

Maria Fernanda Torres, PhD

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EMPLOYMENT

POSTDOCTORAL RESEARCHER UNIVERSITY OF GOTHENBURG

DEPARTMENT OF BIOLOGICAL &
ENVIRONMENTAL SCIENCES
2018- | Gothenburg, Sweden

RESEARCHER AND CURATOR DNA AND TISSUE COLLECTION

INSTITUTO DE INVESTIGACIONES
ALEXANDER VON HUMBOLDT
2012-2013 | Cali, Colombia

EDUCATION

UNIVERSITY OF EDINBURGH

PHD IN EVOLUTIONARY BIOLOGY
2014-2018 | Edinburgh, UK

UNIVERSIDAD DE LOS ANDES

MASTER IN EVOLUTIONARY BIOLOGY
2010-2012 | Bogotá, Colombia

UNIVERSIDAD DE LOS ANDES

BACHELOR IN EVOLUTIONARY BIOLOGY
2006-2010 | Bogotá, Colombia

SKILLS

Spanish (fluently written and spoken)
English (fluently written and spoken)

•Bioinformatics and programming
Assembly and quality check of whole genome
and target sequence data: ABySS, SPAdes,
Velvet, aTRAM, SECAPR, BUSCO, BLAST, and
others.

Variant calling and file manipulation with GATK,
picard, samtools, VCFtools.

Experience using clusters and job managers
(SLURM).

Phylogenomics and Phylogenetics: RAxML,
BEAST(+), MrBayes, iqtree.

Programming languages: Python (very
proficient in Pandas and Matplotlib), Bash, R,
HTML.

•Molecular Biology
Extraction, amplification and sequencing of
animal and plant DNA.

Library preparation protocols for Next
Generation Sequencing •

•Others
Web maintenance.

PROFILE

I am a Colombian researcher passionate about biodiversity. I am particularly interested in the macro- and micro- evolutionary processes giving rise to the high biodiversity in the Neotropics. My research implements phylogenetic, phylogenomic, and population genomics methods to explore the diversity behind diversification.

I have explored the sources of diversification from the perspective of species interactions (ant-plant mutualisms), within a framework of geological history (Andean uplift), and from population-level processes (demographic history of ants). Currently, I am exploring the genetic basis of phenotypic differences between two varieties of an Amazonian palm and whether such difference results from an ongoing speciation process or not.

During my career, I have and carried out all steps of the scientific method. From planning and executing fieldwork expeditions and experiments, to obtaining the sequence data, to analysing, visualizing and writing the results of my research. I particularly enjoy doing fieldwork and learning new methods for analysing data. I have extensive experience in molecular biology and laboratory work. As a bioinformatician, I have experience with referenced and *de novo* assembly of whole genomes and target-capture sequences, variant calling, and handling large amounts of files and data.

Besides research, I actively participate in science communication and community engagement activities, raising awareness about environmental and social concerns in Colombia. I like cooperative work and horizontal feedback, but I am independent. I consider important to maintain good interpersonal relationships. I have a strong disposition to learn, travel and work.

EXPERIENCE

TEACHING

2019 | Universidad CES, Colombia

WORKSHOP ON BIOINFORMATICS FOR BEGINNERS

I prepared and taught a three-day hands-on workshop about basic unix commands, and the processing and analysis of genomic data, from sequences to a species tree.

2010-2012 | Universidad de los Andes, Colombia

PLANTS AND HUMANS.

I prepared and taught the laboratory practicals and some of the theoretical lectures for the "Plants and Humans" course. I lectured a group of 40 students during three-hour weekly practicals, prepared and facilitated the practical's material, prepared and marked exams.

GRANTS

2019-2020 • The Royal Society of Arts and Sciences in Gothenburg

2019-2020 • Gustaf Adolfs Bratts forelasningsfond for science outreach and communication events

2019-2020 • International Palm Society endowment for research

2015-2016 • Davis Expedition Fund for fieldwork expeditions

2014-2015 • Davis Expedition Fund for fieldwork expeditions

2014-2017 • The Darwin Trust of Edinburgh. Postgraduate research scholarship

2011-2013 • Catalyzing New International Collaborations Program, NSF Grant No. 1132916

2011-2012 • Fondo de Investigaciones de la Facultad de Ciencias, Universidad de los Andes

2006-2010 • Quiero estudiar fellowship, Universidad de los Andes

EXPERIENCE

(continuation)

COLLECTIONS MANAGEMENT

2013 | the Alexander von Humboldt Institute for Research on Biological Resources (Colombia)

DNA AND TISSUE COLLECTION AND THE MOLECULAR BIOLOGY LABORATORY

I managed and curated the collection. I prepared incoming and outgoing material, stored and handled samples, managed the database, and administrated permits and agreements. I managed reagents and consumables for the lab and the collection. I optimized DNA extraction protocols for DNA barcoding and monitoring of illegal traffic of fauna and flora.

2010 | Universidad de los Andes, Bogotá, Colombia.

DNA AND TISSUE COLLECTION - ANDES MUSEUM

I managed and curated the collection. I prepared incoming and outgoing material, stored and handled samples, managed the database, and administrated permits and agreements. I managed reagents and consumables for the collection. I contributed to the digitization of herbarium specimens.

DEMONSTRATING

2015-2016 | University of Edinburgh, UK

POPULATION AND COMMUNITY ECOLOGY.

I taught and assisted students once a week during the three-hour computer practicals. I helped preparing and testing the practicals.

2015-2016 | University of Edinburgh, UK

ECOLOGICAL AND ENVIRONMENTAL ANALYSES.

I taught and assisted students once a week during the three-hour computer practicals. I led three hour Q&A sessions three times every semester in preparations for their last exams.

2015 | Royal Botanic Garden Edinburgh, UK

ORIGIN AND DIVERSITY OF LIFE.

I taught and assisted students during two days of lectures about plant evolution and diversification.

MOLECULAR BIOLOGY

2014-2018 | University of Edinburgh, UK.

Insect and plant DNA extraction from fresh and degraded material, library preparation for Next Generation Sequencing during my PhD project.

2012 | University of Minnesota, US

Insect DNA extractions and amplifications for the Weiblen lab.

2011-2012 | Universidad de los Andes, Colombia

Plant and insect DNA extraction and amplification. Research Assistant of the project: "Molecular phylogenetics of Cecropia: A Keystone Neotropical pioneer, US-Colombia collaboration". Contribution acknowledged in Treiber, E.L., Gaglioti, A.L., Romaniuc-Neto, S., Madriñán, S. and Weiblen, G.D., 2016. Phylogeny of the Cecropieae (Urticaceae) and the evolution of an ant-plant mutualism. *Systematic Botany*, 41(1), pp.56-66.

FIELDWORK EXPEDITIONS

I organized and carried out the following fieldwork expeditions aimed to collect biological material and carry out surveys. I coordinated local guides, local assistance, budgets and timelines.

2019 | Conservation and diversity in the Amazonian forest: Palms of the Amazon

I planned and executed a two week expedition to the remote Biological Station "El Zafire". I coordinated a filming crew of four staff, six helpers, two guides, two international and two national researchers, and two students. We recorded the day-to-day of an all-female expedition to collect palm material with the lead and knowledge of the indigenous communities Bora and Huitoto.

2013-2016 | PhD project "Exploring the roles of geographic barriers in determining mutualistic associations between the Neotropical plant *Tococa* and its *Azteca* ants"

I planned and executed two expeditions lasting for three months to collect ant and plants across 12 locations in the lowland forest of Colombia, including localities in Antioquia, Choco, La Macarena and surroundings, eastern grassland plains, and the Amazon basin.

2012 | Project "Plantas acuáticas de la Orinoquia Colombiana"

2010-2012 | Master's project "Cecropia -Ant interactions in Colombia: Identification and specialization network analysis"

2011 | Project "Restauración ecológica en bosques de sabana en la reserva Tomo Grande, Vichada"

2010 | Bachelor's project "Neotropical ant-plant *Triplaris americana* leaf volatiles as attractants of *Pseudomyrmex mordax* ant queens"

I planned and executing several expeditions throughout the year, performing *in situ* experiments with ants and collecting plant material for chemical analyses.

ONGOING CONTRIBUTIONS

Manuscripts in preparation

- Predictors of palm leaf shape: climate, morphology, and phylogeny. My contribution as leader of this project includes data analyses, scripting, figures and manuscript writing.

Collaborators: **Torres, MF**, Chazot, N, Faurby, S, Emilio, T, Antonelli, A, Bacon, CD

- Genomic basis of leaf shape variation in the Amazonian palm *Geonoma macrostachys*. My contribution as leader of this project includes sample collection, DNA extractions and quality assessment, *de novo* assembly of *G. macrostachys*, analyses of pool-seq data, figures and manuscript writing.

Collaborators: **Torres, MF**, Sanin, MJ, Carvalho, S, Ospina, A, Antonelli, A, Bacon, CD

- A global view of mycorrhizal communities associated with Juglandaceae. My contribution includes quality assessment and assembly of target capture data, target annotation, statistical analyses and figures.

Collaborators: Corrales, A, Folk, R, Ge, Z-W, Song, Y-G, Garibay-Orijel, R, Han, X, Alfonso-Corrado, C, **Torres, MF**, Williams-Linera, G, Chu, C, Manos, P, Vilgalys, R, Gazis, R, Dallin, JW, Turner, B, Clark-Tapia, R, Jusino, M, Troung, C, Soltis, P, Soltis, D, Mujic, AB, Ovrebo, CL, Kozlowski, G, Hadziabdic, D, He, F, Smith, MR.

- Population dynamics and vicariance in the plant-inhabiting *Azteca* ants. My contribution as leader of this project includes material collection, DNA extraction, NGS library preparation, *de novo* assembly of 15 ant and 5 plant genomes, data analyses, scripting, figures and manuscript writing.

Collaborators: **Torres MF**, Stone G, Sanchez A, Richardson JE.

Ongoing projects

- American Palm Phylogeny. My contribution includes backup and metadata management, assembly of target sequences, alignment and production of gene and species trees for all American palm species.

Collaborators: Cano, A, Bacon, CD, Zizka, A, Ariza, M, **Torres, MF**, [...], Antonelli, A.

- Attaleine phylogeny from target capture data. My contribution includes quality assessment, cleaning and assembling target capture sequences to produce gene trees and a species tree for the tribe.

Collaborators: **Torres, MF**, de Medeiros, B, Cano, A, Collevatti, R, Bacon, CD, Antonelli, A.

Authorship order is not defined.

- Lepidocaryeae phylogeny from target capture data. My contribution includes quality assessment, cleaning and assembling target capture sequences to produce gene trees and a species tree for the tribe.

Collaborators: Chazot, N, **Torres, MF**, Zizka, A, Bacon, CD, Antonelli, A.

Authorship order is not defined.

PUBLICATIONS

- 2020** **Torres MF** , Stone G, Sanchez A, Richardson JE. Comparative phylogeography of the *Tococa guianensis*-*Azteca* plant-ant mutualism. To be submitted to the call for papers "Exploring the impact of Andean uplift on the life evolution and landscape modification: from Amazonia to Patagonia", Global and Planetary Change. Guest editors: Carina Hoorn and Luis Palazzesi.
I developed the idea, wrote the manuscript, collected and extracted all data, and ran the analyses.
- 2019** Andermann T*, **Torres MF** *, Matos P, Liberal IM, Batista R, de Sousa F, Blanco-Pastor J, Gustafsson ALS, Bacon CD, Antonelli A. A technical guide for target sequence capture in ecology and evolution. *Frontiers in Genetics*, 10:1407. I wrote and edited the manuscript, and designed its main figure.
***shared first authorship**
- 2019** Wasalathanthri ND, Zaidi SS, Mahrt E, Srivastava S, Yu K, Johansson KSL, Li F, **Torres Jimenez MF** , Lo C, Allareddy V, Romero-Molina C, Mosegaard S, Heaton SM, Park JJ, Bacon CD, Yu S, Polat EO, Wasalathanthri D, Wang W, Agarwal D. Challenging transitions. *Science*, 363(6422):24-26.
I contributed a short paragraph describing my experience as a student transitioning from Colombia to the UK.
- 2018** Richardson JE, Madriñan S, Gomez M, Valderrama E, Luna J, Banda K, Serrano J, **Torres MF** , Jara A, Aldana A, Cortes R, Sanchez D, Montes C. Using dated molecular phylogenies to reconstruct geological, climatic and biological history: examples from Colombia. *Geological Journal*. 53(6):2935-2943.
I contributed to the draft and made the map.
- 2017** **Torres MF** and Sanchez A. Neotropical ant-plant *Triplaris americana* attracts *Pseudomyrmex mordax* ant queens during seedling stages. *Insect Sociaux*. 64(2):255-261.
I developed the research idea, carried out all experiments and drafted the manuscript.
- 2016** Mendoza ÁM, **Torres MF** , Paz A, Trujillo-Arias N, López-Alvarez D, Sierra S, Forero F. and Gonzalez MA. Cryptic diversity revealed by DNA barcoding in Colombian illegally traded bird species. *Molecular ecology resources*, 16:862-873.
I carried out the lab work and species analyses and reviewed the manuscript.
- 2015** Stevenson PR, Link A, González-Caro S, and **Torres MF**. Frugivory in Canopy Plants in a Western Amazonian Forest: Dispersal Systems, Phylogenetic Ensembles and Keystone Plants. *PloS one*, 10(10):p.e0140751.
I developed the research idea, carried out the network analyses, and reviewed the draft.
- 2015** Arbeláez-Cortés E, **Torres MF** , López-Álvarez D, Palacio-Mejía JD, Mendoza ÁM and Medina CA. Colombian frozen biodiversity: 16 years of the tissue collection of the Humboldt Institute. *Acta Biológica Colombiana*, 20(2):163-173.
I gathered and synthesized the information described in the paper and reviewed the manuscript.
- 2012** **Torres MF** , Madriñan S, Weiblen GD. *Cecropia*- Ant interactions in Colombia: Identification and specialization network analysis. Master thesis. Department of Biological Sciences, Universidad de los Andes. Bogotá, Colombia.
- 2010** **Torres MF** , Sánchez A, Quijano C, Madriñan S. Neotropical ant-plant *Triplaris americana* leaf volatiles as attractants of *Pseudomyrmex mordax* ant queens. Undergraduate thesis. Department of Biological Sciences, Universidad de los Andes. Bogotá, Colombia.

PRESENTATIONS

- 2020** Accepted presentation: Predictors of palm leaf shape: climate, morphology, and phylogeny. **Torres, M.F.** , Chazot, N., Faurby, S., Emilio, T., Antonelli, A., Bacon, C.D. World Palm Symposium (August 10-13). Rio de Janeiro, Brasil
- 2019-2020** Series of presentations at the Antonelli Lab, University of Gothenburg and Gothenburg Global Biodiversity Centre. Gothenburg, Sweden
- 2019** Introduction to Bash and how to manage large amounts of data. Presentations at the Antonelli Lab Software Club, University of Gothenburg and Gothenburg Global Biodiversity Centre. Gothenburg, Sweden
- 2017** Effects of Andean geographic history on the population history of the plant-ant *Azteca*. Naomi Pierce lab seminar. Harvard University. Cambridge MA, USA
- 2014 - 2016** Series of presentations at the Science Research Club, Royal Botanic Garden Edinburgh, Edinburgh, UK.
- 2013** Interacciones *Cecropia*- hormiga en Colombia: Identificación y análisis de la red de asociaciones. **Torres MF** , Weiblen GD, Madriñán S. VII Congreso Colombiano de Botánica, Ibagué, Colombia.
- 2011** Interacción planta-hormiga: Atracción química de *Triplaris americana* a reinas de *Pseudomyrmex mordax* . **Torres MF** , Sánchez A, Quijano C, Madriñán S. VI Congreso Colombiano de Botánica, Cali-Colombia.
- 2010** Interacción planta-hormiga: Atracción química de *Triplaris americana* a reinas de *Pseudomyrmex mordax* . **Torres MF** , Sánchez A, Quijano C, Madriñán S. Seminar at Universidad Nacional de Colombia. Bogotá, Colombia.

POSTERS

- 2017** **Torres MF** . Effects of Andean geographic history on the population history of the plant-ant *Azteca*. Evolution 2017, Portland OR, USA.
- 2017** **Torres MF** . Effects of Andean geographic history on the population history of the plant-ant *Azteca*. "Ecological genomics of coevolutionary interactions" workshop at ETHzurich, 2017, Weggis, Switzerland.
- 2016** **Torres MF** . Effects of Andean geographic history on the population history of the plant-ant *Azteca*. Poster presentation for third year students, School of Biological Sciences, University of Edinburgh. Edinburgh, UK.
- 2013** Torres MF, Weiblen GD, **Madriñán S** . "*Cecropia*- ant interactions in Colombia: Identification and network analysis" Poster presentation, Botany, New Orleans, USA.
- 2013** **Torres MF** , Weiblen GD, Madriñán S. "*Cecropia*- ant interactions in Colombia: Identification and network analysis" Poster for the Sciences Faculty research forum at Universidad de los Andes, Bogotá, Colombia.

TRAINING

- 2019** Workshop on Model-based inference in Phylogeography - from single species to communities. ForBio. Drøbak, Norway.
- 2019** Workshop on Genomics. evomics.org. Český Krumlov, Czechia.
- 2017** Ecological genomics of coevolutionary interactions. ETHzurich. Weggis, Switzerland.
- 2017** Population genomics workshop. University of Sheffield. Sheffield, UK.
- 2015** Computational Molecular Evolution. Wellcome Trust Advanced Courses. Cambridge, UK.
- 2014** One week course: Introduction to Python, University of Edinburgh. Edinburgh, UK.
- 2012** Workshop in Evolutionary approaches to biodiversity science. ATBC 2012, Bonito-MS, Brazil.

OUTREACH

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| 2019-2020 | Documentary | Zafire: lessons from the Amazon documentary at the International Science Festival in Gothenburg. The documentary follows my expedition to collect palms in the Amazon. I coordinated the expedition, the filming and helped during the pre-production. Gothenburg, Sweden |
| 2019 | Blog post | Looking for palms in the Amazon forest, Antonelli-lab website. http://antonelli-lab.net/wp-admin/post.php?post=802&action=edit |
| 2019 | Public presentation | International Biodiversity Day: Tales from the field
Goteborgs Naturhistoriska Museum |
| 2019 | Mentorship | 1000 girls 1000 futures mentorship program program
The New York Academy of Sciences |
| 2017 | Blog post | The smell of a brand new house, Insectes Sociaux
https://insectesociaux.com/2017/06/09/the-smell-of-a-brand-new-house/ |
| 2017 | Staff | Evolution conference. Portland OR, USA |
| 2017 | Organizer | March for Science. Me and other three collaborators lead, organized and coordinated the march. From permits to stewarding. Edinburgh, UK |
| 2016 | Presenter,
brochure editor | "rbgeColombia, eight years of ongoing collaborative research". Stand at the President of Colombia's state visit. Natural History Museum. London, UK |
| 2015 | Presenter | Cabaret of Dangerous Ideas -The Cocaine Conspiracy. Public outreach and education event about positive and negative impacts of drug legalization. Fringe Festival, Edinburgh, UK |
| 2015 | Presenter | Seminar: the environmental impact of the illegal production, trade and consumption of cocaine. Uppsala University, Sweden |
| 2014 - | Guide and | Expedition Botanics at the Edinburgh International Science Festival. |
| 2015 | presenter | Edinburgh, UK |
| 2014 | Presenter | Cabaret of Dangerous Ideas -Between white lines. Public outreach and education event about social and environmental impacts of cocaine production. Fringe Festival, Edinburgh, UK |

REFERENCES

- Dr. Christine Bacon – University of Gothenburg. Gothenburg Global Biodiversity Centre, Gothenburg, Sweden. christine.bacon@bioenv.gu.se
- Dr. James Richardson – Royal Botanic Garden Edinburgh, Tropical Diversity section. Edinburgh, UK. Universidad del Rosario, Departamento de Biología. Bogotá, Colombia. jamese.richardson@urosario.edu.co
- Dr. Adriana Sánchez – Universidad del Rosario, Departamento de Biología. Bogotá, Colombia. adriana.sanchez@urosario.edu.co
- Dr. Graham Stone – University of Edinburgh, School of Biological Sciences. Edinburgh, UK. gstone@staffmail.ed.ac.uk
- Dr. Pablo R. Stevenson – Universidad de los Andes, Bogotá, Colombia. Departamento de Biología. pstevens@uniandes.edu.co