

Phylogeny of lions in West and Central Africa

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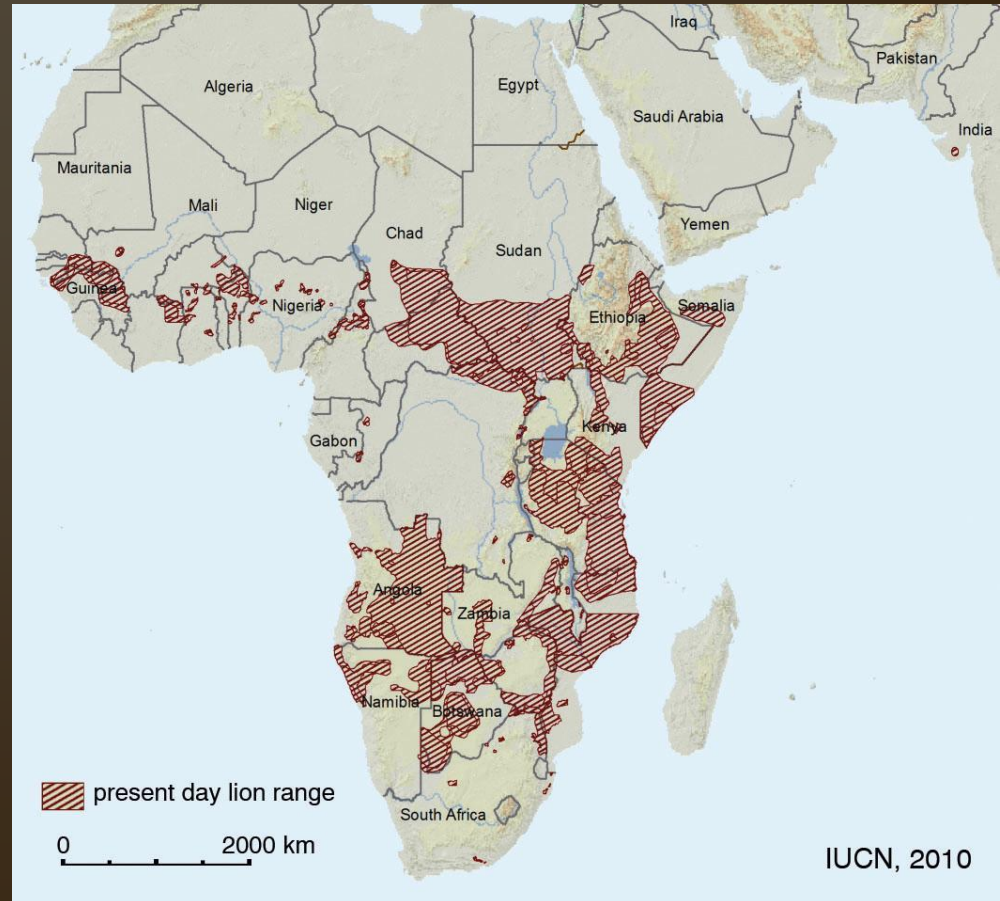
Institute of Environmental Sciences (CML), Leiden University

Institute of Biology Leiden (IBL), Leiden University

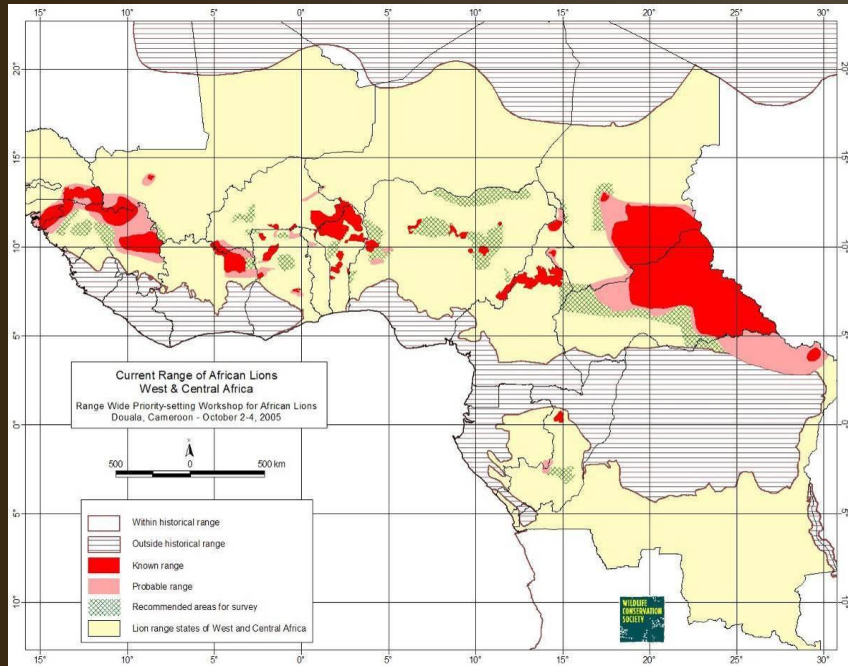


Background

- Distribution present day lion populations
- Two subspecies (IUCN): African & Asiatic lion
- More variation in species → distinct clades
- Taxonomy important for conservation



Background



From the Conservation strategy for the lion in West and Central Africa, 2006

West and Central Africa:

- 10% of total African lion population
- Populations small and isolated
- Lion regionally endangered
- Not (sufficiently) sampled for phylogenetic studies

Background

Position of West and Central African lions unknown

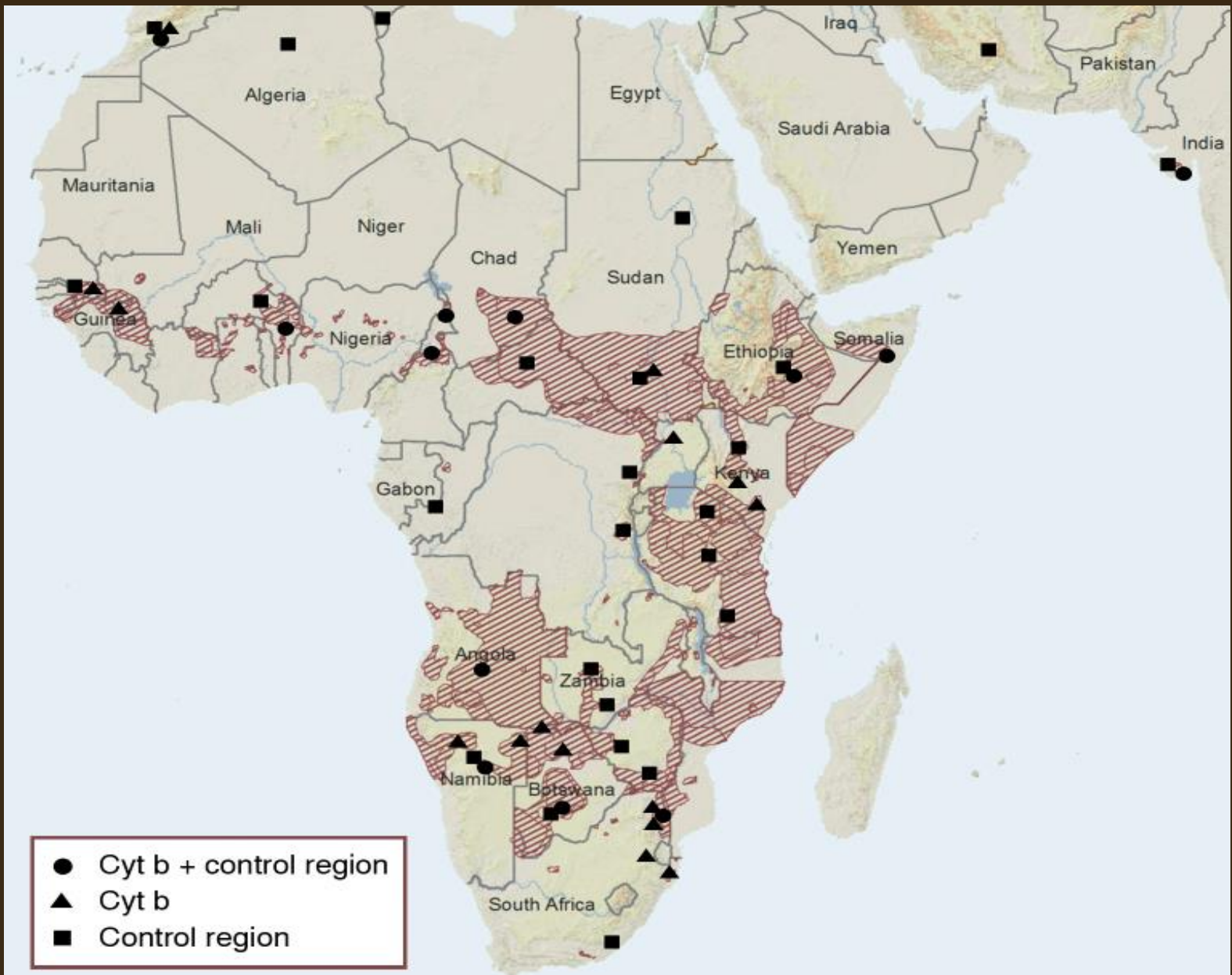
- West Africa unique climatological history
- Dichotomy in other African mammals

Questions

- Do lions from West and Central Africa form one or more distinct clade(s) within the species?
- Evolutionary history of population
- Genetic make up of populations
- Implications for conservation management

Approach

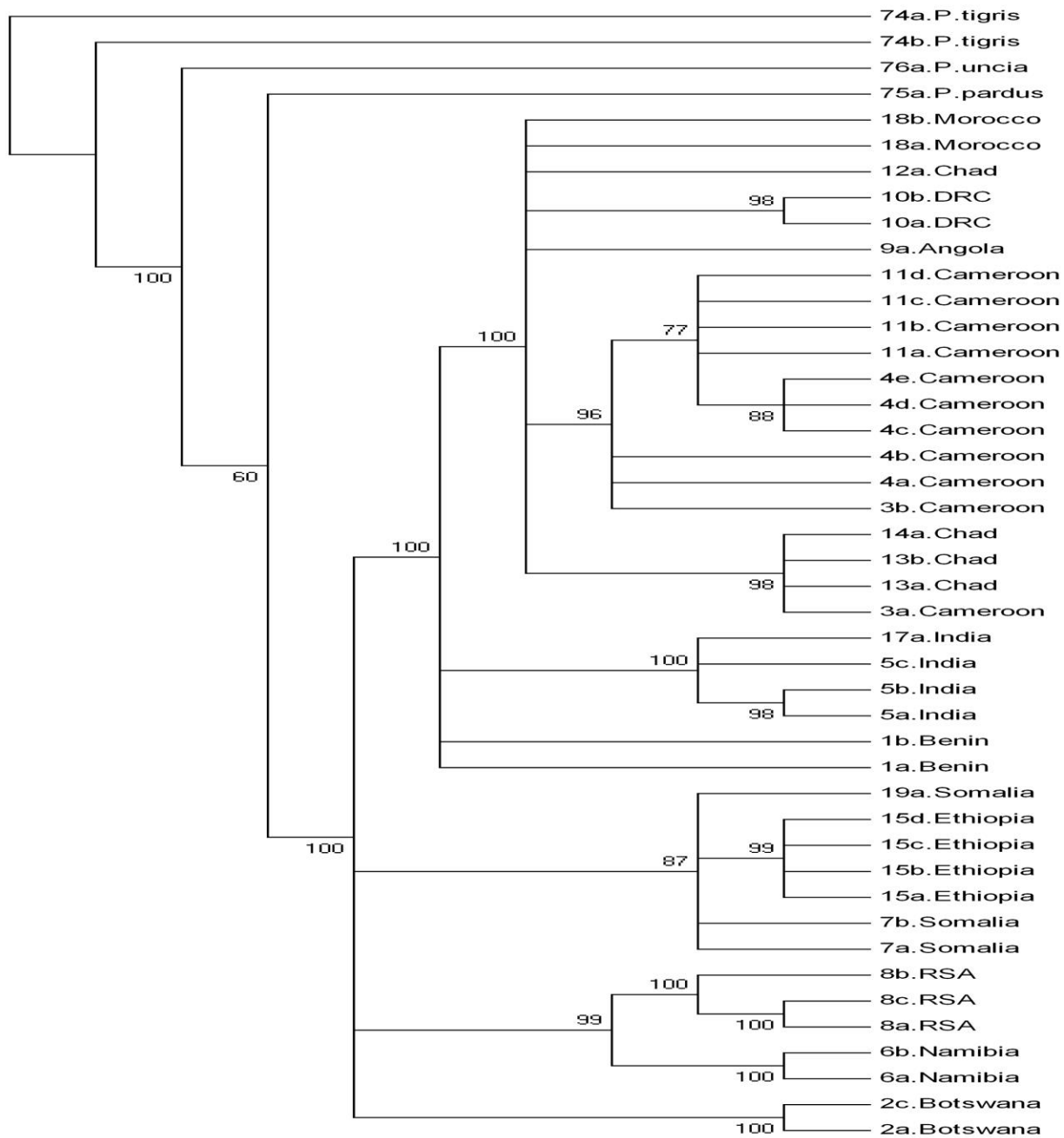
- Collecting samples (wild & zoo)
- DNA data: cyt b + control region: n = 53 (15 countries)
- Increasing sample size with Genbank data:
cyt b: n = 28 (5 countries)
control region: n = 45 (19 countries)
- Phylogenetic analyses:
 - Bayesian analysis
 - Maximum Likelihood analysis (ML)
 - Maximum Parsimony analysis (MP): haplotype network

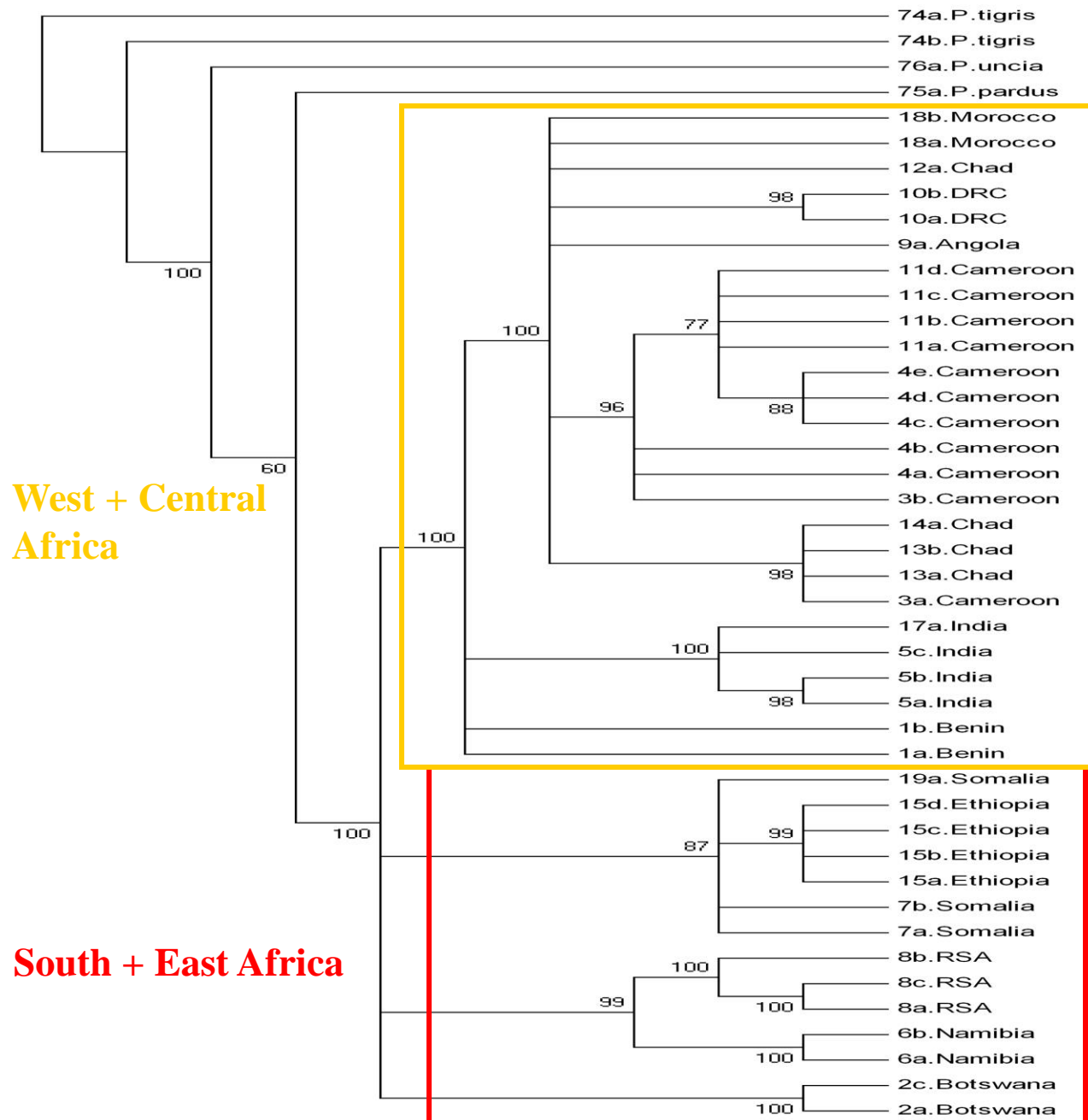


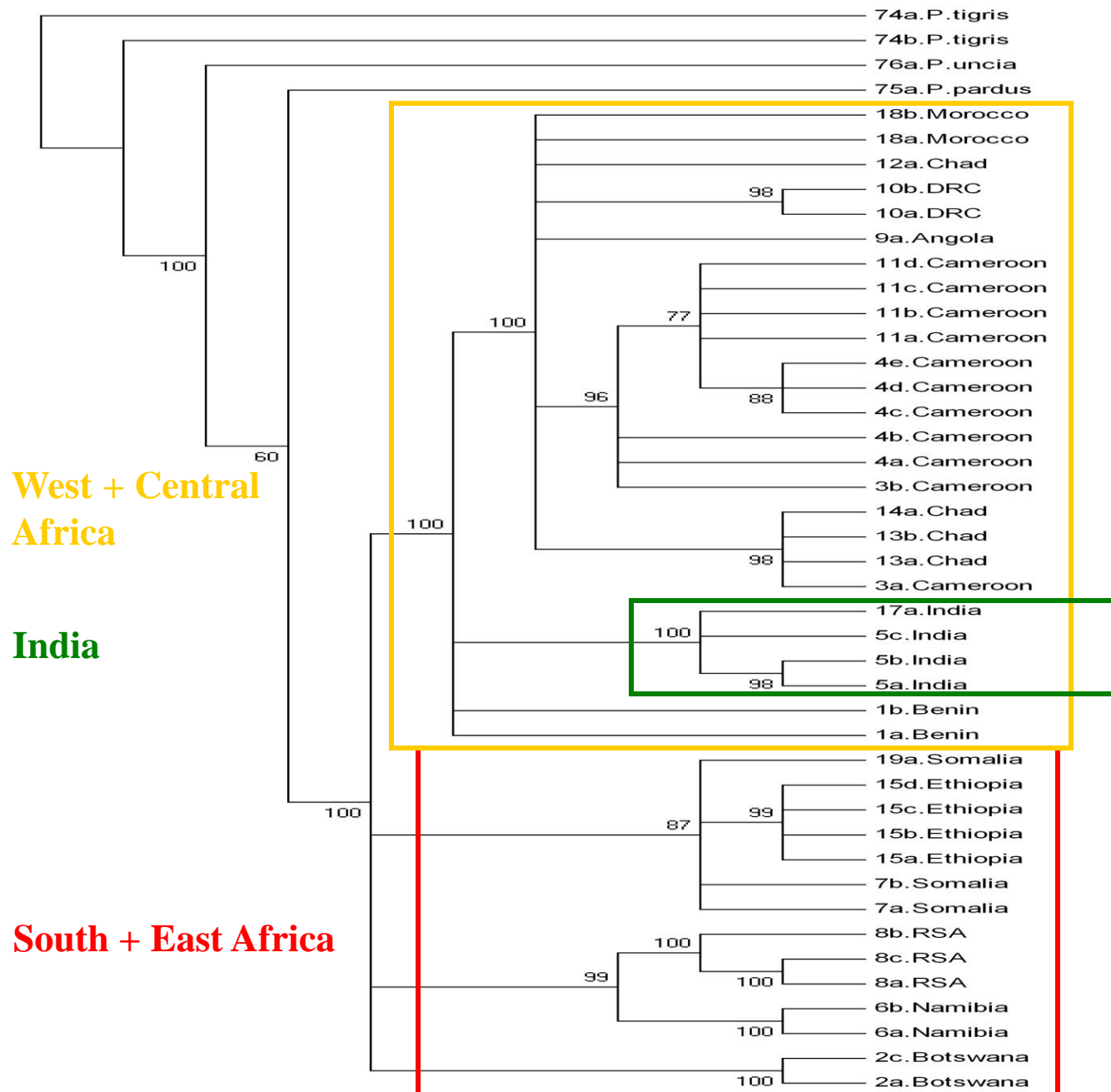
Results

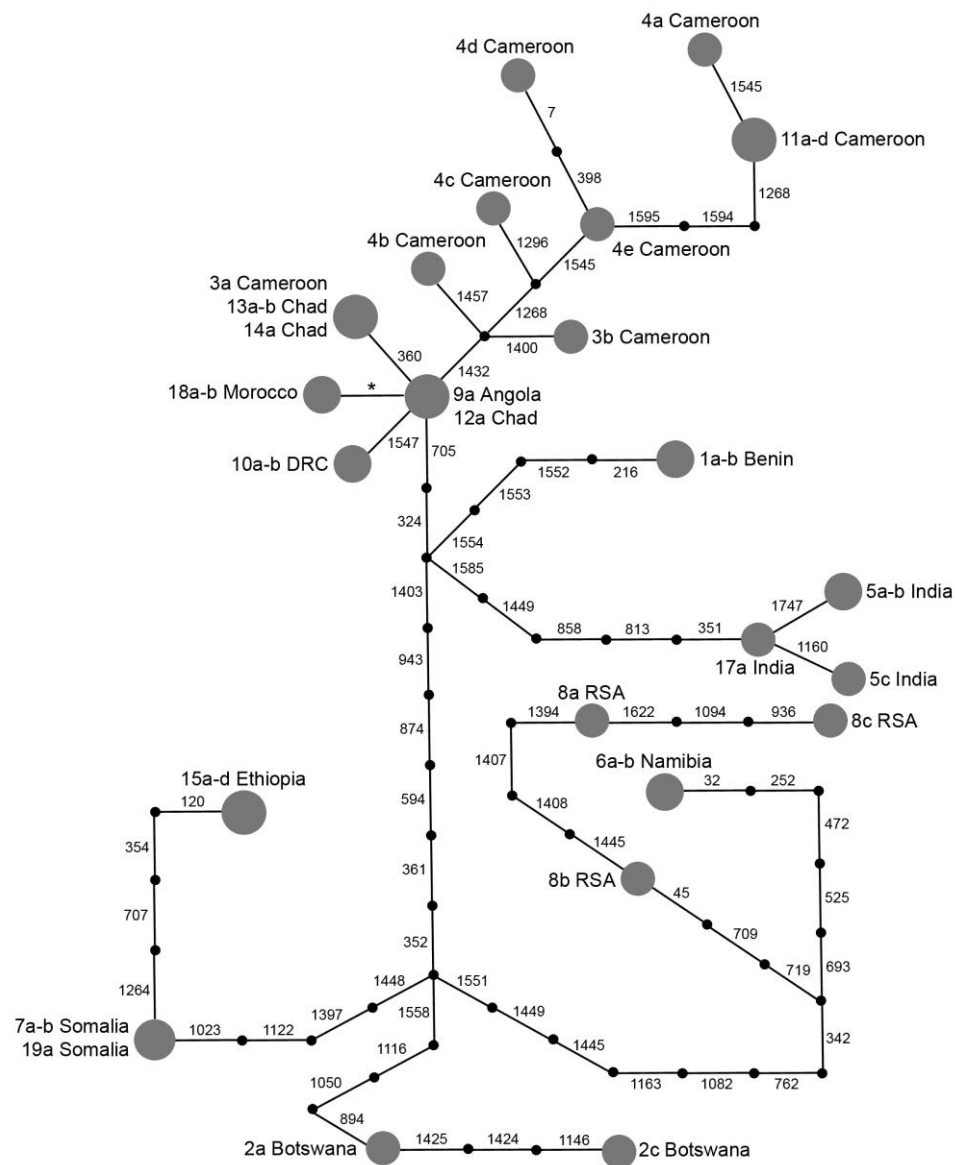
Consistent pattern in data:

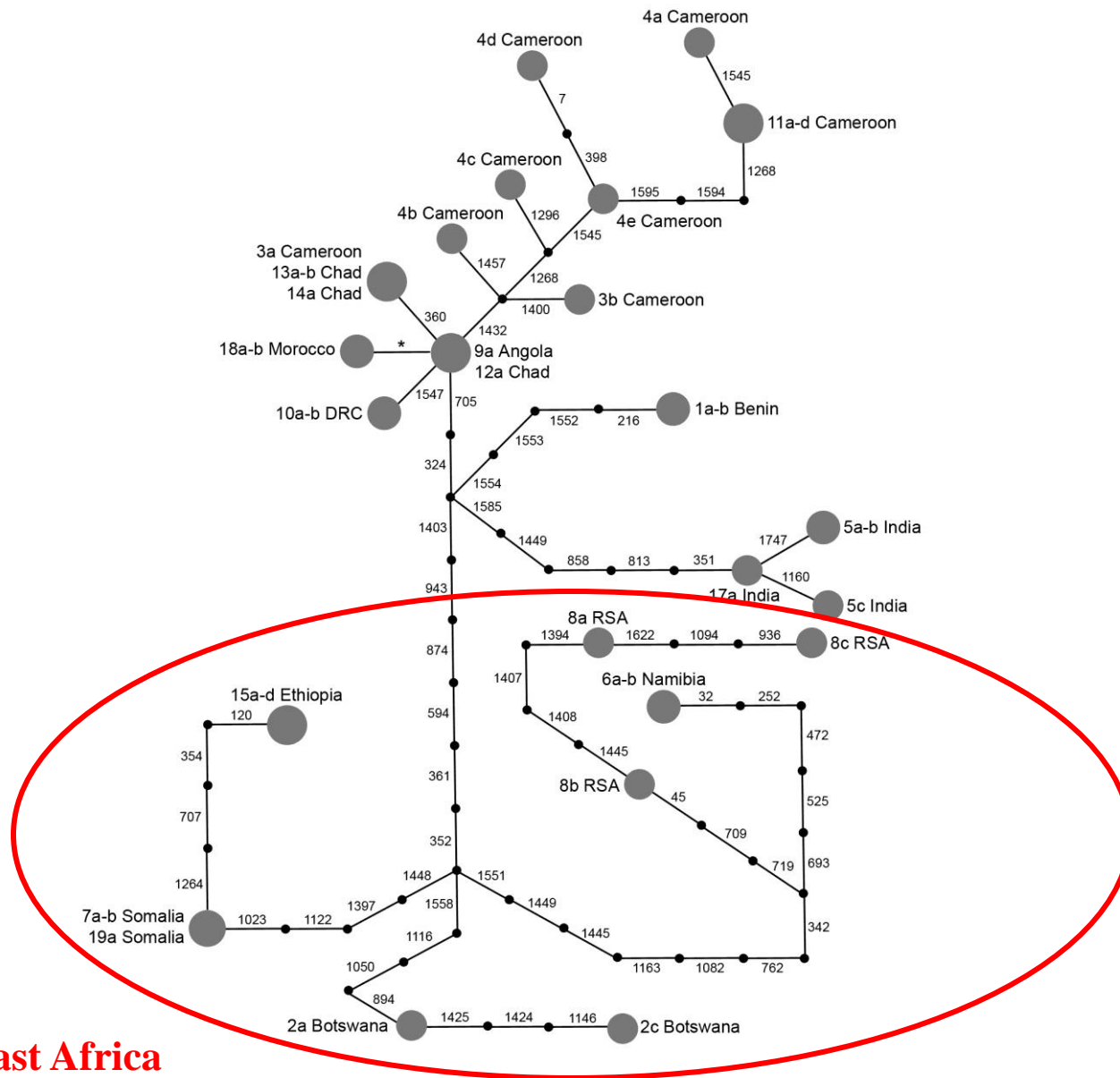
- South + East Africa: high genetic diversity
- West + Central Africa: low genetic diversity
- Close relationship India and West + Central Africa





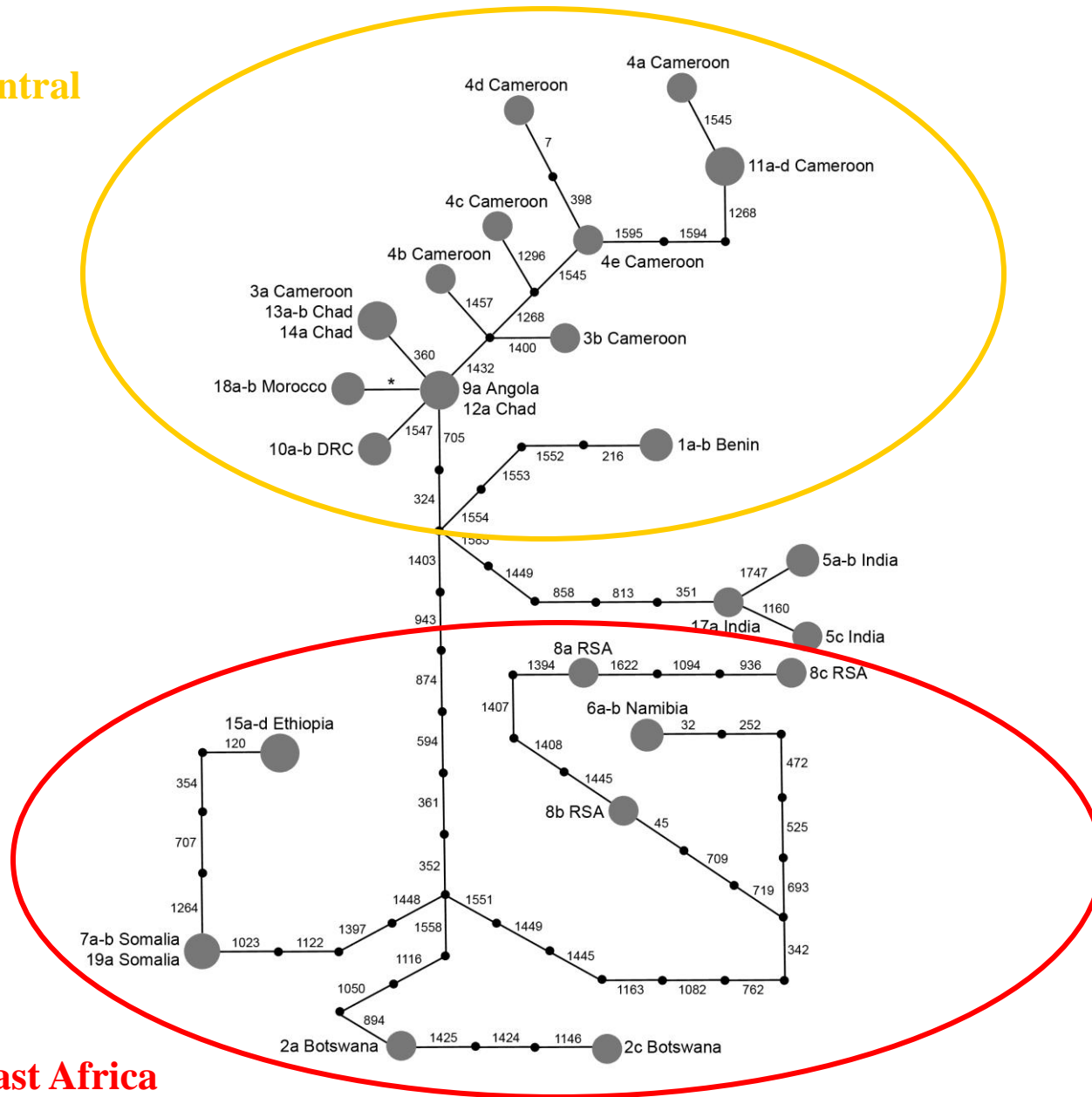






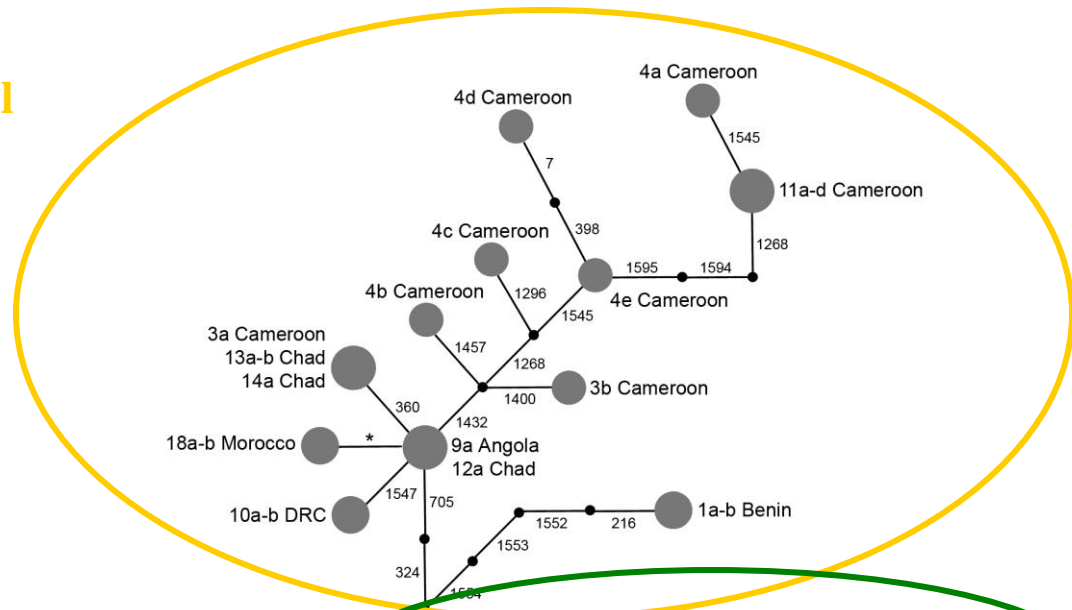
South + East Africa

West + Central Africa

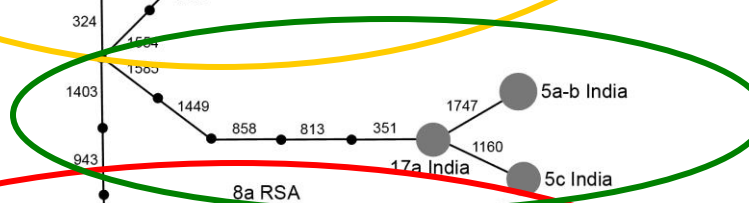


South + East Africa

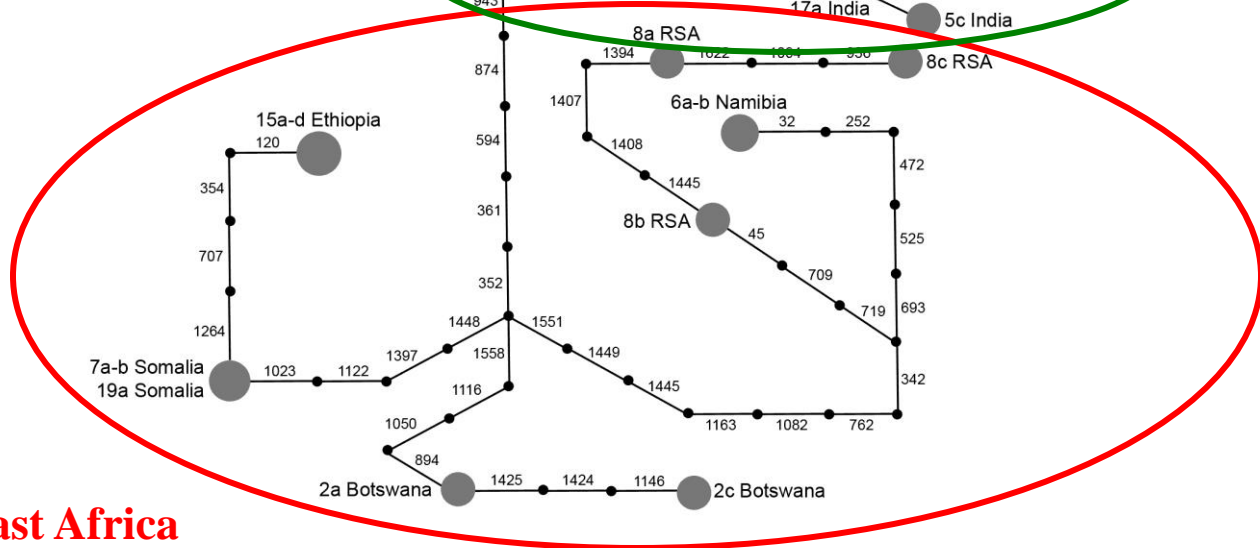
West + Central Africa



India



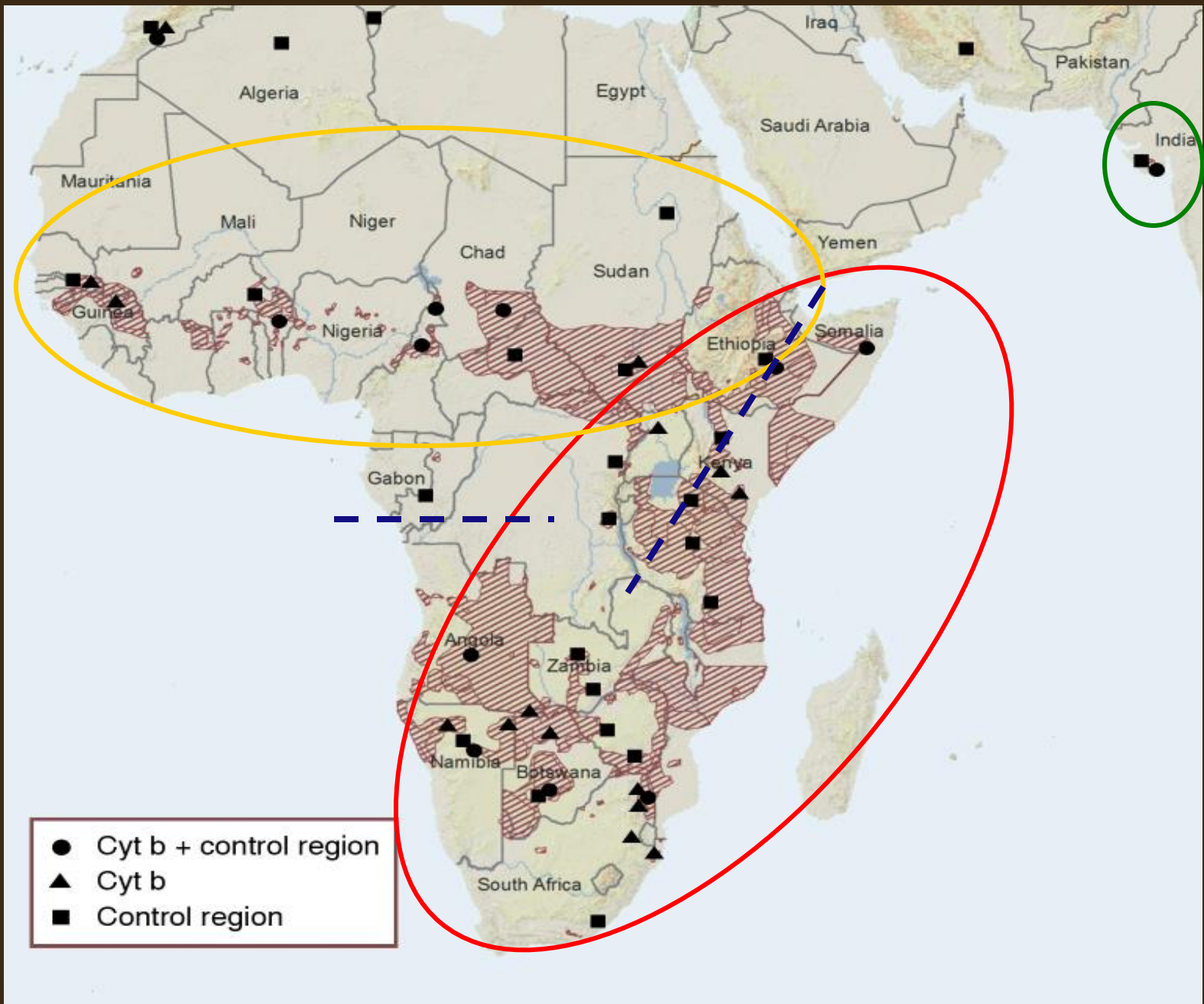
South + East Africa



Discussion

Genetic pattern can be explained by:

1. Current natural structures
(Sahel belt, rain forest, Rift valley)



Discussion

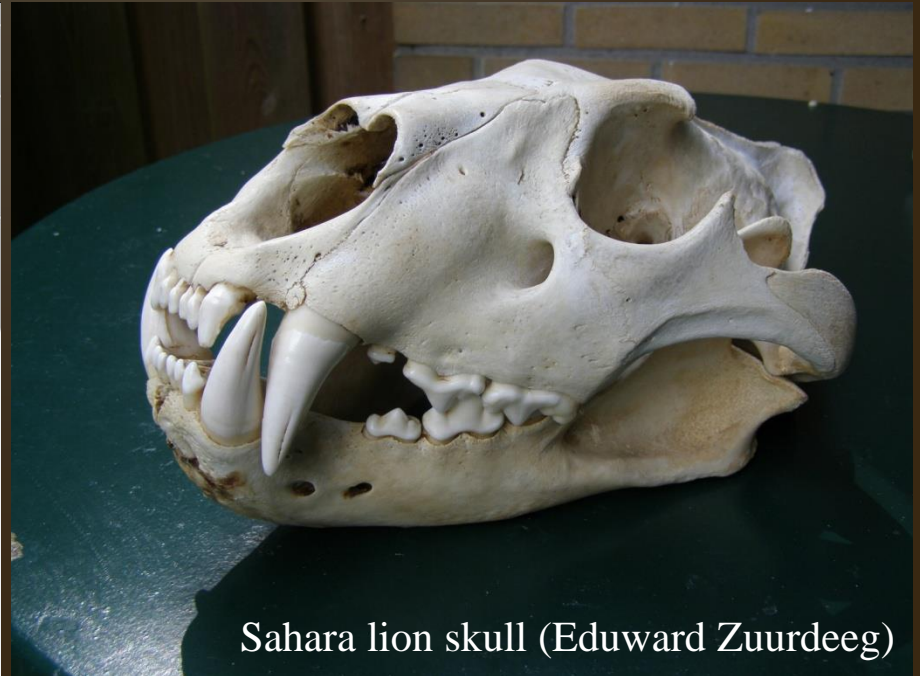
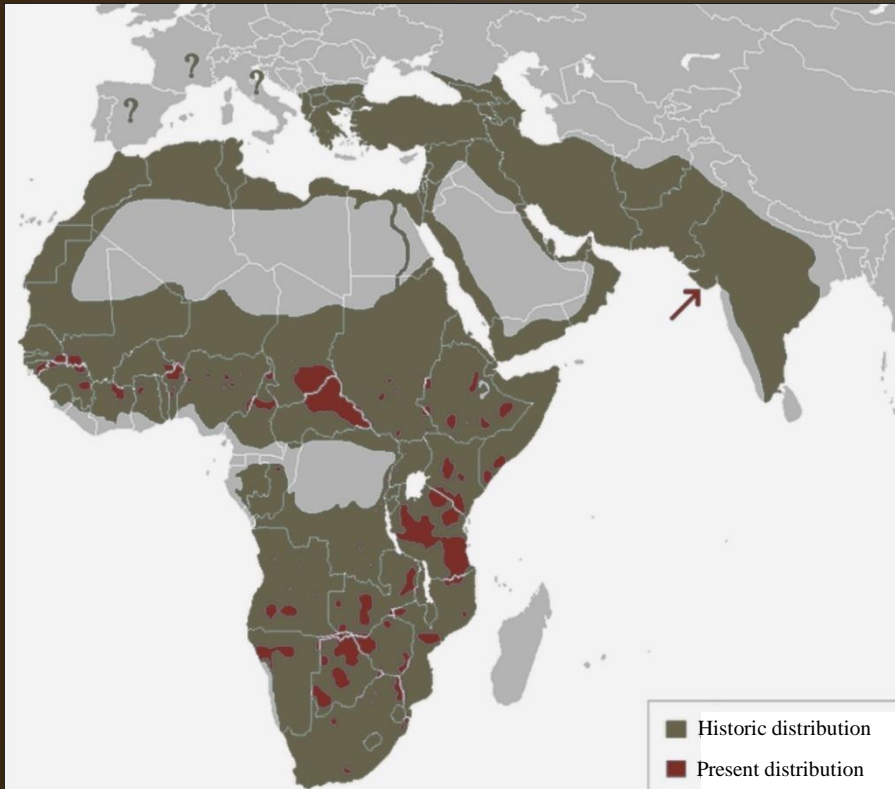
Genetic pattern can be explained by:

2. Climatological history
(hyperarid conditions in Western Africa)

- Hyperarid conditions in Western Africa in late Pleistocene → local extinction
- Refugia in Middle East
- Recolonization of Western Africa
(evolutionary young clade → low genetic variation)

Current research

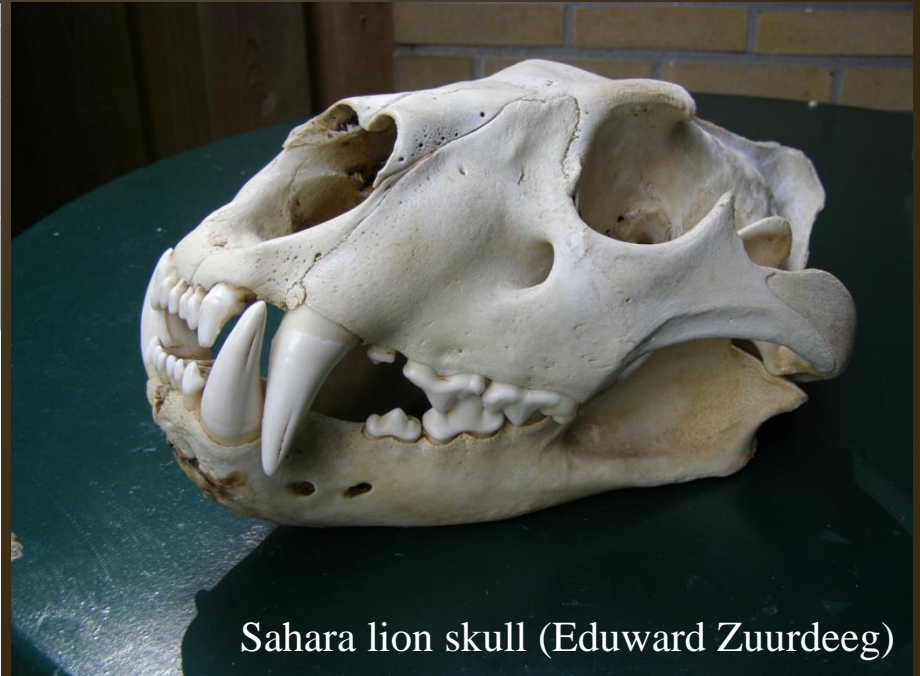
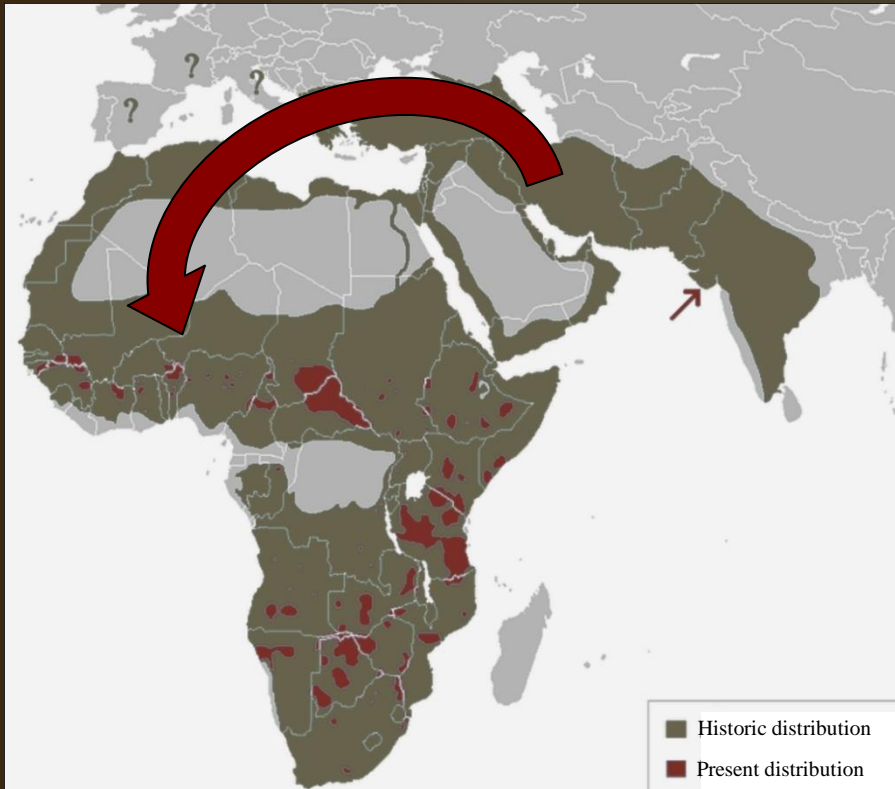
- Intermediate position of lions from North Africa and the Middle East?
- Ancient DNA methods on nowadays extinct lion populations



Sahara lion skull (Eduward Zuurdeeg)

Current research

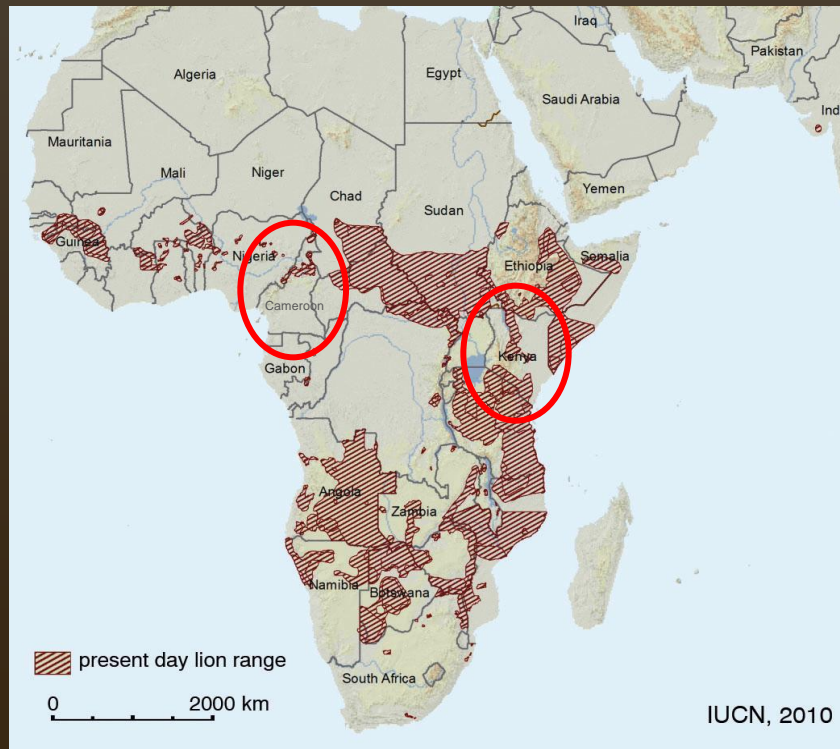
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Current research

- Low genetic diversity in lion populations in West and Central Africa (inbreeding?)
- Comparison genetic make up and level of inbreeding Cameroon – Kenya lion populations.



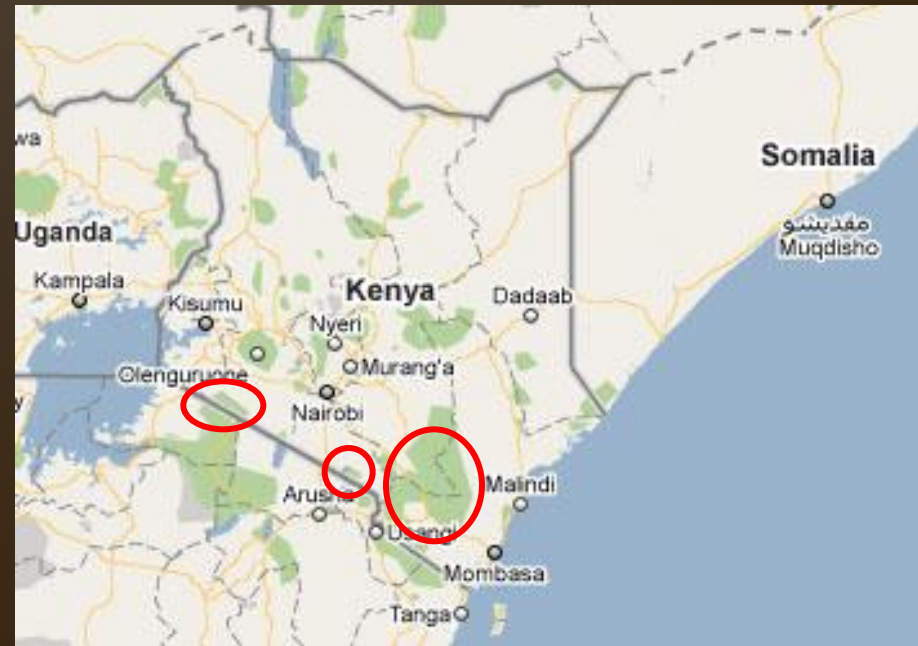
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Current research

- Non-invasive sampling
- Microsatellite analysis:
 - Genetic variation: polymorphism + level heterozygosity
 - Risk of inbreeding
- Population/park size, park management



Current research

- Results based on mDNA only (maternally inherited)
- Dissolving of tree

→ Extend dataset:

- Distribution of samples
- Target other genetic regions:
 - Y-chromosomal region (paternal lineage)
 - Complete mitochondrial genome (maternal lineage)
 - Single nucleotide polymorphisms (SNP),
>30,000 datapoints

Conclusion

West and Central Africa:

- Genetically distinct
 - Different level of genetic variety
 - Unique evolutionary history
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- Insight into evolutionary processes in Africa
 - Giving priority to wild (meta)populations
 - Breeding programs for captive stocks
 - In the future: revision of phylo-taxonomy?

Acknowledgements

- Dr. Hans de Iongh
- Dr. Klaas Vrieling
- Prof. Dr. Geert de Snoo
- Zoos and researchers who provided us with samples

- Hermen Visser
- Lana Müller
- Hester Jongbloed

