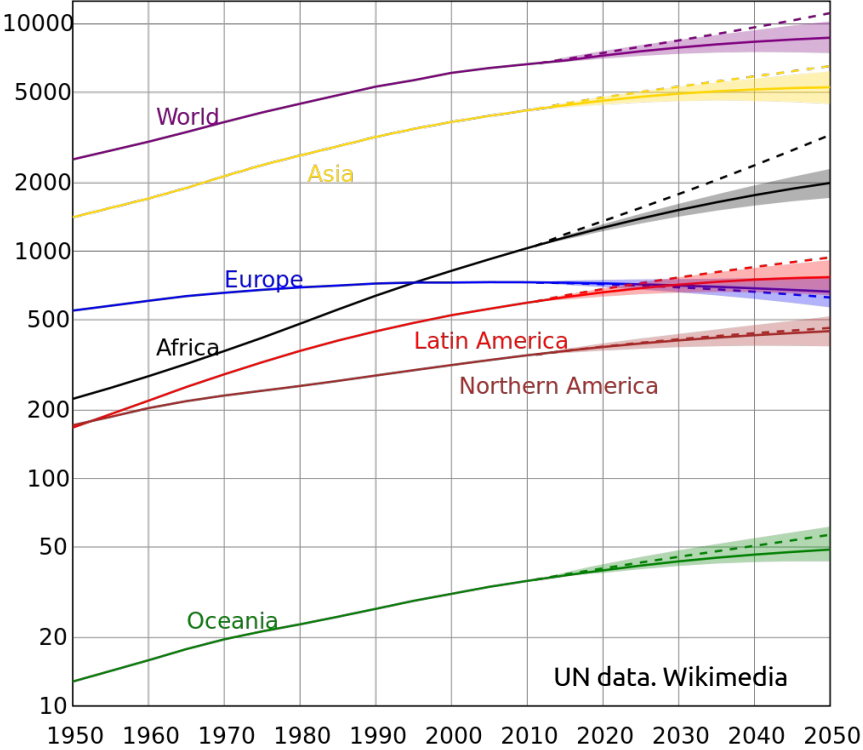


Presenting project MAEVA:
**Mammalian Evolution in Anthropized
Environments**
(Marie Skłodowska-Curie Global Fellowship)

Samuel Ginot

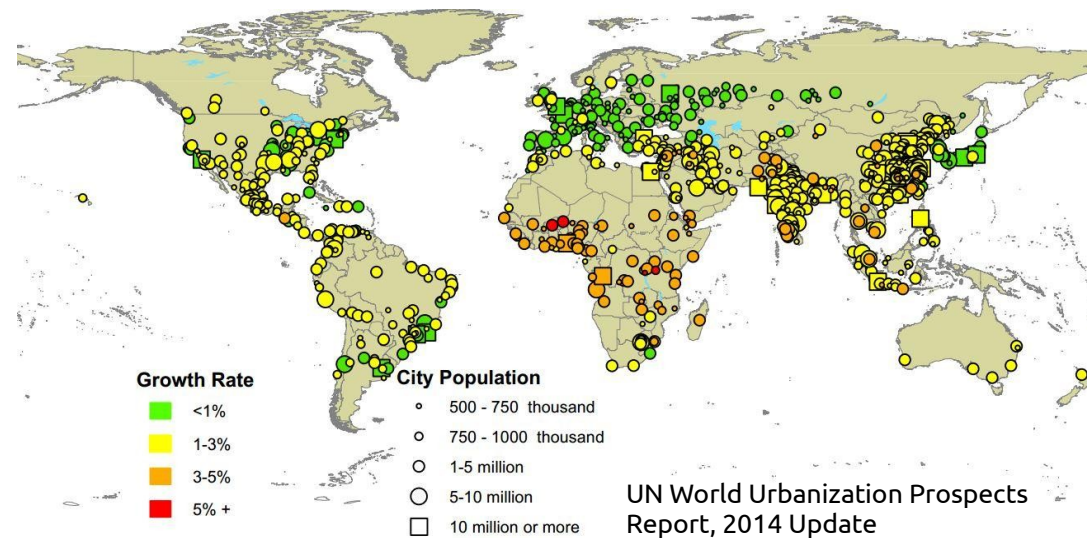
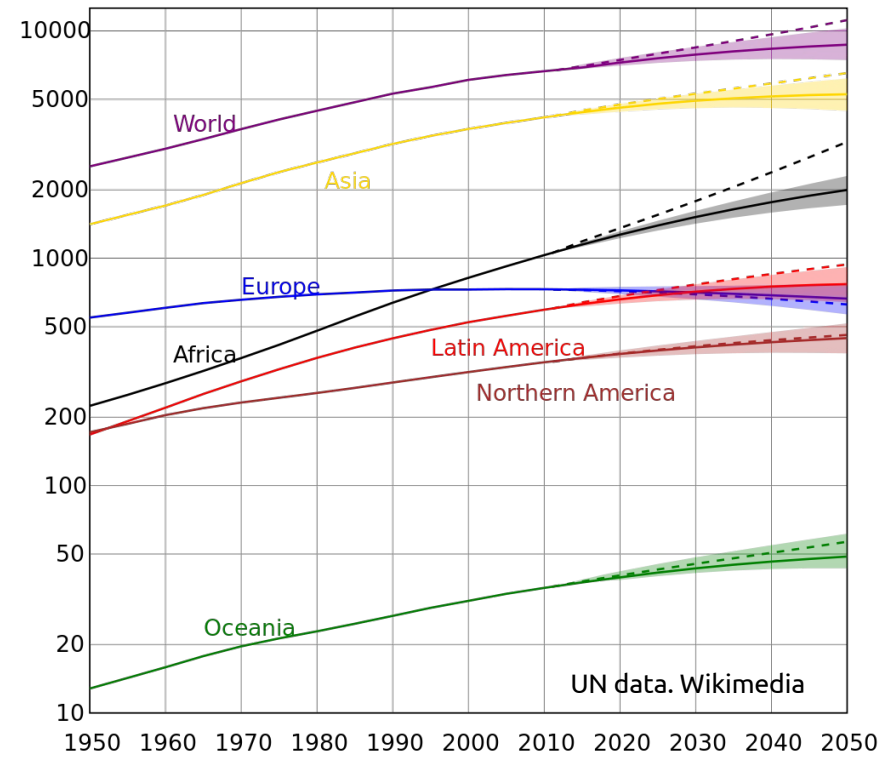


World population is increasing overall, in particular in Africa and Asia.



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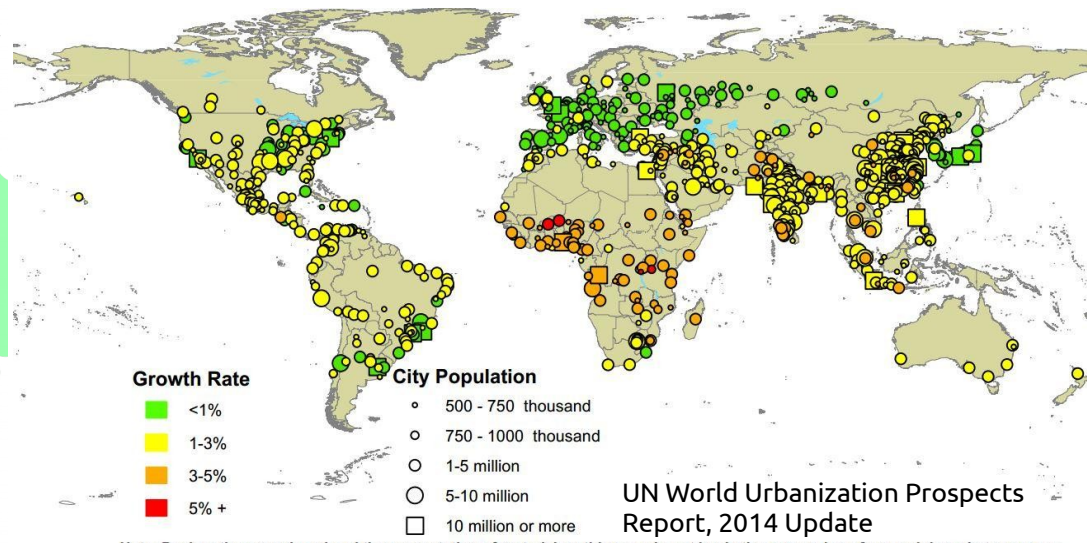
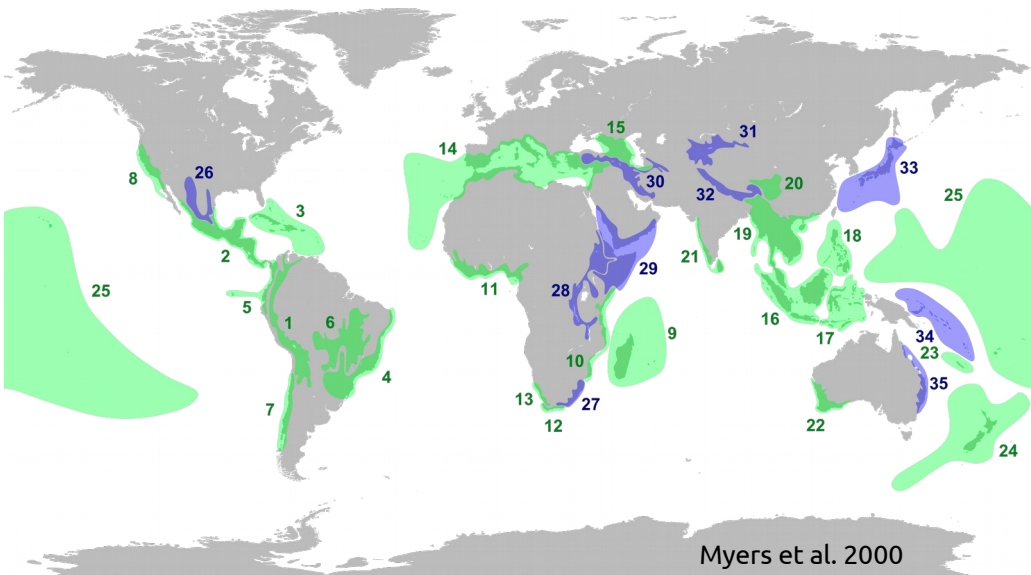
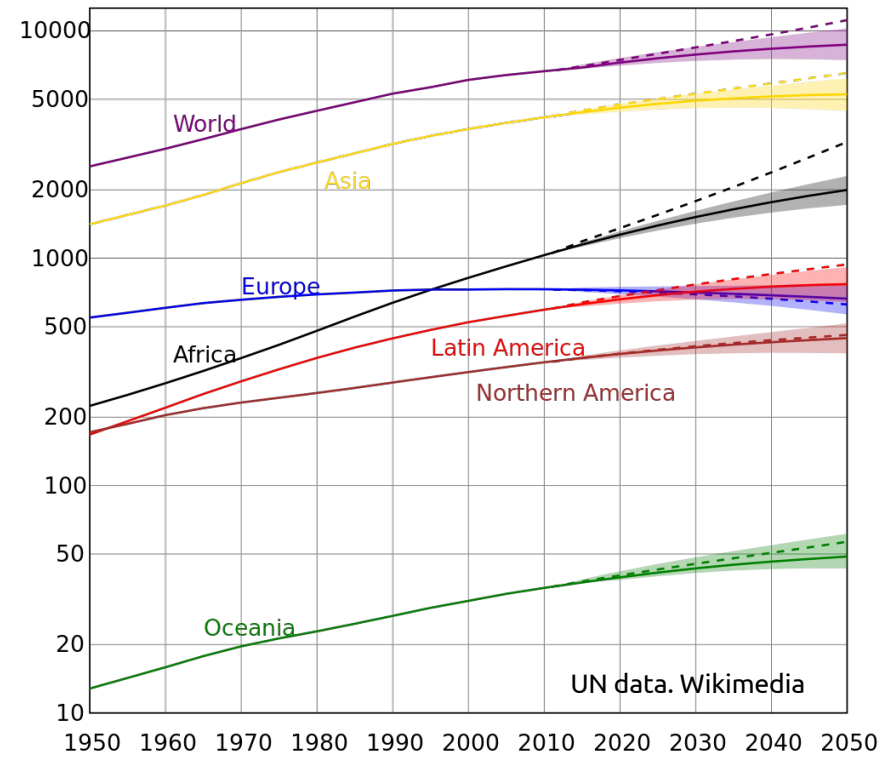
Agricultural and urban areas are spreading.



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Agricultural and urban areas are spreading.

More and more species are becoming impacted by these changing environments => biodiversity hotspots like West Africa ('Guinean Forests').



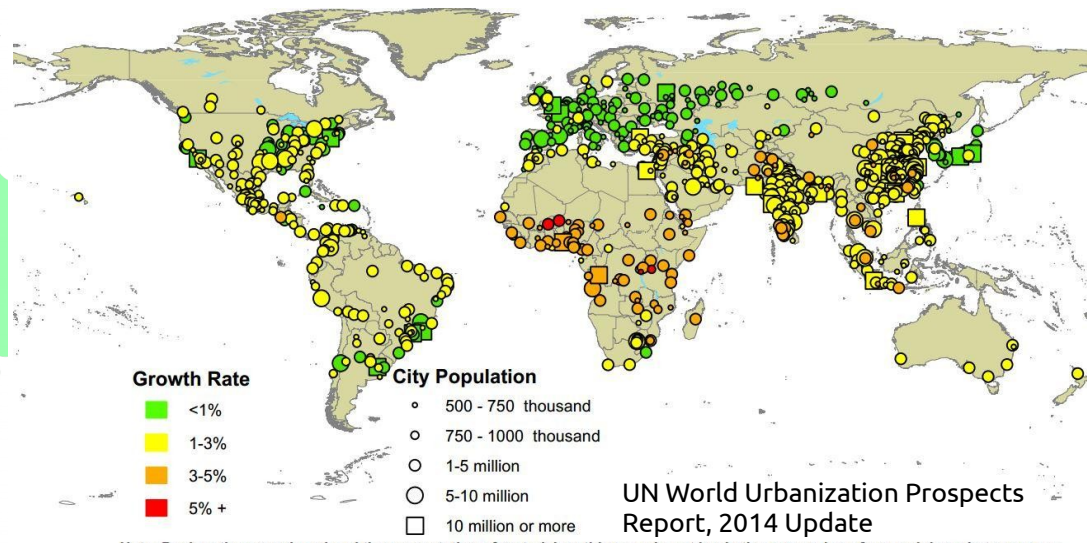
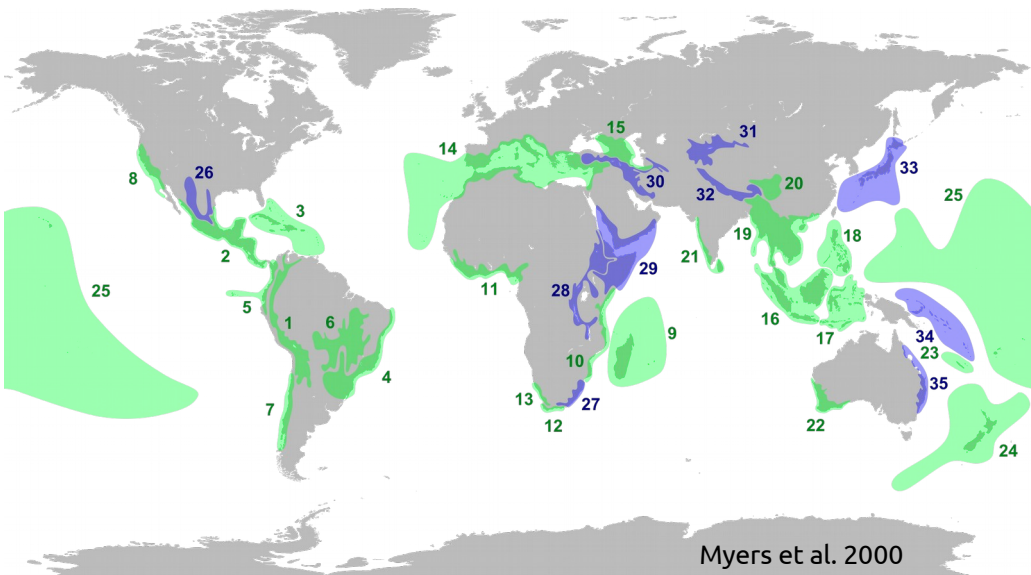
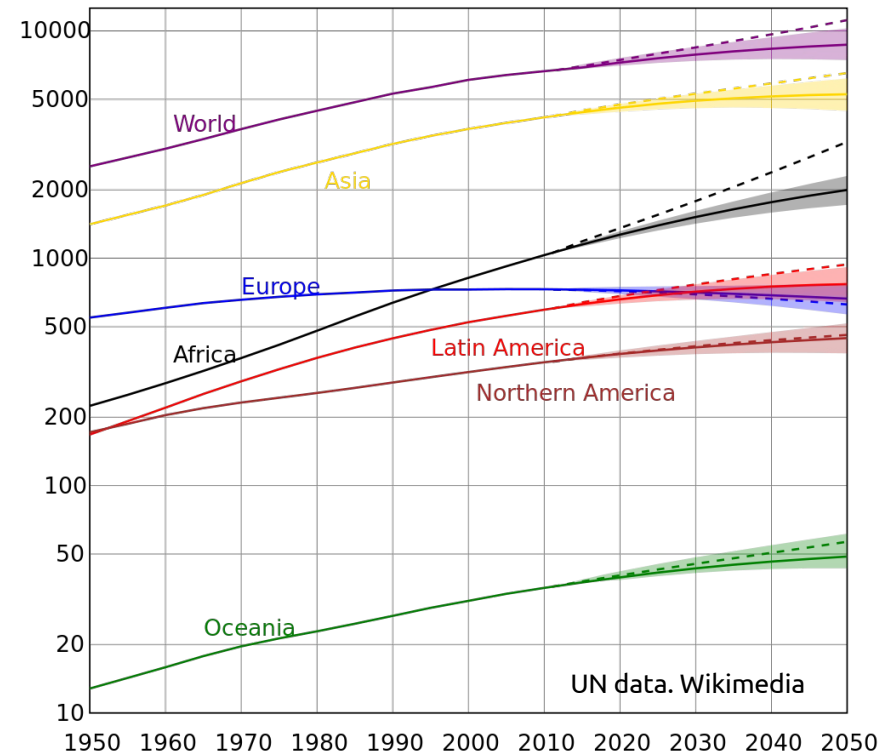
World population is increasing overall, in particular in Africa and Asia.

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Studying how **anthropization impacts** biodiversity is important in terms of **conservation, health and pest control**.

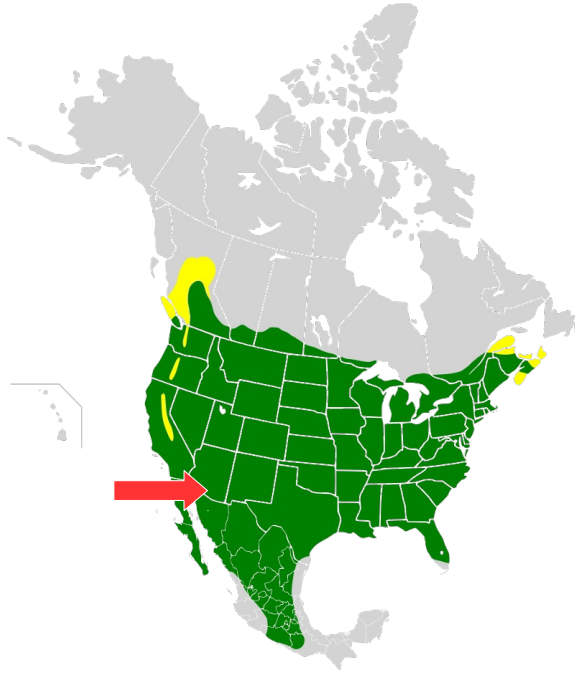
Biologists argue that it is an **opportunity** to answer **fundamental evolutionary questions**, studying them in 'real-time' (Thompson et al. 2018)



Example case study: Badyaev et al. 2008, Evolution



House finch male, *Haemorhous mexicanus*.
John Benson, Wikimedia



Univ. of Arizona (Tucson)

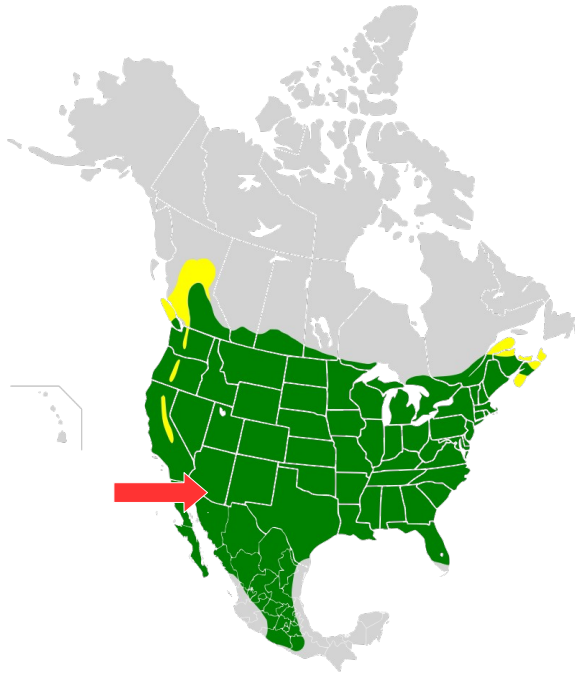


Mount Wesson (Saguaro park)

Example case study: Badyaev et al. 2008, Evolution



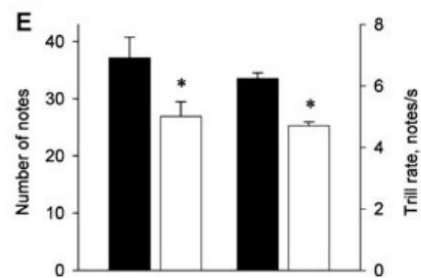
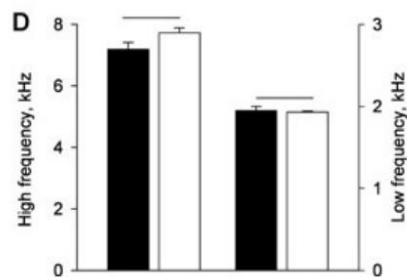
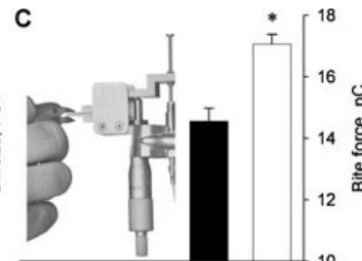
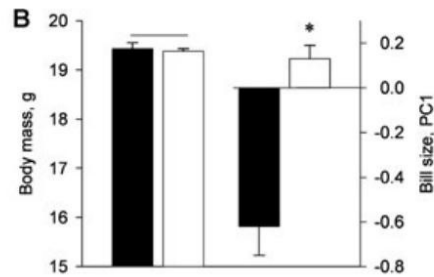
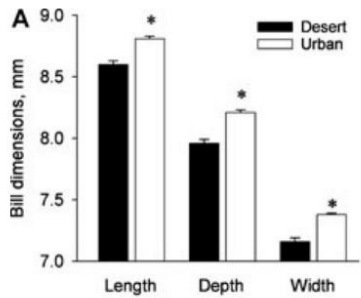
House finch male, *Haemorrhous mexicanus*.
John Benson, Wikimedia



Univ. of Arizona (Tucson)



Mount Wesson (Saguaro park)



Differences in diet = Strong selection for different beak morphologies.

- Differences in bite forces.
- Produce different mating songs.
- Genetic differentiation.
- Maintenance of local adaptation + isolation of populations.

Anthropized environments have large differences with surrounding 'natural areas', and can therefore produce strong selection on organisms.



Wikimedia Commons

MAEVA aims at understanding **how small mammals**, in particular those living in contact with humans **are evolving and adapting** to the fast **modifications** humans are producing.

Requires species that can be found in **various environments**, including anthropized ones, to **compare between populations**.

Are there differences between populations?

→ Local adaptation to new habitats / diets.

→ Otherwise, these species are versatile and can manage in very different conditions.

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Species of interest : Rodents, shrews



Mastomys erythroleucus

© IRD/J.-J. LEMASSON



© IRD/J.-M. DUPLANTIER

Praomys daltoni



Crocidura olivieri
Crocidura fuscomurina

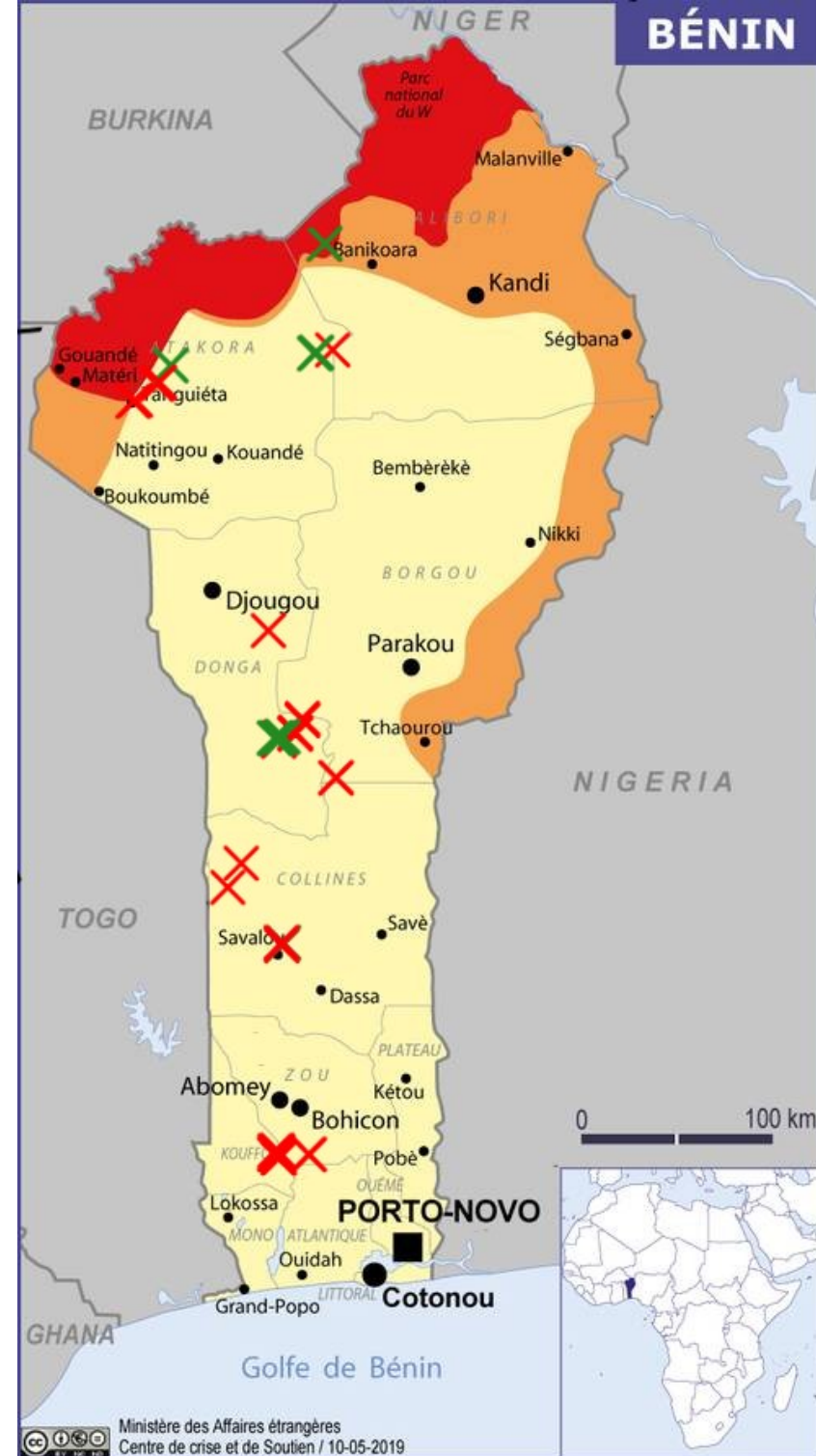


Rattus rattus

© IRD/J.-M. DUPLANTIER

Area of interest: Benin

- **All species** are known there,
- Part of the **biodiversity hotspot**,
- Fastly **growing population**,
- **Partner** with CBGP / IRD.



Formellement déconseillé
Déconseillé sauf raison impérative
Vigilance renforcée
Vigilance normale

Comparison: **populations** in **anthropized** habitats vs. **non-anthropized** habitats.

Example study: Gryseels et al. (2016) did a transect around the town of Morogoro, Tanzania (>300k inhabitants). Focused on *Mastomys natalensis* (ubiquitous in this region).

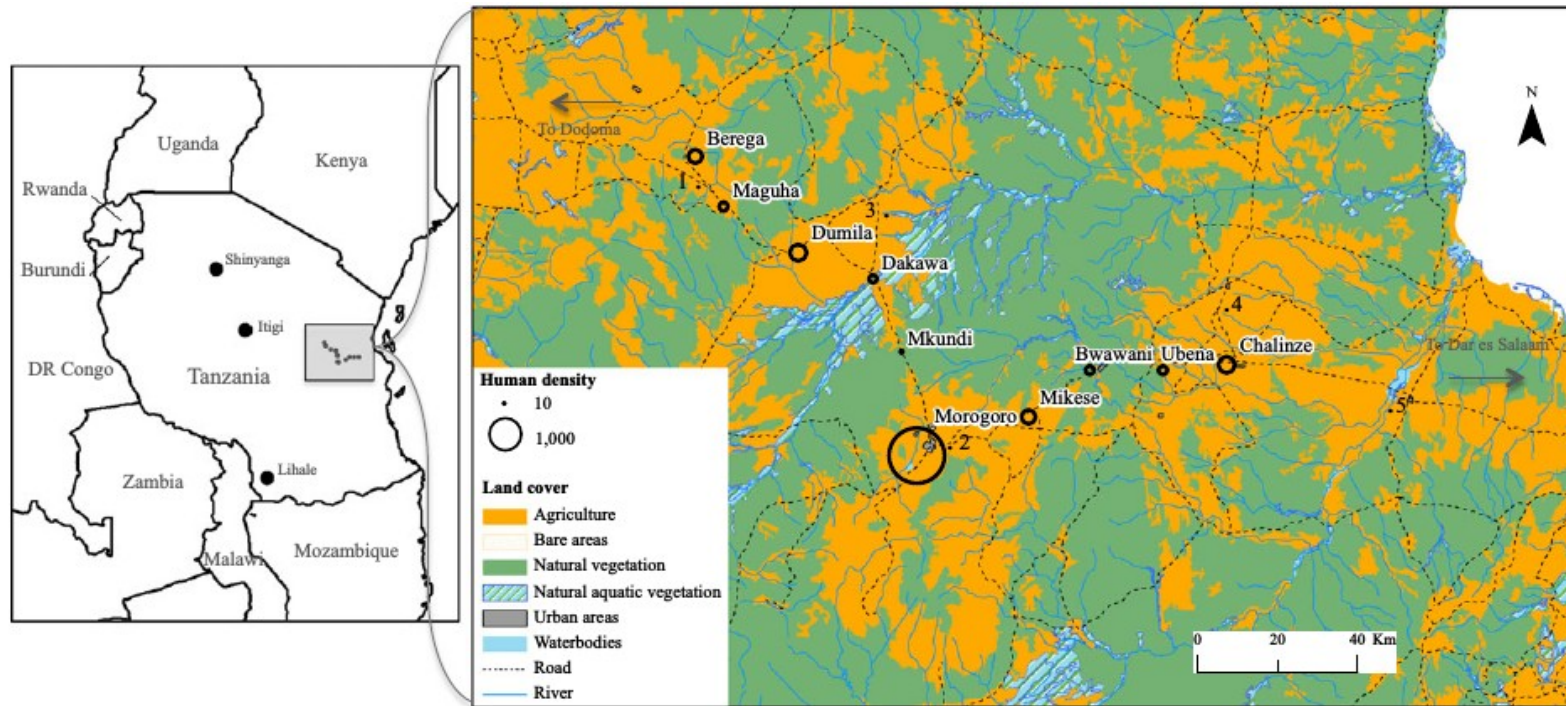
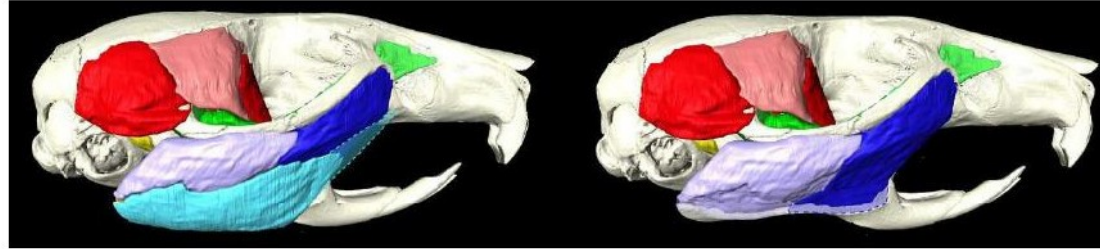
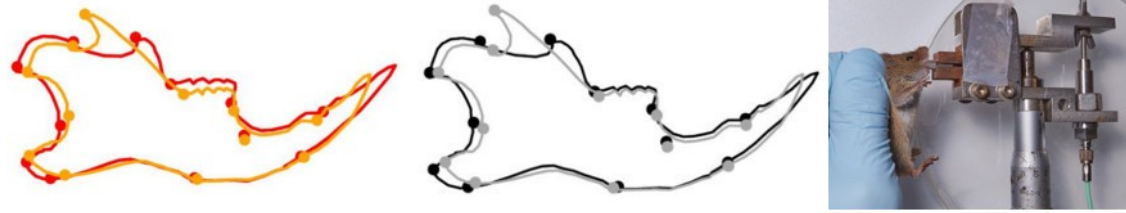


Fig. 1 Sampling area. Left: overview of Tanzania and neighbouring countries including the three wide-scale sampling localities. Right: transect sampling localities. The map background is a simplified version of the land cover layer used in the landscape connectivity analyses. The sizes of the circles represent average human population density (per km²) in a 5-km radius around each sampling locality. Numbers indicate meteorological stations from which monthly precipitation averages were obtained (see Fig. S3): 1: Berega, 2: Morogoro, 3: Wami prison farm, 4: Lugoba Mission post, 5: Ruvu.

Used microsatellites and found **differentiation** in the **city population**, with no obvious gene flow barrier. Suggests **strong selection** gradient.

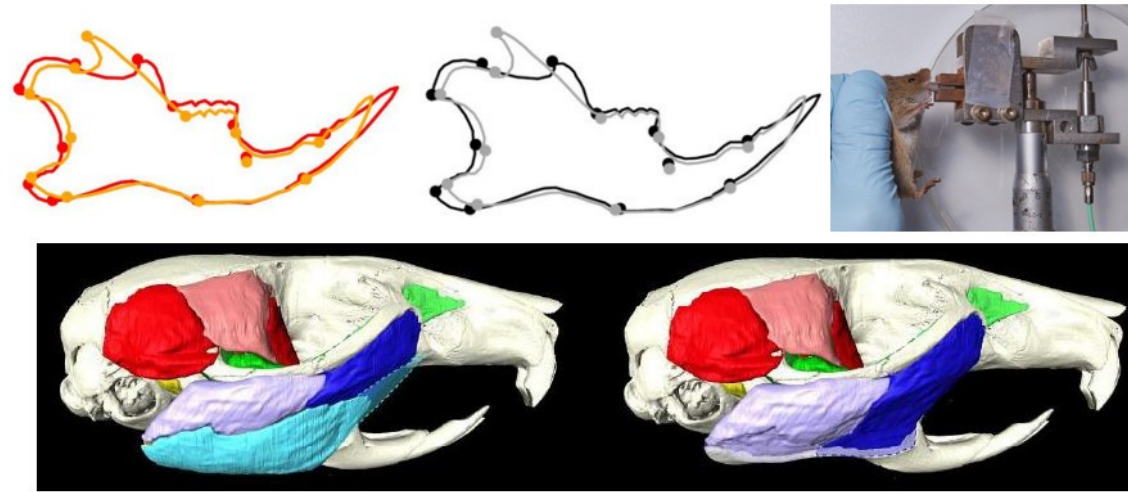
Similar sampling scheme with more complete data:

- **Skull morphology**, defined by muscular and osteological variation.
- **Functional differences**, linked to morphology, but also with direct bite force measurements.

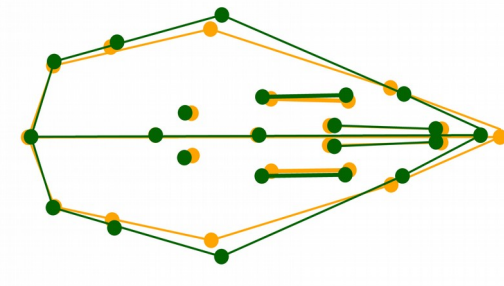
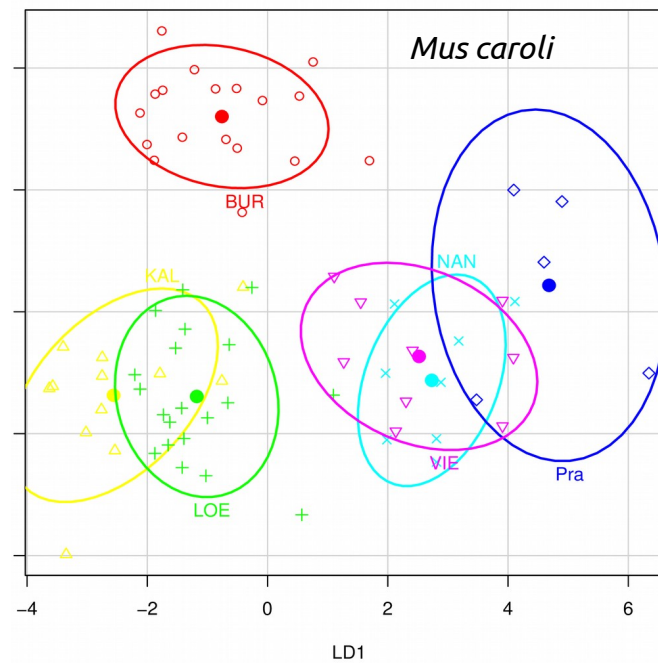
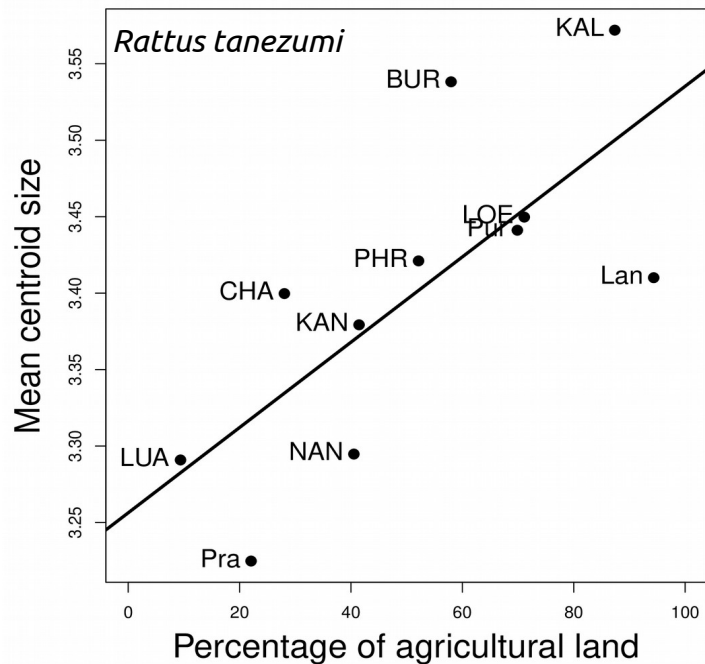


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Examples from my PhD. Rodents from Thailand, correlated with land-cover data from ESA. **Differences in skull size and shape**, linked with the **percentage of cultivated land**.



Could be plasticity?
No idea about genetic differentiation.

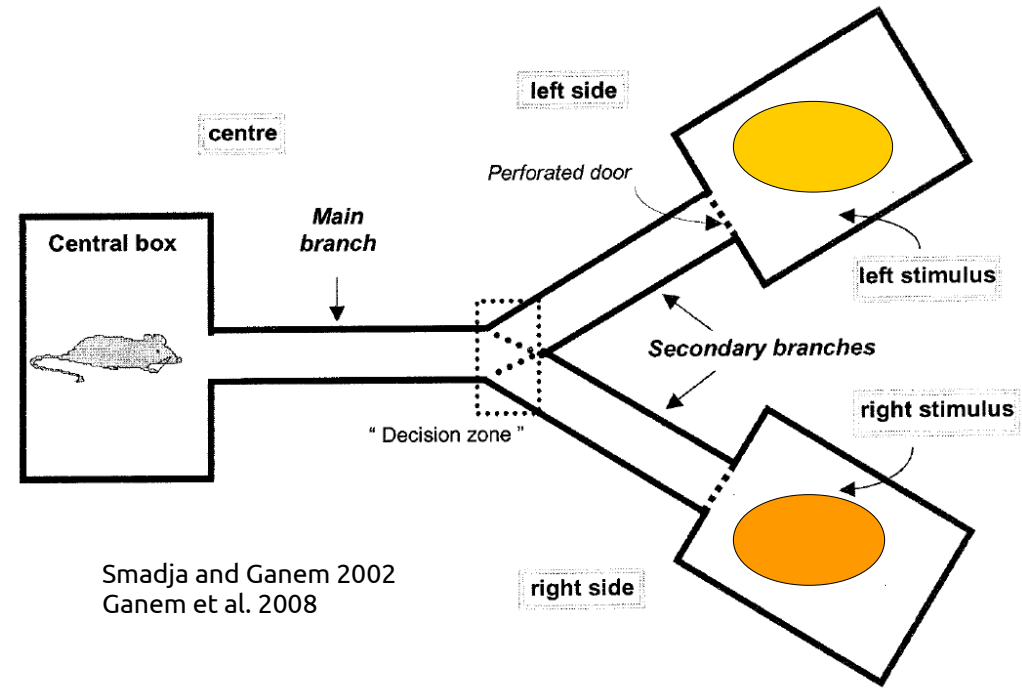


Behaviour / Mate preference

Y-maze:

- Time spent in each branch.
- Time spent sniffing stimulus.

→ Is there assortative mating?



Behaviour / Mate preference

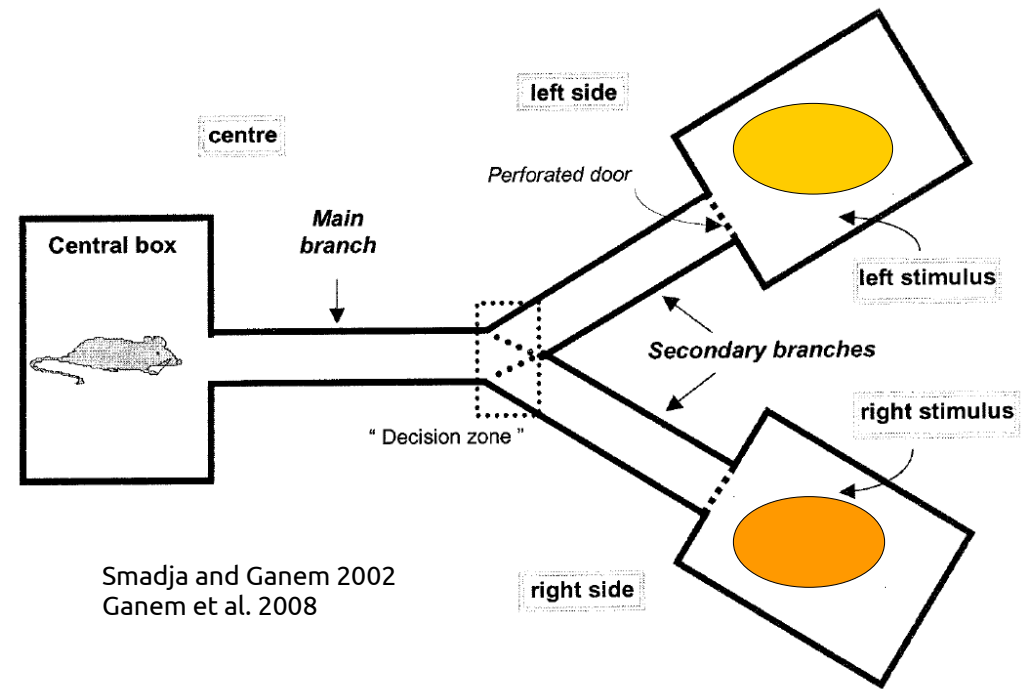
Y-maze:

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Open field:

- Time in the center.
- Latency before movement.
- Total distance.

➡ Do anthropophilic animals have behavioural adaptations?



Behaviour / Mate preference

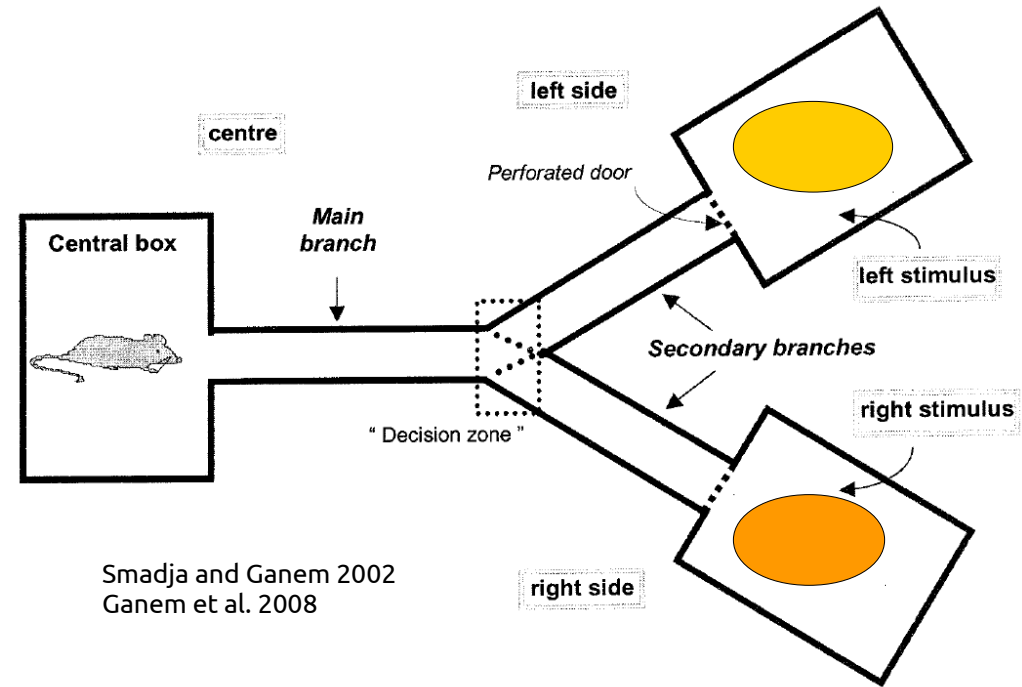
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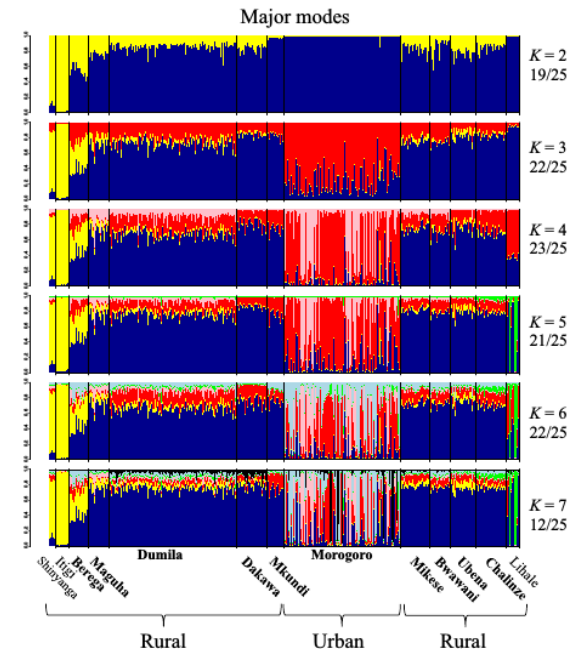


Population genetic structure: Microsats.

Example Gryseels et al. found a clear differentiation of urban population vs. rural surrounding populations.

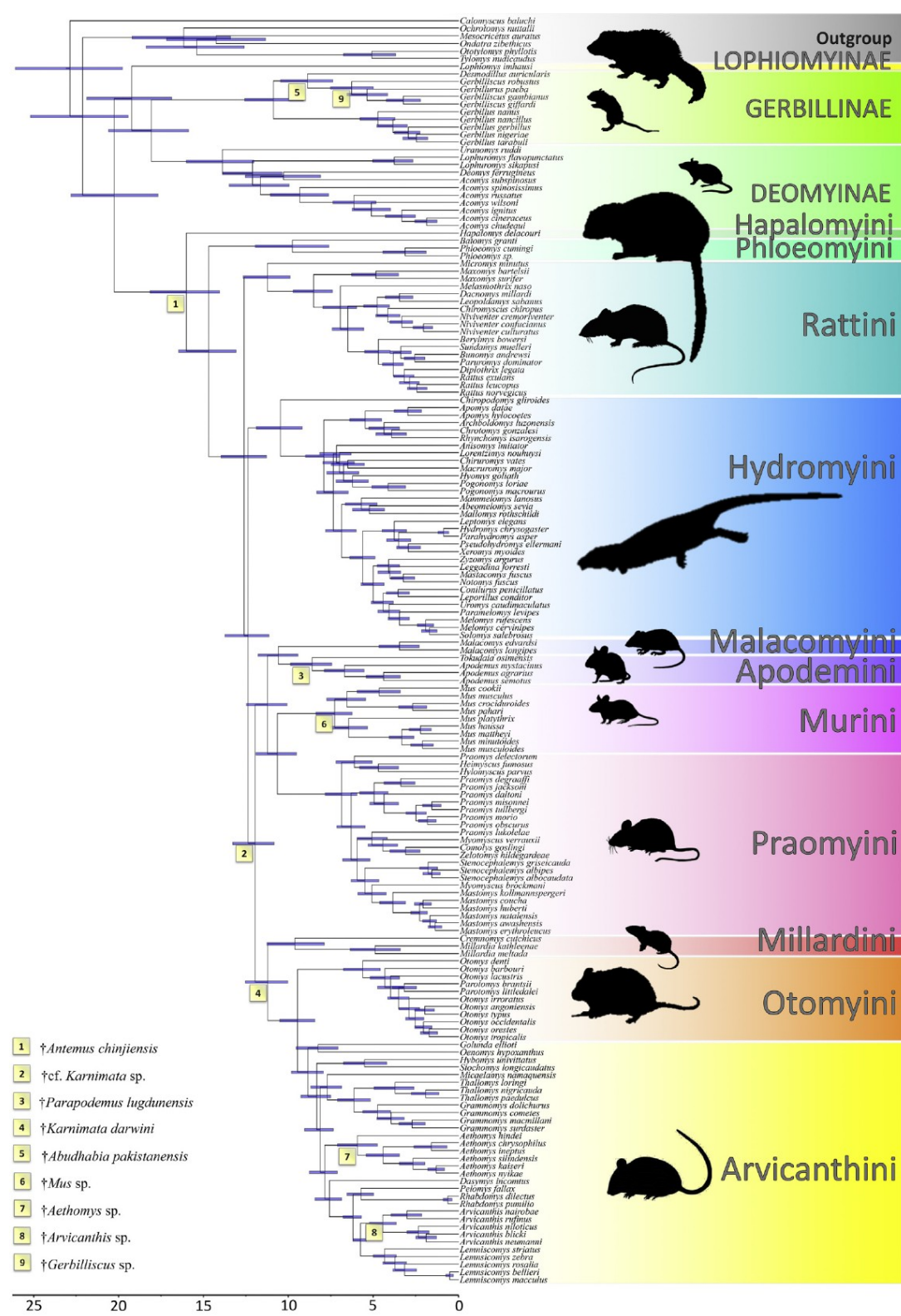
Landscape / ecology:

Land cover-land use maps.
Stomach contents to analyse diet.



Gryseels et al. 2016

Related, large scale aim:
Interspecific differences between commensal / ubiquitous / anthropophobic species?



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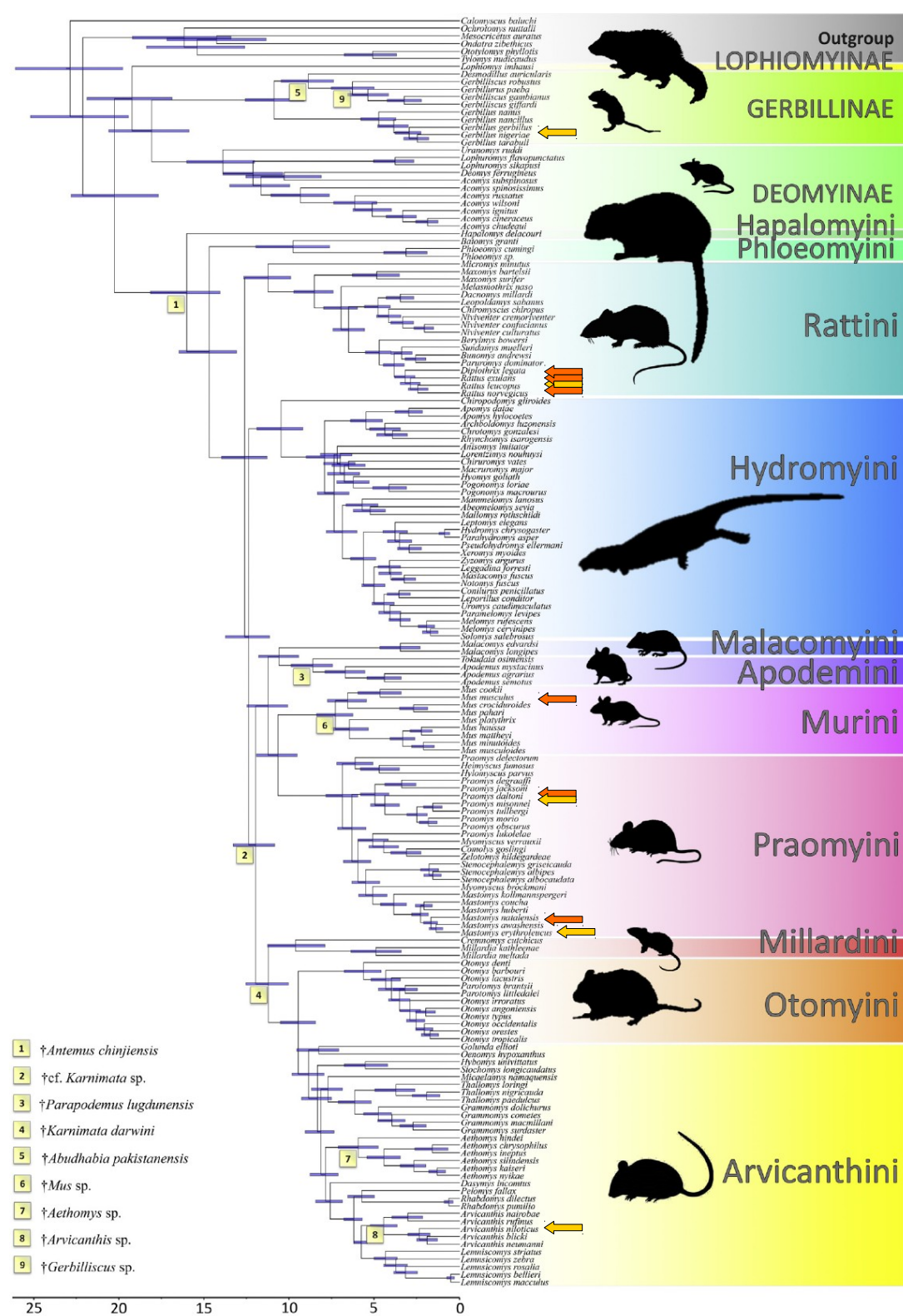
Interspecifically differences between commensal / ubiquitous / anthropophobic species?

Several sources of data:

- Specimens obtained during this project.
- Osteological collection of **CBGP** (5k specimens).
- Osteological collection of **ISEM** (CERoPath, 3k specimens).



~90 species ; 6 'commensal' ; 5 'ubiquist'.



- 1 †*Antemus chinjiensis*
- 2 †cf. *Karnimata* sp.
- 3 †*Parapodemus lugdunensis*
- 4 †*Karnimata darwini*
- 5 †*Abudhabia pakistanensis*
- 6 †*Mus* sp.
- 7 †*Aethomys* sp.
- 8 †*Arvicanthis* sp.
- 9 †*Gerbilliscus* sp.

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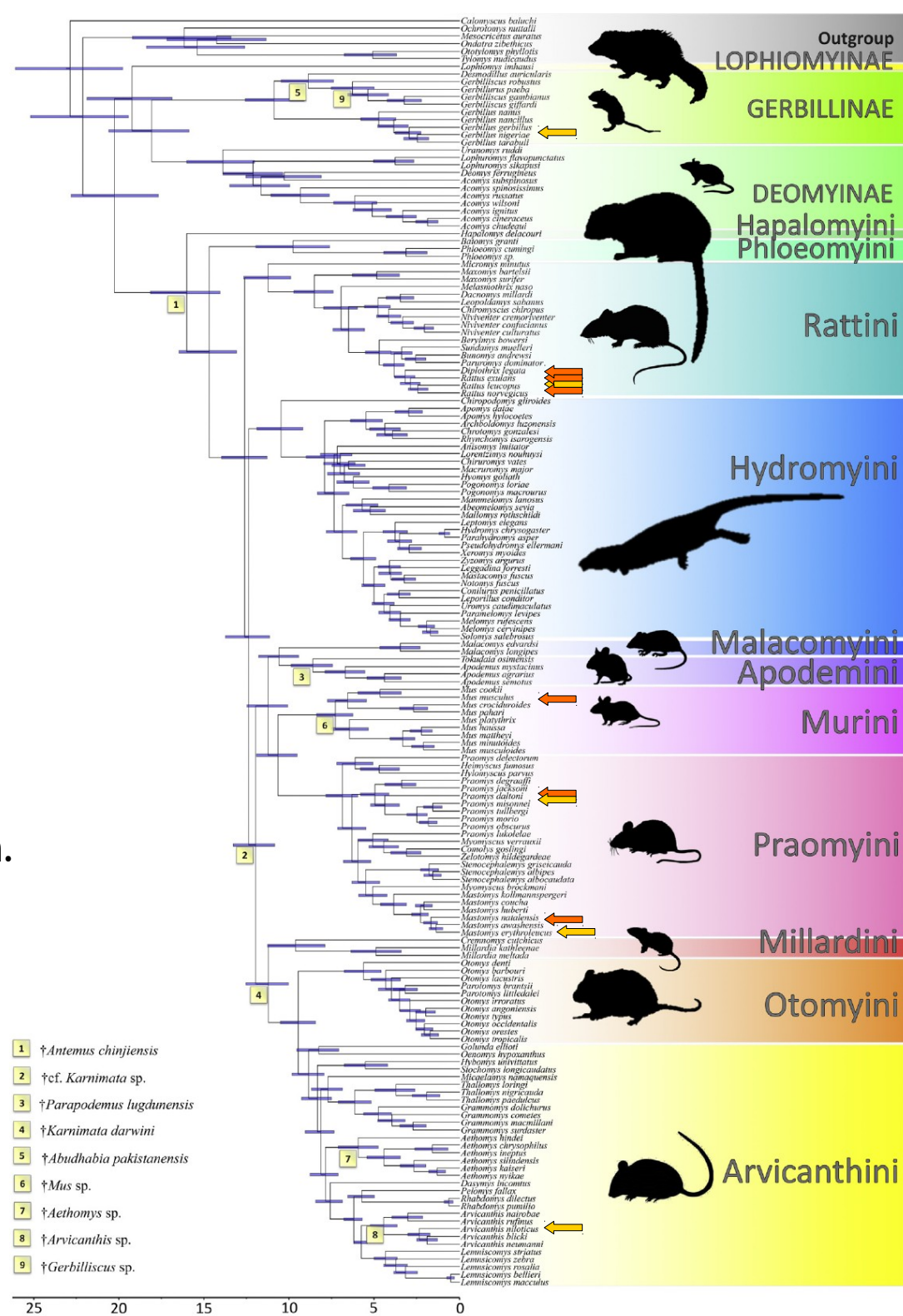


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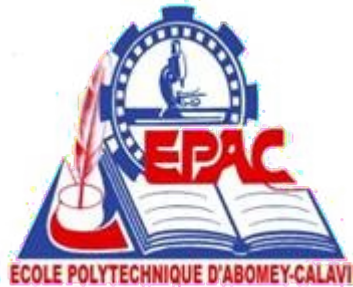
Specimens from West Africa and Southeast Asia, **independent** origins for **commensalism**.

➔ **Comparative anatomy / function** across Muridae. **Convergences** linked to these ecologies?

➔ **Comparison with intraspecific patterns**. **Adaptive changes** linked to anthropized environments?



Partner institution



People:
Gualbert Houéménou and students.

Two years stay in Benin.

Gauthier Dobigny

Hosting institution



People:
Laurent Granjon, Carine Brouat.

One year return phase.

Results in February 2020