

Dimensions US-BIOTA: A multidisciplinary framework for biodiversity prediction in the Brazilian Atlantic forest hotspot

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Pre-Columbian range

We develop a broad interdisciplinary framework to explain and predict the distribution of biodiversity in the endangered yet megadiverse Brazilian Atlantic Forest (AF) as a function of environmental changes in space and time.

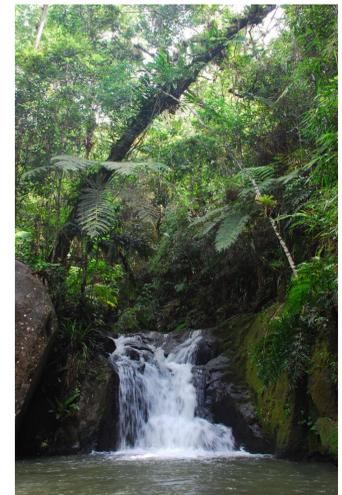
- In pre-Columbian times, the AF extended for 3000 km² between the Atlantic Ocean and the drier uplands of the Brazilian shield.



M. Teixeira

RPPN Serra Bonita, a private reserve in Bahia.

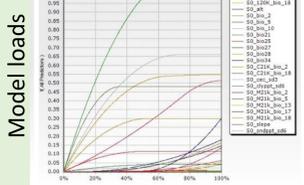
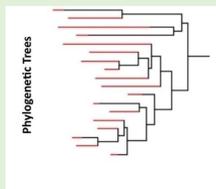
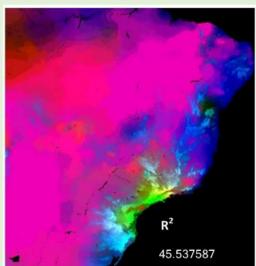
- Today, it is reduced to <11%, yet its fragments harbor one of the largest percentages of endemic species in the world.



C. Grohmann

Ribeira river valley

GDM Maps



Mapping turnover in *Hypsiboas* treefrogs as a function of the environment (present and past). By J. Brown.

- To describe the spatial patterns of diversity in the AF, we synthesize data on taxonomic diversity.
- We integrate data from producers (three Angiosperm families), consumers (harvestmen, amphibians, lizards, birds), parasites, and bacterial symbionts.
- We expand on phylogenetic analyses and summarize patterns of richness, endemism and turnover, for species and lineages.



Caesalpinia echinata, Brazil's national tree (Pau Brasil).



Mitopernoides variabilis.



Dolichoura espiritusanctensis.



Machaeropterus regulus.



Hypsiboas albomarginatus.

W. Thomas

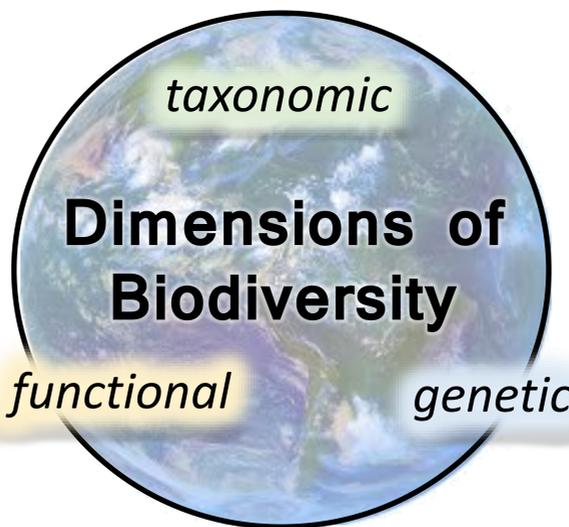
R. Pinto-da-Rocha

F. Michelangeli

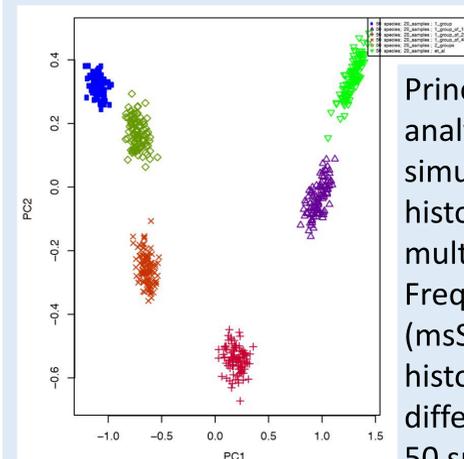
H. Batalha-Filho

A. Carnaval

- We integrate data on the ecological mechanisms acting on the AF flora and fauna with dynamic environmental models that describe variability of precipitation, temperature, and landscape configuration.
- Historical reconstructions particularly focus on the last six glacial-interglacial cycles.
- These models are informed by remote sensing and paleoclimatology, including pollen fossil and speleothem data.



- Through validated computation methods, we use genetic and genomic data to statistically test the fit of aggregate population histories to those inferred environmental shifts and demographic processes.

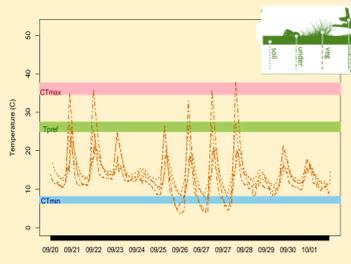


Principle component analysis of 25,000 SNPs simulated under various histories using a novel multi-species Site Frequency Spectrum (msSFS). The simulated histories involve different proportions of 50 species co-expanding

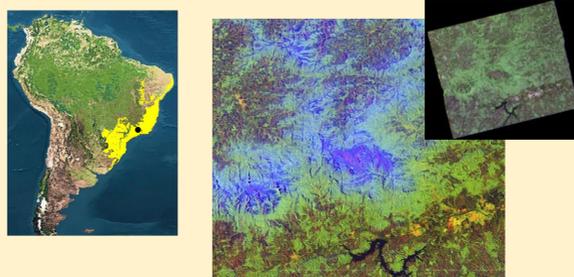
at one time, and suggest that the msSFS can be used to test alternative community histories using RAD-seq data. By X. Xue.

Part of this work is undertaken within the framework of the ALOS Kyoto & Carbon Initiative. The ALOS data were provided by the Alaska Satellite Facility and JAXA EORC. This project is co-funded by NSF (DEB 1343578, 1343612), FAPESP (BIOTA 2013/50297-0), and NASA.

Left: The geochemistry of cave deposits helps us model past precipitation regimes. Here, a stalagmite under study from the Tamboril cave, Minas Gerais. By N. Strikis.



Top right. Microhabitat temperatures under rocks and 5cm deep in soil in Parque Nacional do Itatiaia, along with median critical thermal maximum, preferred and critical thermal minimum temperatures for the local lizard *Colobodactylus dalcyanus* (n=9). By M. Stangas.



ALOS PALSAR and Landsat are used to map habitats and characterize temporal dynamics at spatial resolutions of ~10 - 50m. Single-date SAR imagery combined with a DEM allow us to assess vegetation structure as related to topography in Itatiaia. By K. McDonald.