Delimitation of Sudanian savanna phyloregions using rodents as a model group

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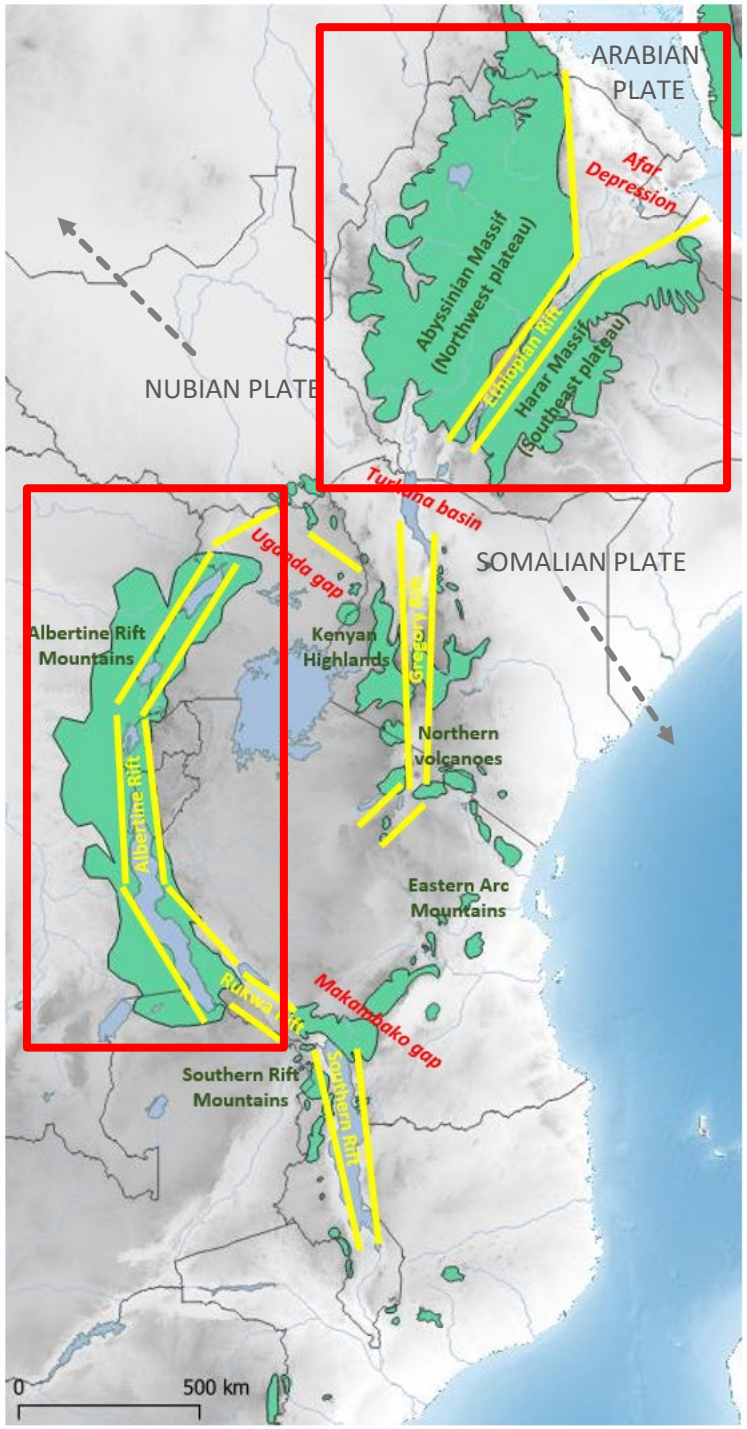
Key points

- Biodiversity distribution
  - Intensive sampling
  - Comparable species delimitation



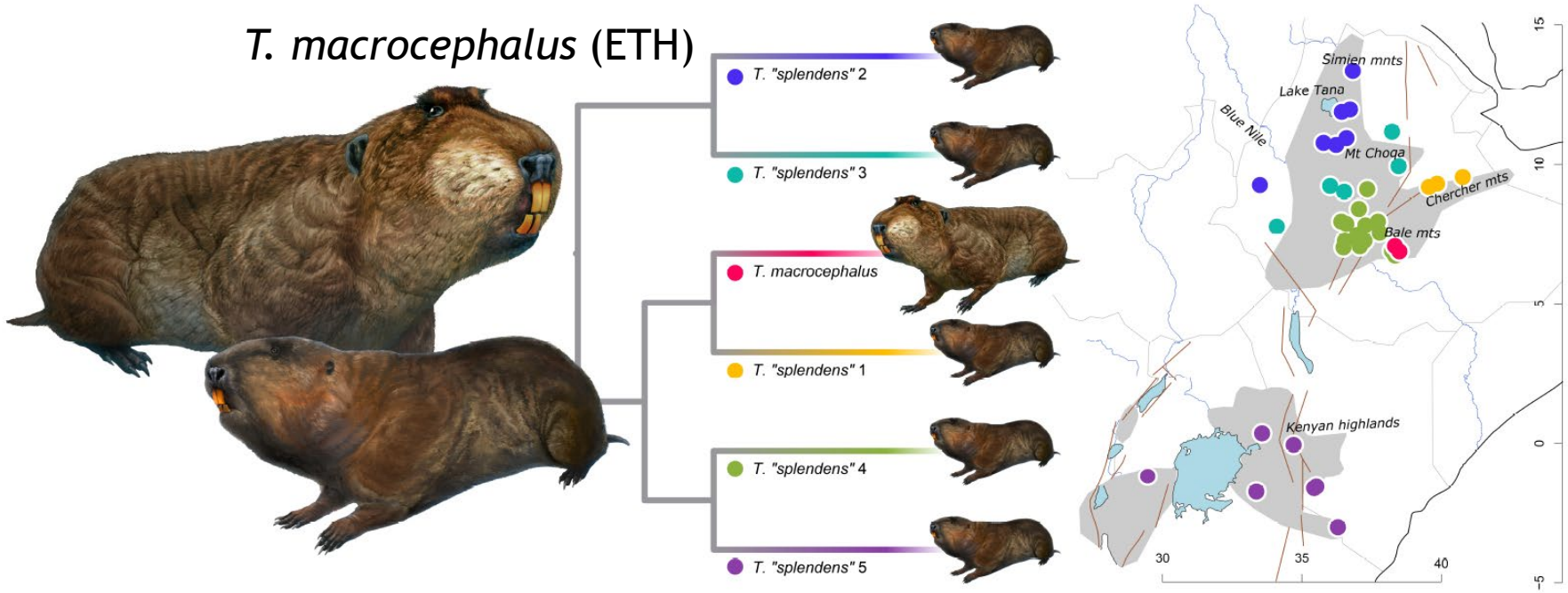
Eastern Afromontane Biodiversity Hotspot (EABH)

- Albertine Rift – considered as the most diverse part of EABH
- Ethiopian Highlands – the most neglected part of EABH despite the large area and geomorphological diversity

„out of Ethiopia“

root rats (*Tachyoryctes*)

T. macrocephalus (ETH)



T. „splendens“ (1 sp. ETH, 12 spp. Albertine rift)

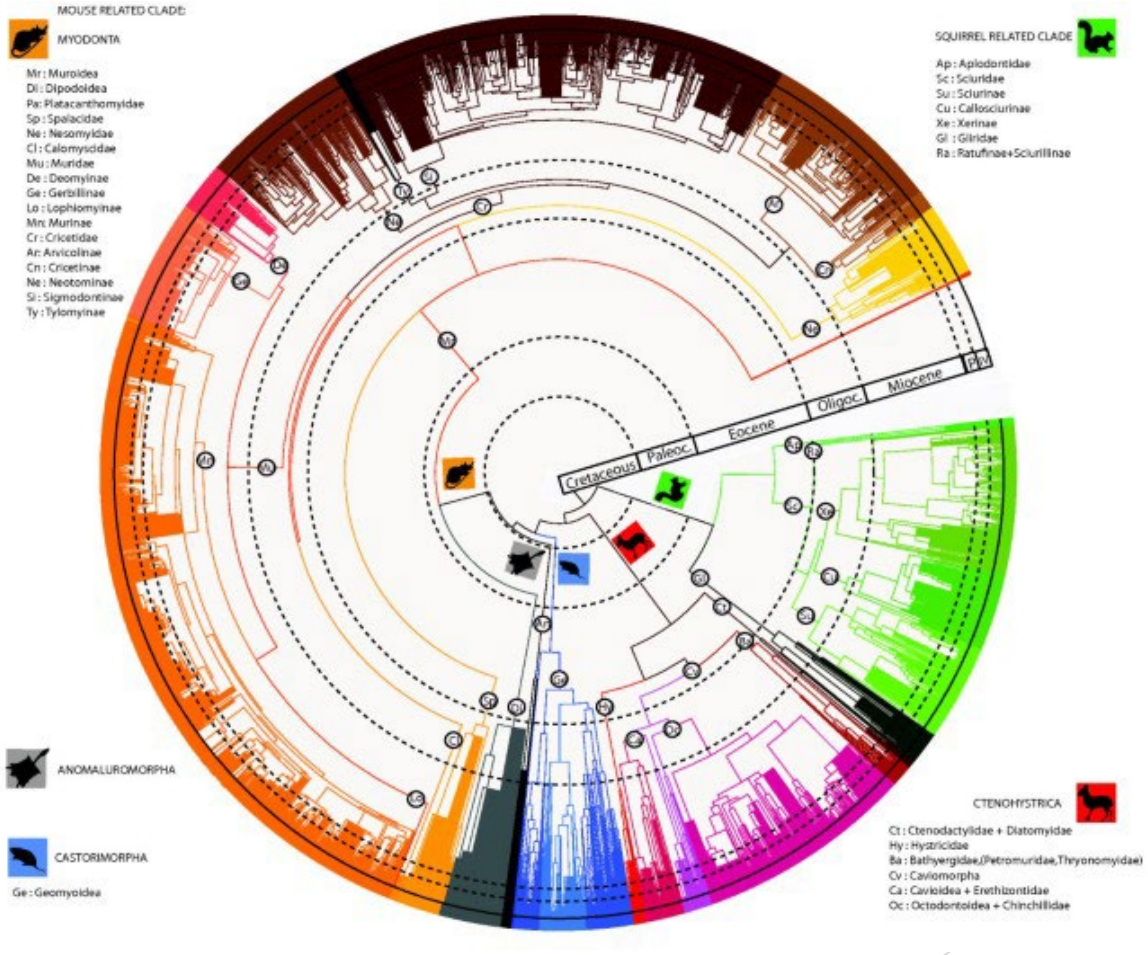
- the highest diversity in Ethiopia (5 species using PSC)
- a single colonization of Kenyan Highlands and Albertine Rift Mts.

Šumbera et al. 2018

Species delimitation

- Species delimitation and definition have been controversial and inconsistent

⇒ hard to work on a large and consistent dataset

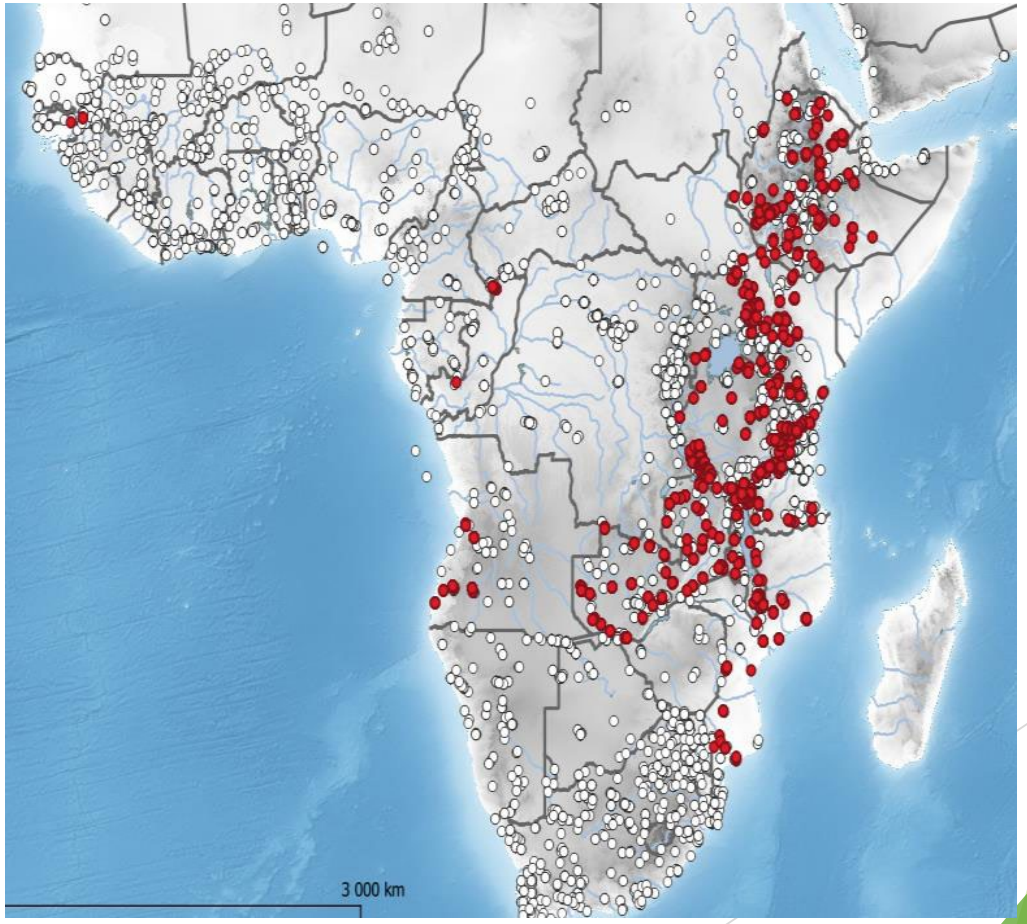


Rodent species-level evolutionary dated tree

Fabre et al. 2012

Rodents as a model group to delimitat phyloregions of the Sudanian savanna

- Subjected to intensive samplings, phylogenetic and phylogeographic research



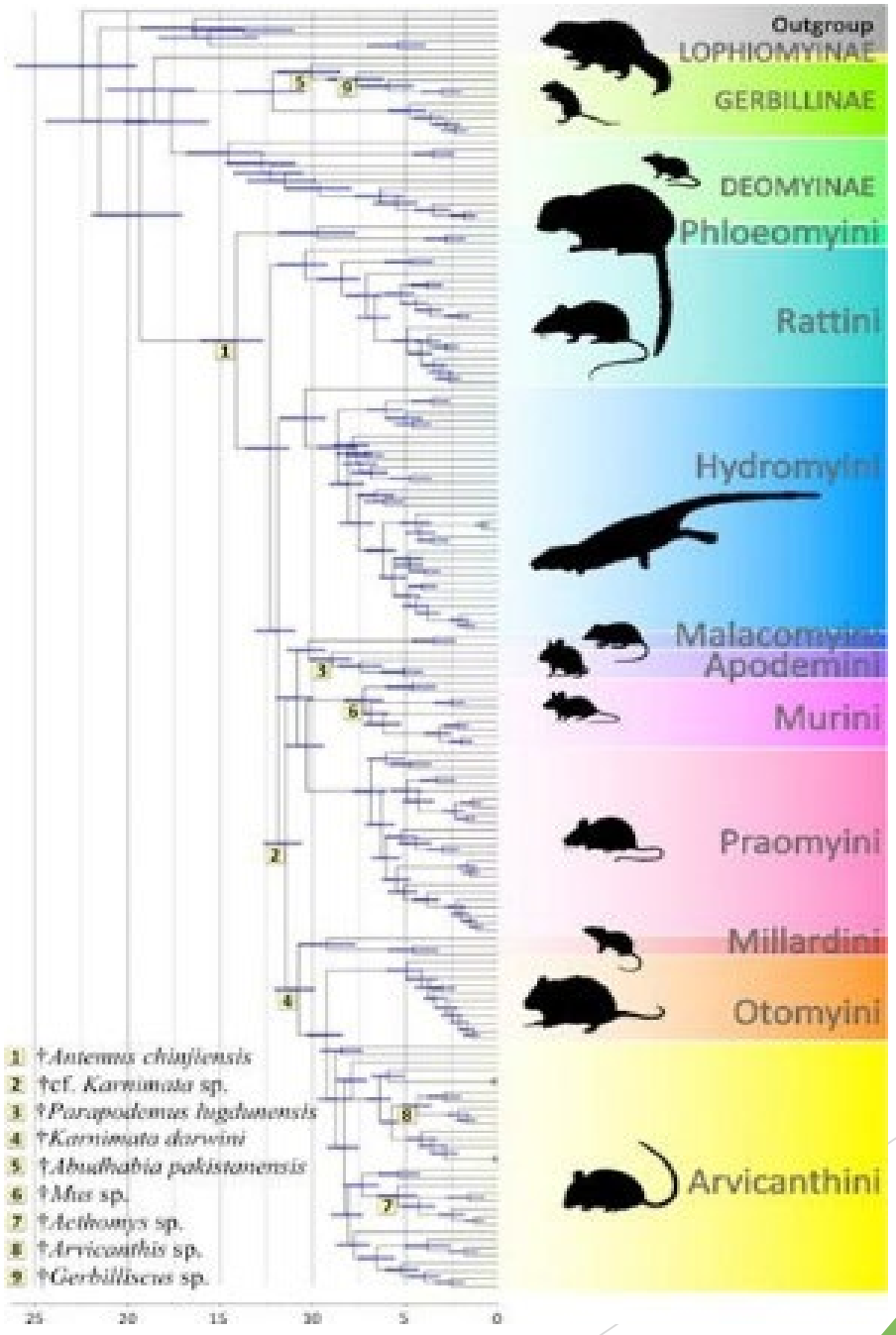
Rodents as a model group to delimitat phyloregions of the Sudanian savanna

- Well documented fossils record

→ calibration of molecular clock

- High level of phylogenetic niche conservatism + low level of dispersal

→ high phylogenetic beta diversity



Methodology

1. Phylogenetic and phylogenomic reconstruction to delimitate MOTUs in an unbiased way
2. Dated phylogenomics of revealed MOTUs
3. Phyloregionalisation of the Sudanian savanna

Phylogeny of two additional rodent genera

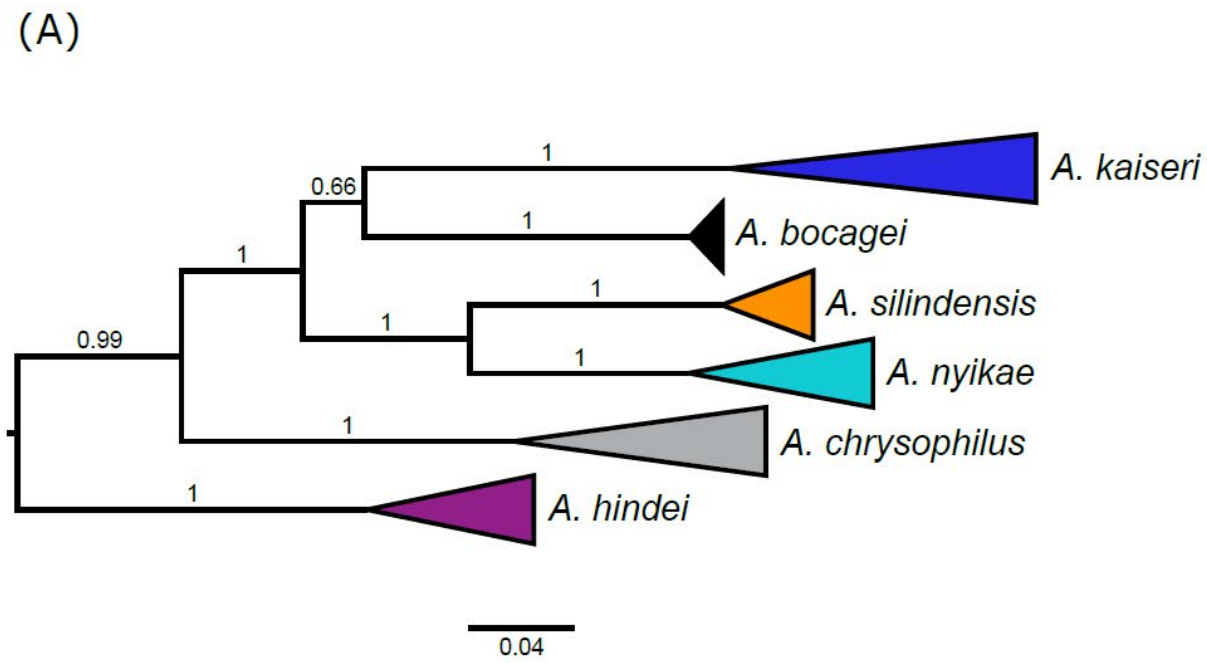
- 2 genera of rodents not yet touched by evolutionary genetics approaches:
- *Graphiurus* (Gliridae family) and *Aethomys* (Muridae family).
- They have a pan-African distribution, and are very poorly solved taxonomically and biogeographically

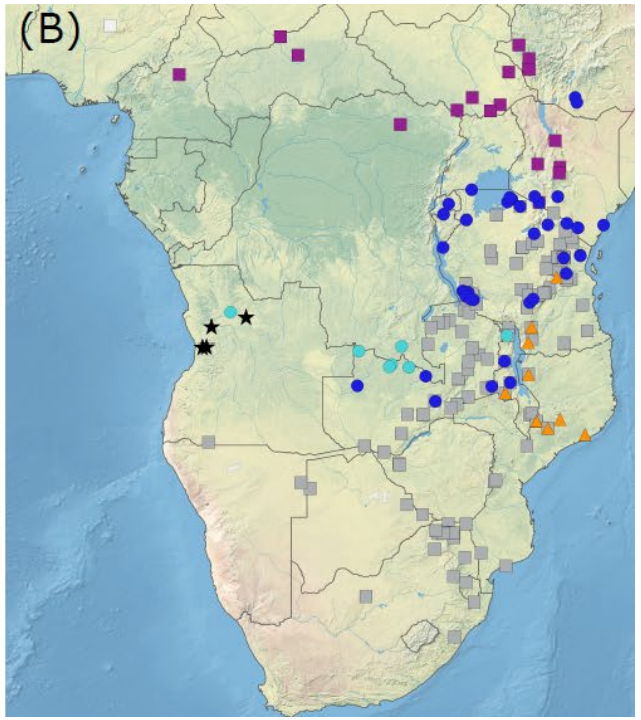
Graphiurus kelleni

Aethomys chrysophilus

→ First resolved time calibrated phylogenies

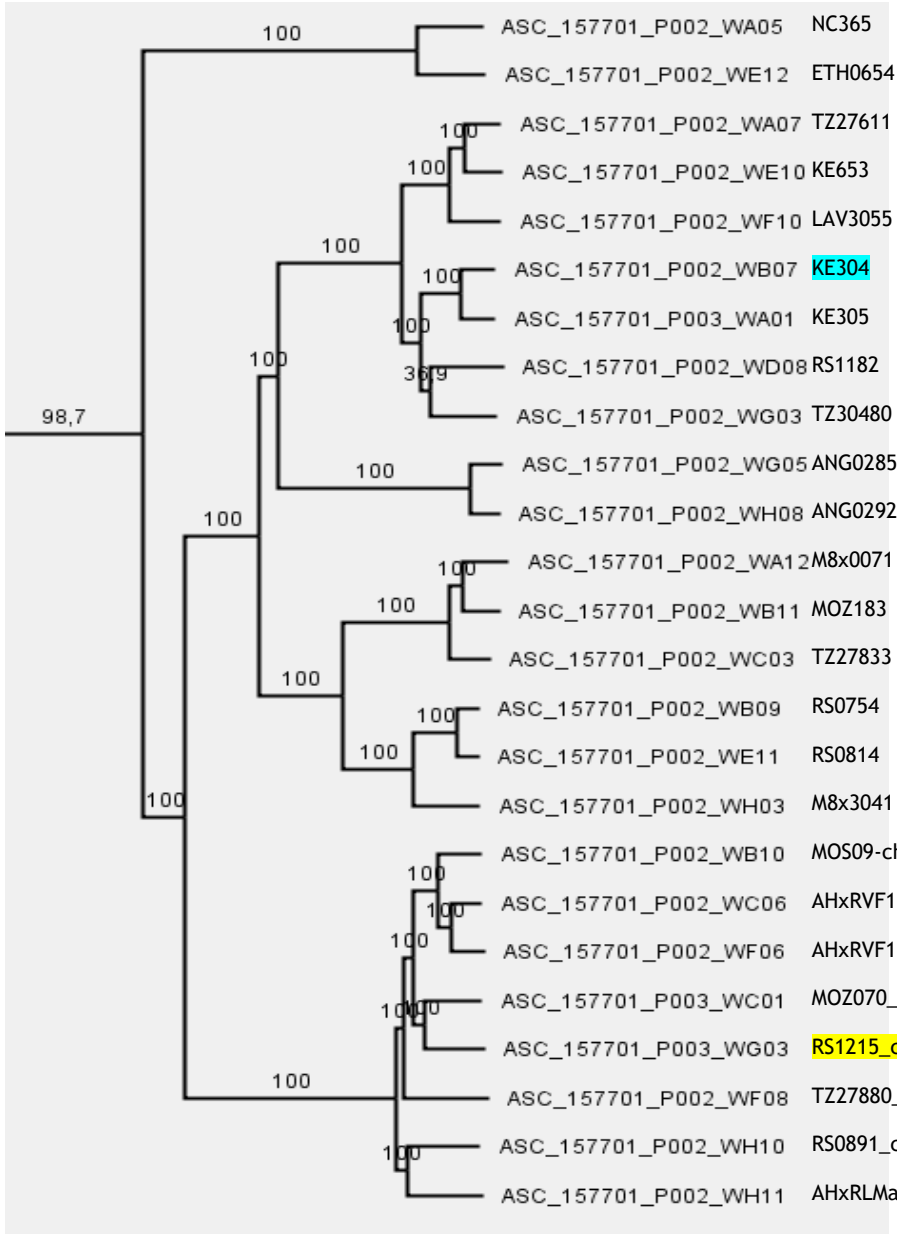
Aethomys state of the art





Krásová et al. (2021)
Diversity and Distributions, 27: 2571-2583

Provisional UCE tree of *Aethomys*



hindei

kaiseri_North

kaiseri_South

mtDNA introgression – this specimen has mtDNA of „hindei“, but is from the same locality as KE305

bocagei

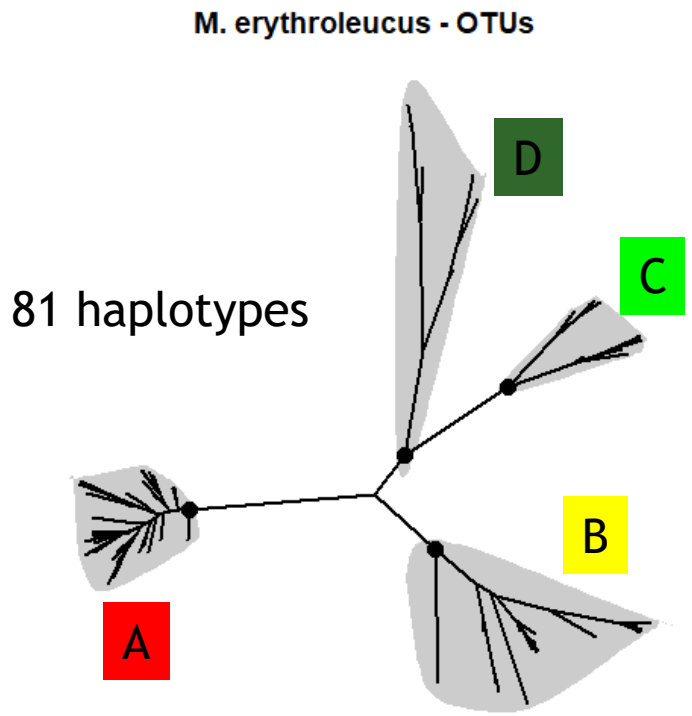
silindensis

nyikae

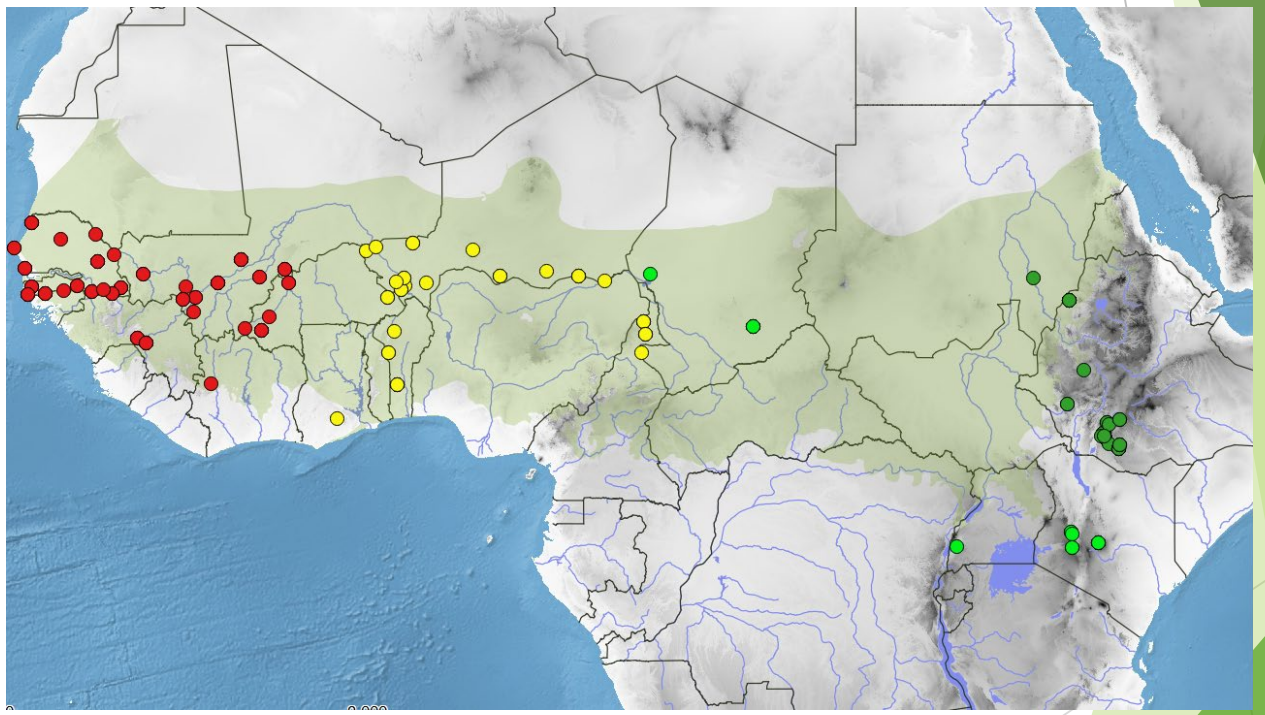
chrysophilus/ineptus

UCE topology does not correspond to mtDNA topology

EXAMPLE: Mastomys erythroleucus



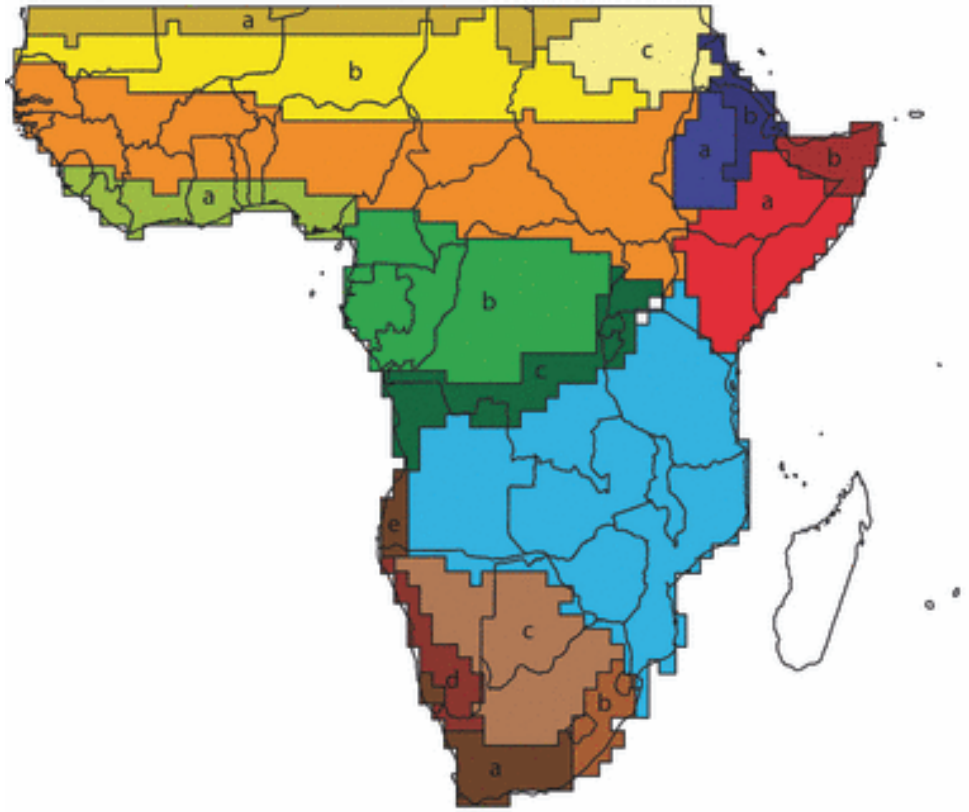
81 haplotypes

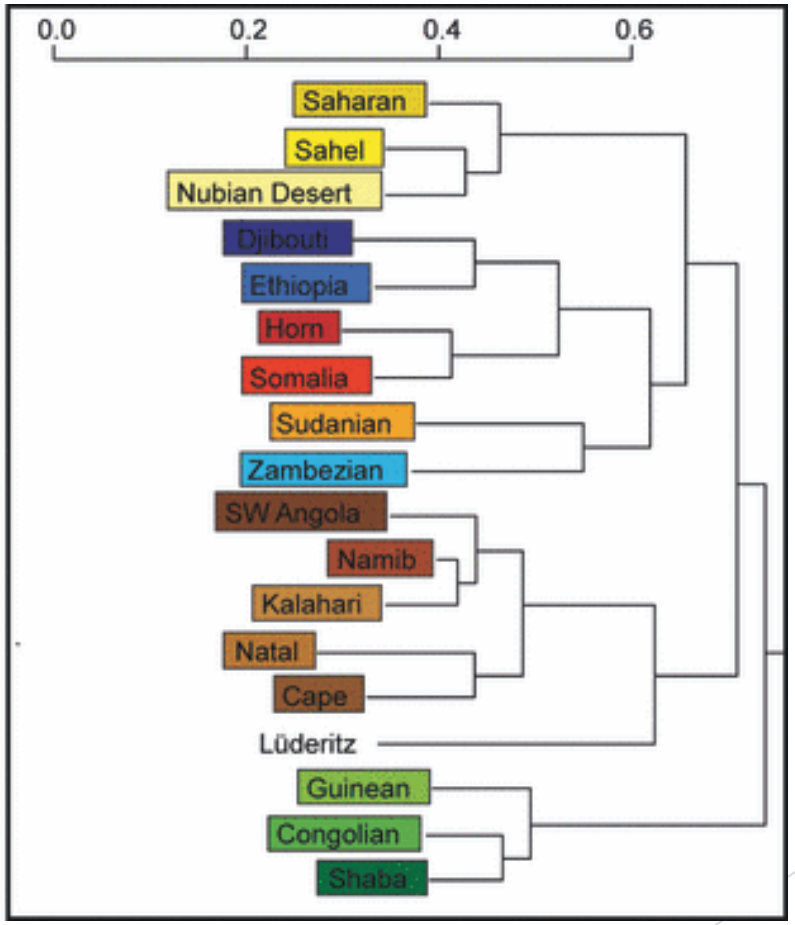


- most effort in previous phylogenetic studies was in western part of the Sudanian bioregion
- recently collected material from Ethiopia, Uganda and Kenya (by IVB team) not yet properly analysed)

Bioregions

The partitioning of Africa: statistically defined biogeographical regions in sub-Saharan Africa





Journal of Biogeography, Volume: 39, Issue: 7, Pages: 1189-1205, First published: 21 May 2012, DOI: (10.1111/j.1365-2699.2012.02728.x)

What is phyloregionalisation

- It is the association of species into distinct phylogenetically delimited biogeographic units = phyloregions

- Because phylogeny captures information on the evolutionary history of taxa, it provides a powerful tool for delineating biogeographical bondaries and for establishing relationships among them

- Capture historical processes:
  >diversification,
  >niche conservatism,
  >dispersal
  >extinction

What is phyloregionalisation

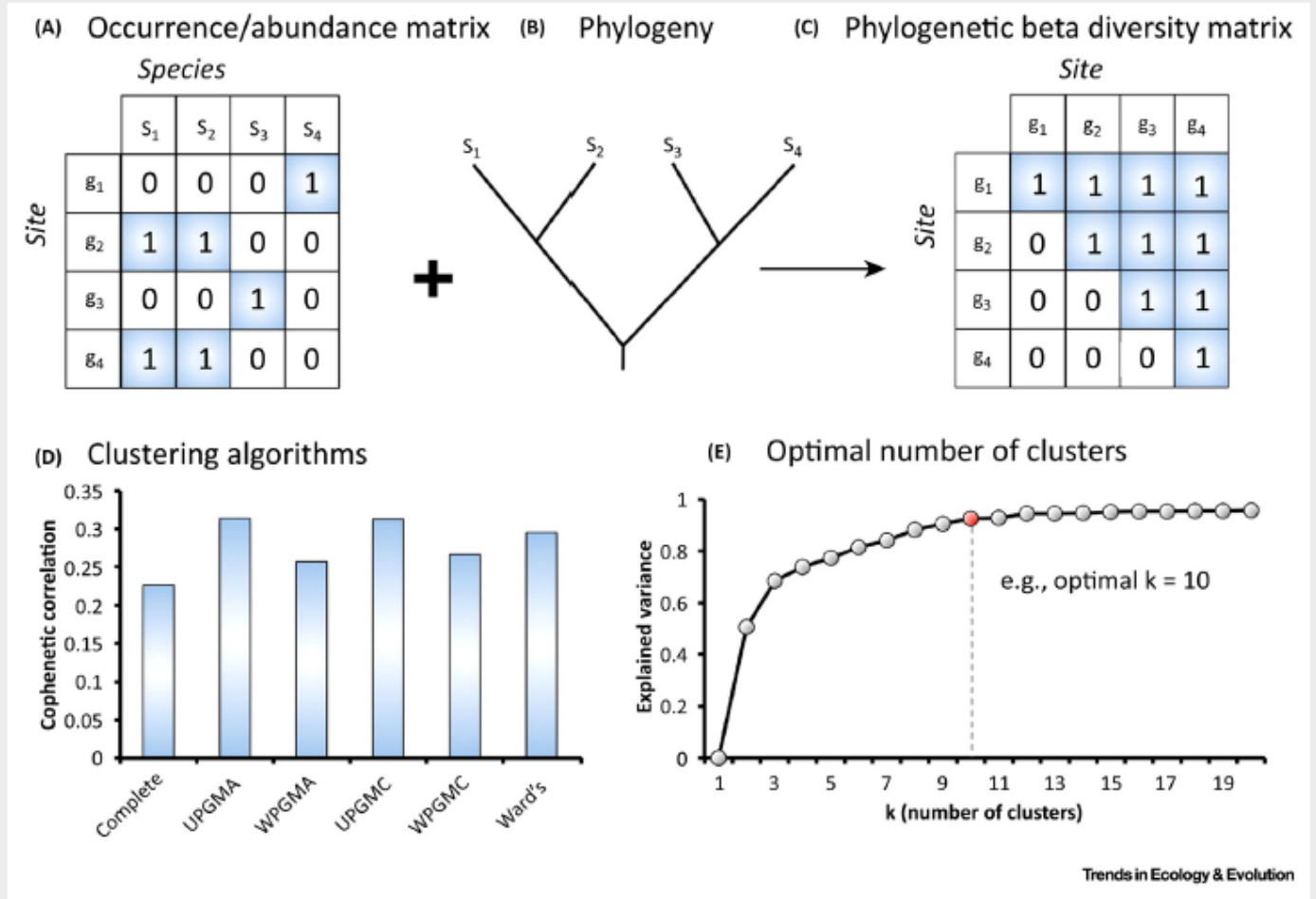


Figure I. Schematic Overview of Phylogenetic Regionalization. (A) Species presence/absence data are combined with (B) branch-length information from a phylogenetic tree to calculate (C) the phylogenetic beta diversity matrix. The performance of (D) clustering algorithms is evaluated using cophenetic correlation and (E) the threshold of explained variances to identify the optimal number of clusters. The 'elbow' (optimal cluster, k) of the graph in (E) is indicated by the red circle. Abbreviations: UPGMA, unweighted pair-group method using arithmetic averages; UPGMC, unweighted pair-group method using centroids; WPGMA, weighted pair-group method using arithmetic averages; WPGMC, weighted pair-group method using centroids.

Partition of Sudanian savanna into rodent phyloregions, can be used for further macroecological and biogeographical analyses in this project, and serve for comparison with phyloregions of other taxonomic groups.

Importantly, the regionalization has conservation implications as it would present the minimum set of regions with unique small mammal faunas.

Thank you for your attention