Genetic diversity in African wildlife species

Day 1, Open Institute workshop, Kilifi, August 7th 2024

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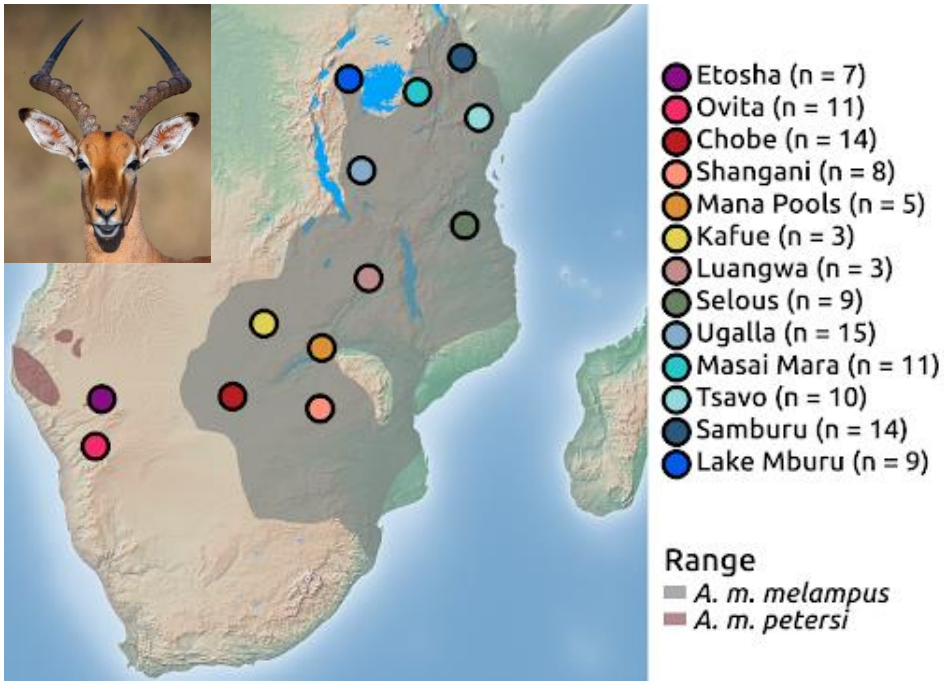
Making sense of genetic diversity results

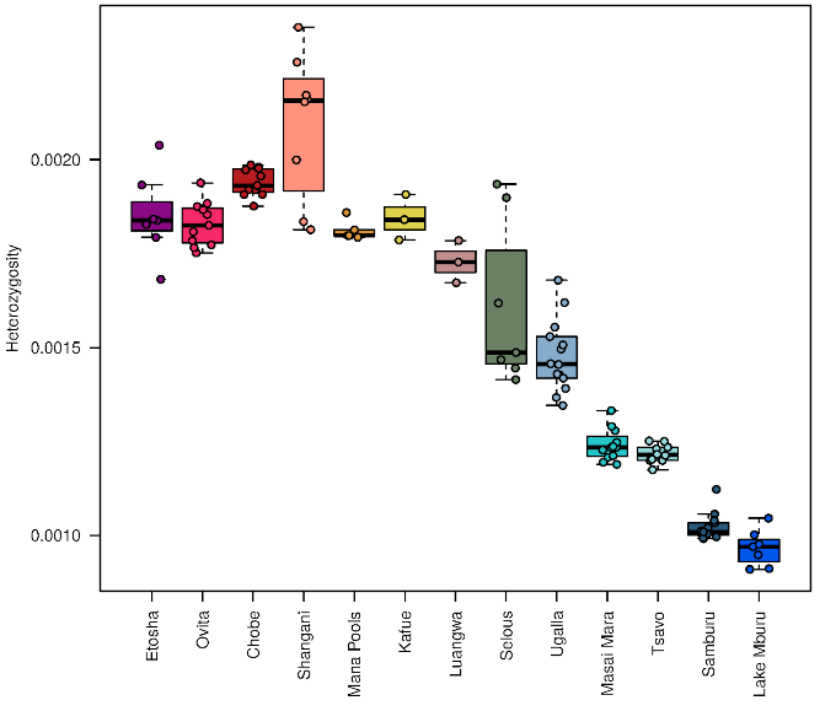
We have seen that genetic diversity is both:

- a proxy for population history,
- an indicator of genetic “health”

In the following, we will look at some genetic diversity results from African wildlife and see what we can conclude from them.

1. Tracking species origins and movement





Can we deduce the origin and movement pattern of common impala?

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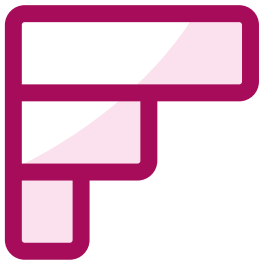

Order these populations in terms of which you think is closer to the geographical origin of impala. Start by the population you think is closest to the origin.

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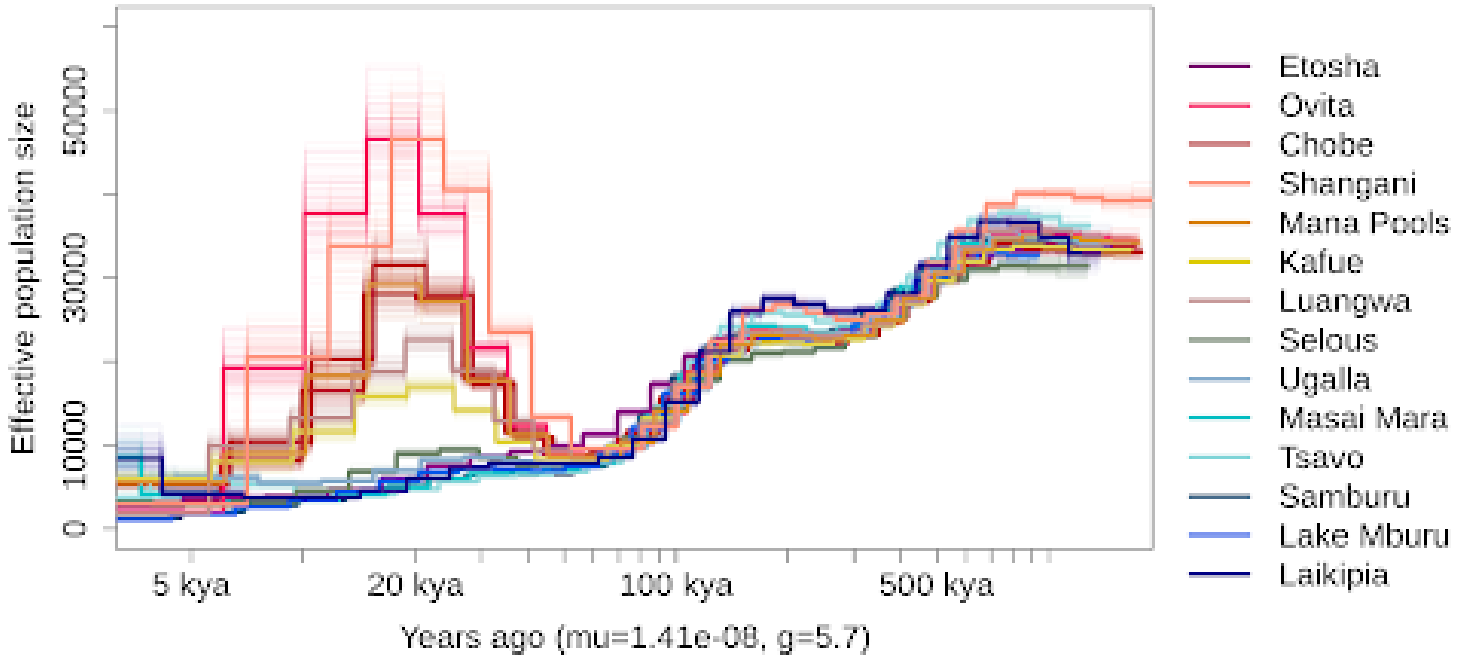
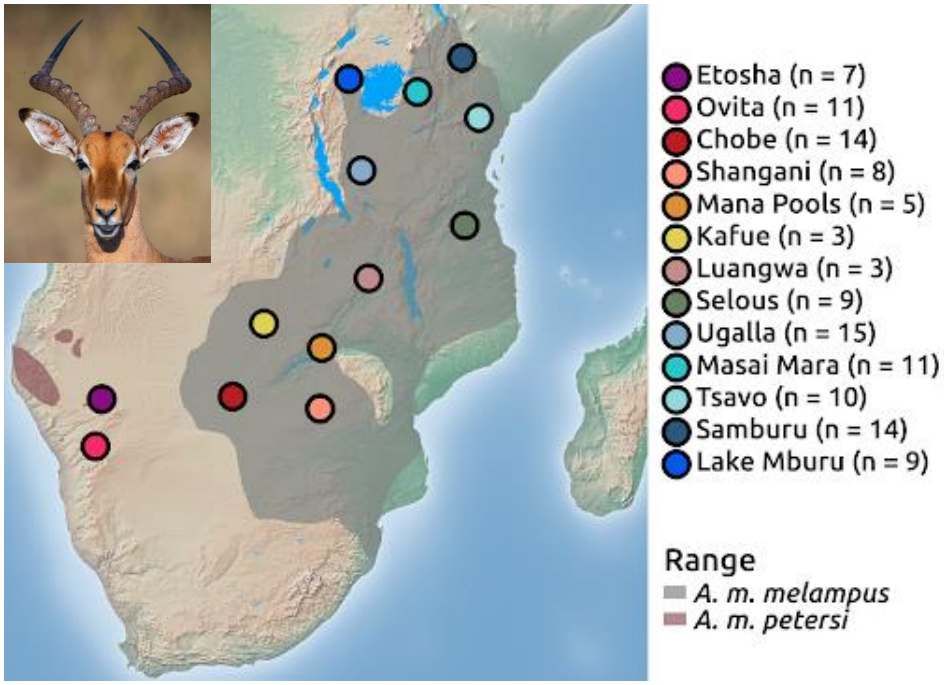
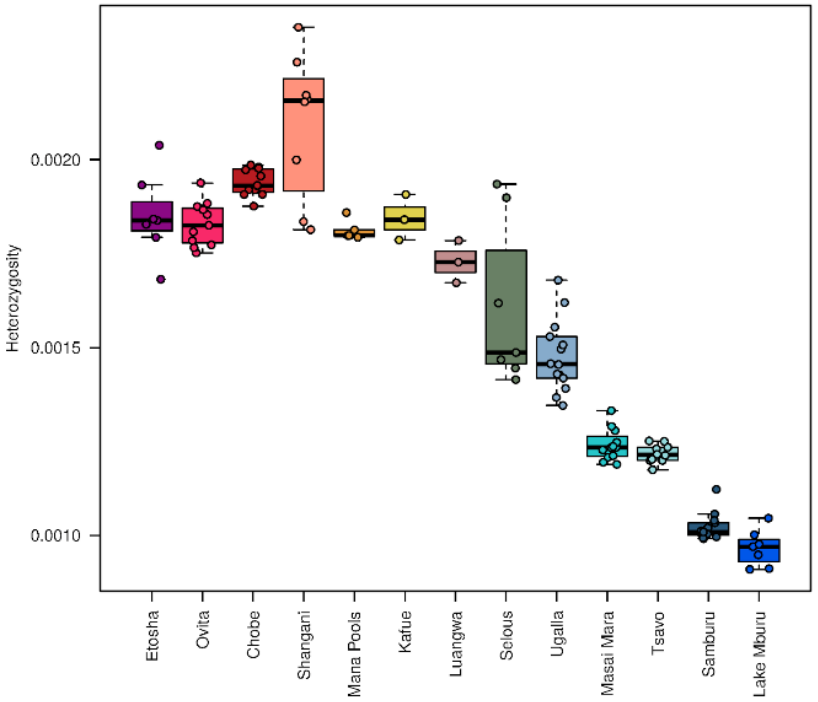

Effective population size
0
10000
30000
50000
5 kya
20 kya
100 kya
500 kya
Years ago (mu=1.41e-08, g=5.7)
Etosha
Ovita
Chobe
Shangani
Mana Pools
Kafue
Luangwa
Selous
Ugalla
Masai Mara
Tsavo
Samburu
Lake Mburu
Laikipia

1. Tracking species origins and movement





Which impala populations may struggle to adapt to a new selection pressure?

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In which populations do you anticipate selection to be more efficient?

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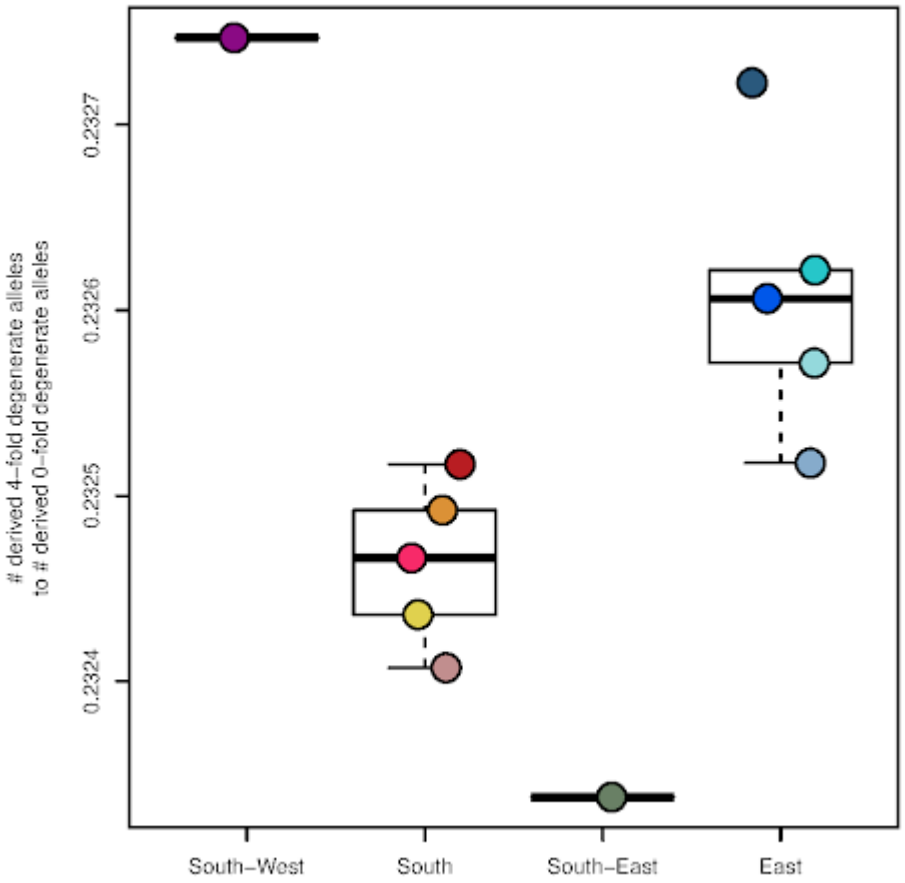
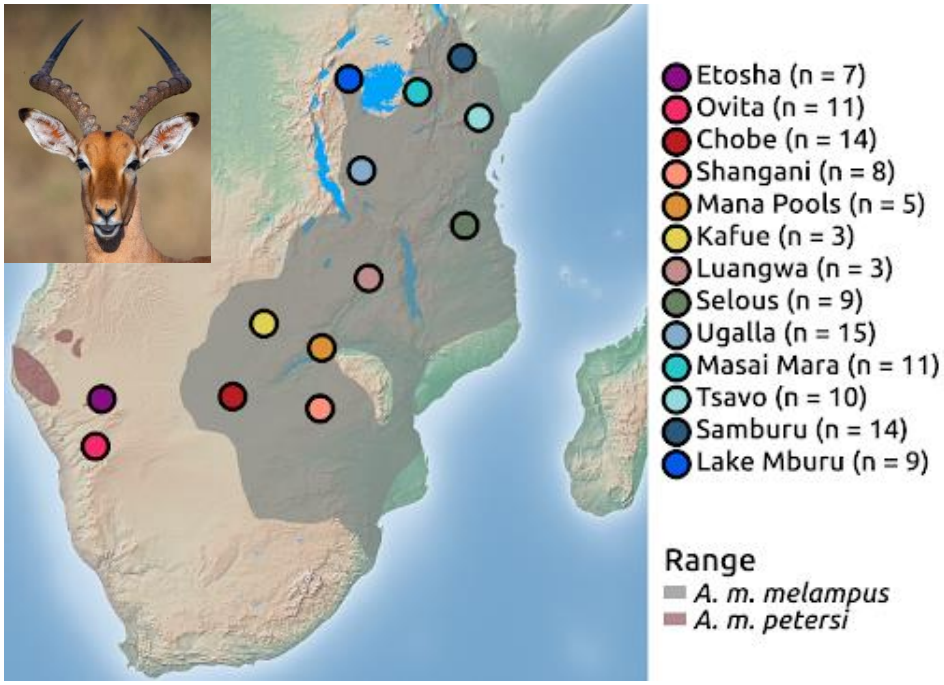
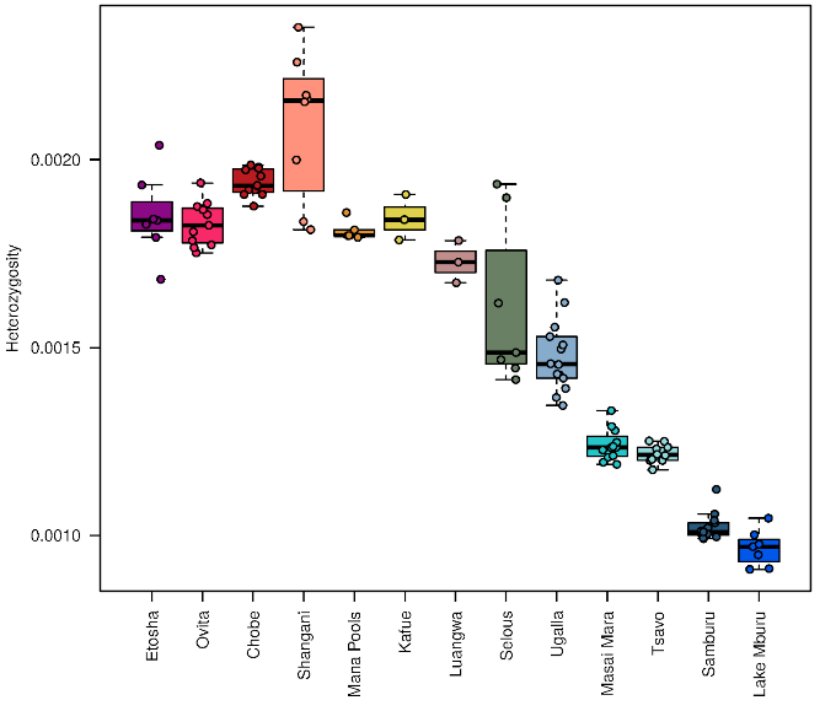

derived 4−fold degenerate alleles
to # derived 0−fold degenerate alleles
0.2324
0.2325
0.2326
0.2327
South−West
South
South−East
East

1. Tracking species origins and movement





In which populations would you expect more inbreeding?

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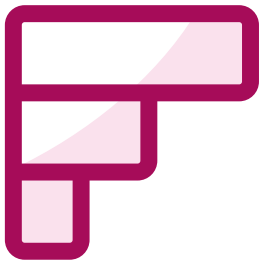

Order these populations by the amount of inbreeding you expect to see in its individuals. Start by the least inbred population.

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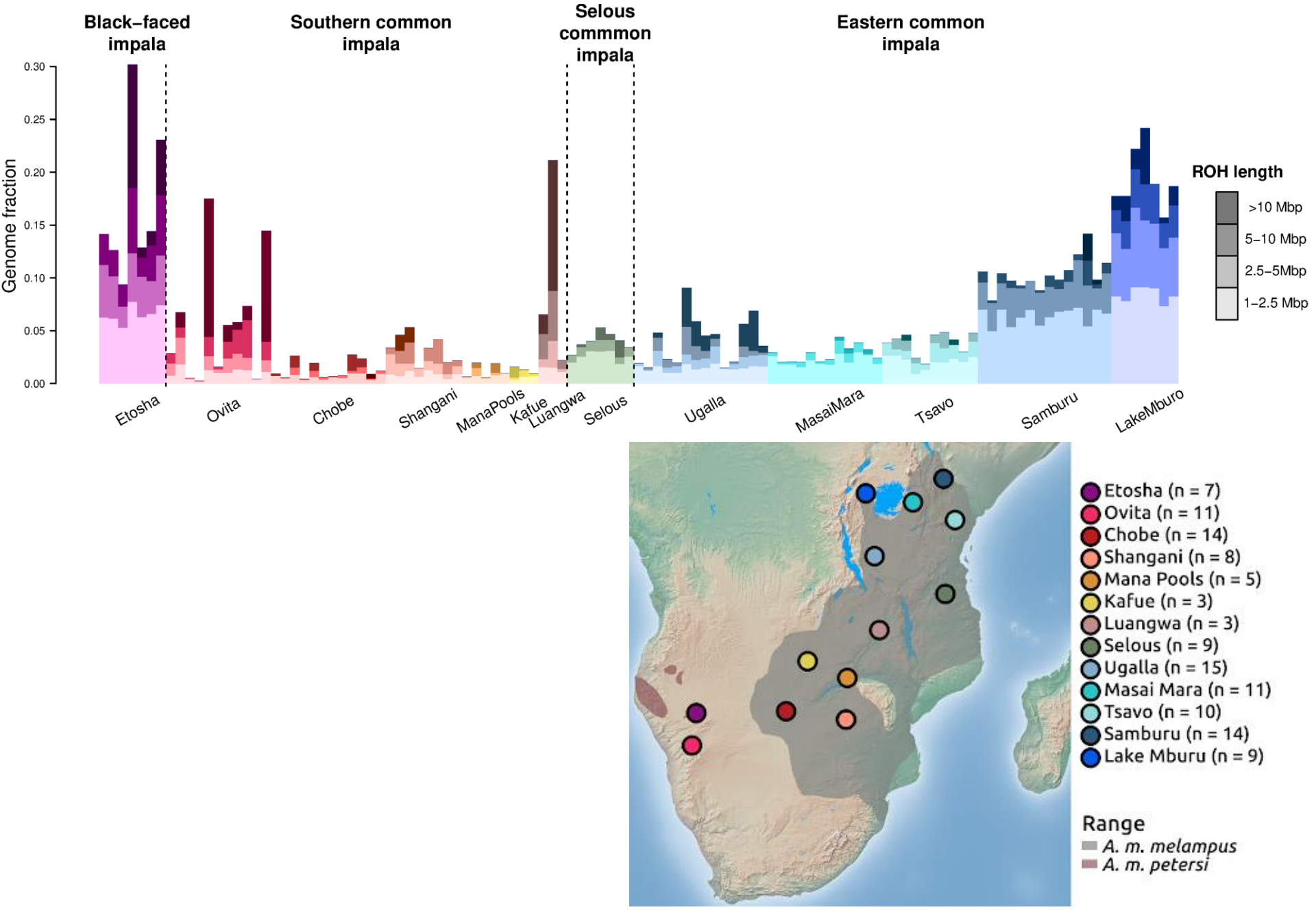
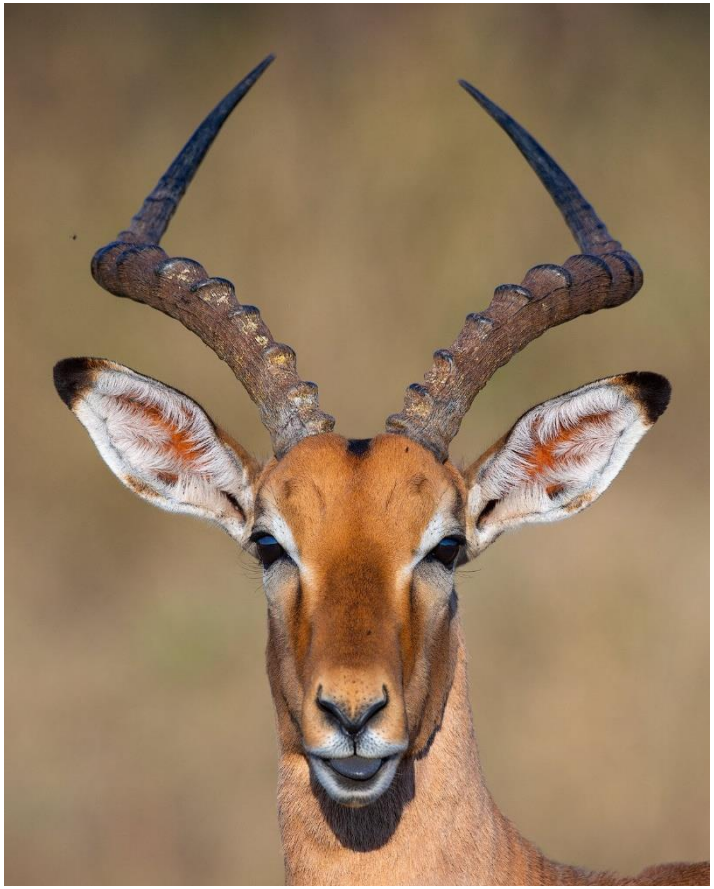

Black–faced impala
Southern common impala
Selous commmon impala
Eastern common impala
Genome fraction
0.30
0.25
0.20
0.15
0.10
0.05
0.00
ROH length
>10 Mbp
5–10 Mbp
2.5–5Mbp
1–2.5 Mbp
Etosha
Ovita
Chobe
Shangani
ManaPools
Kafue
Luangwa
Selous
Ugalla
MasaiMara
Tsavo
Samburu
LakeMburo
Etosha (n = 7)
Ovita (n = 11)
Chobe (n = 14)
Shangani (n = 8)
Mana Pools (n = 5)
Kafue (n = 3)
Luangwa (n = 3)
Selous (n = 9)
Ugalla (n = 15)
Masai Mara (n = 11)
Tsavo (n = 10)
Samburu (n = 14)
Lake Mburu (n = 9)
Range
A. m. melampus
A. m. petersi



Let us hear what you think – what should we be doing for impalas in Kenya?

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If tasked with making a management plan for the common impala in Kenya, how would you integrate the information from this study?

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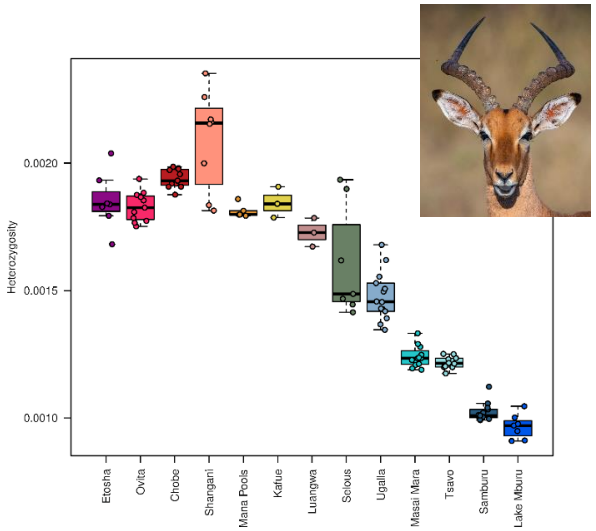
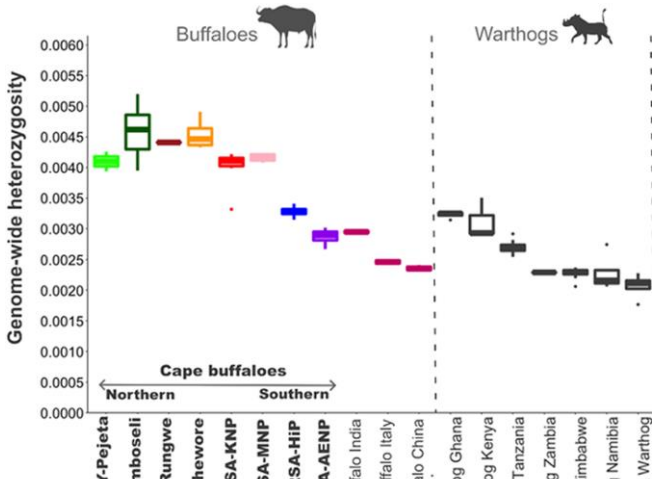
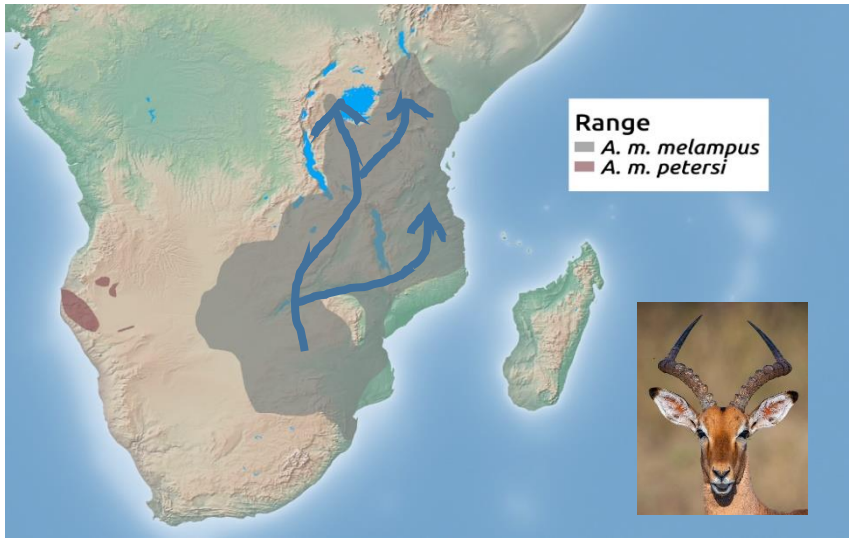
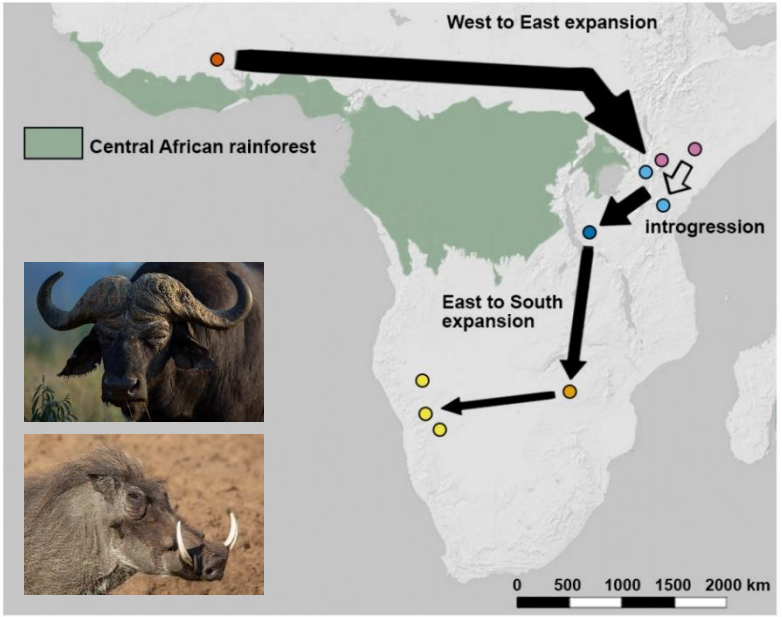
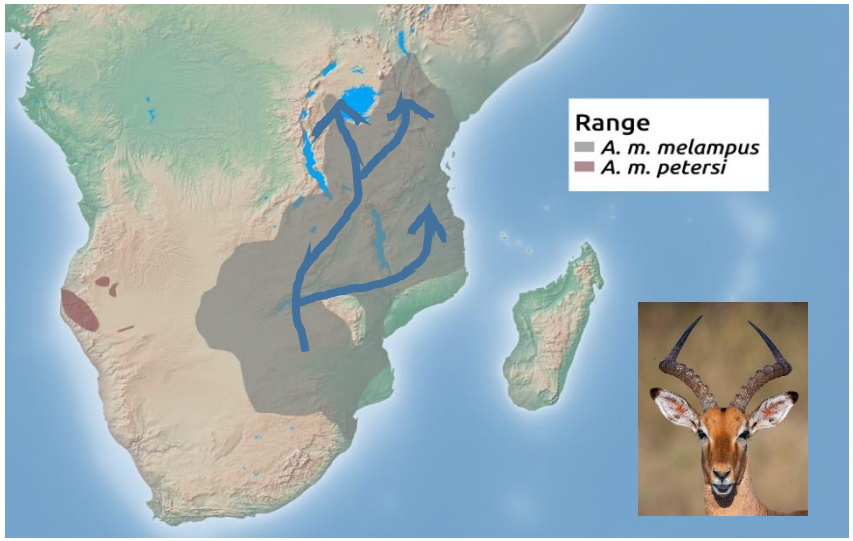
2. Looking across African wildlife species

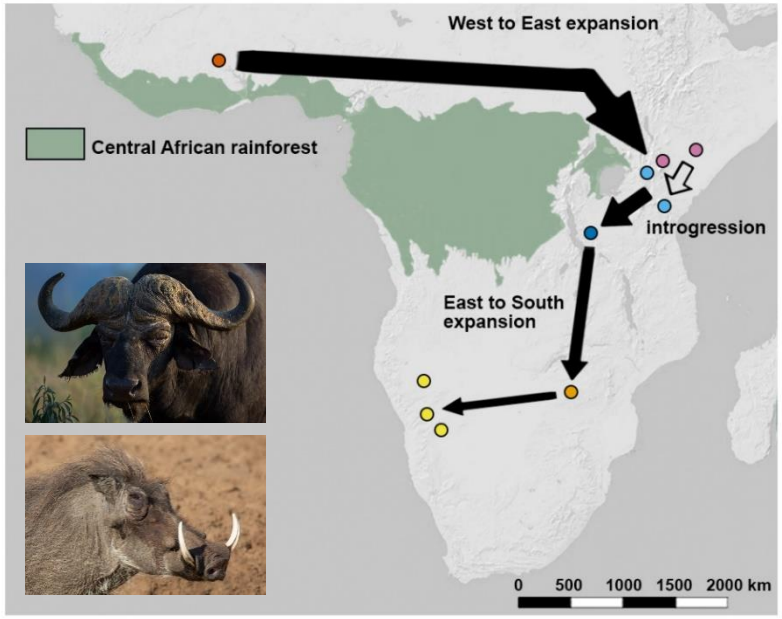








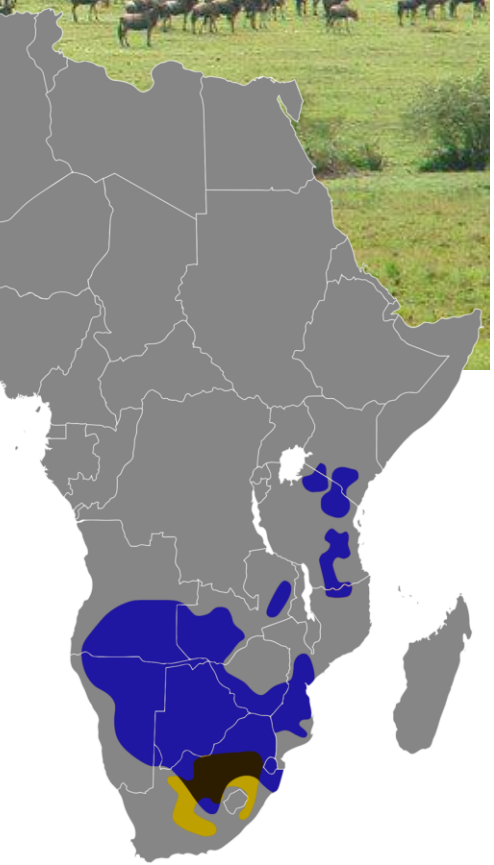




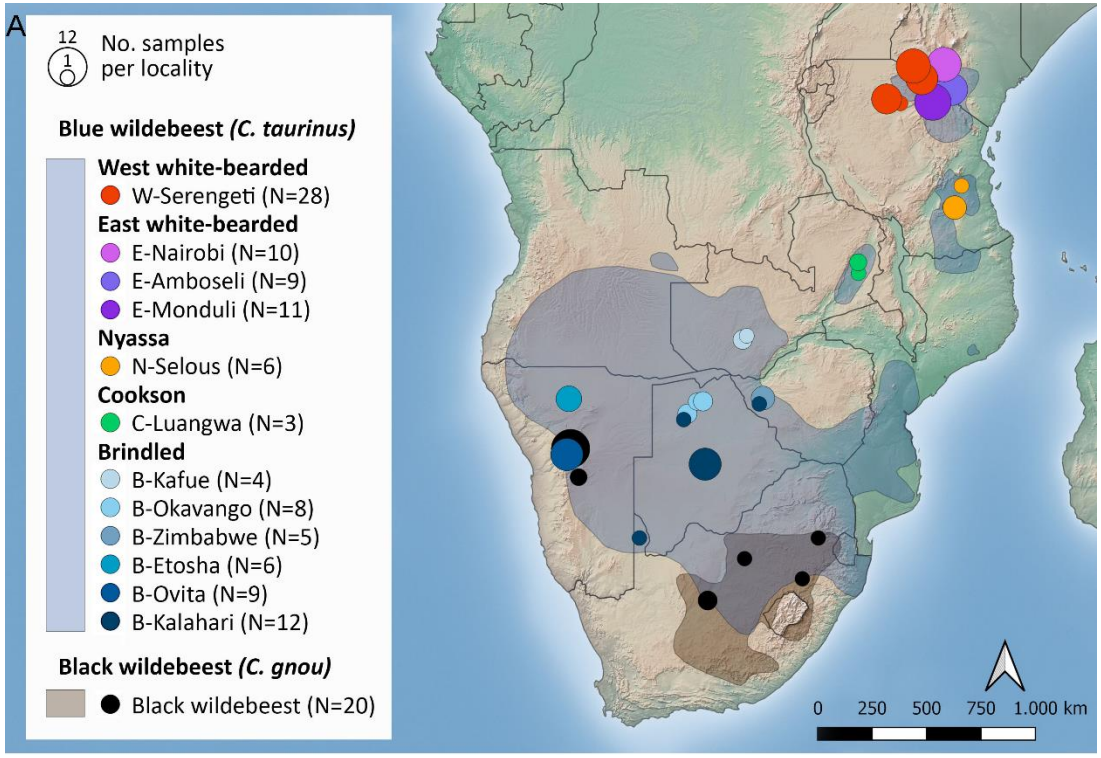
Different species have different dispersal histories
…and therefore different distributions of genetic diversity.

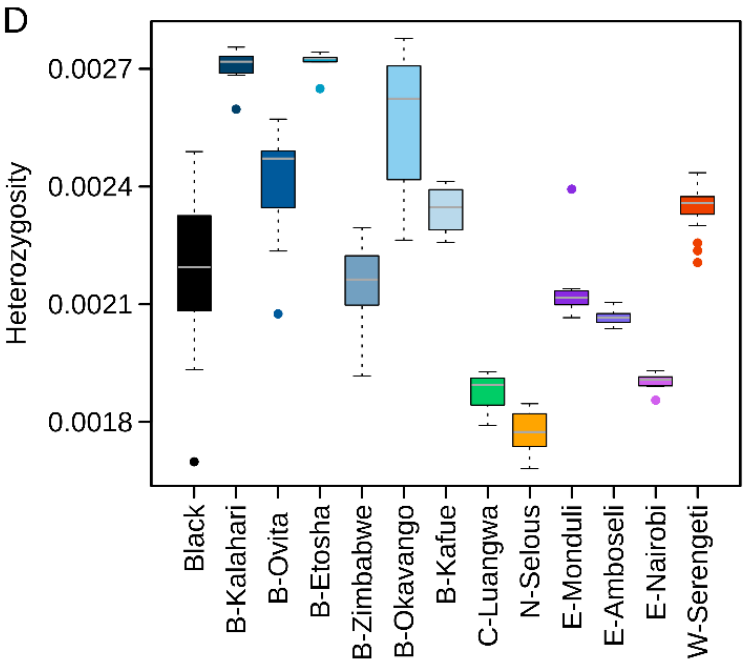
Knowing each species' distribution of diversity and dispersal histories is very useful for assessing where we need to be extra vigilant.

3. The wildebeest case



A complicated pattern – or?





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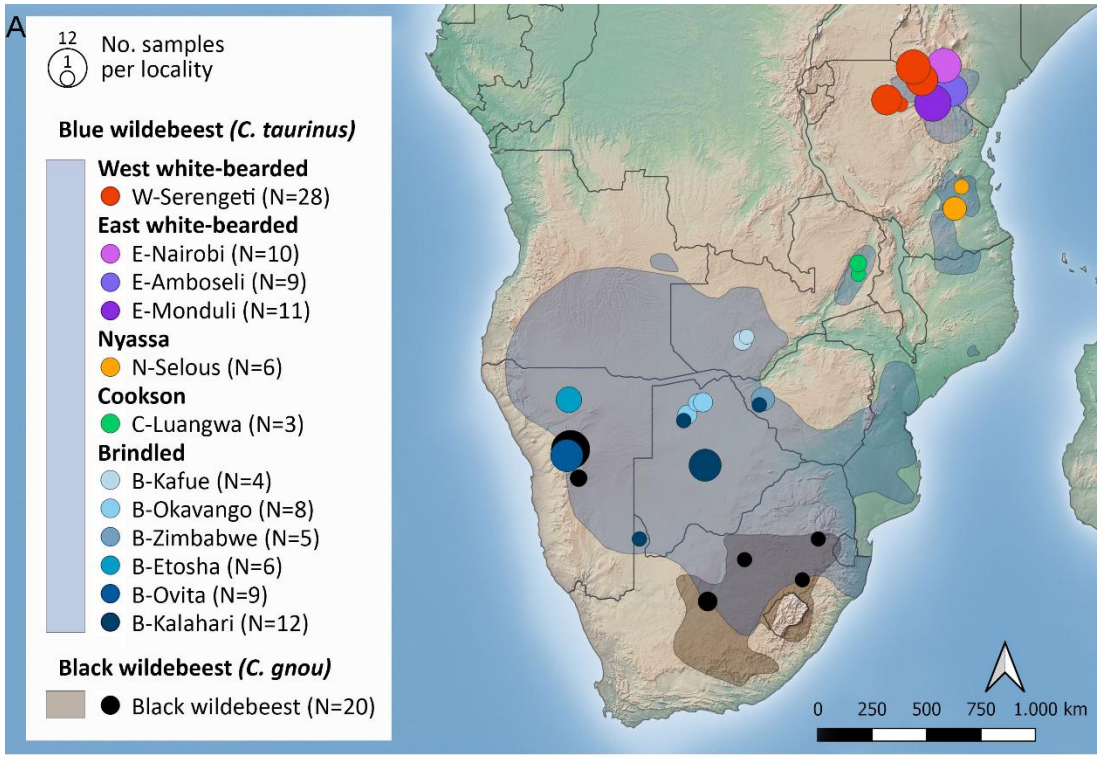
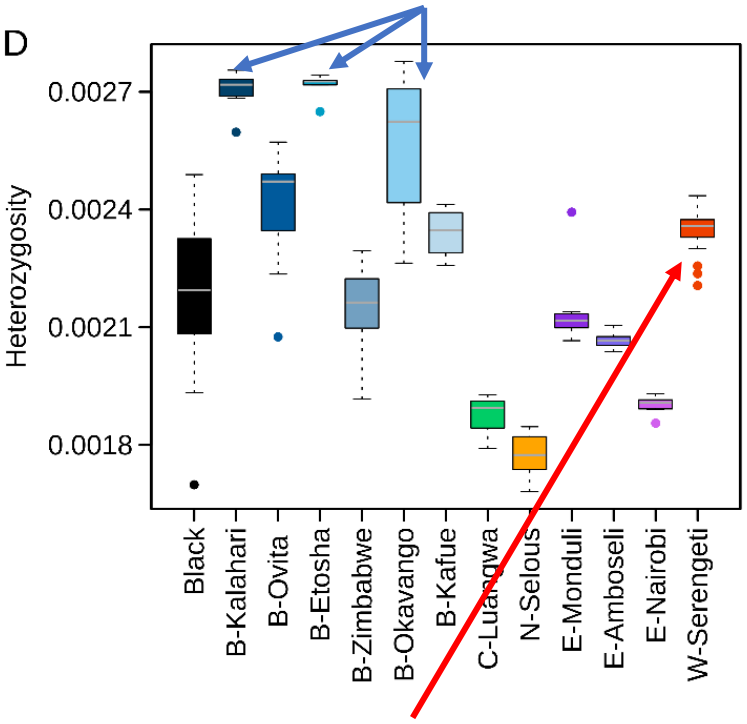
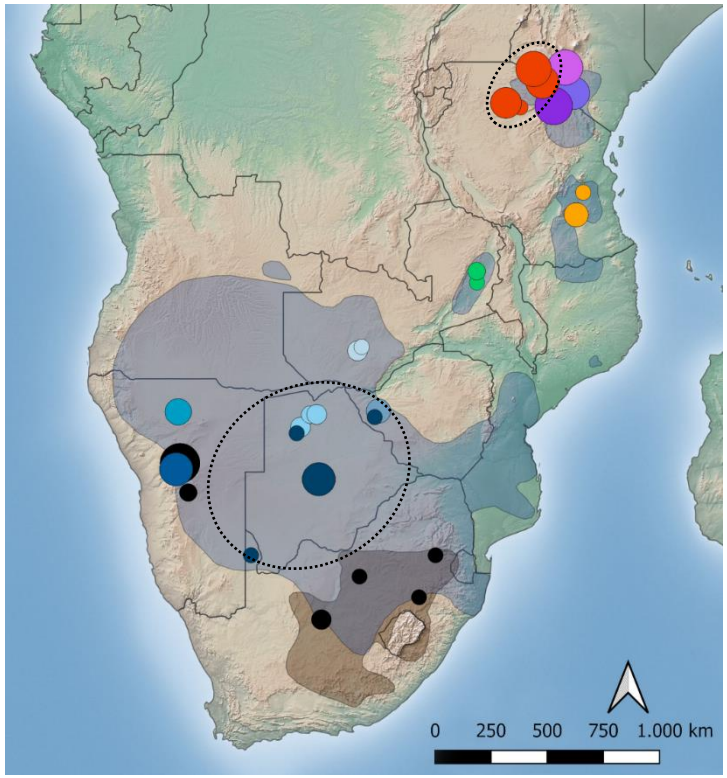


Migratory populations - South

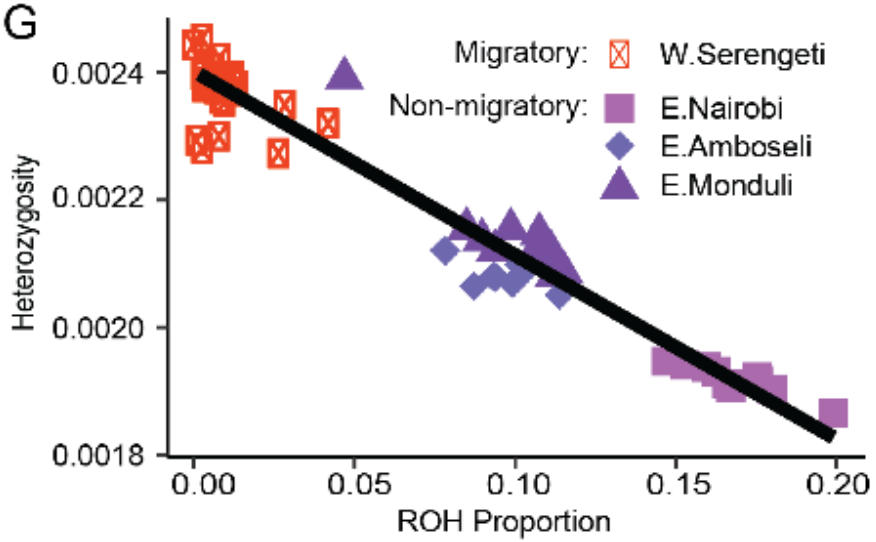


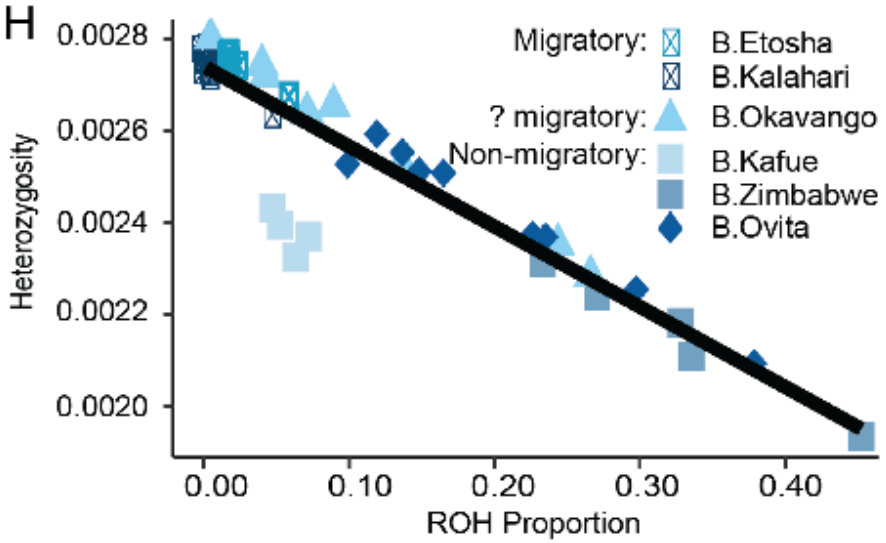
Migratory population - North

Migratory populations in both eastern and southern Africa have higher genetic diversity than their non-migratory neighbors.

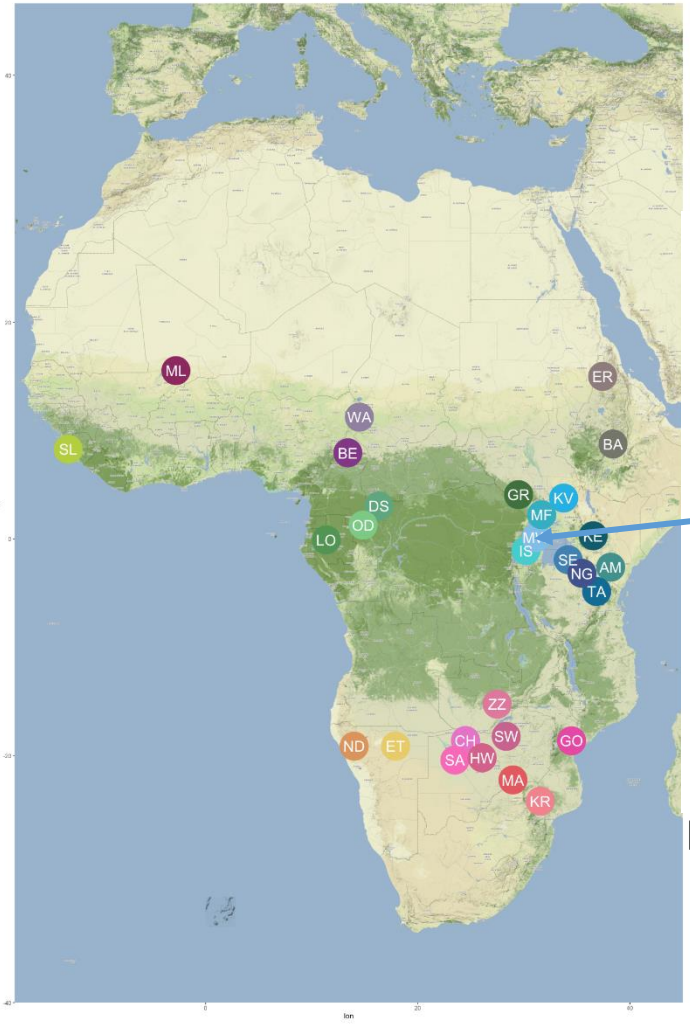


Intact migrations

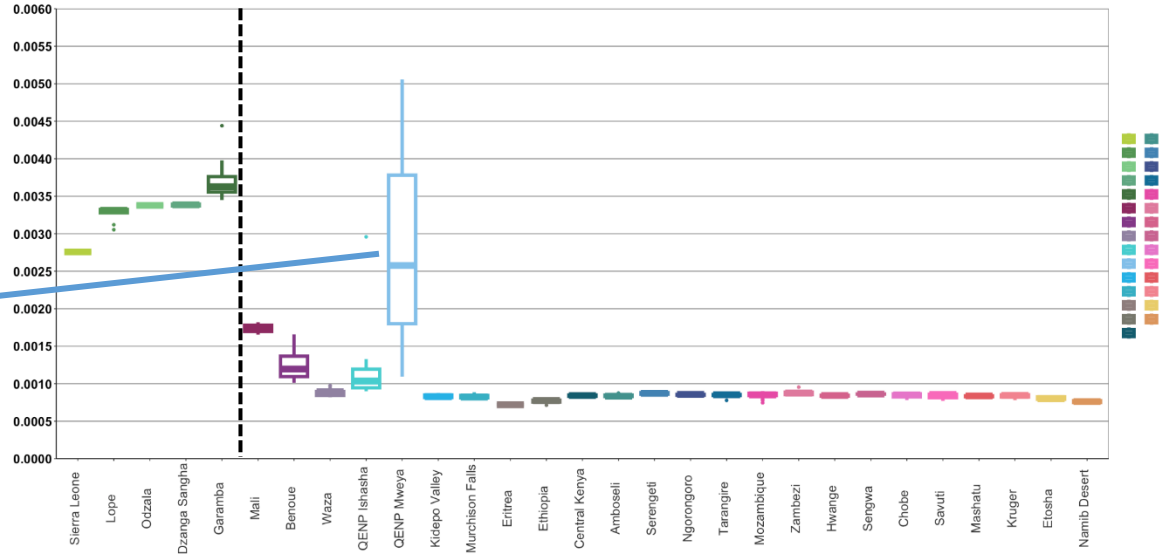




4. Genetic diversity can reveal other phenomena



Savannah elephants



Forest elephants

What is going on with Ugandan savannah elephants?

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Why do savannah elephants have increased genetic diversity relative to other savannah elephants?

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