



**PLANT ENDEMISM OF THE CENTRAL ANDEAN VALLEYS,
BOLIVIA**

*DARWIN INITIATIVE ANNUAL REPORT
FOR 1 APRIL 2004-31 MARCH 2005*

*DEPARTMENT OF PLANT SCIENCES
UNIVERSITY OF OXFORD*

***Darwin Initiative for the Survival of Species
Annual Report***

1. Darwin Project Information

Project Ref. Number	162/11/010
Project Title	<i>Plant Endemism of the Central Andean Valleys of Bolivia</i>
Country	<i>Bolivia</i>
UK Contractor	<i>Department of Plant Science, University of Oxford</i>
Partner Organisations	<i>Herbario Nacional de Bolivia, La Paz (principal partner) Herbario Nacional Forestal "Martin Cardenas", Cochabamba Herbario del Oriente, Museo "Noel Kempf Mercado", Santa Cruz Herbario de Chuquisaca, Sucre</i>
Darwin Grant Value	£187,866
Start/End dates	1 October 2002 – 30 November 2005
Reporting period	1 April 2003 – 31 March 2004 Annual Report no. 3
Project website	N/A
Authors, date	<i>John R. I. Wood with contributions from Stephan Beck (La Paz), Susana Arrázola (Cochabamba) and Colin Hughes (Oxford) 6 May 2005</i>

2. Project Background

Most conservation and biodiversity research in Bolivia has been centred on the moist tropical forests in the Andean foothills and Amazonian lowlands, and it is in these areas that most protected areas are located. The essential premise of the project is that the drier, central Andean valleys are relatively neglected both in terms of research and conservation, and that they contain rich biodiversity and important centres of plant endemism. The area of the project's work is essentially the Andean basin of the Rio Grande and its tributaries and a series of inter-Andean valleys lying between this area and the Peruvian border.

This area contains several of the country's major centres of population including Cochabamba and the legal capital, Sucre, while the two largest towns, La Paz and Santa Cruz lie at the edge of the project area. While this clearly increases the potential threat to the biodiversity of the project area and the urgency of identifying key areas for protection, it also means that all four established herbaria, our partner institutions in Bolivia, have a close interest in our area of study. These institutions are all relatively new and have few resources. They have almost no tradition of taxonomic research, which remains largely the preserve of non-Bolivians to this day.

The project essentially works in Bolivia for the six-month period, November-April each year. This coincides with the rainy season when significant plant collecting is

practical. UK training is planned to take place in the June-October period when project activities within Bolivia are minimal.

3. Project Purpose and Outputs

- *Project Purpose: to identify hotspots of plant endemism in and around the central Andean valleys of Bolivia for future conservation.*

Although it has been long suspected that the central Andean valleys are home to many endemic plants, our project can for the first time provide concrete evidence for this. The situation is complex with variation from area to area and from plant family to plant family. However, we are now able to identify seven patterns of endemism within the project area, by far the largest consisting of species widespread in the valley of the Rio Grande. This is a large area, which also contains populations of very local endemic species. We have already had informal discussions with the Dirección General de Biodiversidad (D.G.B.), some local community leaders and other stakeholders about possible areas of conservation. Our final report for the D.G.B will include recommendations (and justifications) for establishing protected areas (with community participation) in the mountains immediately west of Sucre and in the central Rio Grande basin between Pucará and Nuevo Mundo extending upriver at least to the point where the Rio Mizque and Rio Grande join. We will also propose that the hilltop archaeological park at Samaipata (which lies outside the jurisdiction of the National Parks Authority) and the essentially palaeontological park at Torotoro are re-assessed from a management and biodiversity viewpoint because they contain a large number of endemic plants. If these proposals are accepted many, perhaps 50%, of the endemic species of the Rio Grande basin will be conserved in protected areas and the outstanding dry forest and xerophytic chaco-type vegetation of the Rio Grande will also be under protection.

- *Project Output 1: List/Data base of as many endemic plants as possible with distribution maps.*

The data base at all four institutions continues growing fast. All specimens collected during the project's life (some 5000) have been entered together with data for over 10,000 other specimens. We are now in the process of identifying firmly the endemic species from the project area and our final report for the D.G.B. will include representative maps to show patterns of endemism in the project area. Three of the four institutions in Bolivia are actively using the BRAHMS data base to enter other data besides that which is project-related.

Project Output 2: Six Bolivians able to identify species in six major families or groups.

All six principal project workers continue making progress with their respective groups (Amaranthaceae, Cactaceae, Compositae, Ferns, Labiatae, Leguminosae, Portulacaceae, Umbelliferae and petaloid monocotyledons). A week-long workshop has provided time and opportunity for general identification of specimens in their families of specialisation, while the project has also supported field and herbarium studies to elucidate specific taxonomic problems. However the main impulse is as a result of UK training. Our three colleagues who were in Oxford from June to September have all deepened their knowledge of one main family (Amaranthaceae, Leguminosae and Umbelliferae) and of a specific genus, in particular. This has resulted in papers recognising seven new species, all endemic. Two resulting papers (one on *Gomphrena* and one on *Mimosa*) should be published later this year while the third (on *Eryngium*) should be ready shortly. All have additional papers under preparation. We are optimistic that there will be a

similar positive response to UK training this summer. Since so few taxonomic papers have hitherto been published by Bolivians this is a significant advance.

Project Output 3: Attractive popular field guide to selected plants with emphasis on endemics.

We have now completed the collection of digital photographs for the field guide and have agreed a plan for its production over the next six months. After the success of the design and printing of our colour posters we will probably make use of the same designer and printing company in Santa Cruz.

Project Output 4: Production of posters on value and conservation of selected species/habitats.

Six full colour posters illustrating selected plants from the project area were completed at the end of March 2005, on schedule even though we had anticipated a delay till May (see below). These have been enthusiastically received by the Bolivian authorities. Training materials will be prepared in May this year and teacher training and distribution will take place in September-October this year. Although not originally in the project plan we hope to produce four additional posters on specific localities, each prepared in different Bolivian participating institutions.

- *In October 2004 the Darwin secretariat agreed to a change in the dates for the milestones in the later stages of the project. These are as follows:*

By 05/05	Printing of posters and selection of teacher trainer
9-10/05	Workshops on use of posters
By 10/05	Draft of field guide and report for D.G.B. ready
By 12/05	Delivery of report to D.G.B.
By 12/05	Printing and publication of field guide
By 12/05	Meeting to launch field guide and publicise project achievements
By 31/01/06	Final report for DEFRA

4. Progress

- *Project history:*

Although preliminary discussions between Oxford University and our four partner institutions in Bolivia had taken place over several months in the summer of 2002, the project really began in November 2002 with the arrival of our field co-ordinator, John Wood, in Bolivia. During the final months of 2002 project workers were selected in all four partner institutions in Bolivia on the basis of public advertisement and selection by representatives of Oxford and the Bolivian institutions. Over the following year all basic equipment for project work was provided for each institution. This included computers, printers, software for the data base system, digital cameras, GPS, collecting equipment etc. Training was provided in the use of digital cameras, data-basing with BRAHMS, field work and plant identification through workshops and on the job training. Continued support for the herbarium infrastructure and good functioning has been provided through the purchase of herbarium cabinets and compactors, the purchase of herbarium paper glue and other supplies, payment for technicians to mount specimens etc. Training in techniques of botanical illustration was given in two workshops in early 2004. An extensive programme of field collecting, digital photography, data entry, specimen mounting and identification got underway early in the project and has continued since then.

- *The agreed work plan for the project over the reporting period, which was outlined in our previous annual report, is copied below:*

April 2004	Final month of second cycle of field work in Bolivia
May	Data base training to update systems, trouble shoot problems, install new software, give further training and copy all data for inter-institutional sharing
June-Sept	3 (possibly 4) project workers come to UK for training and research project leading to production of taxonomic papers
September	Final agreement on projects and supervisors for UK training in 2005 with loan requests etc
October (late)	Return of Oxford field co-ordinator to Bolivia
November	Meeting of project workers to plan project activities in the final year, agree exact timetable, priorities and responsibilities etc Workshop on plant identification (La Paz) Initiation of final six month cycle of field work, data base entry, processing of specimens, collection of digital pictures etc Visit by Rosemary Wise to follow up illustration workshop and complete posters
December	Completion of taxonomic papers by Bolivian staff who received UK training in 2004
March 2005	Possible additional visit by Rosemary Wise if outside sponsorship is obtained. Preparation of posters for publication. Selection of teacher collaborator for poster workshops.
Early 2005	Final visit by Denis Filer to update data base systems and provide additional training.

This programme was followed completely till March with only two minor exceptions. Only 3 project workers came to Britain for training in 2004 but the full programme will be completed in 2005. Two of the taxonomic papers were in fact finished and submitted for publication by October 2004 while the third (and most ambitious) was deferred till May 2005 to allow additional fieldwork to clarify some problems. This too should be finished without further problem.

The possible additional visit by Rosemary Wise in March 2005 did not take place because BG (Bolivia) was unable to fund it. On the positive side the posters were in fact produced in March. Denis Filer's visit was postponed till October 2005 to coincide with the new Spanish language materials being produced for the BRAHMS data base system.

Two additional activities should be mentioned:

We have made steady progress in building up living collections of cacti in both Sucre and Cochabamba where special areas are reserved for this purpose. We have also been able to identify possible areas for conservation and begin tentative negotiations with possible stakeholders.

- *The project has made steady progress during the year building on the work done in the previous years in all our activity areas:*

Data-basing: This year has seen steady development along the lines described in the previous report. All four herbaria are entering field collection data in the BRAHMS data-base, which is also used to generate herbarium labels. Three of the herbaria are using BRAHMS to enter additional data and are transferring older EXCEL data into the new system. Training continues to be provided by Denis Filer, partly through e-mail and partly by visits, the most recent being in May 2004. Progress continues to be made to provide instructional material on-line in Spanish, a task to which the project has contributed. BRAHMS undergoes regular updates, which our Bolivian staff can now access through the Internet. A further visit is anticipated to add mapping software, ensure that all four institutions have access to each other's data and ensure that use of the system can be sustained after the project's end through the internet. It will then be possible for the first time to produce accurate species distribution maps and quantify endemism and species conservation value in an objective manner in Bolivia. This will hopefully inspire similar efforts more widely in other parts of Bolivia. Furthermore, once made available online this fundamental biodiversity data can be used to underpin conservation planning and monitoring.

Field collecting: The project has now made approximately 5000 collections of herbarium specimens, which exceeds our projected total by a thousand. The main sequence of collections made with our project co-ordinator amounts to around 3500 while about 1500 numbers have been collected by our Bolivian colleagues on their own. This latter figure is extremely reassuring as it indicates increased independent (and therefore sustainable) activity on the part of some of our project workers. A particular stimulus to this has been the small independent projects to collect digital photographs and specimens from four specific areas of tourist interest within the project's overall area of study in order to produce posters for sale to visitors to these areas. We have also continued to build up living collections of cacti, which are grown in the Botanical Garden in Cochabamba and in the Faculty of Agronomy in Sucre. We are particularly pleased by the interest this has aroused in Sucre which suggests that maintenance of this collection will be sustainable. We also think it might be a useful insurance to take advantage of a recently approved community botanical garden in Pulguina in the heart of the cactus zone.

Our emphasis on collecting continues to be on high quality specimens with good field data and often linked to digital photographs. All herbarium specimens are deposited in the national herbarium in La Paz and they are usually duplicated both at Kew and in the herbarium of the Department in which they were collected. The vast majority of the projects specimens, even those collected this year have been mounted and labelled and are available for study by project workers and others including experts visiting Bolivia.

We have collected widely within the project area. We target specific localities for a variety of reasons including the following: reports of rain in a particular area, little-known areas, areas which have been productive in the past, "extreme" areas (i.e, areas which are exceptional in terms of altitude, rainfall, geological type, tree cover etc), areas that might be recommended for conservation or, usually, a combination of these factors. During the year we have visited the following areas (divided according to Department with number of visits indicated):

La Paz: Sorata (3), Inquisivi (1), Zongo (1), Sud Yungas (2)

Potosi: Torotoro (2), Ravelo (1), Betanzos area (1)

Chuquisaca: Azurduy (1), Villa Serrano area (2), Mojocoyo (1), Presto (1), Zudanez (2+), Chataquila-Cerro Obispo (4), environs of Sucre (many visits), Cintis (1)

Tarija: Tarija valley –Cuesta de Sama (2)

Santa Cruz: Samaipata (6), Mairana (1), Postrervalle (1), Vallegrande area (4), Comarapa-Siberia (2)

Cochabamba: Pasorapa (2), Aiquile (2), Tiraque (1), Capinota (1), Mizque (1+), Ayopaya (1), Sehuencas (1), environs of Cochabamba (many visits).

This represents a very large number of days in the field and good coverage of the project area, although several visits to the same locality would be desirable as vegetation changes rapidly according to the seasons. Even though rain was essentially normal this year, we suffered some frustration because of political problems and we are acutely aware that our knowledge of the zone remains patchy. Every major field trip yields something unknown and it is clear that there is a lot yet to be discovered.

Digital photography: This has received considerable emphasis and virtually every field trip has involved digital photography as well as specimen collection. Some have, in fact been planned with photography as the main objective. Digital photographs often support herbarium specimens and we are linking photographs to collection numbers in our data-base. However, our main aim has been to build up a bank of photographs which we can use for the field guide and with this in mind photographs have been taken to allow recognition of the plant rather than to show technical details which might be appropriate for research. Obviously these two objectives are not mutually exclusive. Each of our four partner institutions has a digital camera provided by the project and this work is almost entirely in Bolivian hands.

We think we have satisfactory or good digital photographs of all common species in the project area so prospects of producing a high-quality, popular field guide are good.

Training in taxonomy/systematics: Training during the past year has been essentially of two types: on the job training in Bolivia and UK training from which three of our six principal project workers have benefited. Training in Bolivia is essentially informal and takes place during field trips and meetings or (the very occasional) project workshop, mostly involving John Wood interacting with one or more project worker although Stephan Beck (La Paz), Anna Haigh (Kew) and John Carr (Hull) have also helped. Three of our staff (Moises Mendoza, Margoth Atahuachi and Teresa Ortuño) received UK training from June to September 2004. This is described in *Oxford Plant Systematics*, which accompanies this report. All three studies involved inter-institutional collaboration, bibliographic studies and some techniques unavailable in Bolivia such as the use of the SEM. It essentially involved guided research to produce at least one taxonomic paper.

Important aims of our training programme, both in the UK and in Bolivia, include the transfer of skills, the raising of professional confidence and greater learner self-sufficiency and autonomy. Confidence is particularly important as plant taxonomy in Bolivia has been dominated by mostly older male foreigners with PhDs from prestigious institutions. This creates a "glass barrier" for many Bolivian botanists, which we hope to help break down. We are also deeply concerned to reduce an academic dependency culture. We are still concerned that the initiative for fieldwork and for academic papers often lies with someone from the UK. In consequence we are particularly pleased that the completion of one research paper seems to be stimulating our colleagues to go on to produce others. We are also pleased with the decision made at our planning meeting in November to assign a specific photograph and poster project to project members in each institution. Since they have to do the field work, the photography and the poster planning on their own, with the field co-ordinator only providing funds and occasional advice, this encourages autonomy. All the signs are that this initiative has been very successful.

Plant identification: We continue to make progress in getting specimens identified although much remains to be done. We are reasonably competent with Acanthaceae, Amaranthaceae, Araliaceae, Chenopodiaceae, ferns, Labiatae, Portulacaceae and parts of Leguminosae and Compositae. Expert help is available with families such as

Asclepiadaceae, Bromeliadaceae, Ericaceae and Myrtaceae while our competence in Anacardiaceae, Bignoniaceae, Cactaceae, Celastraceae, Convolvulaceae, Malvaceae, Polygalaceae, Scrophulariaceae and many smaller families is rising.

Botanical illustration: This has been a year of great progress in meeting our twin aims of producing high quality botanical illustrations and enhancing Bolivian capacity in this field. A second visit to Bolivia in November 2004 enabled Rosemary Wise to complete paintings of over 100 plants prepared from living plants in the project area. Most of these have been incorporated in the posters submitted with this report. Additionally Rosemary Wise was able to continue training Eliana Calzadilla who was identified as the most promising illustrator in the previous workshops. Eliana has now completed high-quality illustrations for Moises Mendoza's *Eryngium* paper and is beginning to work on illustrations for a paper on *Lepechinia* (Labiatae) for John Wood. As Julia Gutierrez will be unable to come for UK training this year for family reasons, we plan to revert to our original plan to give the last scholarship place to an illustrator. Eliana will, therefore, come to Oxford this year to study with Rosemary Wise and we hope she will be able to illustrate the taxonomic papers being prepared by the other award holders. Again this will help develop critical national capacity and self-sufficiency for taxonomic and applied botanical research.

Capacity building: The project has continued to support all four institutions with which it works. In the current year our support has been mostly in the form of herbarium cabinets (or compactors) and materials for mounting specimens, although we have helped with bibliography, collecting equipment and other things in a modest way. This support has helped to make thousands more specimens available for consultation. We have also invested a small amount of money in maintenance costs and it is pleasing to report that all project equipment is in place and operating correctly. Our only frustration has been in the unexpected delays in the delivery of compactors to two herbaria.

Conservation site selection: We have tentatively identified three sites for conservation (The Samaipata archeological park, the lower Rio Grande and the mountains west of Sucre) and will present detailed reasons for this selection in our report to the D.G.B. While all three sites contain a considerable number of endemic species and interesting types of vegetation, it has to be acknowledged that there are other equally interesting sites (in the Pasorapa region, for example). What makes these sites different is that there are other justifications for conservation. In the case of the mountains west of Sucre, for example, the region is of outstanding natural beauty and is already popular for trekking. It has unusual geological formations, fossil remains and cave paintings and other relics of ancient culture. It is also the region from which most of Sucre's water supply comes. We feel that we are far more likely to achieve agreement for conservation if we can marshal multiple synergistic arguments in favour of conserving a particular area. If we can also obtain community support from the people who live in the area, our proposals are still more likely to be accepted and so we have already begun exploratory conversations with people in this area.

- *Difficulties*

We have had no significant difficulties during the current year. Two minor problems could be mentioned. One of our Bolivian colleagues selected for UK training was unable to come in 2004 because of job insecurity. This is now settled and she will come for training in 2005 with the budget allocation transferred to this year with Darwin secretariat approval. We also failed to get any outside funding from British Airways and BG (Bolivia). The former was not unexpected but the latter was disappointing as our posters were (and still are) included in their budget provision for 2005 but the company would not implement any of its projects because of the long and continuing delay in approving the new Gas Law in Bolivia which places BG's presence in Bolivia in doubt. We have gone ahead with printing using our Darwin

grant but may have difficulty in printing the four additional posters which were not envisaged in our original project proposal.

- The original design of the project was sound and has not been significantly revised. We have asked for and received approval for a slight extension of time to deliver our final outputs, which perhaps indicates that the original design was ambitious. We remain confident that we will be able to complete the very full work plan outlined below based on our experience with the productivity of our project workers and of designers and printers during the current reporting period. We do not foresee any particular problem over our exit but the impact of the project will clearly be enhanced if our proposals for project follow-up are accepted.

- Workplan for the next reporting period.

05/05	Preparation of teacher training materials for use with project posters Selection of images for use in field guide
06-09/05	Preparation of text to accompany images in the field guide
06-09/05	UK training for 3 Bolivian project participants
By end 09/05	Draft final report for D.G.B. prepared
09-12/05	Final visit of J. Wood to Bolivia to complete project
09-10/05	Teacher training workshops on posters
10/05	Final visit and workshop by D. Filer to revise and update data bases and data base systems
10/05	Editing and preparation of camera-ready text for field guide
By end 11/05	Printing of field guide Finalisation and printing of final report for D.G.B. Design and production of 4 additional posters if funds permit
By 15/12/05	Final conference to launch project results Return of J. Wood to UK
By 31/01/06	Final project report for Darwin secretariat

5. Actions taken in response to previous reviews

The following issues were raised in the previous review. These have been reported to and discussed with our collaborators who perform a crucial role in our response to the third of these.

- *I have no serious concerns with the report, but I would like to see a full list of the project participants in order to understand authorship of papers etc.*

The main participants are as follows:

Head of principal counterpart institution: Stephan Beck (La Paz)
La Paz: Teresa Ortuño
Santa Cruz: Moises Mendoza
Sucre: Hibert Huaylla, Julia Gutierrez
Cochabamba: Magaly Mercado, Margoth Atahuachi
Oxford: John Wood (Field co-ordinator), Robert Scotland (grant holder), Colin Hughes, Denis Filer (data bases), Rosemary Wise (botanical illustration)

Papers submitted for publication were sent to ECTF in October 2004 and should

be available for consultation

- *It would also be good to append a sample of the training materials used in workshops in order to help make the assessment of the project's training.*

These were submitted to ECTF in October 2004 and should be available for review.

- *You suggest that follow-up work might include discussing management options for some of the sites with relevant organisations. I think that now would be the time to start developing contacts with these groups so that a coordinated bid for extra funding can be developed before the end of the project.*

We have discussed informally with the D.G.B. our probable proposals for conservation sites and some of the reasons for these proposals. We have also made contact with community leaders and local authorities in two areas we are interested in and have also had a meeting with the director of the archaeological park at Samaipata about extending its role to include nature conservation. All these discussions and "feelers" have been received positively but we can obviously not proceed further without both the formal approval of the D.G.B. after submission of our final report and some agreed funding. We should point out that the two major sites involve a range of different communities and authorities and negotiations to secure community agreement are likely to be protracted.

6. Partnerships

- One of the strengths of this project lies in the excellent relationship between Oxford and the four host country partner institutions. At all levels this has been positive and productive throughout the reporting period. There is a clear understanding of the project's aims and budget and of everyone's role in the project and in consequence we believe that both sides have been able to comply with the requests and hopes of their partners. Meetings have been positive, planning co-operative and all parties are benefiting from the project. We believe that the smaller partner institutions in particular have benefited beyond their expectations from our relatively small budget to strengthen their infrastructure and collection management. If there were a project extension, we would like to use the good reputation we have built up to try and put pressure on the university authorities, on whom our partner institutions depend, to provide regular, budgeted funding for the necessities of the herbaria and especially for biodiversity and conservation work. This is a problem everywhere but more especially in Sucre. Good news in this context was the recent conferment of an indefinite contract as herbarium curator in Cochabamba on one of our principal workers, Magaly Mercado.
- Apart from a Belgian project in Cochabamba, the only other organisation supporting plant biodiversity studies in Bolivia has been the Missouri Botanical Garden. Most of our project participants are contributors to the "Checklist of Bolivian Plants", which is funded by Missouri and we have collaborated with Missouri in field trips and plant identification.
- Our most important link has been with European institutions, who have helped in our training programme. In particular, we are grateful to Mark Watson and the staff of Edinburgh Botanic Gardens for help given generously to Moises Mendoza for his project on *Eryngium* and also to Thomas Borsch of the Nees Institute for Systematic Botany in Bonn for help given to Teresa Ortuño in her project with *Gomphrena*. All have benefited from our close collaboration with Kew and its staff and we are pleased to have organised field work in collaboration with Kew in Bolivia this year. This inter-institutional collaboration will be important in this

year's training as well. It is described in more detail in Oxford Plant Systematics 12: 8-9, which is submitted with this report.

7. Impact and Sustainability

- The project is well-known within the botanical and biodiversity community in Bolivia where it is thought of highly. The director of the D.G.B., the director of S.E.R.N.A.P. (National Parks Service) and individual national park directors have all spoken highly of the project. Amongst the wider public it is little known. This, however, is likely to change dramatically over the next 12 months following publication and distribution of our posters and field guides and the related training and publicity events.
- The main evidence for increased biodiversity capacity lies in the growing capacity of project workers to name plant material, the increasing size of the project data base with its capacity to generate information, the growing bank of digital photographs and the increasing accessibility of herbarium specimens for all who do biological research.
- The project has been designed and implemented in collaboration with permanent local institutions and a major role of the project is to strengthen these institutions. The departure of the project will in no sense weaken these institutions. However if the project purpose of "identifying sites for conservation" is to be taken towards the stage of implementation, the follow-up strategies in this report will need to be taken up.

8. Post-Project Follow up Activities

- The following activities grow out of and would serve to consolidate project results:
 - a) Detailed botanical surveys of each site identified for conservation action in the original project to produce a complete plant species checklist and assess local abundance / conservation status of endemic species.
 - b) Consultations with local communities, the wider scientific community (archaeology, palaeontology, zoology, ornithology), other interested groups and government bodies to facilitate negotiations to establish conservation areas or community reserves and associated management guidelines. An important part of this would be educational, as local communities would need to know and value what they are being asked to conserve.
 - c) Preparation of publicity material and posters/short guides for each selected site. These popular guides would serve to raise public awareness of the importance of the site.
 - d) Some support for living collections, especially of cactus, which have an exceptionally high rate of endemism in the project area. There are three possible sites.
 - e) Financial support for academic/study visits, data repatriation (especially associated with type specimens), field work and other opportunities for Bolivian staff to expand their publications on specific genera to full accounts of the families of their specialisation based on work in the project and as a follow-up to the "Checklist of the Bolivian Flora". This activity would reinforce the legacy of the project by strengthening the skills of Bolivian botanists transforming them into genuine national experts while at the same time providing biodiversity workers with effective keys and guides to important plant families. It may be appropriate to apply for a Darwin scholarship for the

most outstanding project participant after all have completed UK training in September 2005.

- f) Bolivian botanists have taken enthusiastically to data-basing material using BRAHMS and the main herbaria have data of great interest to the wider scientific and conservation community which is being organised for research and curation purposes. The next logical steps would be to add in data from literature and foreign herbaria and make this data available on the internet. The benefits to both the scientific community and the Bolivian herbaria would be high. Implementation would require training from Denis Filer.
 - g) The development of a larger bank of digital photographs as an adjunct to the data base (f) and as a support for the activities outlined in a-e above.
 - h) Continued capacity building for Bolivian herbaria.
- These follow-up activities serve to sustain the achievements of the original project and fit Darwin's aims fully, focussing on conservation and raising public awareness of and participation in biodiversity conservation. There is also a strong emphasis on increasing Bolivia's capacity to carry out taxonomic and conservation work through training and repatriation of data.
 - Evidence of the commitment and capacity of the host country lies in the support the existing project has received from participating institutions in Bolivia and in the progress and enthusiasm of project workers. It also lies in the resources given to the Bolivian herbaria by the Darwin Project and in the increasingly accurately named herbarium material in each Bolivian herbarium. It also lies in the unsolicited offer by the Director of the D.G.B. to write in support of a project extension and in the repeated requests of the host institutions for the same.

9. Outputs, Outcomes and Dissemination

- There are no significant differences between actual outputs and those originally agreed except:
 - a) We have completed 6 (not 4 posters), made over 5000 (not 4000) reference collections and provided 29 (not 25) weeks work within Bolivia
 - b) We are behind schedule on some original milestones (UK training, teacher training workshops) but all date changes have been approved by the Darwin secretariat and should be completed by the revised dates shown in our work plan in Section 4 above.
 - c) The cactus plots at the two towns are additional to our original outputs
- Essentially no dissemination activities have been done as yet. However we are almost ready for the workshops related to the posters and we have the D.G.B.s undertaking to host a final conference to publicise our results, at which time we will make press releases for a wider public.

Table 1. Project Outputs (According to Standard Output Measures)

Code No.	Quantity	Description
4C/D	3 Bolivian botanists	13 x 2 and 11x 1 training and guided research in Oxford with visits to Kew, Edinburgh and Bonn for collaborative supervision
5	6 Bolivian botanists	Principal project workers who receive on-going training in field and herbarium
6	6 Bolivian	One week's workshop on plant identification led by

	botanists	John Wood and Stephan Beck in La Paz
6	6 Bolivian botanists	Training in use of BRAHMS database through Filer's visit and e-mail link.
7	1 data-base manual	Spanish version of BRAHMS data-base manual accessible on line at "www. brahmsonline. com"
8	30 weeks	One week by Filer on data base work, 3 weeks by Wise on illustration work and 26 weeks by Wood on field work, on the job training and project co-ordination.
	6 posters	Full colour posters of almost 100 plants for educational purposes produced
11A	2	Two papers in peer-reviewed journals published, both in Novon
11B	3	Three papers submitted for publication (Two already accepted)
12A	1	BRAHMS data-base handed over, fully functioning and regularly enhanced
13a	>5000	Reference herbarium specimens handed over (representing 2000 additional this year)
20	£2300	Mostly compactors and herbarium cabinets with smaller amounts spent on presses, pots, herbarium mounting equipment etc
22	2	Two plots used as cactus gardens, one in Cochabamba and one in Sucre
23		No outside funding but Rosemary Wise's time (three weeks in Bolivia, at least one in UK), Colin Hughes time as supervisor for Margoth Atahuachi (three weeks), Mark Watson's time in supervising Moises Mendoza (two weeks), Robert Scotland and Thomas Borsch's time supervising Teresa Ortuño (at least one week each) and all John Wood's time in the UK on Darwin work (about fifteen weeks). Total value at least £6000.

Table 2: Publications

Type	Detail	Publishers	Available from	Cost
Journal	1. A distinctive new species of <i>Ovidia</i> (Thymeleaceae) from Bolivia – Rogers, Antezana, Wood & Beck – Novon 14(3): 332-337 (2004) 2. Dos nuevas especies de <i>Gomphrena</i> (Amaranthaceae:	Missouri Botanical Garden	Missouri Botanical Garden, St Louis, USA	

	Gomphrenoideae) de los valles secos – Ortuño & Borsch. Novon 15 (1): 180-189 (2005)		
Journal	*The Oxford-Bolivia Darwin Project	Dept. of Plant Sciences, University of Oxford	South Parks Road, Oxford OX1 3RB (Attn. Serena Marner)

Various other publications are in the pipeline (two accepted, one awaiting referees comments, others in preparation) and a steady run of publications based mainly on project work can be expected over the next few years.

* Submitted with this report, the other two submitted in October 2004.

general underspend in this area because of the high rate of sterling against the US dollar, in which we pay local salaries.

11. Monitoring, Evaluation and Lessons

- Our evaluation is essentially informal but is both quantitative and qualitative. Essentially it answers questions similar to the following:

Dried specimens collected: What is the total number? (about 5000) What proportion of species occurring in the dried valleys are represented? (perhaps 75%+) What comments do we receive from professional botanists on the quality of our specimens? (Outstanding). What proportion have been well-identified? (About 50% and rising almost daily)

Living specimens collected: What is the total number? (around 400). What proportion are still alive at the end of the reporting period? (over 90%). Is the labelling system durable (ie weather and handling-proof)? (Weather-proof yes but vulnerable in the hands of untrained gardeners)

Bolivian staff training: What proportion of our project workers attend workshops (normally 100%). Are they confident/accurate in identifying specimens in their families of specialisation? (confidence variable, accuracy difficult to evaluate but definitely improving) How many independent field trips do our project workers undertake? (some want to do more than we can finance, others disappointingly few). How many attended UK training (50% so far). Were the specific training objectives? (yes and mostly exceeded). Have papers resulted? (Yes). Are they published? (not yet but undergoing editing and review process). How do our Bolivian staff report their experience? (positive)

Posters. Were there sufficient original paintings? (in excess) Were they representative of all principal families, life-forms and habitats in the project area? (yes) Is the design of the posters clear/uncluttered? (yes, according to observers) Is the final product attractive? (yes) Can it be used educationally (probably but yet to be assessed)

- We evaluate whether our outputs and outcomes actually contribute to the project purpose by following the logic of "If you do x, then y will result". Thus, if we list/database as many endemic plants as possible, then we can identify potential hotspots of diversity. In the same way, if we produce attractive posters for use in schools, we will raise public awareness of the diversity and uniqueness of their plants and then can obtain wider support for their conservation. Similar logic links all our outputs and outcomes to the project purpose
- Various experiences and lessons are implied in the previous sections of this report but we would like to draw attention to two, which are related to confidence and ownership. While there is still some way to go in both areas, we feel that the design of UK training so that it would result in specific publications has been sound. Not only will we achieve this outcome but all three beneficiaries are working towards additional publications and we seem to have created some kind of snowball effect, We are also pleased with the positive response to delegated mini-projects, such as the individual poster project. In any future project we would like to build in the preparation of publications and the creation of individual responsibility for particular aspects of a project within the overall project.

12. Outstanding achievements of your project during the reporting period

- The six project posters are of exceptional quality and have received universal praise. Nothing similar has ever been produced for the plants of Bolivia. They are

likely to contribute significantly to the conservation of Bolivian plants and endemic species, in particular, by raising public awareness of their value and beauty. A programme of workshops for teachers will reinforce their impact on schools and in the community. They may play an important role in a programme to protect endangered species planned by the D.G.B. with possible support by Conservation International.

- Scientific publication of new endemic plants species discovered during the project in international botanical journals by young Bolivian botanists is an outstanding achievement. This will leave a legacy of renewed botanical inspiration and bolstered confidence that is needed if the rich endemic flora of Bolivia is to be safeguarded for the future.
- ✓ **I agree for ECTF and the Darwin Secretariat to publish the content of this section**

Annex 1: Project Logical framework

Project summary	Measurable indicators	Means of verification	Important assumptions
<p><i>Goal</i></p> <p>To assist countries rich in biodiversity but poor in resources with the conservation of biological diversity and implementaion of the Biodiversity Convention</p>		<p>1 Legislation/Regulations related to conservation, biodiversity and education</p> <p>2. Reports by the Direccion Nacional de Biodiversidad and other relevant bodies</p> <p>3. Media reports on public attitudes to conservation issues</p> <p>4.<i>Data on habitat and speces loss</i></p>	<p>1 Public support for conservation is maintained</p> <p>2.Rural poverty is progreesively eliminated</p> <p>3. <i>Government regulation is effectively implemented</i></p>

<p>Purpose</p> <p><i>To identify centres of plant endemism in and around the central Andean valleys of Bolivia for future conservation</i></p>	<p>1 Number of key sites/zones identified</p> <p>2 Number of endemic species accurately named for each site/zone</p> <p>3 <i>Enhanced public awareness of and support for the conservation of endemic species</i></p>	<p>1. Reports submitted</p> <p>2. Proposed conservation measures by local/national authorities</p> <p>3 Sale of project guides, calendars etc</p> <p>3. <i>Media reports</i></p>	<p>1. Staff available for field work in Bolivia</p> <p>2. Plants can be accurately named</p>
<p>Purpose</p> <p><i>To identify centres of plant endemism in and around the central Andean valleys of Bolivia for future conservation</i></p>	<p>1 Number of key sites/zones identified</p> <p>2 Number of endemic species accurately named for each site/zone</p> <p>3 <i>Enhanced public awareness of and support for the conservation of endemic species</i></p>	<p>1. Reports submitted</p> <p>2. Proposed conservation measures by local/national authorities</p> <p>3 Sale of project guides, calendars etc</p> <p>3. <i>Media reports</i></p>	<p>1. Staff available for field work in Bolivia</p> <p>2. Plants can be accurately named</p>
<p>Outputs</p> <p>1. List/Data base of as many endemic plants as possible with distribution maps</p> <p>2. Six Bolivians able to identify species in six major families or groups</p> <p>3 Attractive, popular field guide to selected plants with emphasis on endemics</p> <p>4. <i>Production of posters on value and conservation of selected species/habitats</i></p>	<p>1. Existence of data base for consultation by relevant organisations</p> <p>2. Species and geographical coverage of data base</p> <p>3 Number of Bolivians successfully completing training</p> <p>4 Existence of field guide and posters</p>	<p>1 Examination of final documents including data base, field guide and posters.</p> <p>2 Number of specimens identified by Bolivians trained in project</p> <p>3. Publications by Bolivians trained</p> <p>4 <i>Project reports</i></p>	<p>1. There is time to assess a representative range of sites with endemic plants in different seasons</p> <p>2. Bolivian staff reach a sufficient level in their training</p> <p>3 Experts are available and willing to identify specimens where appropriate</p>
<p>Activities</p> <p>1. Training of Bolivians in data bases, field collecting, herbarium identification and the preparation of botanical illustrations and photos.</p> <p>2. 6 x UK training in systematics of specific groups.</p> <p>3. Field collecting</p> <p>4 Enhanced capacity in Herbario Nacional with equipment and bibliography</p>		<p>1. Project reports</p> <p>2. Number and quality of specimens collected and illustrated</p> <p>3. Number of Bolivian staff able to use data base</p>	<p>1 Suitable candidates for training are available</p> <p>2 Bolivian staff are given time for training and field work.</p> <p>3 Bolivian staff are available for field work</p>

Project summary	Measurable Indicators	Progress and Achievements April 2004-Mar 2005	Actions required/planned for next period
<p>Goal: To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but poor in resources to achieve</p> <ul style="list-style-type: none"> • The conservation of biological diversity, • The sustainable use of its components, and • The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources 			
<p>Purpose <i>To identify centres of plant endemism in and around the central Andean valleys of Bolivia for future conservation</i></p>	<p>1 Number of key sites/zones identified</p> <p>2 Number of endemic species accurately named for each site/zone</p> <p>3 Enhanced public awareness of and support for the conservation of endemic species</p>	<p>We have tentatively identified three areas that merit conservation and have begun consultations with stakeholders. Steady progress towards naming accurately the endemic species is being made.</p>	<p>Justifications for the selection of the sites with lists of endemic species will be presented to the D.G.B. in November. It is anticipated that our posters and subsequently our field guide will enhance public awareness of plant diversity and the need for conservation</p>
<p>Outputs</p>			
<p>1. List/Data base of as many endemic plants as possible with distribution maps</p>	<p>1. Existence of data base for consultation by relevant organisations</p> <p>2. Species and geographical coverage of data base</p>	<p>All 5000+ specimens collected by the project have been data-based together with 10000 others mostly from the project area. These are available for consultation.</p>	<p>Addition of all data for additional endemic species</p> <p>Co-ordination and sharing of data from all four institutions.</p>
<p>2. Six Bolivians able to identify species in six major families or groups</p>	<p>3 Number of Bolivians successfully completing training</p>	<p>8+ Bolivians have benefited from in-country training. 3 have completed UK training successfully</p>	<p>2 further Bolivians will receive UK taxonomic training (one will receive training in botanical illustration)</p>
<p>3 Attractive, popular field guide to selected plants with emphasis on endemics</p>	<p>4 Existence of field guide and posters</p>	<p>Photo data now collected. Field guide planned</p>	<p>Popular field guide scheduled for publication in November</p>
<p>4. Production of posters on value and conservation of selected species/habitats</p>	<p>4 Existence of field guide and posters</p>	<p>Posters completed</p>	<p>Training materials to be finished (May) and workshops for</p>

			teachers on poster use in October Additional 4 posters to be produced in November if budget allows.
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Note: Please do NOT expand rows to include activities since their completion and outcomes should be reported under the column on progress and achievements at output and purpose levels.

Annex 3: Correspondence related to changes in the budget and the project milestones.