

DAVIS EXPEDITION FUND

REPORT ON EXPEDITION / PROJECT

Expedition/Project Title:	Effects of Andean geographic history on the evolutionary dynamics of ant-plant coevolution in the plant family Melastomataceae.
Travel Dates:	December 7 th 2014 to 10 th March 2015
Location:	Arusí-Chocó, Antioquia, Serranía de La Macarena-Meta, Bajo Calima-Valle del Cauca, Villagarzón-Putumayo (Colombia)
Group Members:	María Fernanda Torres Jimenez
Aims:	To collect Melastomataceae plants and its ant symbionts at different populations settled at both sides of the Andean cordillera.

Outcome (not less than 300 words):-

Introduction

My PhD project aims to explore the role of Andean geography as barrier to gene flow on the evolution and diversification of Neotropical plant-ant mutualisms, with Melastomataceae myrmecophyte plants as a model. Using molecular data obtained from plant and ant genomes I will 1) find informative markers to identify plant and ant molecular operational taxonomic units 2) explore plant and ant evolutionary history at species and population level, including patterns of speciation, cospeciation and/or host switching, 3) estimate genetic differentiation among populations located across the Andean cordillera, and 4) detect possible vicariance by comparing the timing of speciation events and geographic events.

The main purpose of this expedition to Colombia was to collect material from different populations of ants and plants symbionts located at both sides of the cordillera. In addition to the genetic data generated from the samples, useful ecological information was recorded during the expedition by collecting only associated partners and by sampling more than one domatium per plant.

Expedition itinerary

The locations originally proposed were revised and some of them were changed. All locations I visited were under optimal conditions of security and local hired guides constantly accompanied me. Despite the time required to organize each fieldtrip, to move across large areas and to contact helpers in each area, a total of five locations were visited, within which at least 5 different sub-areas separated by 1 km or more were sampled from (Figure 1).



Figure 1. Map of Colombia showing the collecting locations sampled from December 2014 to beginning of March 2015. The west side of the Andean Cordillera comprises the areas of: 1) Arusí in the Department of Chocó; and 3) Bajo Calima in the Department of Valle del Cauca. The central inter-valley area comprises San Luis, San Carlos and Río Claro, all nearby areas in Antioquia. The east side of the Andean Cordillera comprises the areas of: 2) Serranía de La Macarena, Meta; and 5) Villagarzón, Putumayo.

Methods

Setting aside the days spent on travelling, I spent at least 3 full days at each collecting locality, during which I covered large areas collecting samples growing inside a radius of 10 m. After collecting each population of the species locally, I moved to a different sub-location at least 1km distant to increase the probability of sampling different populations. I collected silica-dried tissue for DNA extraction from myrmecophyte Melastomataceae plants. From each of those plants I opened 3-10 domatia and collected 10-30 ant workers and fertile individuals (when present). When plants were fertile I collected herbarium samples that I deposited at the Universidad de los Andes and Universidad Distrital herbaria. Currently, material transfer agreements between RBGE and Universidad Distrital are being arranged to

allow for material exchange. All plant and ant collections were made under the Macro permit granted from the National Authority for Ambient Licences-Colombia to the Universidad Distrital.

Collected samples reflect community assembly in each area since all myrmecophyte melastome morphotypes were collected along with other myrmecophyte plants. Plant-associated ants are not restricted to Melastomes and their presence inside other plants is ecologically informative.

Preliminary results

I identified all melastome samples to species or morphotype, however, intraspecific morphological variation is wide, especially for *Tococa guianensis*. Once the genetic analyses are done morphological identification will be compared with the operational molecular taxonomic units identified. Ants were labelled with the same collection number as the host plant since identification in the field is difficult. The list of collected material is listed in Table 1 (for each plant sample there is a corresponding ant collection).

Table 1. Itinerary and plant-ant samples collected on each collecting site, sorted by species.

Collecting locations	Number of samples
Arusi	
January 6th - January 11th	
<i>Tococa</i>	2
<i>Tococa guianensis</i>	42
<i>Tococa spadiciflora</i>	16
<i>Conostegia setosa</i>	15
<i>Henriettella cuneata</i>	3
Gesneriaceae	2
No ID	5
Subtotal	85
Macarena	
January 15th - January 19th	
<i>Tococa guianensis</i>	37
<i>Tococa stenoptera</i>	2
No ID	1
Subtotal	40
Bajo Calima	
January 28th - February 1st	
<i>Tococa</i>	1
<i>Tococa guianensis</i>	51
<i>Conostegia setosa</i>	5
<i>Miconia</i>	1
No ID	16

Subtotal	74
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Antioquia	
February 15th - February 20th	
<i>Tococa guianensis</i>	10
<i>Tococa guianensis</i> ssp 1	12
No ID	5
Subtotal	27
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Putumayo	
February 28th - March 4th	
<i>Tococa</i>	2
<i>Tococa caquetana</i>	7
<i>Tococa guianensis</i>	8
<i>Tococa guianensis</i> ssp <i>decumbent</i>	28
<i>Tococa guianensis</i> ssp <i>elongata</i>	8
<i>Tococa guianensis</i> spp <i>larga</i>	1
<i>Tococa bullifera</i>	27
<i>Maieta</i>	5
Subtotal	86
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Total	312
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Though I haven't formally identified my ants to species, superficially ant composition seems to change from one side of the cordillera to the other, as well as from north to south of the eastern side of the cordillera. Moreover, different ants have different nest habits and behaviour (aggressiveness on opening the domatium). For instance, ants collected in the north area of the western slope produce extra entrances to the domatia that are not found in plants growing on the southwest or the east sides of the cordillera. Before my next field visit, I will use DNA barcoding to identify ants to known genera and to molecular operational taxonomic units within these. A further preliminary observation is that melastome myrmecophytes, especially *Tococa guianensis*, appear to be associated with humid, acidic soils and usually grow in secondary (or primary disturbed) forest.

Future work

Colombia is a variable and complex country, both geographically and socially. Some locations suggested originally were changed due to unpredicted governmental activities in those areas. However, other areas previously under-explored are being opened to research, tourism and industry. This grant covered a good number of locations and I aim to increase sampling coverage on the next expedition, adding areas that offer information that was not available before and improving the pair-wise comparisons of populations among and across different sides of the cordillera (Figure 2).

The areas to be sampled between 2015-2016 are shown in Figure 2a: 1) Nariño County; 2) Florencia, Caquetá, easily reached by bus; 3) La Pedrera, Amazonas; 4) inter-valley area near Ibagué, Tolima, easily reachable by bus; 5) Yopal and nearby areas in Casanare, easily reachable by bus; 6) Inírida, Guainía; 7) Cimitarra, Santander; and 8) Catatumbo, Norte de Santander. Areas of special interest are

Cimitarra and Catatumbo, regions to which access is now possible and which represent a highly diverse underexplored area. As I am aware of the situation in Colombia and as a citizen of the country, I would change locations to nearby, more secure areas when necessary, but sticking to the mutualism's distribution and as far as possible ensuring non-biased data.

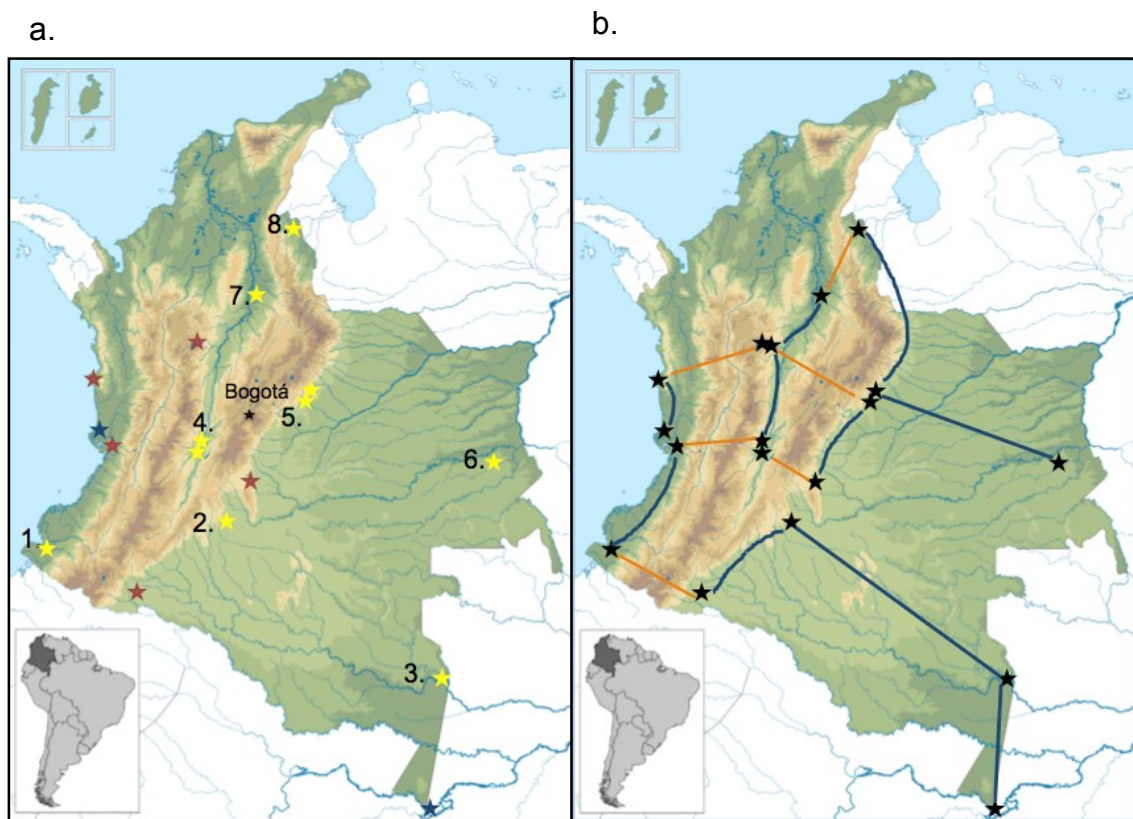


Figure 2. a) Map of Colombia showing the collecting locations for the project. Blue stars represent locations collected in 2013. Orange stars represent locations collected between 2014 and 2015. Yellow stars represent locations to be collected between 2015-2016. b) Pair-wise comparisons between collecting locations. Orange lines stand for comparisons across the Andean cordillera and blue lines stand for comparisons on each side.

Expenses

Location	Expense description	Number of days	Number of people	Amount in GBP
Bogotá	Tickets Edinburgh-Bogotá	NA	1	£1,497.85
	Taxi from house to the airport (round trip)	2	1	£15.70
	Transportation inside Bogotá	-	1	£26.17
	Subtotal			£1,539.73
Arusí-Chocó (January 6th - January 11th)	Taxi from house to the airport (round trip)	NA	1	£15.70
	Tickets Bogotá-Medellín-Nuquí (round trip)	NA	1	£244.90

	Boat from Nuquí to Arusí (round trip)	NA	2	£130.87
	Stay in Arusí	5	2	£65.43
	Guide salary	5	1	£34.03
	Food (including the guard at the reserve)	5	3	£104.69
	Subtotal			£595.63
La Macarena-Meta (January 15th - January 19th)	Taxi from house to the bus station (round trip)	NA	1	£10.47
	Bus Bogotá-Villavicencio-La Macarena (round trip)	NA	2	£26.17
	Stay in La Macarena	4	2	£39.26
	Guide salary	4	1	£31.41
	Gas (motorcycle)	4	2	£13.09
	Food	4	2	£65.43
	Subtotal			£185.83
Bajo Calima-Valle del Cauca (January 28th - February 1st)	Taxi from house to the airport (round trip)	NA	1	£15.70
	Tickets Bogotá-Cali (round trip)	NA	1	£124.09
	Taxi Cali airport-bus station (round trip)	NA	1	£26.17
	Bus Cali-Buenaventura (round trip)	NA	1	£14.13
	Moto Buenaventura-Bajo Calima (round trip)	NA	1	£5.23
	Guide salary	4	1	£26.17
	Food	4	2	£28.79
	Subtotal			£240.30
Antioquia (February 15th - February 20th)	Taxi from house to the airport (round trip)	NA	1	£15.70
	Tickets Bogotá-Río Negro (round trip plus change charge)	NA	2	£250.48
	Taxi Río Negro-Medellín (round trip)	NA	2	£19.63
	Stay in Medellín	1	2	£17.01
	Bus Medellín-San Luís	NA	2	£8.90
	Stay in San Luís	1	2	£24.86
	Bus San Luís-Rioclaro	NA	2	£13.09
	Stay in Rioclaro reserve (food included)	3	2	£167.51
	Bus Rioclaro-San Carlos	NA	2	£39.26
	Stay in San Carlos	1	2	£15.70
	Food (Medellín, San Luis, San Carlos)	3	2	£94.22
	Taxi inside Medellín	2	2	£12.56
	Subtotal			£678.94
Villagarzón-Putumayo (February 28th - March 4th)	Taxi from house to the airport (round trip)	NA		£15.70
	Tickets Bogotá-Puerto Asís (round trip)	NA	2	£357.67
	Bus Puerto Asís-Mocoa	NA	2	£26.17
	Bus Mocoa-Finca-nearby areas	5	2	£26.17
	Stay in la finca	5	2	£130.87

Guide salary	4	1	£83.75
Food	5	2	£104.69
Subtotal			£745.03
TOTAL			£3,985.45
For Davis Expedition Fund			£14.55