DAVIS EXPEDITION FUND

REPORT ON EXPEDITION / PROJECT

Expedition/Project Title:	Collecting *Passiflora* subgenus *Astrophea* (Passifloraceae) in Colombia
Travel Dates:	December 2025
Location:	Colombia
Group Members:	Rebecca Hilgenhof
Aims:	To understand morphological, chemical and genetic diversity of *Passiflora* subgenus *Astrophea* by collecting herbarium specimens, leaf samples and photographs of species native to the Western and Central Andes of Colombia.

Photography consent form attached: (*please refer to your award letter)*

☒ Yes
☐ No

Outcome (a minimum of 500 words):-

DAVIS EXPEDITION FUND

Collecting *Passiflora* subgenus *Astrophea* (Passifloraceae) in Colombia

Rebecca Hilgenhof

December 2025

THE UNIVERSITY of EDINBURGH

Royal Botanic Garden Edinburgh

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Summary

A three-week field expedition was conducted in the northern portion of the Western and Central Andes of Colombia in support of my PhD project titled, "*What shapes leaves? The interaction of physiology, defence and escape in passionflower leaf optimisation*." The aim was to collect herbarium vouchers, silica-dried samples, and photographs of passionflowers belonging to the subgenus *Astrophea* to fill data gaps. 26 collections of *Passiflora* were made during the fieldwork, comprising 6 species. This includes 5 of the 13 species from sect. *Astrophea*, a group that is poorly understood, rarely collected, and largely endemic to Colombia. The field expedition has been a great success in collecting samples of the targeted *Astrophea* species.

Acknowledgements

Thank you very much to the Davis Expedition Fund for their financial support of the collecting expedition in Colombia; without it, the fieldwork would not have been possible. Thank you also to the botanic garden in Bogotá, with special thanks to Carlos A. Vargas and Juan Fernando Phillips Bernal for their continued support in my PhD fieldwork and for helping with the collecting permit as part of the Memorandum of Understanding between the Royal Botanic Garden Edinburgh (RBGE) and Jardín Botánico de Bogotá José Celestino Mutis (JBB). A big thank you to my collecting team, and to those who have continuously supported me from afar (you know who you are). And lastly, thank you very much to the directors and curators who hosted my herbarium stays: Santiago Mesa Arango (JAUM research associate), Felipe Alfonso Cardona Naranjo (HUA), Alvaro Idárraga (JAUM), Bibiana M. Bonilla Hernández (MEDEL), Manuela A. Sánchez Quiroga (JBB), and Boris S. Villanueva Tamayo (JBB).

Background

The proposed fieldwork was to be conducted as part of my PhD project titled, "*What shapes leaves? The interaction of physiology, defence and escape in passionflower leaf optimisation*." The PhD project set out to study leaf evolution in a complex group of passionflowers, *Passiflora* subgenus *Astrophea*. *Astrophea* passionflowers are of ecological importance and have co-evolved with a small group of host-specific butterflies in the *Heliconius sara-sapho* complex. These butterflies rear their larvae exclusively on *Astrophea* leaves, having evolved to cope with, and even utilise, the plant's chemical defence compounds (namely cyanogenic glycosides) for their own defence. In turn, *Astrophea* are hypothesised to have diversified their chemical profile. In addition, they have deployed physical defence mechanisms, such as complex leaf morphology that includes extrafloral nectaries, which attract ants and wasps for protection. *Astrophea* passionflowers are found in a variety of habitats, ranging from lowland Amazonian wet forests to high-montane cloud forests of the Andes. My PhD investigates whether their complex leaf morphology results from biotic or abiotic interactions, and the interplay between these two major selective forces. Collecting field samples for phylogenomic, metabolomic, and morphological analyses is a crucial aspect of my PhD, as collections are limited and historic specimens are often inadequate.

Passiflora L.

Passiflora, with more than 645 recognised taxa, is the most species-rich genus in Passifloraceae s.s. Juss. ex Roussel and has its centre of diversity in the Neotropics (Ulmer and MacDougal, 2004; Krosnick *et al.*, 2013). The vast majority of species are herbaceous or woody. Most are tendril-bearing perennial climbers, but there are a few climbing annuals, and some self-supporting shrubs and trees lack climbing aids entirely. The genus *Passiflora* is divided into six subgenera: *Astrophea* (DC.) Mast., *Deidamioides* (Harms) Killip, *Decaloba* (DC.) Rchb., *Passiflora*, *Tetrapathea* (DC.) P.S. Green and *Tryphostemmatoides* (Harms) Killip (Feuillet and MacDougal, 2003; Yockteng and Nadot, 2004; Muschner *et al.*, 2012; Krosnick *et al.*, 2013; Buitrago A., MacDougal and Coca, 2018). The PhD project specifically focuses on the poorly known subgenus *Astrophea*.

Passiflora subgenus *Astrophea* DC.

Subgenus *Astrophea* contains 75 species of woody lianas, shrubs, and trees native to the tropical and subtropical regions of South and Central America (Hilgenhof *et al.,* in review; Ocampo, Velásquez and Velásquez, 2020). The greatest number of species is found in Brazil (Mezzonato-Pires *et al.*, 2020) and Colombia (22 spp.; Ocampo *et al.*, 2007), but those taxa native to Colombia remain largely unrevised. Of section *Astrophea*, which contains all true trees and shrubs, 10 out of the 16 recognised taxa are endemic to Colombia (Hilgenhof *et al.,* in review).

Colombia

Despite being of intermediate size, Colombia is the second most biodiverse country in the world. Its flora is rich, with the world's highest percentage of species endemism (Pérez-Escobar *et al.*, 2022). In total, there are between 40,000 and 45,000 plant species recorded in Colombia, which equates to 10-20% of the global species total (Ulloa Ulloa *et al.*, 2017). Colombia is a hotspot for species in the subgenus *Astrophea,* and the genus in general, as slightly more than a quarter of the 575 known species are native. Colombia's species richness is mainly the result of its complex geography (Antonelli, 2008; Pérez-Escobar *et al.*, 2022). The country is divided into six distinct

biogeographic regions (Ocampo *et al.*, 2007). The Andes, which dominate the country, form one of these biogeographic regions. Colombia's Andes are unique, divided into three distinct branches known as the Cordillera Occidental (Western), Cordillera Central, and Cordillera Oriental (Eastern). This field expedition focused on the northern portion of the Western and Central Andes of Colombia (see Figure 2).

Methodology

Herbarium visits

Prior to going to the field, I visited three regional herbaria: the University of Antioquia (Universidad de Antioquia; HUA), the National University of Colombia in Medellín (Universidad Nacional de Colombia - Sede Medellín; MEDEL), and the Medellín botanic garden (Fundación Jardín Botánico Joaquín Antonio Uribe de Medellín; JAUM). All these herbaria (see Figure 1A-D), but especially the herbarium of the University of Antioquia, house some of the best contemporary herbarium collections of *Astrophea,* including some types (e.g., holotype of *P. gironensis* C. Aguirre, M. Bonilla & A. Rojas). I studied all vouchers referring to species of subgenus *Astrophea* with a focus on section *Astrophea*. To record morphological data, I took images of all specimens, which I can analyse in ImageJ at a later stage, and detailed notes on characters not easily visible in photos. For example, I recorded the distribution and density of hairs for each collection, and the number of extrafloral nectaries located along the petiole-midrib junction.

Visiting these three local herbaria prior to the fieldwork formed an important aspect of the trip, as their collections are not digitised and collection data is largely unavailable online. The information will not only contribute to the data for my PhD but was also crucial to the trip, as it informed our collection efforts.

At the end of the expedition, I also had the chance to visit the herbarium of the botanic garden in Bogotá (Jardín Botánico de Bogotá José Celestino Mutis; JBB) and study its collection. This was convenient as I had to drop off the collected specimens at JBB post-trip.

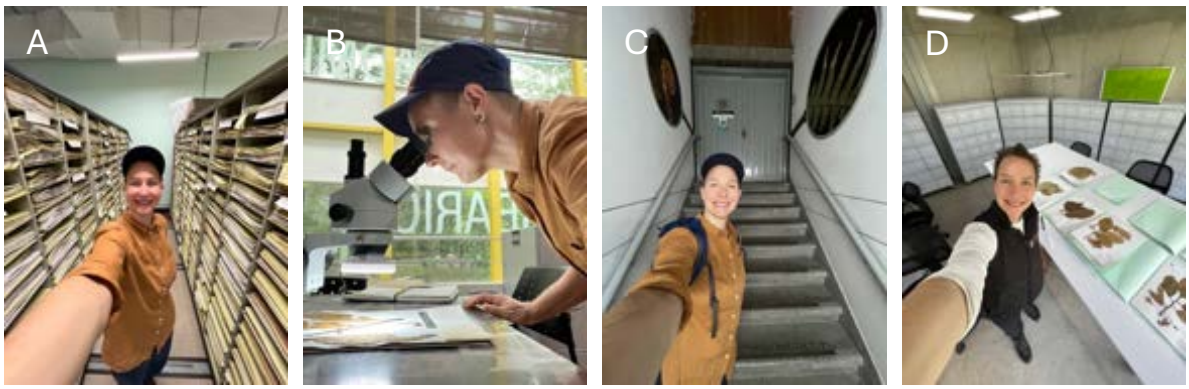

Figure 1: Visit to the three herbaria in Medellín: MEDEL (A), JAUM (B), HUA (C), and JBB (D).

Fieldwork

In December 2025, I spent two weeks in the field in the Western (Cordillera Occidental) and Central (Cordillera Central) Andes of Colombia with the aim of collecting herbarium vouchers, silica-dried samples, and photographs of passionflowers belonging to subgenus *Astrophea*.

Study areas

The fieldwork was conducted in the northern portion of the Western and Central Andes of Colombia (see Figure 2). Here we visited a total of nine collecting sites: (1) Santa Fe de Antioquia, (2) Santa Rosa de Osos, (3) El Carmen de Viboral, (4) Alejandría, (5) La Ceja, (6) Pereira (see Figure 7B), (7) Santa Rosa de Cabal, (8) Tuluá & (9) Bolívar. These collecting sites were located within 3 different Colombian departments: 1–5 in Antioquia, 6–7 in Risaralda and 8–9 Valle del Cauca. We covered a distance of 420 km between our northern- & southernmost field locations.

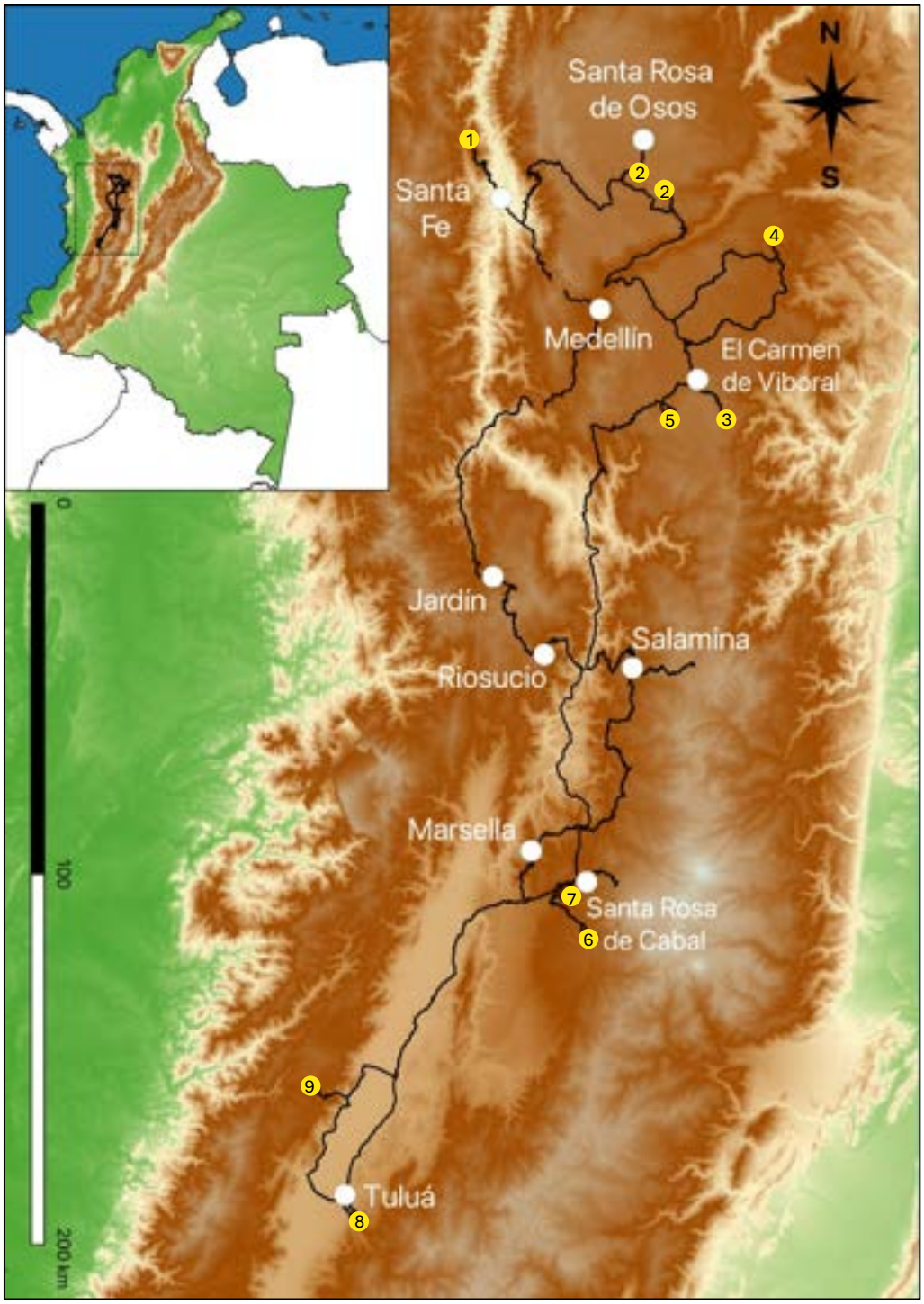

Figure 2: Map of all collection sites. Yellow circles indicate collection areas according to the numbering in the above text; Inset: map of Colombia with field expedition area indicated. Map modified from Connolly-Moyls (2025).

Field expedition team

During my time in the field, I was accompanied by Medellín-based botanist Santiago Mesa Arango (JAUM research associate), free-lance botanist Connor Connolly-Moyls (RBGE research associate and graduate of the University of Edinburgh), and our driver Ricardo Franco Bedoya (HUA). In Santa Rosa de Cabal, we were accompanied by local field guide Sebastián Gutiérrez García (see Figure 3).

Figure 3: The field expedition team (from left to right): me, Santiago, Connor, Ricardo, & Sebastián.

Collections

The field expedition and its collecting of specimens were carried out with support from the botanic garden in Bogotá and form part of the Memorandum of Understanding between the Royal Botanic Garden Edinburgh (RBGE) and the Jardín Botánico de Bogotá José Celestino Mutis (JBB).

The following types of collections and associated data were taken during the two-week field expedition to Colombia, and support the successful undertaking of my PhD:

Herbarium specimens were collected of all *Astrophea* species encountered during the field expedition to Colombia (see Figure 4A). *Passiflora* from other subgenera were also collected to be used as outgroups. Both fertile and sterile specimens were collected, with the former preferred where possible to improve species determination. Each herbarium collection (e.g., see Figure 4B) was made in 2–5 duplicates to allow distribution of specimens to other national and international herbaria. For every collection in bloom, flowers were longitudinally dissected to expose informative internal structures. Specimens were pressed using a field press, corrugated cardboard, and newspaper, and dried using an electric fan heater for at least 24 hours at medium-high heat. Each specimen, newspaper, and security jewellery tag was labelled with important collection information: primary collector, collection number, and date collected.

Silica-dried material was collected in duplicates of two for each collection. We used sterilised secateurs to cut rectangular pieces (max. 10 x 7 cm) of leaf lamina from the often-large leaves, whereby excluding prominent veins. This ensured a quick and even drying. The leaf material was placed flat in a teabag with important collection data, before being submerged in silica gel. The material remained in the closed silica container for at least 24 hours. The samples will be used for both the phylogenomic and metabolomic analysis. To prevent enzyme-induced metabolite changes, we refrained from tearing the leaf material into smaller pieces—a common practice when collecting for DNA analysis only. The preserved secondary metabolites will inform herbivore-interaction as part of the PhD. To ensure uniformity of the overall data set, leaf samples were taken from the second leaf from the apex along a chosen branch. Selecting the 2nd leaf additionally ensures that the sample is taken at the right level of leaf maturity.

Photographs were taken of each sample collection—especially of leaf characters and taxonomically informative floral structures. To ensure uniformity of the data, the first 4-5 leaves of a chosen branch were photographed in sequence from youngest to oldest (see Figure 4C).

Additional data were recorded for each collection, including location data (department, municipality, nearby places, etc.), GPS coordinates, elevation, habitat, associated flora, growing aspect, and the time and date of collection. We also recorded environmental conditions (sun vs shade, windy vs wind still, etc.) at the time of specimen collection.

Figure 4: *Vargas 5002*: (A) Collecting in the field, (B) dried specimen, and (C) photograph of leaf dimensions.

Outcomes

During the 3-week expedition to Colombia, the following notable outcomes were achieved:

I. **26 herbarium collections** (*Carlos A. Vargas 5200* to *Carlos A. Vargas 5225*) of *Passiflora* were made, comprising 6 taxa (see Table 1);

II. Total collections covered **5 species of *Passiflora* sect. *Astrophea***, a group of 13 species of passionflowers that is poorly understood, rarely collected, and largely endemic to Colombia (77% of taxa);

III. The topset for each of the 26 herbarium collections remained at the JBB herbarium to form part of their collection;

IV. Each of the 26 preserved collections is represented by 2-5 duplicates, which will allow for the wider **distribution to herbaria nationally** (e.g., COL, HUA, and JAUM) **and internationally** (e.g., E, MO, etc.);

V. **7 collections of the rare *Passiflora engleriana* Harms** (see Figure 6A-B), an Antioquian endemic species, were made in flower and fruit, expanding its known range within the department and doubling the number of all known collections;

VI. Collected **7 gatherings of *Passiflora magnoliifolia* F.Dietr.** (see Figure 7A), **the type species for section *Astrophea*,** from across its range among the Western and Central Andes;

VII. All **collection data has been added to Tropicos, the online database** of the Missouri Botanical Garden;

VIII. **Dried silica samples** accompanying each of the herbarium collections are deposited at JBB, and 50% shared with RBGE (E). The samples will be used for the phylogenomic and metabolomic analysis of the PhD;

IX. **Observations on herbivore interactions were recorded for each collection** (see Figure 7C)**;**

X. **Detailed photographs** taken for each collection will be used to capture morphological data, inform taxonomy, and produce a guide to the arboreal passionflowers of Colombia in collaboration with JBB;

XI. **4 important Colombian herbaria** (JAUM, JBB, HUA, and MEDEL) were visited as part of the trip;

XII. ***Passiflora sphaerocarpa*** (see Figure 5) **was collected in living form** (seed) to be added to the living collection at JBB and JAUM, supporting the *in-situ* conservation efforts of these local botanic gardens.

Figure 5: A small stand of *Passiflora sphaerocarpa* in the Western Andes near Santa Fe de Antioquia.

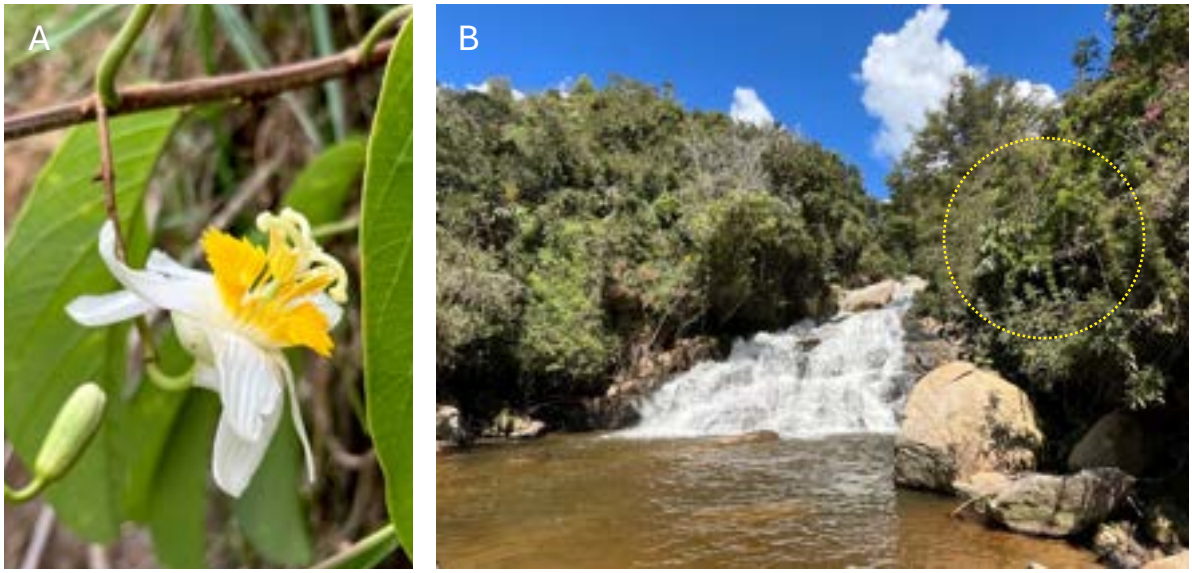

Figure 6: *Passiflora engleriana*; (A) flower & (B) small tree [encircled] growing along a waterfall near St Rosa de Osos.

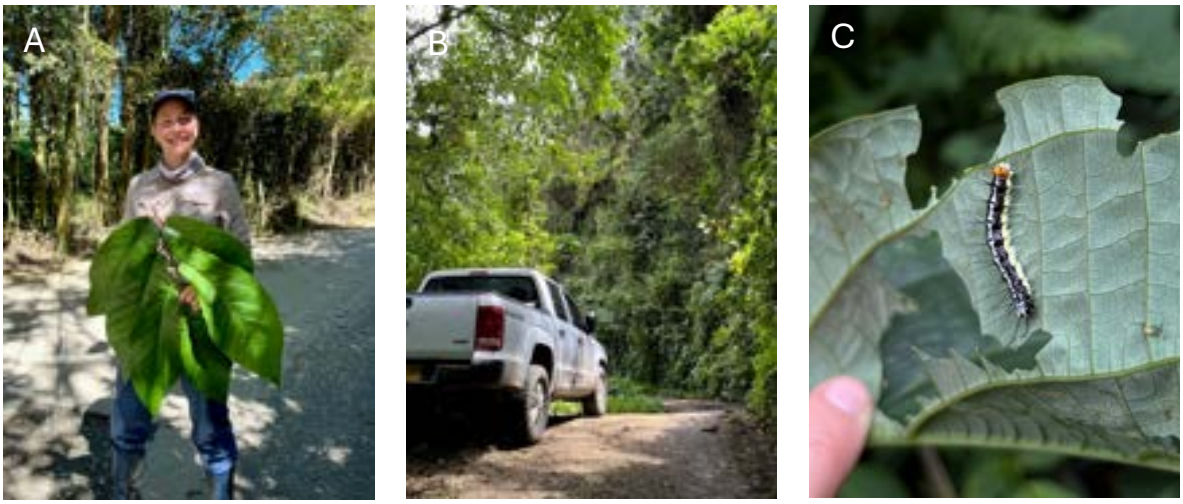

Figure 7: (A) the large leaves of *P. magnoliifolia* and I, (B) cloud forest around Pereira, (C) heliconiine caterpillar feeding on *Astrophea* leaves.

Table 1: Collections made during the field expedition to Western and Central Andes of Colombia.

COLLECTOR	NUMBER	ADDCOLL	FULLNAME	COUNTRY	MAJORAREA	MINORAREA
Carlos A. Vargas Rincon	5200	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora sphaerocarpa Triana & Planch.	Colombia	Antioquia	Santa Fe de Antioquia
Carlos A. Vargas Rincon	5201	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora sphaerocarpa Triana & Planch.	Colombia	Antioquia	Santa Fe de Antioquia
Carlos A. Vargas Rincon	5202	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora engleriana Harms	Colombia	Antioquia	Santa Rosa de Osos
Carlos A. Vargas Rincon	5203	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora engleriana Harms	Colombia	Antioquia	Santa Rosa de Osos
Carlos A. Vargas Rincon	5204	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora engleriana Harms	Colombia	Antioquia	Santa Rosa de Osos
Carlos A. Vargas Rincon	5205	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora engleriana Harms	Colombia	Antioquia	Santa Rosa de Osos
Carlos A. Vargas Rincon	5206	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora engleriana Harms	Colombia	Antioquia	Santa Rosa de Osos
Carlos A. Vargas Rincon	5207	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora magnoliifolia F. Dietr.	Colombia	Antioquia	La Ceja
Carlos A. Vargas Rincon	5208	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora magnoliifolia F. Dietr.	Colombia	Antioquia	La Ceja
Carlos A. Vargas Rincon	5209	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora engleriana Harms	Colombia	Antioquia	El Carmen de Viboral
Carlos A. Vargas Rincon	5210	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora engleriana Harms	Colombia	Antioquia	El Carmen de Viboral
Carlos A. Vargas Rincon	5211	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora magnoliifolia F. Dietr.	Colombia	Antioquia	Alejandría
Carlos A. Vargas Rincon	5212	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora magnoliifolia F. Dietr.	Colombia	Antioquia	Alejandría
Carlos A. Vargas Rincon	5213	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya, Connor Connolly-Moyls & Sebastián Gutiérrez García	Passiflora magnoliifolia F. Dietr.	Colombia	Risaralda	Pereira
Carlos A. Vargas Rincon	5214	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya, Connor Connolly-Moyls & Sebastián Gutiérrez García	Passiflora magnoliifolia F. Dietr.	Colombia	Risaralda	Pereira
Carlos A. Vargas Rincon	5215	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya, Connor Connolly-Moyls & Sebastián Gutiérrez García	Passiflora sphaerocarpa Triana & Planch.	Colombia	Risaralda	Santa Rosa de Cabal
Carlos A. Vargas Rincon	5216	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora sphaerocarpa Triana & Planch.	Colombia	Valle del Cauca	Tuluá
Carlos A. Vargas Rincon	5217	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora sphaerocarpa Triana & Planch.	Colombia	Valle del Cauca	Tuluá
Carlos A. Vargas Rincon	5218	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora sphaerocarpa Triana & Planch.	Colombia	Valle del Cauca	Tuluá

Carlos A. Vargas Rincon	5219	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora sphaerocarpa Triana & Planch.	Colombia	Valle del Cauca	Tuluá
Carlos A. Vargas Rincon	5220	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora sphaerocarpa Triana & Planch.	Colombia	Valle del Cauca	Tuluá
Carlos A. Vargas Rincon	5221	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora sphaerocarpa Triana & Planch.	Colombia	Valle del Cauca	Bolívar
Carlos A. Vargas Rincon	5222	Rebecca Hilgenhof, Santiago Mesa Arango, Ricardo Franco Bedoya & Connor Connolly-Moyls	Passiflora antioquiensis H. Karst.	Colombia	Antioquia	Jardín
Carlos A. Vargas Rincon	5223	Rebecca Hilgenhof & Amanda G. Shalit	Passiflora magnoliifolia F.Dietr.	Colombia	Bogotá D.C.	Jardin Botanic de Bogotá
Carlos A. Vargas Rincon	5224	Rebecca Hilgenhof & Amanda G. Shalit	Passiflora lindeniana Planch. ex Triana & Planch.	Colombia	Bogotá D.C.	Jardin Botanic de Bogotá
Carlos A. Vargas Rincon	5225	Rebecca Hilgenhof & Amanda G. Shalit	Passiflora emarginata Bonpl.	Colombia	Bogotá D.C.	Jardin Botanic de Bogotá

Next steps

The data collected as part of the field expedition to Colombia is currently being curated and prepared for analysis. Measured leaf characters will be studied using a morphometric and Elliptical Fourier analysis. Leaf samples are currently stored at RBGE until the start of molecular extraction in the labs at RBGE in spring 2026, and for mass spectrometry-liquid chromatography at the Edinomics lab facilities at the University of Edinburgh later in 2026.

Future fieldwork is planned (if funding can be secured) for the Cerrado savannah and Atlantica forest biomes in Brazil in January 2027, with the aim of collecting *Astrophea* species native to Brazil. This dataset will aid in answering the PhD questions by comparing the evolution of the Colombian and Brazilian *Astrophea* species.

Conclusion

The field expedition to the Western and Central Andes of Colombia has been a great success in collecting samples of the targeted *Astrophea* species. Despite setting out to find an elusive group of plants, we collected all the target species. Of these species, we were able to obtain multiple collections from across their range in the Colombian Andes. This will enable exploration of genetic, chemical, and morphological variation within a single taxon. The collected data will help fill data gaps and will be utilised to construct the first subgenus-wide phylogeny, investigate cyanogenic glycoside diversity within *Astrophea,* and explore morphological diversity between and within species. Furthermore, the herbarium specimens collected during the trip were deposited at the herbarium of the botanic gardens in Bogotá (JBB) and Medellín (JAUM), the National University of Colombia (COL), and the Royal Botanic Garden Edinburgh (E). All collection data have been added to Tropicos, the online database of the Missouri Botanical Garden. Photographs taken during the expedition will be used to produce a guide to the arboreal passionflowers of Colombia, in collaboration with JBB.

Expenses

Table 2: Expenditure for the 3-week expedition to Colombia, including one-week visiting herbaria in Medellín and 2-weeks in the field.

Item	**Cost (GBP)**
Airfare (international & national flights)	£815.00
Transport (car hire, driver, fuel, road tolls, etc.)	£1,815.00
Accommodation (covering 3 people during the 2- week field expedition)	£2,455.00
Food (covering 3 people during the 2- week field expedition)	£780.00
Collecting equipment	£90.00
Visa	£0.00
TOTAL COST	**£5,955.00**
Award received from the Davis Exp Fund	£3,595.00
Additional funding acquired	£2,360.00

References

Antonelli, A. (2008) Spatiotemporal evolution of neotropical organisms: new insights into an old riddle. Göteborg: Department of Plant and Environmental Sciences, University of Gothenburg.

Buitrago A., M.A., MacDougal, J.M. and Coca, L.F. (2018) 'Passiflora kumandayi (Passifloraceae), a new species from the Colombian Andes in a new section within subgenus Decaloba', *Phytotaxa*, 344(1), p. 13. Available at: https://doi.org/10.11646/phytotaxa.344.1.2.

Feuillet, C. and MacDougal, J.M. (2003) 'A New Infrageneric Classification of Passiflora L. (Passifloraceae)', *Passiflora*, 13(2), pp. 37–40.

Hilgenhof, R., MacDougal, J.M., Atkins, H., Hudson, A. and Mezzonato-Pires, A.C. (in review) 'Nomenclatural synopsis and lectotypification of *Passiflora* subgenus *Astrophea*, with notes on the historic and current taxonomic treatment of the group', *Taxon*.

Krosnick, S.E. *et al.* (2013) 'New Insights into the Evolution of Passiflora Decaloba(Passifloraceae): Phylogenetic Relationships and Morphological Synapomorphies', *Systematic Botany*, 38(3), pp. 692–713. Available at: https://doi.org/10.1600/036364413X670359.

Mezzonato-Pires, A.C. *et al.* (2020) 'A Taxonomic Revision of Passiflora subgenus Astrophea (Passifloraceae sensu stricto) in Brazil', *Phytotaxa*, 473(1), pp. 1–60. Available at: https://doi.org/10.11646/phytotaxa.473.1.1.

Muschner, V.C. *et al.* (2012) 'Phylogeny, biogeography and divergence times in *Passiflora* (Passifloraceae)', *Genetics and Molecular Biology*, 35(4 suppl 1), pp. 1036–1043. Available at: https://doi.org/10.1590/S1415-47572012000600019.

Ocampo, J. *et al.* (2007) 'Diversity of Colombian Passifloraceae: biogeography and an updated list for conservation', *Biota Colombiana*, 8(1), pp. 1–45.

Ocampo, J.A., Velásquez, A.I. and Velásquez, J.O. (2020) 'A rediscovery for the Colombian flora: *Passiflora mariquitensis* Mutis ex L.Uribe (Passifloraceae), a species lost for more than two centuries', *Check List*, 16(6), pp. 1591–1602. Available at: https://doi.org/10.15560/16.6.1591.

Pérez-Escobar, O.A. *et al.* (2022) 'The Andes through time: evolution and distribution of Andean floras', *Trends in Plant Science*, 27(4), pp. 364–378. Available at: https://doi.org/10.1016/j.tplants.2021.09.010.

Ulloa Ulloa, C. *et al.* (2017) 'An integrated assessment of the vascular plant species of the Americas', *Science*, 358(6370), pp. 1614–1617. Available at: https://doi.org/10.1126/science.aao0398.

Ulmer, T. and MacDougal, J.M. (2004) Passiflora*: Passionflowers of the World*. Timber Press.

Yockteng, R. and Nadot, S. (2004) 'Phylogenetic relationships among Passiflora species based on the glutamine synthetase nuclear gene expressed in chloroplast (ncpGS)', *Molecular Phylogenetics and Evolution*, 31(1), pp. 379–396. Available at: https://doi.org/10.1016/S1055-7903(03)00277-X.