

Darwin Fellowship - Final Report

(Please check guidance for submission deadlines, max 6 pages.)

Darwin Project Ref No.	EIDPS020
Darwin Project Title	Systematics, distribution and conservation status of <i>Cardenanthus</i> and related genera in Bolivia.
Name of Darwin Fellow	Hibert Huaylla
UK Organisation	RBG, Kew
Your Organisation	RBG, Kew
Your role in your Organisation	Team Leader, Lilioids & Alismatids, HLAA
Start/end date of Fellowship	30 Sep 2009 – 1 Feb 2010
Location	RBG, Kew
Darwin Fellowship funding (£)	£7350
Type of work (e.g. research, training, other, please specify)	Research & training
Main contact in UK Organisation	Paul Wilkin
Author(s), date	Paul Wilkin, 8 Feb 2010 Hibert Huaylla 10 March 2010 John Wood 10 March 2010 Felix Forest 15 March 2010

1. Background

- Briefly describe your involvement in the Darwin project before the start of your fellowship.
- Describe aim and objectives of the Fellowship, and programme of work.
- Briefly describe the roles of the UK and Fellow's institutions.
- If you have undertaken a formal course of training, please provide a brief explanation of the course and a link to the course website if available.

Hibert Huaylla belonged to the team of botanists in the Darwin Initiative Project 161/11/010 "Plant Endemism in the Central Andean Valleys of Bolivia". During his work for that project Hibert added to his expertise in ferns by developing an interest and knowledge of bulbous monocots especially the families Amaryllidaceae and Iridaceae, both of which are diverse and interesting in Andean Bolivia with high levels of endemism and potential risks through over-collecting because of their horticultural value. Hibert participated in all aspects of the original project including field work, guided research in the UK and production of the Field Guide to the Plants of the Bolivian valleys. Subsequent to the project he has written several papers related to the families in which he is interested and co-authored a field guide to the plants of the Torotoro National Park, one of the key areas identified by the project for conservation.

Cardenanthus belongs to the tribe Tigridieae of the Iris family (Iridaceae), a group of ill-defined genera in urgent need of further study to establish their status and relationships. It is a small genus with about ten species occurring at high altitude in the Andes. Most are restricted to a single area and about six are apparently endemic to Bolivia. Patterns of variation and distribution within and between species are poorly understood, as is the relationship with the closely related or possibly congeneric *Mastigostyla*. Iridaceae are often neglected because most species have a short flowering season (so are rarely collected), make poor herbarium specimens

(so cannot easily be studied) and can only be distinguished by characters that are often lost in the preservation process. There is no modern study of the Andean Tigridaeae, but the great majority of species occurring in Bolivia are believed to be narrowly endemic.

Approximately 90% of the time available during the four months Hibert spent at RBG, Kew was used initially for training in and subsequently undertaking research using molecular methods. The following were all used: DNA extraction, polymerase chain reaction (PCR) and cycle sequencing. Subsequently Hibert learnt sequence editing, assembly, matrix construction and parsimony analysis using the lab suite of Macintosh computers. During the fellowship Hibert stated that he believed he was the first plant systematist from Bolivia to learn these important comparative techniques. Time taken to learn them and some problems with obtaining data from some regions (e.g. ITS, a problem with primers, which was out of Hibert's control) consumed which would otherwise have been allocated to morphological studies.

A limited time was spent on morphological study using Kew's own and loaned herbarium specimens (10%). This was primarily used to compile a morphological matrix which was analysed both alone and in combination with the molecular data. Thus progress towards species-level revision was limited. The latter research can and will be undertaken post-fellowship in Bolivia. It needs to be supported by more material and thus forms part of an ongoing project.

RBG Kew's role was to provide training, support and coaching for Hibert. This came principally from Paul Wilkin in the form of general plant systematics and conservation status assessment expertise, and Felix Forest, who gave specialist molecular systematics support. However, other staff in the molecular systematics lab also made a substantial input (see below)

John Wood (Department of Plant Sciences, University of Oxford and honorary research associate at Kew) provided practical support related to logistics such as travel and visas and liaison with Bolivian authorities. He was also responsible for help in organising pre- and post-fellowship field work in Bolivia related to *Cardenanthus* in collaboration with Hibert.

Hibert's Bolivian base is the Bolivian National Herbarium, which supported his fellowship and loaned specimens for the current study. It will also be the focal point through which the results of Hibert's work will be publicised. At the time of writing no firm programme has been agreed.

2. Achievements

- Summarise the work undertaken during your Fellowship. What were the main activities undertaken. Highlight any work undertaken but not originally planned and explain why this happened. Highlight any problems encountered and how they were overcome.
- What have been the main achievements of your fellowship? Key documents should be annexed to this report.

The primary achievement of Hibert's fellowship was the compilation and parsimony analysis of a 3 plastid gene matrix for 45 taxa. This was supplemented and combined with research using morphological character data. Hibert worked with Lola Lledo (a hispanophone and laboratory manager at RBG Kew) in the lab to circumvent linguistic issues and also received help and support from other molecular systematics staff. Mehdi Zarrei in particular helped Hibert with learning analysis techniques. This was appropriate because Mehdi also specialises in Lilioid monocots. Problems occurred with sequencing the nuclear region ITS. Despite numerous attempts to change the parameters and PCR mix, success was not achieved. This coupled with the time expended in training reduced that which could be allocated to morphological studies of specimens. Thus Hibert was exposed to both the excellent learning culture and supportive environment of the molecular systematics lab and to international research and researchers working in the lab.

Two manuscripts will be written post-fellowship by email: A re-evaluation of the status of *Cardenanthus* and related Andean genera in Tigridaeae based on DNA sequence data and A

taxonomic revision of *Cardenanthus* in Bolivia based on morphology. The latter may still need significant further research however. It will include conservation status assessments for all species.

3. Outcomes, lessons and Impact

- Do you feel that the work undertaken during your Fellowship has improved skills that are relevant and important for your work in your organisation? How are you planning to apply those skills in future work?
- What arrangements have been made for your future involvement, what more could be done, what discussions have taken place with your original employer to ensure that your new skills are utilised?
- Has the Fellowship helped to improve your capacity to solve practical problems related to the sustainable use and/or conservation of biodiversity in your country?
- Have you had the opportunity to make contacts with other UK biodiversity institutions, intergovernmental organisations, NGOs or the private sector during your fellowship? Will these contacts be useful for your future work, and how are you planning to maintain them?
- Any other issue emerging from your experience as Darwin Fellow that you would like to raise, or suggestions for improvements to the Darwin Initiative Fellowship scheme.

Hibert believes that the fellowship has enhanced his skills through molecular systematic techniques. This will strengthen the capacity of the La Paz herbarium to conduct systematic research in the future in various plants. Hibert can share his experience and knowledge with colleagues in La Paz and elsewhere in Bolivia.

In the UK Hibert has developed contacts with a range of staff working in both laboratory research and conservation. He plans to continue with molecular systematic studies, possibly in a regional specialist lab in the Universidad de Estadual de Feira de Santana-Bahia, Brazil run by Dr Cassio van den Berg, an ex- RBG Kew PhD student and research fellow. He will link this research to studies of morphology, species delimitation and conservation status. At the time of writing contact has been made with Dr van den Berg and Hibert plans to apply for a Brazilian government scholarship in May to continue with his research in Iridaceae. There is also a possibility that he could be involved in studies for the sustainable use of ornamental plants – Bulbous plants such as Iridaceae have obvious potential – and a project for exactly this purpose is currently under discussion between Kew and Bolivian institutions.

An illustrated paper for distribution to government organisations (e.g. SERNAP), Conservation Organisations working in Bolivia (Conservation International, Fundación Puma, Nature Serve etc) to promote conservation of Tigridieae.

Publications are being planned to raise awareness in Bolivian newspaper magazines and similar publications to raise awareness of conservation issues in Tigridieae using their photogenic nature

An illustrated talk will be given at a future date at the convenience of Hibert and his institution.

A paper will be prepared to provide temporary names for two species formerly in the now non-existent genus *Sphenostigma*, which are endemic to Bolivia and important to highlight for conservation.

Retrospectively it would have been better for the fellow to have had a longer fellowship given the difficulties experienced in the molecular work.