

DAVIS EXPEDITION FUND

REPORT ON EXPEDITION / PROJECT

Expedition/Project Title: *Begonia* Collecting Trip to the Central and Northern Peruvian Andes-Amazon Slope

Travel Dates: 7th February to 5th March 2016

Location: Peru – Piura, Cajamarca, Amazonas, San Martín, Huánuco, Junín, and Pasco Regions

Group Members: Peter Moonlight



Royal
Botanic Garden
Edinburgh



University
of Glasgow

Peru Expedition 2016

Royal Botanic Garden Edinburgh

with

La Universidad Agraria La Molina (Lima)

The University of Glasgow

Introduction

The expedition to Piura, Cajamarca, Amazonas, San Martín, Huánuco, Junín, and Pasco Regions of Peru was led by Peter Moonlight of the Royal Botanic Garden Edinburgh and University of Glasgow in conjunction with Universidad Agraria La Molina.

The main purpose of the expedition was to visit areas of the western slope of the Andes in Central and Northern Peru identified through herbarium work as rich in *Begonia* species, including at least five undescribed species. The majority of target species were known from few collections and are threatened by human activities. We produced herbarium, DNA, and seed collections and collected habitat data from all populations. These data are being used to reconstruct a phylogeny of Andean *Begonia* and reconstruct niche variables across that phylogeny to discern the evolutionary history of adaptation in the group.

Expedition Participants & Associates

Peter Moonlight (leader), RBGE & University of Edinburgh
Aniceto Daza, Universidad Agraria La Molina
Dr Carlos Reynel, Universidad Agraria La Molina
Joshua Richards, Muddy Boots Peru



1 - *Begonia elachista* Moonlight & Tebbitt *in prep.* photographed in Sector Paujil, Parque Nacional Yanachaga-Chemillen. This is believed to be the smallest known species of *Begonia* in the world and was collected for only the second time during this expedition.

Expedition Itinerary

The following sites were visited:

Date	Details
23 rd -26 th January	Arrive in Lima. Meet with counterparts. Collect and purchase expedition equipment. Travel north to Piura Region.
26 th -27 th January	Collections in Huancabamba (Border of Piura and Amazonas Regions)
27 th -29 th January	Travel to and collections in the Cordillera del Condor (Border of the Amazonas and Cajamarca Regions)
30 th January	Travel to and collections in the Santiago Valley (Amazonas Region)
31 st January-2 nd February	Travel to and collections in Alto Mayo (Border of Amazonas and San Martin regions)
3 rd -4 th February	Collections around Tarapoto (San Martin Region)
5 th February	Collections around Sapasoa (San Martin Region)
6 th February	Travel to Tingo Maria (Huánuco Region) and collections on route

7 th -8 th February	Collections around Boqueron de Padre Abad (Ucayali Region)
9 th February	Collections around Uchiza (Huánuco Region)
10 th -11 th February	Collections around Carpish (Huánuco Region)
12 th February	Travel to Concepcion (Junín Region)
13 th February	Travel to Satipo (Junín Region) and collections on route
14 th -15 th February	Travel and return to Atalaya (Ucayali Region) and collections on route
16 th -17 th February	Collections in Chanchamayo (Junín Region)
18 th February	Travel to Oxapampa (Pasco Province)
19 th to 24 th February	Collections around Oxapampa and Pozozo (Pasco Province) Work in HOXA herbarium Application to collect in Paujil
25 th to 26 th February	Travel to Paujil (Pasco Province) Collections in Paujil
27 th -29 th February	Return to Lima
1 st to 4 th March	Curation of specimens Application for export permits
5 th March	Return to UK



2 - *Begonia polypetala* A.D.C. photographed in Huancabamba, Piura Region. This species is known only from this locality.

Methods

At least four collections of each herbarium specimen were made where possible to allow distribution between our partner herbarium in Peru (MOL), the Peruvian National Herbarium (USM), the Royal Botanic Garden Edinburgh (E), and relevant taxonomic specialists. Specimens were dried over kerosene stoves in the field. Where possible, seed was collected and dried in tea bags and silica gel samples were taken to facilitate phylogenetic study. Field data was entered into a spreadsheet and imported into RBGE's PADME *Begonia* dataset and BGBase.

Results

A total of 216 herbarium specimens of *Begonia*, Gesneriaceae, *Calceolaria*, Malvaceae, and Solanaceae were made (see Fig. 5). These specimens are currently being exported to RBGE. Sixteen *Begonia* species collected including seven new species, which were:

- *Begonia bifurcata* Irmsch (Fig. 3)
- *Begonia octopetala* L'Her
- *Begonia velata* L.B.Sm. & B.G.Schub.
- *Begonia geraniifolia* Hook. (Fig. 3)
- *Begonia piurensis* L.B.Sm. & B.G.Schub.
- *Begonia polypetala* A.DC. (Fig. 2)
- *Begonia erythrocarpa* A.DC.
- *Begonia rubrotincta* L.B.Sm. & B.G.Schub.
- *Begonia fischeri* Schrank
- *Begonia peruviana* A.DC.
- *Begonia albomaculata* C.DC.
- *Begonia semiovata* Liebm.
- *Begonia maynensis* A.DC.
- *Begonia* **sp. nov.** Sect. *Knesebeckia* 1
- *Begonia* **sp. nov.** Sect. *Cyathocnemis* 2
- *Begonia parviflora* Poepp. & Endl.
- *Begonia monadelpha* Ruiz & Pav. ex A.DC.
- *Begonia tropaeolifolia* A.DC.
- *Begonia glabra* Aubl.
- *Begonia urticae* L.f.
- *Begonia* **sp. nov.** Sect. *Knesebeckia* 2 (Fig. 5)
- *Begonia* **sp. nov.** Sect. *Eupetalum* 1 – *Begonia specula* in prep
- *Begonia* **sp. nov.** Sect. *Cyathocnemis* 2
- *Begonia hirtella* Link
- *Begonia buddleiifolia* A.DC.
- *Begonia gesnerioides* L.B.Sm. & B.G.Schub.

- *Begonia subciliata* A.DC.
- *Begonia viridiflora* A.DC.
- *Begonia obtecticaulis* Irmsch.
- *Begonia anemoniflora* Irmsch.
- *Begonia lophoptera* Rolfe
- *Begonia arrogans* Irmsch.
- *Begonia urubambensis* Tebbitt
- *Begonia pleiopetala* A.DC.
- *Begonia* **sp. nov.** Sect. *Knesebeckia* 3 – *Begonia chemillenensis* in prep
- *Begonia rossmanniae* A.DC.
- *Begonia* **sp. nov. sect. nov.** (Fig. 1) – *Begonia elachista* in prep



3 - Flowering plants of *Begonia geraniifolia* Hook. (smaller, peltate species) and *B. bifurcata* L.B. Sm. & B.G. Schub. (larger, basifixed species) on the Huancabamba pass, Piura Region. *B. geraniifolia* represents a new record for this Region while *B. bifurcata* is endemic to Huancabamba.



4 - Collecting localities for *Begonia* species collected during the expedition.

Silica gel samples were taken of all collections and molecular work is ongoing at RBGE to incorporate all *Begonia* samples into a well-sampled, global phylogeny of *Begonia* (Moonlight *et al.* 2015).

The following herbaria were also visited:

- HOXA – Herbario Estacion biológica del Jardin Botanico de Missouri, Oxapampa
- MOL – Herbario forestal, Universidad Nacional Agraria La Molina, Lima
- USM – Herbario Universidad Nacional Mayor de San Marcos, Lima

Where possible, all *Begonia* specimens in these institutions were determined. All specimens have also been entered into the RBGE's PADME *Begonia* database, which is due to be published online in 2015. This has further allowed MaxEnt

species distribution models to be produced to test whether *Begonia* species live in significantly different environments and to allow the reconstruction of niche variables across a phylogeny of *Begonia*.

References

Joly *et al.* (2014) Species Radiation by Niche Shifts in New Zealand's Rockcresses (*Pachycladon*, Brassicaceae) *Systematic Biology* 63(2): 192-202.

Moonlight *et al.* (2015) Continental-scale diversification patterns in a megadiverse genus: the biogeography of Neotropical *Begonia*. *Journal of Biogeography* 42(6): 1137-1149.



5 - A new species of *Begonia* collected in Bosque Proteccion Alto Mayo, San Martin Region. The sectional affinities of this species are unclear and phylogenetic work is currently being undertaken to determine them.