Final Project Evaluation Report

We ask all grant recipients to complete a project evaluation that helps us to gauge the success of your project. This must be sent in **MS Word and not PDF format**. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Complete the form in English and be as concise as you can. Note that the information may be edited before posting on our website.

Please email this report to jane@rufford.org.

Your Details	
Full Name	Ricardo Koroiva
Project Title	Diversity and Conservation of Dragonflies and Damselflies in the Pantanal Plateau of the Mato Grosso do Sul
Application ID	19689-1
Grant Amount	£4995
Email Address	ricardo.koroiva@gmail.com
Date of this Report	20 Jun 2017

1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Organisation and digitisation of the Odonata Collection/ Website.				We took pictures of all species collected and added these images in the Bold System. Also, these images will be available on our website when our checklist is published in the scientific journal. In addition to the website, following the suggestion of the NGO "Neotropica do Brasil", we created a Facebook page aimed at publicising the project. The website is available online in Portuguese and English at https://www.environmentalsentinels.com/
Present our results to the owners of tourist attractions and divulge to visitors about local Odonata species and the importance of environmental conservation.				The partnership with the NGO allowed us to divulge it to the tourist attraction owners association of Bonito, as well as to tourists and residents. From September 2017 on dissemination of results will be done through presentations and talks about projects already developed by the NGO.
Library of DNA barcode sequences for Odonata species from the Pantanal Plateau				We have sequenced 74 species found in the Bodoquena Plateau. This number represents almost 10% of all species registered in Brazil. A manuscript with part of this data is "minor review" at *Plos ONE* and another one will be submitted by the end of August 2017.
Collection of specimens from 60 sites located in the Pantanal Plateau and an update of				We collected in 44 sites. Some farmers that initially had agreed with our sampling changed their mind and did not allow us to collect. The updated checklist was performed and submitted to *Biota*

the checklist of Odonata;				*Neotropica* and will be posted on our website as soon as it is accepted.
Identification of sites and habitat characterization of endangered Odonata species (IUCN) of the Pantanal Plateau				We did not find any other specimens of *Elga newtonsantosi* and *Micrathyria pseudhypodidyma*. However, we consider this result as a warning for the disappearance of these species.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.

Initially, we believed that we would be able to enter all the farms that, informally, had given us permission, but that did not happen. Thus, our samplings were restricted to 44 sites (73% of initial planning), which compromised sampling in some areas.

Another problem was with finding the two species considered threatened by the IUCN: *Elga newtonsantosi* and *Micrathyria pseudhypodidyma*. Although we performed several focal searches and samplings in regions close to where individuals were collected before, we found no individuals for both species. However, this negative result demonstrates the rarity of these species in the region.

3. Briefly describe the three most important outcomes of your project.

a) In total, we sampled 44 sites, where 782 individuals from 46 species were collected. *Phyllogomphoides suspectus* Belle, 1994 (Odonata: Gomphidae) was registered for the first time in the state, expanding its record about 800 km south. Considering the specimens deposited in the Reference Collection at the Federal University of Mato Grosso do Sul (CEUFMS) that had not been recorded before, we provided an additional 42 new species records for the region. To date, 111 odonatan species are registered for Serra da Bodoquena, which makes this area one of the regions with the greatest dragonfly diversity in Brazil (for comparison purposes only, the entire UK has 57 registered species).

b) We sequenced 74 species of dragonflies and built one of the first local DNA Barcode database for insects in Brazil. Part of this database is already available in the BOLD system and should be available through GenBank as of August 2017. Because of this work, we are conducting a test to use

this technique for dragonfly biomonitoring. This work should be completed by August 2017.

c) The information we shared about the presence of endangered species and the high diversity of dragonfly species in the Serra da Bodoquena to the local population, as well as to tourist attraction owners and decision makers, has already caused some effects in the local community. In association with NGOs and other conservation groups, information about the presence of endangered species will be considered in the new conservation projects. In addition, a hotel farm that authorised our entrance showed interest in providing better disclosure of results with its guests. Finally, the communication about the importance of conserving the streams for dozens of farmers allowed direct contact with the owners, the main agents for conservation of these areas.

4. Briefly describe the involvement of local communities and how they have benefitted from the project.

We made contact with several owners and farm managers to carry out the project. When we visited most of them were available to listen about the dragonfly information and the need for stream preservation. Due to this contact and the interest to help in the research, some sites were added to the sampling because of the residents' own indication.

Also, we began this year talking with owners of tourist attractions, tourists and local community. The presentation of the posters, website, and Facebook page began recently, but has already had considerable repercussions. As described above, some tourist attractions have already shown interest in disseminating the results regarding the diversity and presence of certain species in the region. The NGO "Neotropica do Brasil" has helped us to disseminate the results. Meetings with government representatives and ATRATUR are some ways in which our research results have reached decision makers. Events in the second half of 2017 will be important for direct dissemination to the community and are already in the plans of our research group.

5. Are there any plans to continue this work?

Yes, this project is part of my PhD that has a deadline of November 2017. With the development of the DNA Barcode database in this project, we are conducting a test to verify its use in species biomonitoring programs. Some dragonfly species are sensitive to environmental conditions and can be used like biological indicators. Due

to the limited number of taxonomist experts for the group, the use of molecular tools may aid in the identification of specimens.

6. How do you plan to share the results of your work with others?

We have already started to disseminate our results through publications of scientific article in specialised journals. We have submitted two manuscripts: (1) an inventory of species for the Serra da Bodoquena region, which is "Minor review" at Biota Neotropica; and (2) an article about our DNA Barcode database, which is "Minor review" at Plos ONE. We have also been sharing our results with farmers of Bonito through talks and posters. We also expect to publish at least one more scientific article in peer-reviewed journals and write popular science articles for Revista Ciência Pantanal. Additionally, as stated above, we will participate in the dissemination of results with the NGO. Finally, the information generated in this project will complement my PhD thesis.

7. Timescale: Over what period was the grant used? How does this compare to the anticipated or actual length of the project?

Data collection started in February/March 2016 when I submitted my proposal to Rufford Foundation. However all activities regarding fieldwork were intensified starting in August 2016 after receiving the grant, which was essential for entomological nets and field assistance. During September/October 2016, we carried out almost all the samplings because of the financial resources for travel and food. One positive point was that we received free accommodation through the university. In the last 8 months, the money has been used to purchase molecular lab products, with the main expense being Taq Polymerase and extraction kits. Thus, the resources provided by Rufford Foundation were fundamental for the development of this project. Without this financial support, the number of sites, specimens, and species would not have been so high.

8. Budget: Provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Field transportation	265	480	-215	Some vehicle problems during collection and the change of some sampling sites had led to increased costs.
Lodging + food	1500	800	+700	We got free accommodations with the help of the university.
Entomological nets	120	120	0	Fully spent.
Taq polymerase	180	319.52	-139.52	We changed the Taq polymerase supplier to get better results. I also underestimated the amount needed.
Molecular plastics	200	200	0	Fully spent.
DNeasy Blood & Tissue extraction kits	600	1026.94	-426.94	I bought kits with a capacity for a higher amount of DNA extractions.
DNA Sanger molecular sequencing	2000	2000	0	Did not change, because I bought a letter of credit for sequencing when I received the money.
Website register	50	50	0	Fully spent.
Printed Poster	80	0	+80	Printed at the university press.
TOTAL	**4995**	**4996.46**	**-1.46**	

9. Looking ahead, what do you feel are the important next steps?

First, the most important thing is to divulge the results. Following the suggestion of the journalist responsible for scientific dissemination at our university, we will wait for the publication of our results in scientific journals to begin this process. In addition to the university's communication vehicles, such as the website and magazine, we have plans to have an interview with a website of scientific divulgation, write an article for Revista Ciência Pantanal and disseminate ours results to the community with the help of the NGO. The next step has already been started by testing our DNA Barcode database for biomonitoring of odonatan species. If we succeed with this

technique, we intend to present to the feasibility of this technique to government agencies. Considering that almost ½ of the species present in the state are already sequenced, another next step could be sequencing the missing species, making the state of Mato Grosso do Sul into the first Brazilian state with complete DNA Barcode information for a taxonomic group.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Yes, the RF logo and RSG reference were cited in all my activities. I used RF logo on the poster presented to the tourist attractions (see the pictures), on the website, and on the Facebook page. The RF logo will also be in all material created with the NGO in the second semester. RSG reference is cited in the two papers that we already submitted and will be cited in the manuscript that tests the use for biomonitoring odonatan species. RSG reference will also be cited in every interview that will be conducted regarding the data generated in this project and will be in the "Acknowledgments" section of my PhD thesis.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

12. Any other comments?

I would like to thank the Rufford Foundation for research funding, because without this financial aid the whole project would not have been viable. Although the large-scale dissemination has not yet began, the first impression is that our results, especially about the IUCN endangered species, will have a strong impact on the conservation discussion in the municipality of Bonito, which is considered a model-city for Ecotourism in Brazil. The development of the DNA Barcode database should also have a positive effect on my university and for scientific production in the state. On behalf of all the collaborators and dragonflies from Mato Grosso do Sul state, I would like to say thank you very much!

The project's logo

Advertising poster

Lagoa Misteriosa

Hotel Cabanas

Balneario Rio da Prata

Estancia Mimosa

Pousada Olho d´água

Some tourist attraction places with our advertising poster.
Lagoa Misteriosa- http://www.vidadeturista.com/atracoes/lagoa-misteriosa-bonito-ms.html
Hotel Cabanas - https://www.hotelcabanas.com.br/

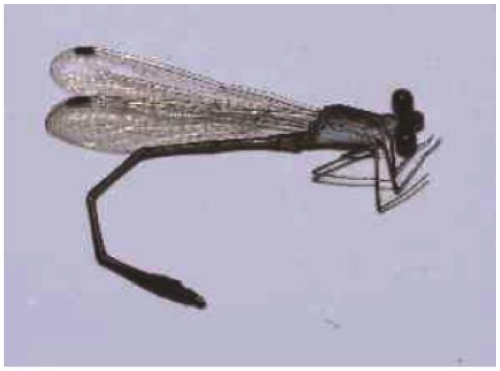
Balneário Rio da Prata recanto ecológico - http://riodaprata.com.br/
Estância Mimosa - http://www.estanciamimosa.eco.br/
Pousada Olho d´água - http://www.pousadaolhodagua.com.br/

Photo of the meeting with myself, Professor Fabio de Oliveira Roque and Dr. Nicholas Kaminski, executive superintendent of the NGO "Neotropica do Brasil". Dr. Nicholas is holding our publicity poster.

Myself during the collection process.

Material sorting

Elga newtonsantosi



Lestes biupilatus

Erythrodiplax basalis

Oxyagrion terminale

Ischnura fluviatilis

Perithemis mooma

Photographs of odonata specimens

Odonates from Bodoquena Plateau: checklist and information about endangered species

Abstract

Here, we provide an updated checklist of the odonates from Bodoquena Plateau, Mato Grosso do Sul state, Brazil. We registered 111 species to the region. The families with the highest number of species were Libellulidae (45.05%), Coenagrionidae (38.74%) and Gomphidae (10.81%). 35 species are registered in the IUCN Red List species and two are in Threatened categories. In addition, *Phyllogomphoides suspectus* Belle, 1994 (Odonata: Gomphidae) was registered for the first time in the state, expanding its record in about 800 km towards the south.

Keywords: Dragonfly; Damselfly; inventory; Cerrado, Brazil

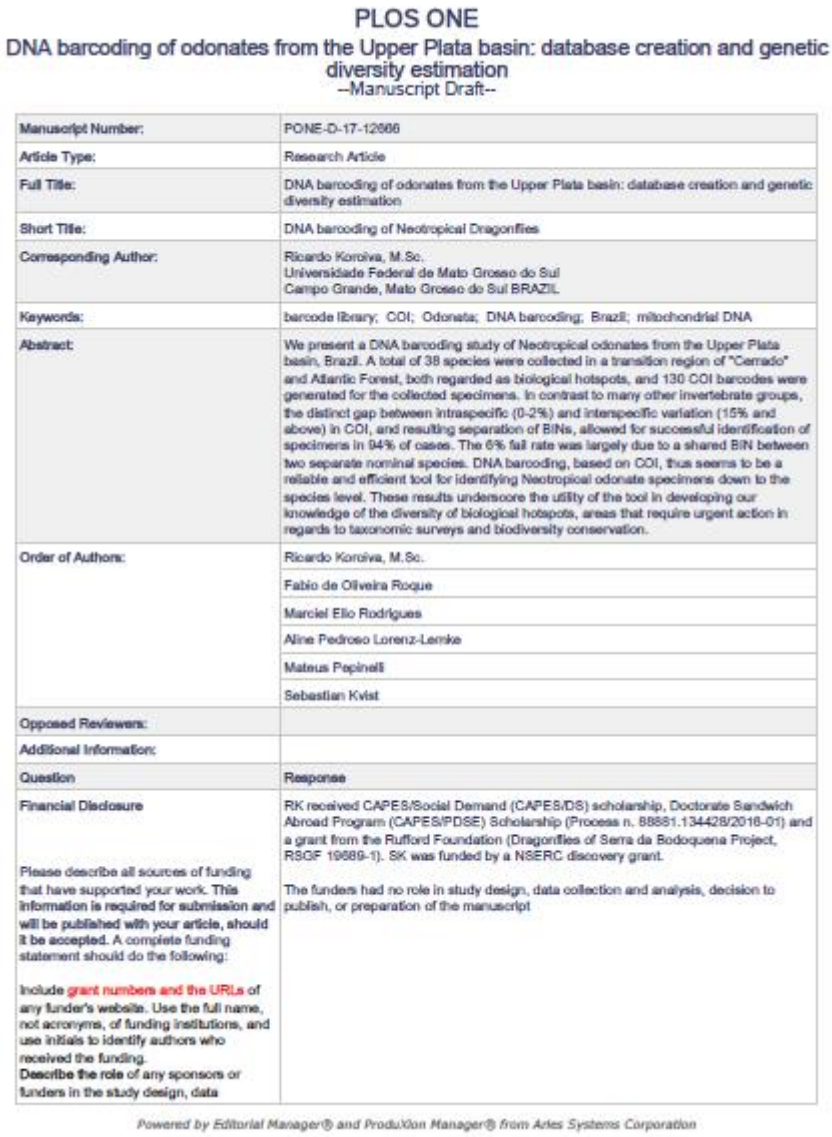
Libélulas da Serra da Bodoquena: lista de espécies e informações sobre espécies ameaçadas

Resumo

Nós apresentamos um inventário atualizado das espécies de libélulas presentes na Serra da Bodoquena, Estado de Mato Grosso do Sul, Brasil. Nós registramos 111 espécies para a região. As famílias com o maior número de espécies foram Libellulidae (45.05%), Coenagrionidae (38.74%) e Gomphidae (10.81%). 35 espécies são registradas na Lista Vermelha de espécies da IUCN e duas estão em categorias de ameaçadas. Também, *Phyllogomphoides suspectus* Belle, 1994 (Odonata: Gomphidae) foi registrado pela primeira vez no estado, expandindo seu registro em cerca de 800 km em direção sul.

Palavras-chave: Libélulas; donzelinhas; Inventário; Cerrado; Brasil

Manuscript to Biota Neotropica - First page of the submission



PLOS ONE

DNA barcoding of odonates from the Upper Plata basin: database creation and genetic diversity estimation
--Manuscript Draft--

Manuscript Number:	PONE-D-17-12666
Article Type:	Research Article
Full Title:	DNA barcoding of odonates from the Upper Plata basin: database creation and genetic diversity estimation
Short Title:	DNA barcoding of Neotropical Dragonflies
Corresponding Author:	Ricardo Korroiva, M.Sc. Universidade Federal de Mato Grosso do Sul Campo Grande, Mato Grosso do Sul BRAZIL
Keywords:	barcode library; COI; Odonata; DNA barcoding; Brazil; mitochondrial DNA
Abstract:	We present a DNA barcoding study of Neotropical odonates from the Upper Plata basin, Brazil. A total of 38 species were collected in a transition region of "Cerrado" and Atlantic Forest, both regarded as biological hotspots, and 130 COI barcodes were generated for the collected specimens. In contrast to many other invertebrate groups, the distinct gap between intraspecific (0-2%) and interspecific variation (15% and above) in COI, and resulting separation of BINs, allowed for successful identification of specimens in 94% of cases. The 6% fail rate was largely due to a shared BIN between two separate nominal species. DNA barcoding, based on COI, thus seems to be a reliable and efficient tool for identifying Neotropical odonate specimens down to the species level. These results underscore the utility of the tool in developing our knowledge of the diversity of biological hotspots, areas that require urgent action in regards to taxonomic surveys and biodiversity conservation.
Order of Authors:	Ricardo Korroiva, M.Sc.
	Fabio de Oliveira Roque
	Marciel Elio Rodrigues
	Aline Pedroso Lorenz-Lemke
	Mateus Pepinelli
	Sebastian Kvist
Opposed Reviewers:	
Additional Information:	
Question	Response
Financial Disclosure Please describe all sources of funding that have supported your work. This information is required for submission and will be published with your article, should it be accepted. A complete funding statement should do the following: Include grant numbers and the URLs of any funder's website. Use the full name, not acronyms, of funding institutions, and use initials to identify authors who received the funding. Describe the role of any sponsors or funders in the study design, data	RK received CAPES/Social Demand (CAPES/DS) scholarship, Doctorate Sandwich Abroad Program (CAPES/PDSE) Scholarship (Process n. 88881.134428/2016-01) and a grant from the Rufford Foundation (Dragonflies of Serra da Bodoquena Project, RSGF 19689-1). SK was funded by a NSERC discovery grant. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript

Powered by Editorial Manager® and ProduXion Manager® from Aries Systems Corporation

Manuscript to Plos ONE - First page of the submission