

PhD Position in Evolutionary Biology / Phylogenomics

Project Title

■ Genomic and phylogenetic bases of evolutionary insular plant radiations, the case of the Sapotaceae in Madagascar

Host Institution

■ Geneva Botanic Garden
■ University of Geneva (UNIGE), Faculty of Science, Department of Plant Sciences

Supervisors

■ Prof. Yamama Naciri (UNIGE, Geneva Botanic Garden)
■ Dr. Charles Pouchon (Geneva Botanic Garden)

Duration

■ 5 years (start date: 01.09.2026)

Location

■ Geneva Botanic Garden

Scientific Background

Evolutionary radiations, defined as the rapid diversification of a single lineage into an exceptionally large number of descendant species, are considered a major driver of current biodiversity on Earth. Studies in plants and animals have identified key innovations (e.g., morphological or behavioural traits) and key environments (e.g., oceanic islands, sky islands) that correlate with radiations. However, evolutionary radiations have rarely been examined within a single family under a shared biogeographic framework, using extensive sampling and standardized molecular markers. As a result, heterogeneity in data can significantly affect phylogenetic reconstructions of diversification and biogeographic patterns.

Several genetic factors have also been proposed as drivers of evolutionary radiation, including hybridization, gene/genome duplications, activation of transposable elements (TEs), and genetic drift during the early stages of radiation. Yet, most of these processes remain poorly studied, particularly in plants.

This project aims to bridge this gap by investigating multiple, independent radiations within the Sapotaceae family in Madagascar, using an innovative combination of phylogenomic and genomic approaches. Building on two previous projects, we developed a targeted gene capture kit that allowed a thorough revision of the family's systematics and phylogeny, doubling the known number of species and providing a robust backbone for further research. A remarkable feature of the family is that 55% of its genera independently radiated in Madagascar (6 out of 11 genera), each giving rise to 17–53 species. However, the processes that generated this diversity have not yet been explored.

This PhD project aims to deepen understanding of both extrinsic factors (environmental variables such as climate, geography, landscape, and soil) and intrinsic factors (trait syndromes, genomic changes, TE dynamics, demographic processes, adaptive evolution, gene duplications) driving these radiations. To achieve this, we will leverage previous phylogenomic reconstructions, incorporating extensive sampling (~200 species, >1000 specimens), targeted gene capture for broad coverage, and whole genome sequencing for a subset of 20 species.

By combining high-resolution phylogenomic data, broad taxonomic sampling, and the complementary expertise of the two principal investigators and three international collaborators in evolutionary biology and ecology, this project will establish a novel integrative framework for testing key hypotheses in insular evolutionary radiations. Additionally, the project will include outreach and educational activities to communicate evolutionary processes to the public in both Switzerland and Madagascar.

Research Objectives

The PhD will explore the phylogenetic and genomic drivers of evolutionary radiations in Sapotaceae in Madagascar, addressing the following research questions:

- Diversification patterns: How do the tempo, mode, and geography of diversification differ across genera radiating within Madagascar's insular environment?
- Neutral vs adaptive processes: What is the relative influence of neutral processes (e.g., small ancestral populations, genetic drift) versus adaptive processes (e.g., natural selection) on diversification?
- Genomic mechanisms: What genomic factors (e.g., transposable elements, genome duplications, gene losses, epigenetic modifications) underlie these radiations?

Methodology

The PhD candidate will work with a comprehensive dataset including:

- Phylogenomic data from target gene capture across ~200 species and >1000 specimens
- Genome and transcriptome sequencing for a subset of ~20 species
- Existing taxonomic, ecological, and environmental data

Approaches will include:

- Field works
- Phylogenomic and divergence time reconstructions
- Collect of morphological, ecological and environmental datasets
- Comparative analyses of diversification rates across lineages by modelling trait evolution and diversification processes
- Genomes reconstruction and annotation
- Genomic analyses (TE dynamics, genome duplications/loss, adaptive evolution)

Expected Outcomes

- Publications in high-impact journals in evolutionary biology and genomics
- Novel insights into the intrinsic and extrinsic drivers of evolutionary radiations
- Development of an integrative framework applicable to other insular radiations

- Contribution to biodiversity research and conservation in Madagascar

Candidate Profile

Education:

- Master's degree (or equivalent) in evolutionary biology, genomics, bioinformatics, ecology, or a related field

Required Skills:

- Strong background in evolutionary biology and/or phylogenetics
- Experience with bioinformatics and large genomic datasets
- Proficiency in programming (e.g., R, Python)

Additional Assets:

- Experience in phylogenomic or population genomics
- Familiarity with ecological or environmental data analysis
- Fieldwork experience

Personal Qualities:

- Analytical thinking and problem-solving skills
- Ability to work independently and collaboratively
- Motivation and curiosity for interdisciplinary research

Skills Developed During the PhD

- Expertise in phylogenomic and evolutionary genomics
- Quantitative and computational skills for large-scale data analysis
- Scientific writing and publications
- Project management and collaboration in an international research team
- Oral communication and presentation at conferences

Research Environment

The candidate will join a dynamic and collaborative research group at the Geneva Botanic Garden (PhyloLab) with expertise in evolutionary biology, population genetics, phylogenomic, computational biology and ecology.

The PhD study is part of larger project (MIARA), subsidised for five years (2026-2031) and hosted by the Geneva Botanic Garden. It aims at increasing the scientific knowledge on the Malagasy floristic diversity while providing new tools and incentives for species and habitat preservation.

The project involves close collaboration between the:

- Two principal investigators,
- International collaborators in Madagascar, Switzerland and France (Dr. Mijoro Rakotoarinivo, University of Antananarivo, Dr. Laurent Gautier, Geneva Botanic Garden; Dr. Jérôme Chave, CNRS Toulouse)),
- A research assistant with access to state-of-the-art computational and genomic resources.

Funding and Conditions

- Fully funded PhD position
- Salary according to institutional/national standards
- Opportunities for conference participation and international collaborations

Application Procedure

Required Documents:

- CV
- Motivation letter
- Academic transcripts
- Contact details of 1-2 referees

How to Apply:

- Send your application to: yamama.naciri@unige.ch and/or yamama.naciri@geneve.ch

Deadlines :

- The deadline for applications is May 15, 2026.
- Interviews will be conducted online on May 21 and 22, 2026
- Applicants will be notified of the outcome by the end of May.

Closing Statement

- This PhD offers a unique opportunity to investigate evolutionary radiations at the intersection of phylogenomic, ecology, and genomics, contributing to our understanding of biodiversity patterns in Madagascar and advancing methods in evolutionary biology.