

## The Rufford Small Grants Foundation

### Final Report

Congratulations on the completion of your project that was supported by The Rufford Small Grants Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. 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. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to [jane@rufford.org](mailto:jane@rufford.org).

Thank you for your help.

Josh Cole

Grants Director

#### Grant Recipient Details

<b>Your name</b>	Albert Chakona
<b>Project title</b>	Comparative phylogeography of <i>Pseudobarbus</i> , <i>Barbus</i> , <i>Sandelia</i> and <i>Galaxias</i> species in the Breede and associated river systems, South Africa: implications for conservation of a threatened fauna
<b>RSG reference</b>	59.04.08
<b>Reporting period</b>	November 2008 to October 2010
<b>Amount of grant</b>	£5980
<b>Your email address</b>	<a href="mailto:achakona@yahoo.com">achakona@yahoo.com</a>
<b>Date of this report</b>	25 October 2010

**1. Please 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
To conduct comprehensive sampling across the Breede and associated river systems to collect ecological attributes and fish tissue samples for genetic analysis			Fully achieved	A comprehensive survey across the study area has been successfully completed (405 sites sampled in total). Specimens have been deposited in the National Fish Collection at the South African Institute for Aquatic Biodiversity for future reference and tissue samples have been deposited in the Biomaterial Bank (also at SAIAB). Locality information will be made available via the SAIAB data base.
To get a better understanding of species ecology			Fully achieved	One manuscript has been accepted for publication in the <i>Journal of Fish Biology</i> that describes the discovery of air breathing in one of the species. This has major implications for their conservation and management. Another manuscript has been completed and will be submitted for publication in December (target: international peer reviewed journal).
To identify unique genetic lineages, describe new species and map their distribution		Partially achieved		The present study has identified four new unique lineages of <i>Galaxias</i> and one new unique lineage of <i>Pseudobarbus</i> . Distribution ranges of all unique lineages (including others identified by previous studies) have been successfully mapped. Taxonomic revision of the South African galaxiid fishes including the ones from the present study is currently underway with the help of Bob McDowall from New Zealand. Description of the newly discovered <i>Pseudobarbus</i> species will be done next year by Chakona & Swartz.
To assess which evolutionary		Partially		A manuscript on the phylogeography of one of the recently discovered

<p>processes have been responsible for the observed genetic diversity</p>		<p>achieved</p>		<p>widely distributed <i>Galaxias</i> species has been completed. It will be submitted for publication in January 2011 (target: international peer reviewed journal). Data analysis for comparative phylogeography of <i>Pseudobarbus</i>, <i>Sandelia</i> and <i>Galaxias</i> is in progress. The final manuscript is expected to be completed by the end of December 2010.</p>
<p>To identify priority areas for fish conservation (biodiversity hotspots) and make recommendations to conservation authorities on how to best manage genetic diversity</p>			<p>Fully achieved</p>	<p>Findings on fish distributions and unique lineages have been used to help define national freshwater fish sanctuaries (led by Ernst Swartz, SAIAB) for the Breede and associated systems as part of the National Freshwater Ecosystems Priority Areas (NFEPA) initiative. These sanctuaries will be used to define priority freshwater areas for conservation in South Africa (led by the CSIR and SANBI in South Africa in partnership with SAIAB). The NFEPA project will be completed in 2011 and it is expected to become a critical tool in future freshwater conservation planning in the country. Information from the present study has also led to a more informed permit evaluation process within CapeNature (which is the conservation authority in the study area).</p>

**2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).**

We did not experience any difficulties in implementing the project. Describing the new species has been dependant on other collaborations and was probably not a realistic goal in the first place. We have, however, achieved more than we expected with the conservation planning and prioritisation due to the fortunate timing of other initiatives that we could link to.

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

- The extensive field surveys allowed us to discover several unique genetic lineages of *Galaxias* and one new species of *Pseudobarbus*. The newly discovered galaxiid species are in the process of being described (Swartz et al. in prep). Description of newly discovered *Pseudobarbus* species will commence next year. The updated checklist of obligate freshwater fishes of the Breede and adjacent river systems now contains at least 15 species (4 *Pseudobarbus*; 2 *Sandelia*; 8 *Galaxias* and 1 large tetraploid Barb *Barbus andrewi*) compared to only four recognised species before our study. We have successfully mapped the distributions of all the unique lineages and identified key threats to their future survival. This information has been used to identify priority areas for conservation and to define national freshwater fish sanctuaries. We have also been able to help motivate that one of CapeNature's staff be dedicated to freshwater fish species conservation and we now work closely with this person to develop species action plans in the study area.
- This is the first study that has conducted detailed assessment of the ecological attributes and habitat requirements for small native fishes of the Cape Floristic Region of South Africa. It is also the first study to document emersion tolerance capabilities in an African galaxiid fish. This work has been accepted for publication in the *Journal of Fish Biology* (Chakona et al., in press). We also documented, for the first time, that the fishes of this region exhibit non-random distribution patterns. This has important implications for understanding the species' evolutionary history and conservation management (one manuscript in preparation). We discovered that some species are more vulnerable than others due to their specific habitat requirements. A manuscript on the habitat features associated with the occurrence of indigenous fishes within the study area has been completed and will be submitted to an international peer reviewed journal. We have been able, based on knowledge of species habitat requirements and genetic relationships, to reconstruct historical distribution patterns of the fishes across mainstream river sections where native fishes have been extirpated by introduced invasive piscivores.
- This study forms part of Albert Chakona's PhD research supervised by Dr Ernst Swartz and Dr Gavin Gouws. The thesis will be submitted in February (2011). At least four publications in peer reviewed journals will be produced from this study.

**4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).**

The present study engaged with land owners, local communities and conservation authorities to find long term solutions for protecting and ensuring recovery of the remaining populations of indigenous fishes of this region. The study has led to increased awareness (among farming communities, land owners and conservation authorities) of the region's exceptional diversity as well as the several key factors that threaten the future survival of the unique fish species of the region. Through our interactions, there is willingness from wine farmers to adopt good farming practices in order to protect and ensure recovery of critical habitats. We are planning to work through the Wine and Biodiversity Initiative to formalise this opportunity. Ernst Swartz has also held several stakeholder workshops aimed at mapping critical biodiversity hotspots (NFEPA project) and areas where introduction of invasive alien fishes should not be allowed (NEM:BA project). We are also providing information for conservation planning and prioritisation to the Breede River Catchment Management Authority, CapeNature's Scientific Services, SANParks and the Agulhas Biodiversity Initiative. This information has already led to a more informed permit evaluation process within CapeNature. We also participate in CapeNature's Freshwater Forum to inform them about threatened fishes and conservation issues of the Breede and associated river systems.

#### **5. Are there any plans to continue this work?**

Yes. The next phase of this study is to identify necessary interventions to ensure recovery and possible down-listing of many of the severely threatened fish species identified during the present study. We have successfully established linkages between the South African Institute for Aquatic Biodiversity (SAIAB), CapeNature, Rhodes University, University of Cape Town and the community within the Tradouw River catchment to initiate a project aimed at finding the necessary interventions to prevent extinction of the Barrydale redbfin, a recently discovered and Critically Endangered *Pseudobarbus* species restricted to the Tradouw catchment within the Breede River system. This project will act as a species conservation template for CapeNature to implement similar interventions on other threatened fishes in the Cape Floristic Region. This project will be implemented in March next year depending on availability of funding.

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

Findings from this study have been and will continue to be disseminated via popular articles, publications in peer reviewed journals, pamphlets, posting on the SAIAB website, international and local conferences and various workshops and seminars organised through SAIAB, CapeNature and Rhodes University. We have also send informal reports to land owners and other interested stakeholders.

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

This was a 3-year project (January 2008 to December 2010). RSG funding was used over a 1-year period (February 2009 to February 2010). Additional funding for the whole study was mobilised from other sources (National Research Foundation, South Africa; International Foundation for Science and WWF Prince Bernhard Scholarship).

**8. Budget: Please 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.**

Item	Budgeted Amount	Actual Amount	Difference	Comments
Field surveys	2800	2800	0	Used as planned
Genetic analysis	3000	3080	-80	Some samples had to be re-sequenced due to poor quality results on first run.
Expendable supplies	180	120	+60	Saved some money on stationary
<b>TOTAL</b>	5980	<b>6000</b>	-20	

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

All of the newly discovered unique lineages of native fishes in the CFR are at an elevated risk of extinction, due to small known population sizes, restricted distribution ranges, increasing human demand for water and land as well as range expansions of invasive alien species. The next step is to identify appropriate measures (e.g. restoration or protection) to ensure recovery and stabilisation of populations. There is also need for reviewing the conservation statuses of many of the newly discovered species. These are the objectives of the next phase of the study.

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

Yes, the logo was used in presentations at workshops and conferences. The RSGF has been and will be acknowledged in all popular articles and peer-reviewed publications from this study, one of which has already been accepted for publication.

**11. Any other comments?**



The paucity of information has been a major impediment to implementing effective conservation strategies in the Cape Floristic Region. Through this grant, we have gained a deeper understanding of the state of biodiversity in the CFR (a globally renowned endemic species hotspot). The study has shown that the freshwater fish are a much more important component than previously thought, and the study has spawned new ideas for future projects that will help prevent extinction of the region's exceptional biodiversity. Your support has undoubtedly made an immense contribution towards capacity building at SAIAB amongst the team members and towards conservation of biodiversity in the CFR.