



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

***Tree Diversity and Agroforestry  
Development in the Peruvian Amazon***

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## ***Annual Report***

### **1. Darwin Project Information**

Project title	<i>Tree diversity and agroforestry development in the Peruvian Amazon</i>
Country(ies)	<i>Peru</i>
Contractor	<i>Royal Botanic Garden Edinburgh</i>
Project Reference No.	<i>09/017</i>
Grant Value	<i>166,685</i>
Start/Finishing dates	<i>Oct 2000/Oct 2003</i>
Reporting period	<i>1.4.2002-31.3.2003</i>

### **2. Project Background**

Peru is a resource poor country containing c. 10% of the world's plant species (equivalent to the whole of Central America). The most important habitat, both socio-economically, and in terms of numbers of species is the rain forest of the Amazon Basin. The International Centre for Research in Agroforestry (ICRAF; now re-branded as the World Agroforestry Centre), a key collaborator in this project, is developing small scale agroforestry systems for resource-poor farms using native tree species as a means of slowing the destruction of virgin forest by slash and burn, conserving genetic resources of trees and improving the livelihoods of poor farmers. ICRAF surveyed farmers to determine their preferred tree species for agroforestry, and compiled a list of 150 species that are widely used and have potential for various agroforestry systems. However, many of these priority tree species have not been scientifically identified, and are known only by their Spanish vernacular names. Until their scientific names are discovered with certainty, nothing will be known of existing data relating to their uses or about related species of economic use. Furthermore, ICRAF is unable to collect seed from across their range for proper evaluation in growth trials. This project will name these species, provide a user-friendly guide for their identification, and a database of information on their distribution, uses and ecology. In the process, it will build the capacity of the Peruvian National Forest Herbarium (MOL; based at the Universidad Nacional Agraria, La Molina, Lima), the other collaborator in the project, by providing training of local personnel, new equipment and repatriated information from the Royal Botanic Gardens Edinburgh (RBGE) and Kew (RBG Kew).

### **3. Project Objectives**

1. Training in Peru of scientists, technicians and students in taxonomy, field collection and identification skills, and curation and databasing techniques.
2. Training Peruvian scientists in the UK in taxonomy, identification skills, curation and databasing techniques.
3. Collect and accurately identify 150 priority tree species selected by local farmers in the Peruvian Amazon as economically beneficial; prepare a database on these species using collections in herbaria at MOL, RBGE and RBG Kew; and produce a user-friendly identification manual in Spanish for these and related species.

4. Repatriate specimen data and important literature relating to priority species from UK to MOL.
5. Improve the capacity of MOL by supplying the basic equipment for running and curating its herbarium.
6. Promote awareness of Peruvian forest biodiversity issues locally, nationally and internationally.

Two changes were made to the project schedule this year, both of which were agreed with the Darwin Secretariat. One was the delay of undergraduate training from May until October/November, which was caused by unforeseen personal circumstances for Toby Pennington. The second was the field training in September, which was brought forward to May to co-incide with flowering and fruiting times of key tree species.

#### **4. Progress**

The project ran for 18 months before the start of this reporting period. The initial six month phase of the project involved long periods of UK project staff time in Peru. Key achievements were the signing a MOU between the Universidad Nacional Agraria, La Molina and the RBGE plus the purchase and installation of c. £20K of equipment and material for the MOL herbarium. Training of project staff in specimen databasing, curation, botanical fieldwork and identification skills also started in this period, and continued through the second year of the project. In the second phase leading up to this reporting period, another key element was training in the UK. A Peruvian Darwin Fellow worked at RBGE and RBG Kew to database and repatriate specimens and literature. A Peruvian student also started to study for the MSc in the biodiversity and taxonomy of plants at the University of Edinburgh and RBGE. In Peru, work in this second phase of the project focused upon two areas: (i) continuing to improve the herbarium collection at MOL by mounting and databasing specimens that had not previously been incorporated into the collection; (ii) the production of the principal output of the project, the user-friendly identification guide to the priority species, which utilised the data repatriated from the UK, and involved fieldwork plus research in the MOL herbarium.

Progress over the past year has been good, and we are in line with the agreed schedule with all key milestones met. An entire draft of the text and illustrations of the key project output, the user-friendly guide to the priority species has been completed. UK project staff have been in Peru on three separate visits for a total of 15 person-weeks. The field research and training has run smoothly, and is now complete, with collections made of 130 of our 150 priority species. Twenty Peruvian undergraduate students received training in field taxonomic skills, and eight advanced undergraduates were taught a three day intensive course in herbarium curation and the identification of the family Leguminosae, which is the dominant tree family of many Peruvian forests. Peruvian staff in the MOL herbarium have mounted 2800 specimens this year, and databased 1500.

In the UK, a particular highlight was the outstanding performance of Reynaldo Linares, the Peruvian Darwin Student Fellow in his MSc studies. He gained his degree with high exam marks and a distinction for his dissertation. He won a competitive bursary (awarded to only a single student each year) to remain in Edinburgh until December 2002 to write up his dissertation research for publication. He already has one paper accepted for publication in an internationally refereed journal, with another in progress.

We have expanded our objectives to include germination studies of some of our priority species for which no information exists. Furthermore, some of the older and more experienced undergraduate students trained by UK project staff taught herbarium training courses for some of the younger students. Finally, the digital camera purchased by the project has been used to capture images of 2000 herbarium specimens.

## **Research, training, and technical work**

### The user friendly identification manual

Work has progressed well on the principal technical output of the project, the user friendly identification manual to tree species from the Peruvian Amazon with economic potential. Dr Carlos Reynel (project leader in Peru) and Dr Terry Pennington (UK project staff) have led this work, which has occupied the majority of their time. A full draft is now complete. This contains descriptions, illustrations and silvicultural information for 135 species. This is less than the 150 species on ICRAF's original list, reflecting that some species were considered too well known for inclusion (e.g., mango, avocado), that some could not be located, and that others did not have sufficient economic potential. The majority of species have been illustrated with line drawings by Carlos Reynel and Maureen Warwick (RBG Edinburgh) at no extra cost to the project, representing considerable value for money.

The draft format for the guide was developed in discussion with ICRAF, and was tested in the field by project staff, and staff of IIAP (Instituto de Investigaciones de la Amazonia Peruana). Draft page design for the manual has been completed by Diccon Alexander [see supplementary materials 1], who designed the highly successful Darwin funded guide to trees in coffee plantations in El Salvador (*Árboles de los cafetales de El Salvador*). The principal author and project leader for this guide Alexandre Monro (Natural History Museum), accompanied Toby Pennington to Peru in October/November 2002 (see "field research and training" below), and provided valuable input into the content and design of the work. Toby Pennington and Carlos Reynel interviewed potential publishers for the manual in Lima in November 2002, and a publisher has been identified.

### Field research and training

The field trip timetabled in the project schedule to test the draft of the field guide with local users was led by Dr Terry Pennington (UK project staff member with responsibility for Peruvian fieldwork) in May 2002. He was accompanied by one technician from MOL, plus two staff from ICRAF. The trainees were those who had participated in prior project fieldwork, ensuring continuing learning and consolidation of knowledge. They were selected because they have permanent contracts with their organisations, and will therefore be able to pass on plant collection and identification skills beyond the end of the Darwin project. At one field site (Iquitos), we contracted retired forest staff from IIAP (Instituto de Investigaciones de la Amazonia Peruana). These older foresters have excellent skills in the identification of tree seedlings, which are now being passed on the younger generation of workers from ICRAF.

Further fieldwork was also carried out by Terry Pennington (6 weeks) and Toby Pennington (4 weeks). In both cases, this work was related to, and largely financed by other projects, but enabled us to visit Darwin project sites, and in both cases, we were accompanied by the MOL technician. We were therefore able to continue his training,

and also to collect further material of the priority species at little cost to the project. Terry Pennington was also accompanied by the RBG Kew photographer (again, at no cost to the project), who was able to take photos of the highest quality of the priority species for inclusion in the manual. Toby Pennington was accompanied by Alexandre Monro (Natural History Museum), project leader of the recently completed Darwin project “Empowering local people to manage the biodiversity of El Salvador”, who was able to provide valuable additional training to the MOL technician. Alexandre’s visit represented a useful cross-fertilisation between two Darwin projects based in different host countries and UK institutions.

Another field-based aspect of the project is germination trials of five of the priority species for which no information of growth characteristics was available. These germination trials were situated at a University field station in the Chanchamayo valley, relatively close to Lima, and therefore easy for MOL staff to access. Data about the germination requirements of five species was successfully gathered and included in the identification manual.

Dr Toby Pennington (UK project leader) taught on a four day field course (October 2002) in the Peruvian Amazon for 20 undergraduate forestry students (all students following MOL forestry course), alongside staff from the Universidad Agraria, La Molina. The course covered basic skills in plant identification, standard botanical collection techniques, and lectures on major tree families. He also taught a day-long course (November 2002) at MOL to eight advanced undergraduates on the identification of Leguminosae [see supplementary materials 2], which is the dominant tree family in Latin American forests.

We consider the fieldwork aspect of the project, now complete, to have been successful, both in the training aspects, and in furnishing vital specimens for the production of the identification manual. We have collected specimens from c. 135 species, virtually all those that will be included in the manual. Of these, 90% have been collected fertile, which is vital for full descriptions and illustrations. Additionally, we have collected seedlings of 50%, allowing seedling characteristics to be described in the identification manual. Seedlings are rarely collected, but the ability to identify them is important to foresters.

#### Curation and Databasing in Peru

Peruvian project staff have mounted 2800 specimens (7600 specimens mounted in total during the project), all of which have been incorporated into the MOL collection. The expansion has been made possible by the new specimen cabinets purchased by the project. Peruvian project staff have added 1500 specimen records to project database (*BG-BASE*; 5600 records entered in total during the project). More detailed work, unifying two independent databases – that compiled in the UK by Tania Durt and the MOL database – was carried out by Tania Durt (Peruvian Darwin Fellow) on her return to Lima in May 2002. The most time-consuming task in this process was correcting all inconsistencies in the merged database, which were the inevitable consequence of developing independent databases in the UK and Peru. During May 2002 Tania Durt spent two days training Rocio Ravello who enters most data, plus one undergraduate, Euridice Honorio, who has particular interest in the database and attended the databasing course in November 2000. Euridice continued the work in correcting the inconsistencies in February and March 2003, and developed some new materials for the manual of use of *BG-Base* for MOL [see supplementary materials 3].

A further development in curation this year was the use of the digital camera purchased by the project for taking images of specimens. 2000 MOL specimens have now been photographed digitally and placed on CD. This is an important step because most of these specimens are not found in collections outside MOL.

Tania Durt used her experience from the Herbarium Techniques course at RBG Kew to teach a half day workshop to Peruvian undergraduate students. Toby Pennington taught a three day course (November 2002) for eight advanced undergraduates in curation of herbarium using taxonomic monographs, and the use of taxonomic tools relevant to Peruvian botanists available on the internet [see supplementary materials 2].

The staff selected for training and curation work at MOL fall into two categories: technicians with permanent contracts at MOL, who will continue in employment after the end of the project, and undergraduate students with particular interest in plant identification and curation of the herbarium collection.

### Training in the UK

Reynaldo Linares completed the University of Edinburgh/RBGE MSc in Taxonomy and Biodiversity of Plants. His performance was outstanding. He gained a distinction for his five-month research dissertation on Peruvian seasonally dry forests.

Furthermore, he was awarded a highly competitive bursary, enabling him to stay in Edinburgh until December 2002 to write up this work for publication. He already has one paper accepted by the internationally refereed journal *Candollea*, and another in preparation. These forests, which grow in rain-shadow areas of the Peruvian Amazon, grow on fertile soils and have been decimated, but none are protected. Reynaldo's research, which builds upon related prior research at the Royal Botanic Garden Edinburgh, opens interesting avenues for future research.

Euridice Honorio, an undergraduate student who has attended all the project training courses in Peru, and who has been employed as a herbarium technician for the project, has now applied to study for the same MSc course, and has submitted an application to the new Alban Programme of the European Union, which aims to support Latin American students.

### **Difficulties encountered**

Two prior difficulties for the project have happily been largely resolved. First, the change in the US dollar – Pound Sterling exchange rate to c. £1 = \$1.6 meant that funds available for salaries and travel in Peru have risen to match those set in the budget. Second, databasing in Peru has run more smoothly because of the use by project staff at MOL of the manual in Spanish for *BG-BASE* written by Tania Durt, the Peruvian Darwin Fellow.

A difficulty this year for the project was gaining media coverage within Peru. We have been successful in publicising the work to a wider scientific audience in Peru, through our links to NGOs, and via conference talks. However, efforts to disseminate our work in the wider media have not been successful, despite considerable efforts. Tania Durt contacted and sent text to national newspapers within Peru, but this did not lead to any coverage. This was in some cases due to being asked for payment in order for articles to be published, a cost for which there was no provision in the budget. Toby Pennington has twice met with staff of the British Embassy in Lima (October 2000, November 2002), who have promised to help us via their press officer, but nothing has yet come from this. Unfortunately, the staff member of the Embassy who had apparently the greatest interest in our work and helped to develop the project, left in September 2000, just before our work started.

We plan to liaise further with the Embassy, and ask them to arrange a press release in Peru co-inciding with the publication of the identification manual.

## Changes to project design

There have been no major changes to project design. There were two minor changes:

1. The production of project websites (in Spanish and English; <http://www.rbge.org.uk/rbge/web/science/research/biodiversity/peruspan.jsp>) instead of a project newsletter. It was decided that this was a more flexible, cost effective way of reaching a larger audience.
2. The Scottish Tropical Biology Group conference (November 2002) was cancelled, so this dissemination output is postponed until the next meeting (November 2003)

## Timetable for the next reporting period

<i>May</i>	<i>4A/B</i>	<i>One week course in taxonomy and biodiversity for 12 undergraduates takes place</i>
<i>September</i>	<i>11A</i>	<i>3 peer reviewed papers are published</i>
<i>September</i>	<i>12A/B</i>	<i>One new database established and one existing one enhanced</i>
<i>September</i>	<i>13B/20</i>	<i>One species collection enhanced with improved facilities of £19,250.</i>
<i>September</i>	<i>10</i>	<i>One field manual published</i>
<i>September</i>	<i>15D</i>	<i>Local UK press release to mark end of project</i>
<i>September</i>	<i>15C</i>	<i>National UK press release discussing project outcomes</i>

## 5. Partnerships

### Collaboration

Collaboration has continued to be very good. UK project staff have been in Peru for three and a half months (15 person-weeks), which is vital to facilitate communication. When not in the UK, we are in regular e-mail contact, but we find that telephone calls are by far the best means of communication. Budget phone cards continue to be a very cost-effective way of making these calls.

The majority of contact has been with our principal collaborators at MOL, with most discussion on the content and format of the identification manual. Toby Pennington and Carlos Reynel have continued to liaise on the training aspects of the project in relation to MOL students and staff. This resulted in a successful course for eight advanced undergraduates in herbarium curation using taxonomic monographs, and the use of taxonomic tools relevant to Peruvian botanists available on the internet. Toby

Pennington and Terry Pennington have continued to spend time with MOL students advising on research projects. Three students who have been assisted by project staff successfully defended their theses this year. Toby Pennington has also provided training in making grant applications by assisting both an undergraduate student (Euridice Honorio) in applying for an EU Alban scholarship to study for an MSc in the UK, and Reynaldo Linares in applying for PhD grants from various sources. This partly addresses the referees' comment from August 2002 that we should be improving the capacity of our collaborators to prepare project proposals. More training in this area, to Peruvian staff and students, will be included in the final project visit by Tony Pennington in September 2003.

Terry Pennington has co-ordinated the collaborative fieldwork element with ICRAF and MOL staff. There have been further changes in the direction of ICRAF's programmes in Peru, with Carmen Sotelo being replaced as programme director by Julio Alegre. Because Julio who was already known to Carlos Reynel, this fortunately seems to have caused no problems.

### **New links**

During the field research phase of the project we have continued to liaise with two Government organisations: INIA (Instituto Nacional de Investigaciones Agrarias) and IIAP (Instituto de Investigaciones de la Amazonia Peruana). Both organisations, like the project collaborator ICRAF, work on the sustainable economic use of Amazonian biodiversity. IIAP were consulted regarding the best format for the identification guide of our priority tree species.

Carlos Reynel has continued his links with the Asociación Peruana para la Promoción del Desarrollo Sostenible (APRODES), an NGO working in the Chanchamayo Valley and involved in projects re-foresting this area, which has little native vegetation left, being one of Peru's major fruit producing zones. Toby Pennington and Terry Pennington met APRODES staff during their visits to Peru this year, and collected and identified specimens from one of their reserve areas. These collections included new records for Peru, and new species. Collaboration with APRODES to further document the flora of this reserve, and to assist in its re-forestation with the economically important species of *Podocarpus* and *Cedrela* (entirely removed by logging), is one potential area for future collaborative projects.

## **6. Impact and Sustainability**

One of the most gratifying aspects of the project has been the interest that it has generated amongst students within MOL who have participated in training courses. Of particular importance are more advanced undergraduates, who are carrying out thesis research, forming the final year of their degree, based in the MOL herbarium. Several of these students have received assistance and input into their projects by Darwin project staff. Three successfully defended their dissertations this year. Several of these students have been employed by the project to mount specimens, and have thereby gained more training and a deeper understanding of the herbarium. One student, Euridice Honorio, has taken a deep interest in the project database, and has taken responsibility for trouble-shooting after receiving training from Tania Durt. She has updated BG-BASE Manual developed for MOL. She is now applying to study for an MSc at RBG Edinburgh and the University of Edinburgh.

Euridice, Tania Durt, and two other experienced undergraduates who have received training via the project have continued to co-ordinate and teach workshops to less experienced undergraduates. These were "Técnicas de montaje de especímenes de



Herbario” (Herbarium specimen mounting techniques; May 2002) and “Identificación de los géneros de la familia Lauraceae” (Identification of genera of the family Lauraceae; 3 days; April 2003; supplementary materials 4). It should be emphasised that these workshops were the students’ own initiative. Given the excellent employment record of MOL students in Government Agencies and NGOs, the interest of students such as Euridice will ensure that the project does have a lasting legacy.

Reynaldo Linares, the Darwin-funded student who completed his MSc last year, is an individual of exceptional ability, who is deeply committed to plant science and conservation in Peru. He wishes to develop his interests in studying the diversity and conservation of seasonally dry tropical forests within Peru via a PhD. With Toby Pennington, he has submitted several applications for a joint Peru-UK PhD project, which Toby Pennington would supervise.

## **7. Post-Project Follow up Activities**

Two follow-up activities would help to consolidate the results of this Darwin project. Both are suggestions of Peruvian project staff at MOL, who are deeply committed to continuing their work.

The first is to mount, incorporate and database the backlog of fully identified specimens at MOL that have not been curated because of prior lack of funding and staff expertise. If these specimens remain uncurated, they are unavailable as a reference collection and therefore useless. The current Darwin project intended only to mount, incorporate and database collections relating to the 150 priority tree species and relatives, but with the hard work and commitment of project-trained MOL staff, we have made much greater progress. 7600 specimens have been mounted, of which 5600 are databased. The remaining backlog is 15000 specimens, which could be dealt with at low cost (c. 15K, including all salaries and materials). Considering the heavy use of this collection for identification of trees collected throughout Peru, and especially its educational value to undergraduate students at MOL, this would be a valuable long-term investment and legacy..

There is also great potential for further work on a related user-friendly identification manual containing silvicultural information relevant to re-forestation projects in Peru. NGOs such as APRODES (see “new links” above), plus petrochemical companies have communicated a clear need for this product to aid re-forestation programmes in Peru. Developing this manual would use staff trained during the current project and draw upon the improved collections in the MOL herbarium in combination with field and bibliographic research. There is much unpublished silvicultural information within Peru in institutional reports and student theses, which has never been disseminated. Conversely, for species growing outside Peru, silvicultural information is available from published work in neighbouring countries, which is missing from Peruvian libraries.

## 8. Outputs, Outcomes and Dissemination

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

Code No.	Quantity	Description
2	1	Peruvian student gained MSc degree
4A	4 days	20 Peruvian undergraduates trained in field taxonomic skills
4A	3 days	Workshop in herbarium curation, taxonomic tools and the internet and identification of Leguminosae for 8 Peruvian undergraduates and MOL technician
6A	10 days	4 Peruvian undergraduate students received herbarium curation training/ advice with research projects
6A	2 days	2 Peruvians trained in databasing techniques
6A	11 weeks	5 Peruvians received training in field techniques/plant identification
7	1	Updated manual of use of project database
11A	2	2 Papers accepted for publication in <i>Candollea</i>
14B	1	Conference talk, Peru
15A	3	Press releases (Peru)
15A/B	1	Press release (Edinburgh)
16A	1	Project website

One output not achieved was a presentation at the Scottish Tropical Biology Group annual conference because this meeting was cancelled. This output will be fulfilled in November 2003.

The press release outputs were only partially achieved in the sense that they did not result in media coverage (see “difficulties encountered” above).

Additional outputs were:

(i) Two papers being accepted for publication:

Bridgewater, S., Pennington, R.T\*., Reynel, C.\*, Daza, A.\* & Pennington, T.D.\* (accepted). A preliminary floristic and phytogeographic analysis of the woody flora of seasonally dry forests in northern Peru. *Candollea*.

Linares-Palomino, R.\*, Pennington, R.T.\* & Bridgewater, S.\* (accepted). The phytogeography of seasonally dry tropical forests in Equatorial Pacific South America. *Candollea*.

[\*Project staff]

(ii) Project website

(iii) Germination trials for five of the priority species for which no growth information exists.

(iv) Updated guide in Spanish for the use of BG-BASE, specifically designed for the needs of MOL.

**Table 2: Publications**

Type * (e.g. journals, manual, CDs)	Detail (title, author, year)	Publishers (name, city)	Available from (e.g. contact address, website)	Cost £
Website (English)	Toby Pennington, 2002		<a href="http://www.rbge.org.uk/rbge/web/science/research/biodiversity/perueng.jsp">http://www.rbge.org.uk/rbge/web/science/research/biodiversity/perueng.jsp</a>	Nil
Website (Spanish)	Tania Durt, 2002		<a href="http://www.rbge.org.uk/rbge/web/science/research/biodiversity/peruspain.jsp">http://www.rbge.org.uk/rbge/web/science/research/biodiversity/peruspain.jsp</a>	Nil

Carlos Reynel (project co-ordinator at MOL) gave a presentation covering the project at a major conference in Peru (*Conservación de la biodiversidad en los Andes y la Amazonía; "Biodiversity conservation in the Andes and Amazonia"*). A colour poster in Spanish describing the project is displayed at the Universidad Agraria, La Molina. A Spanish language website went on line this year:

<http://www.rbge.org.uk/rbge/web/science/research/biodiversity/peruspan.jsp>

The principal dissemination activity will be the circulation of the principal project output, the user-friendly identification manual, to all relevant organisations and individuals. The manual will be free of charge, and costs for postage can be covered from within the publication budget for the final year of the project. Because the manual will be the first of its kind for Peruvian trees, we are confident that it will generate a good deal of interest. Carlos Reynel (project leader in Peru) will be the lead author of the manual, and his permanent post at MOL will permit him to continue these dissemination activities beyond the end of the project.

There have been some difficulties in achieving media coverage in Peru (see "difficulties encountered" above), which we hope to address in the forthcoming final phase of the project.

## 9. Project Expenditure

**Table 3: Project expenditure during the reporting period**

Item	Budget	Expenditure

All carry forward requests have been approved by the Darwin Secretariat. The most substantial of these, under the "Conferences" head is due to no suitable meetings being available. It will be used in 2003/04.

## 10. Monitoring, Evaluation and Lessons

1. Peruvian undergraduate students: by the ability to collect and properly process plant specimens; through formal examinations of thesis research. Dr Carlos Reynel is supervising this monitoring. He reports good understanding of plant identification skills in botanical collecting in his undergraduate forestry students, who have passed the relevant University exams. All his thesis students are also progressing well, with three who received training from project staff passing this year.
2. MOL and ICRAF staff in the field: all participants should be able to collect and process plant specimens correctly and independently, and should develop improved tree identification skills. Terry Pennington is supervising this monitoring, and he confirms by observation on his field visits that all participants can collect and process specimens properly, and are better able to identify trees, especially those from the list of priority species. Participants should also be able to train others in the use of the non-technical identification aids. They were all involved in the field testing of the draft manual, and they have a sound understanding of its use.
3. MOL technicians and students in the herbarium: participants should be able to use *BG-BASE* (specimen database) and to mount and curate specimens independently. This is confirmed by c. 5600 specimens databased, and 7600 mounted.
4. Peruvian Darwin Student Fellow: through formal examinations and thesis research at the University of Edinburgh. Reynaldo Linares gained his MSc, achieving high exam marks, and a distinction for his research dissertation.

## 11. Author(s) / Date

Toby Pennington

10 May 2003