CEPF FINAL PROJECT COMPLETION REPORT

Organization Legal Name:	University of the South Pacific
Project Title:	Conservation of Fiji's Endemic and Rare Butterflies: *Hypolimnas inopinata* and *Papilio schmeltzi*
Date of Report:	17th June, 2013
Report Author and Contact Information	Hilda Waqa-Sakiti Email: sakitiwaqa_h@usp.ac.fj.

CEPF Region: Polynesia-Micronesia

Strategic Direction: 3. Safeguard and restore threatened species

Grant Amount: $49,300

Project Dates: Apr 1, 2011-Mar 31, 2013

Implementation Partners for this Project (please explain the level of involvement for each partner):
1. Dr. Inoue Takashi (Japanese National Institute of Agrobiological Sciences Owashi 1-2), Japan- he specializes in butterfly-plant interactions in the Pacific and has previously done research on the butterfly genus Papilio in the Pacific region including Fiji. Dr. Takashi continues to assist PhD student with technical advice on *Papilio schmeltzi.*

2. Eric Edwards (Department of Conservation, New Zealand)- His expertise includes work on entomology and ecosystem protection. He has worked recently on butterflies in Samoa and American Samoa and worked collaboratively with experts in those countries and in NZ. He is also interested in butterfly conservation and awareness. We will continue to work with Dr. Edwards and utilize his expertise in species conservation and management and the IUCN Redlisting process.

Conservation Impacts

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

Information gathered during the 24 months duration of this project will greatly enhance our knowledge of these butterflies that we know so little about. It will also allow informed conservation management decision making and provide us with a model for action on other species. Thus, this project proposal directly addresses CEPF's strategic direction #3, to "build awareness and participation of local leaders and community members in the implementation of protection and recovery plans for threatened species".

Please summarize the overall results/impact of your project.
The two years of this project was able to successfully execute the objectives that were set out initially. Apart from a few challenges, most of the outputs were delivered towards the end and a few in the pipeline for completion as the processes involved in the IUCN Redlisting is quite a long process. In terms of the conservation efforts for these two species, the awareness campaigns has tremendously increased the knowledge of the resource owners for these two butterflies as they are now aware of the significance of these two species. Thus the CEPF's strategic direction 3 has been met through this output.

Project Approach (500 words)

This project therefore proposes, for the first time, to carry out scientific research to resolve the following issues:

1. Areas of occurrence.
2. Population size.
3. Seasonality patterns.
4. Host-plants and life history.
5. Rearing experiments to study the lifecycle of *H. inopinata.*
6. Cross breeding and fecundity studies of *P. schmeltzi*

Following this detailed ecological study we will make recommendations on the need for conservation action and we will submit relevant information to the Fiji Government as necessary, with the intention of influencing local and international conservation policy as appropriate.

We also intend to provide local awareness and train locals and landowners on the significance of this project. We will directly engage local communities, by involving villagers in the fieldwork, collection of data and records keeping processes so that they have their first "hands-on" experience on conservation action. We believe that this will build awareness and appreciation of local biodiversity and endemism, which remains poorly understood.

Link to CEPF Investment Strategy

Information gathered during the 24 months duration of this project will greatly enhance our knowledge of these butterflies that we know so little about. It will also allow informed conservation management decision making and provide us with a model for action on other species. Thus, this project proposal directly addresses CEPF's strategic direction #3, to "build awareness and participation of local leaders and community members in the implementation of protection and recovery plans for threatened species".

Planned Long-term Impacts - 3+ years (as stated in the approved proposal):

By investigating the biology and behavioural ecology of *H. inopinata* and *P. schmeltzi*, the population sizes and ranges will be increased; the technical knowledge gained from the research will be a useful tool for studying the status of several other endangered and native butterflies in Fiji and the region.

Actual Progress Towards Long-term Impacts at Completion:

The project has enabled us to increase our technical knowledge on these two rare and endemic butterflies for Fiji. The tools used here will also enhance further efforts in working with other endangered butterflies within the region.

Planned Short-term Impacts - 1 to 3 years (as stated in the approved proposal):

Specific objectives of this project include:
1. Identification of specific larval hosts and flowering plants as nectar sources for adult *H. inopinata.*
2. Investigation of each stage of *H. inopinata* lifecycle in captivity and any behavioural apects.
3. Undertake a study to determine the natural population size and seasonality patterns for the two butterflies.
4. To determine the developmental threshold, larval bioassays, the cause of colour variation in the fifth instar larvae, and fecundity study of *P. schmeltzii.*
5. Create local awareness to schools surrounding these survey sites on the significance of these butterflies.
6. Development of conservation and management plans for the two butterfly species and IUCN Redlisting analysis.

Actual Progress Toward Short-term Impacts at Completion:

Field surveys: were carried out over a 12 month period to assess larval host plants, population estimates, stages through their lifecycle, seasonality patterns and behavioral study such as

feeding and flight patterns. I km transects were marked within the vicinity/ideal habitat and the transect was surveyed on a monthly basis for 12 months to assess population estimates and seasonality patterns. Mark, Release and Recapture Survey for the Fijian swallowtail butterfly was studied at two major sites in Sigatoka (Main Land) and Koro Island (Outer Island) during the dry and wet season for two months in the two-year period.

The rearing experiments for *Hypolimnas inopinata*: A rearing shed was constructed in Savura Forest Reserve in collaboration with the Department of Forestry, Fiji to cater for the breeding experiments. Photographs of each stage of the *Hypolimnas inopinata* were taken and an approximation of each stage was noted. However, the team was not able to enclose the complete lifecycle and repeat this over a few generations. We saw a high mortality rate at the larval (mainly towards the 4^{th} and 5^{th} larval instars) and pupal stages. The greatest challenge of having to breed them in the rearing shed was the supply of host plants and most probably trying to mimic their natural habitat. Since *Elatostema numerosum* is a very sensitive succulent shrub, it was not easy to transplant them into pot plants for the rearing experiment, as such, constant supply of feed for the caterpillars was a hindrance. We also had to resort to taking them back to the lab for rearing in smaller cages and have host plants placed in flasks of water instead. It also seemed that these butterflies are quite sensitive to their natural habitat and surroundings because the transfer of adults from Saliadrau, Namosi to Savura where the rearing shed was constructed for the breeding experiment did not show to perform to their best health and ability. The adults slowly became weak over the next couple of days and eventually died so we were unable to get them to mate in the field cages. Unlike the *Papilio schmeltzi,* transfer of adults from Sigatoka to Suva was not an issue as the adults performed exceptionally well in their field cages and reproduced successfully over six generations. Also *Papilio schmetzi* doesn't seem to be very sensitive to its surrounding environment as was the case with *Hypolimnas inopinata.*

Rearing and Experimental Setup for *Papilio schmeltzi:* The butterfly house for captive breeding of the swallowtail butterflies was built by end of September 2011. The breeding program resulted in rearing six generations of *P. schmeltzi* over a year and different stages of the butterfly were released in the butterfly house to keep the breeding program going from Vatukarasa, Sigatoka and Nacamaki, Koro Island. The survival rate of the butterflies was high during the cold and dry season.

The experimental work (Bioassay and Developmental threshold temperature) was started from May 2012. The butterflies were reared from eggs to adults in different temperatures (8°C, 18°C, 22°C, 25°C, 29°C, 33°C and 35°C) and the amounts of leaf material consumed were measured. Temperature, humidity, light intensity, larval length, larval weight, instar stage and total number of faecal pellets were measured. The mortality rate of *P. schmeltzi* butterflies were 100% in the 8°C and 35°C temperatures. However, the butterflies did well in the 22°C, 25°C and 29°C temperatures with the survival rate of 70%.

Awareness campaigns: These were conducted in the neighboring schools and villages to the field study sites in Namosi and Sigatoka and were very successfully carried out. The local name for *Hypolimnas inopinata* was suggested via a school competition and derived as "Bele-buso" meaning specific to its host plant and sensitive to its environment/habitat. The winning group of this competition was awarded $100.00FJD. Posters, pamphlets and t-shirts were prepared and distributed. Quizzes were also organized for the students and they were rewarded with stationery supplies as prizes.

Capacity building: PhD student, Visheshni Chandra continues with her PhD studies at USP, Fiji titled: "Behaviour and autecology of the endemic Fijian butterfly *Papilio schmeltzi*, with a comparative phylogenetic study of Pacific *Papilio* species". Research Assistant on this project, Apaitia Liga received training in butterfly curation and field sampling techniques from Dr. Eric Edwards (DOC, New Zealand) and Dr. Inoue Takashi (Japan). Apaitia Liga also trained local

assistants (Saliadrau village, Namosi) in field sampling techniques, behavioral studies and data collation.

Overall: Short-term impacts 1-5 have been successfully achieved one way or the other. Impact 6 is yet to be achieved as we are currently synthesizing all the data gathered and will in future work with IUCN Fiji office in conducting IUCN RedListing for these two species for Fiji. The data synthesized here will also be used for the final technical report which we hope will result in a manuscript for peer reviewed publication in the near future.

Further Work to be Completed: Cross breeding experiments of *P. schmeltzi* butterflies for two colour variations to determine if natural selection is acting on colour pattern in *P. schmeltzi* and the study of fecundity and the number of eggs actually deposited by females of different ages will be carried out in June as the weather is ideal to breed the butterflies in cage.

Please provide the following information where relevant:

Hectares Protected: N/A
Species Conserved: We will be working on the IUCN redlisting for these two species in the near future once we have synthesized all the data gathered for this research project.
Corridors Created: N/A

Describe the success or challenges of the project toward achieving its short-term and long-term impact objectives.

Were there any unexpected impacts (positive or negative)?
N/A

Project Components

Project Components*: Please report on results by project component. Reporting should reference specific products/deliverables from the approved project design and other relevant information.*

Component 1 Planned:
Field surveys completed.

Component 1 Actual at Completion:
Field surveys were conducted for 12 months and this has come to a successfully completion with relevant data gathered.

Component 2 Planned:
Rearing experiments in captivity completed.

Component 2 Actual at Completion:
Rearing experiments did not turn out as expected for Hypolimnas inopinata. Continued trials in future in the success of having to rear/breed *Hypolimnas inopinata* will be attempted. Breeding trial for *Papilio schmeltzi* were successfully conducted over six consecutive generations.

Component 3 Planned:
Awareness Programme completed

Component 3 Actual at Completion:
Awareness and outreach activities were conducted successfully.

Component 4 Planned:
Capacity building

Component 4 Actual at Completion:

PhD student, Visheshni Chandra continues with her PhD studies at USP, Fiji titled: "Behaviour and autecology of the endemic Fijian butterfly *Papilio schmeltzi*, with a comparative phylogenetic study of Pacific *Papilio* species". Research Assistant on this project, Apaitia Liga received training in butterfly curation and field sampling techniques from Dr. Eric Edwards (DOC, New Zealand) and Dr. Inoue Takashi (Japan). Apaitia Liga also trained local assistants (Saliadrau village, Namosi) in field sampling techniques, behavioral studies and data collation.

Component 5 Planned:
Development of management plans for *H.inopinata* and *P. schmeltzi*, IUCN Redlisting analysis and final technical report.

Component 5 Actual at Completion:

IUCN Redlisting will be attempted once all available data has been synthesized and is ready for analysis. This work will be done with the technical advice from Dr. Edwards and the IUCN officer in Fiji on the processes involved with Redlisting. A technical report will also be written once data have been synthesized and published as a manuscript in a peer reviewed journal in the near future.

Were any components unrealized? If so, how has this affected the overall impact of the project?
It was decided during the duration of this project that the development of a management plan specifically for these two species be considered at a later stage. In terms of the conservation efforts for these two species, we will go ahead with analyzing the data gathered for IUCN Redlisting.

Please describe and submit (electronically if possible) any tools, products, or methodologies that resulted from this project or contributed to the results.

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.

The awareness component of this project was our greatest strength. It was good to hear of the feedback from the resource owners and for them to understand the uniqueness of the natural resources they have. The presentations to the schools and village were successfully carried out. The responses received from these communities were evidences that the research carried out over the last years were well understood and received and thus conservation of these natural resources have been raised to a higher level at the community level.

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

The reporting phases set out by CEPF (i.e. quarterly and six monthly reports) ensured that projects outputs and deliverables were met at each phase and that projects kept up to the expected outputs and also financially. This made the work efficient and easier to follow.

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

Most of the project outputs were met towards the end of the project as we had the same team members throughout the entire duration of this project to execute the work i.e. from the project design to implementation and final reporting. Each member on the team was aware of their responsibilities from the start and timelines were set on achieving these outputs. The team also kept to the logical framework as a guide and worked on a time schedule to ensure that the deliverables were achieved.

Other lessons learned relevant to conservation community:

Awareness programmes to the resource owners should be an essential tool for any project relating to conservation so that they can realize the value of these resources around them and thus take greater responsibility in the efforts towards their proper conservation and management.

Additional Funding

Provide details of any additional funding that supported this project and any funding secured for the project, organization, or the region, as a result of the CEPF investment in this project.

Donor	Type of Funding*	Amount	Notes
MacArthur Foundation Conservation Trust Fund		$25,000	

Additional funding should be reported using the following categories:

- ***A*** *Project co-financing (Other donors or your organization contribute to the direct costs of this 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 funded 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.

The Conservation Status for the Insect Fauna of Fiji and Polynesia- Micronesia is poorly understood, primarily due to the lack of data available. This project will form a platform or 'good practice' blueprint for future regional conservations efforts in our University's regional member countries who are also part of the Polynesia- Micronesia region for CEPF (Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Tokelau, Tonga and Tuvalu), thus capitalizing on USP's position as the regional university for the South Pacific.

Summarize any unplanned sustainability or replicability achieved.
N/A

Safeguard Policy Assessment

Provide a summary of the implementation of any required action toward the environmental and social safeguard policies within the project.
N/A

Additional Comments/Recommendations

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:

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*****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.	N/A			
2. How many hectares of new and/or expanded protected areas did your project help establish through a legal declaration or community agreement?	N/A			
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.	No			
4. Did your project effectively introduce or strengthen biodiversity conservation in management practices outside protected areas? If so, please indicate how many hectares.	Yes			
5. If your project promotes the sustainable use of natural resources, how many local communities accrued tangible socioeconomic benefits? Please complete Table 1below.	N/A			

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

Table 1. Socioeconomic Benefits to Target Communities

Please complete this table if your project provided concrete socioeconomic benefits to local communities. List the name of each community in column one. In the subsequent columns under Community Characteristics and Nature of Socioeconomic Benefit, place an X in all relevant boxes. In the bottom row, provide the totals of the Xs for each column.

Name of Community	Community Characteristics								Nature of Socioeconomic Benefit												
									Increased Income due to:												
	Small landowners	Subsistence economy	Indigenous/ ethnic peoples	Pastoralists/nomadic peoples	Recent migrants	Urban communities	Communities falling below the poverty rate	Other	Adoption of sustainable natural resources management practices	Ecotourism revenues	Park management activities	Payment for environmental services	Increased food security due to the adoption of sustainable fishing, hunting, or agricultural practices	More secure access to water resources	Improved tenure in land or other natural resource due to titling, reduction of colonization, etc.	Reduced risk of natural disasters (fires, landslides, flooding, etc)	More secure sources of energy	Increased access to public services, such as education, health, or credit	Improved use of traditional knowledge for environmental management	More participatory decision-making due to strengthened civil society and governance.	Other
Total																					

If you marked "Other", please provide detail on the nature of the Community Characteristic and Socioeconomic Benefit: