data, images, information and specimens. The archived and curated collections will have far reaching applications beyond the CEPF project period, including conservation and land management, documenting plant biodiversity, and for ongoing taxonomic studies, as well as contributing to a wide array of international activities. Information obtained will provide leverage for landowners, conservation managers, and policy makers. In coordination with Senilolia Heilala and Marika Tuiwawa, participants also helped implement a methodology for the establishment of permanent monitoring plots for bryophytes. However, application of a methodology on “paper” and implementation in the field was a challenge. The methodology had to be slightly modified for a slightly more complex forest system.

Summarize any unplanned sustainability or replicability achieved.

An unexpected development that was a direct result of the CEPF project is working towards the establishment of a biological research station supported from leveraged funds. This will provide a permanent research facility to use as base to investigate long-term ecological and taxonomic studies in the highlands of Viti Levu, which includes some BDA sites. Another unplanned development was the fostering of a Masters student, Mereia Tabua, and helping her establish methodology for her survey of composition changes with elevation. We are taking advantage of this and creating a long-term monitoring program, where we can revisit individual trees recording succession and regrowth, and exploring change in composition with elevation in the long-term. This is an exciting project that was not part of our original program. We also have climate data

loggers recording some basic environmental parameters long term, which can be used to help collate and explain plant distribution and composition patterns.

Safeguard Policy Assessment

Provide a summary of the implementation of any required action toward the environmental and social safeguard policies within the project.
Not applicable at this stage

Additional Comments/Recommendations

Below is a list of specific outcomes that were achieved as a direct result of the CEPF award, or were made possible with leveraging CEPF funding.

- See http://fieldmuseum.org/explore/fiji-cryptogams for more information about the CEPF and broader project. This year we are going to develop a full website devoted to early land plants for Fiji.
- During the duration of the CEPF funded project supported by leveraged funds, over 4000 specimens of bryophytes, ferns, lycophytes and lichenized fungi were collected from several BDA areas.
- Produced an English and Fijian language 'Rapid Colour Guide'. This was in the form of a five page plastic laminated booklet explaining the ecological significance of bryophytes, ferns and lichens, the differences between them, and their application to conservation.
- Production of an online video outlining the ecological significance of the Fijian bryophyte and lichen flora, and providing an insight into the research participants are conducting. See http://fieldmuseum.org/explore/multimedia/video-botanical-exploration-fiji.
- Participants are now beginning to publish results derived from the 2011 expedition. The following paper acknowledges the generous support of CEPF. The entire issue of the journal of Telopea was dedicated to cryptogams of Fiji, with a special dedication to the staff of the Suva Herbarium. Konrat, Matt von, Naikatini, Alifereti, Tuiwawa, M, Söderström, Lars, Fife, Allan J., Renner, Matthew A., Brownsey, P. J., Perrie, Leon, Hagborg, Anders, Pócs, Tamas, Lumbsch, H.T., Braggins, John E., Séneca, Ana and Brown, Elizabeth A. (2011) A brief history of the cryptogams of Fiji and prospects for the future. *Telopea* 13(3) : 361-374. Papers can be downloaded and accessed from http://fieldmuseum.org/explore/fiji-cryptogams
- Preliminary results that are projected to be reported and published by the first quarter of 2013 includes the following:
    - An estimate of at least 200 new records for Fiji or island range extensions. For example, there are an estimated 150 new records for the BDA Nabukelevu/Mt Washington (Site No. 71)
    - Without full investigation it is impossible to provide a firm estimate of new species to science, but preliminary information indicates possibly up to 20 new species might be described from the CEPF funded expedition alone. However, this will involve detailed comparative and systematic investigation before final conclusions can be made.
    - Valuable ecological and distribution data has been acquired for dozens of taxa that were only known from the type locality or from scant collections. This information will be valuable in applying conservation status to possibly rare and endangered species and has important conservation implications.
    - Oilbody data has been captured for a selection of genera and families, including Radula, some Lejeuneaceae, Lepidoziaceae, Plagiochila, and Frullania. Oilbodies are cellular inclusions that disappear upon drying and

offer critical characters for identification of liverworts. This has never been achieved before for the Fijian liverwort flora.
    - 100's of images have been captured of habitat detail, plant form, and ecology to build an image library for a variety of purposes including scientific publication and as a web resource.
- Trained two scientists and students in the sampling and monitoring of long-term plots.
- Provided preliminary training to Mereia Tabua and Senelolia Heilala with some basic identification of the different major bryophyte genera and families. This was done on two separate field trips.
- Developed a strategy for subsequent distribution of samples by Mereia Tabua and Senelolia Heilala to help aid in identification of samples from their own research activities.
- Leveraged funds to expand and contribute to other research and conservation programs in Fiji, including a workshop devoted to apply the baseline knowledge we have obtained to the conservation status of possible rare and endanged species. This is spearheaded by von Konrat who is on the IUCN SSC Bryophyte Specialist Group in coordination with IUCN Oceania.
- Attempts have been made to help with infrastructure and resources that will help achieve long-term goals by various parties with broad application to conservation. Computer software and data loggers have been purchased, and students trained with their use; a microscope and digital camera have been lent to the herbarium to capture images and more rapidly aid in identification.
- Continue capacity building by brining Fijian students to Chicago. This will serve as training as well as the development of various products. The students will also bring with them their collections from their own projects to aid in identification. They will also participate in the repatriation of specimens and data.

Immediate major goals to be implemented that are derived from the CEPF funded project:

i) Preparation of an introductory guide to bryophytes, lichens and ferns.
ii) An annotated checklist of liverworts and hornworts for the different BDA areas; this will serve as the baseline data to make informed conservation decisions in collaboration with Fijian colleagues.
iii) A special issue of a journal with a series of papers dedicated to cryptogams from Fiji. This will include new species, new records, baseline ecological information that will help raise the profile of this important group of plants and island systems.
iv) Taxonomic treatments on various groups.

Information Sharing and CEPF Policy

CEPF is committed to transparent operations and to helping civil society groups share experiences, lessons learned, and results. Final project completion reports are made available on our Web site, www.cepf.net, and publicized in our newsletter and other communications.

Please include your full contact details below:

Name: Matt von Konrat
Organization name: The Field Museum of Natural History
Mailing address: 1400 S. Lake Shore Drive, Chicago, IL 60605, U.S.A.
Tel: 1-312-6657864
Fax: 1-312-665-7158
E-mail: mvonkonrat@fieldmuseum.org

*****If your grant has an end date other than JUNE 30, please complete the tables on the following pages*****

Performance Tracking Report Addendum

CEPF Global Targets

(Enter Grant Term)

Provide a numerical amount and brief description of the results achieved by your grant.
Please respond to only those questions that are relevant to your project.

Project Results	Is this question relevant?	If yes, provide your numerical response for results achieved during the annual period.	Provide your numerical response for project from inception of CEPF support to date.	Describe the principal results achieved from July 1, 2007 to June 30, 2008. (Attach annexes if necessary)
1. Did your project strengthen management of a protected area guided by a sustainable management plan? Please indicate number of hectares improved.				Please also include name of the protected area(s). If more than one, please include the number of hectares strengthened for each one.
2. How many hectares of new and/or expanded protected areas did your project help establish through a legal declaration or community agreement?				Please also include name of the protected area. If more than one, please include the number of hectares strengthened for each one.
3. Did your project strengthen biodiversity conservation and/or natural resources management inside a key biodiversity area identified in the CEPF ecosystem profile? If so, please indicate how many hectares.				
4. Did your project effectively introduce or strengthen biodiversity conservation in management practices outside protected areas? If so, please indicate how many hectares.				
5. If your project promotes the sustainable use of natural resources, how many local communities accrued tangible socioeconomic benefits? Please complete Table 1below.				

If you answered yes to question 5, please complete the following table.