



Reconstructing the Origins of Madagascar's Biomes

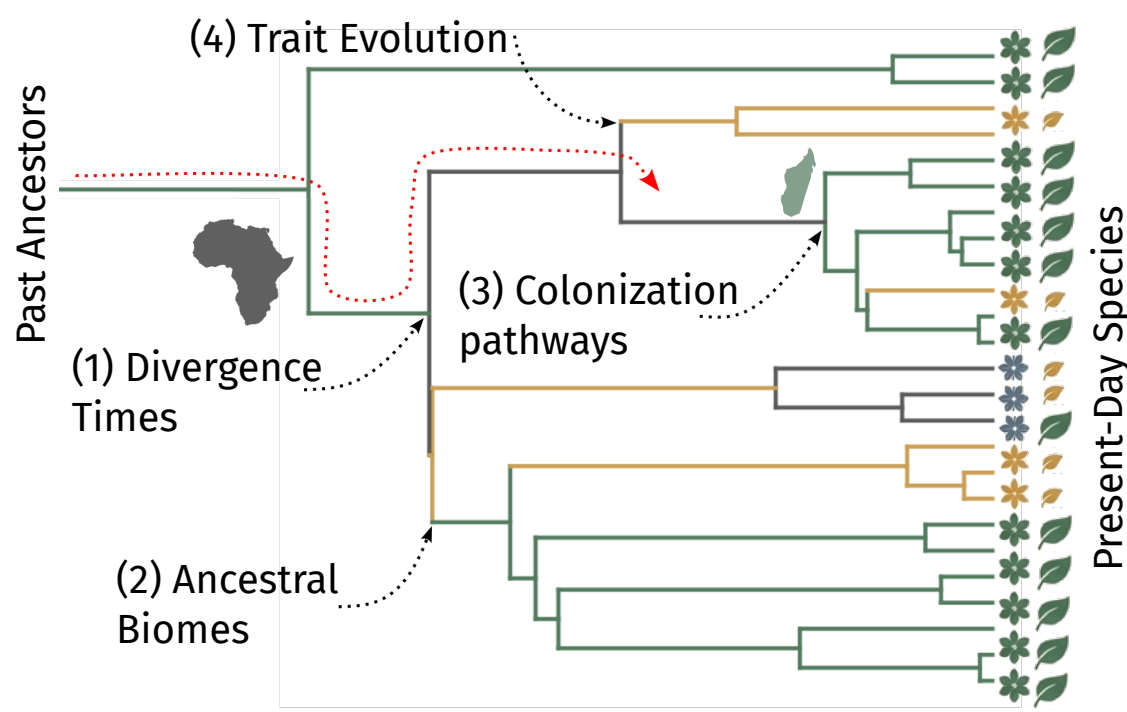
using Plant Phylogenetics

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Research Questions:

- (1) When did lineages split? (2) Which biomes did they inhabit?
- (3) How did they colonize Madagascar? (4) How did traits adapt?



1. Background:

Biomes are large ecological and evolutionary units that have shifted repeatedly with climatic change, tectonics, and biotic changes through Earth's history.

Recent studies emphasize their importance for **conservation** as biomes are characterized by common environmental pressures.

Understanding the history of biomes is thus useful for linking biodiversity to long-term environmental dynamics.

Madagascar, a continental island with exceptional species richness, offers a unique setting to study biome origins and diversification. It's isolation for more than 80 million years together with strong contrasts in rainfall, topography, and soils, has fostered extraordinary endemism, with up to 90% of species found nowhere else.

While many Malagasy lineages likely arrived by transoceanic dispersal and subsequently radiated *in-situ*, the ages and assembly pathways of Madagascar's biomes remain unclear.

2. Case study: Madagascar's endemic Tapia savanna and genus *Uapaca* (Baill.)

(1) Genus *Uapaca*: 25 species: 8 endemic to Madagascar
- often dominant components across forests and savannas in both Africa and Madagascar

(2) Morphological diversity:
stilt roots, bark, fruit, leaves

(3) Tapia Savanna:
dominated by *Uapaca bojeri*

Humid Forest
Grassland-Woodland Mosaic



3. Importance to local communities:

U. bojeri is incredible important to the people of the region whose livelihood is based on what Tapia provides. The trees are **sacred** and fruits cannot be picked from the tree but only collected from the ground. The **bark** is used in traditional medicine. The tree is home to an endemic **silk moth (*Borocera madagascariensis*)**. The cocoons are the source for clothing and traditional burial shrouds and an important **source of income**. *U. bojeri* is associated with **ecotomycorrhiza** and edible **mushrooms**. The **wood** is used as construction material for buildings and equipment of daily use. Natural **fires** and those set by people act as pest control for *U. bojeri* and *B. madagascariensis*. Burning leads to rapid **resprouting** and formation of fresh leaves, which provide the main food source for silk moth caterpillars. Humans have replaced natural **seed dispersal** by extinct megafauna to expand populations.



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[2] Kull, "The 'Degraded' Tapia Woodlands of Highland Madagascar."

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