

Can we derive potential natural mammal species ranges?

Developing species distribution models to estimate historical distributions

Level: Master

Start: Any time

Project form: Modelling spatial data

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Background

To evaluate global impacts of anthropogenic pressures on species distributions, we need to know where species would occur without anthropogenic pressures. Faurby and Svenning (2015) estimated these potential natural ranges of all mammals and published these in the PHYLACINE database (Fig. 1) (Faurby et al. 2018). However, this data is not available for species groups other than mammals, and applying the approach of Faurby and Svenning (2015) requires species-by-species assessments and expert knowledge on species distributions. The development of a method to systematically predict potential natural ranges could be the key to expand estimates of potential natural mammal species ranges to other species groups.

Aim and approach

In this internship, you will use current mammal species spatial range maps (IUCN 2022) and omit parts of the species range where the species has been introduced by humans. Subsequently, you will overlay these species ranges with environmental (e.g., elevation, vegetation, and climate variables) in species distribution models to establish species environmental niches (Santini et al. 2021). Species potential natural ranges can then be derived by combining species environmental niches with environmental variables that represent current natural conditions in absence of humans (e.g., potential natural vegetation instead of land use maps) (Ramankutty et al. 2010). Evaluating the similarity of these potential natural ranges with those in PHYLACINE will inform whether the methodology can be used to derive potential natural ranges for other species groups (Faurby et al. 2018).

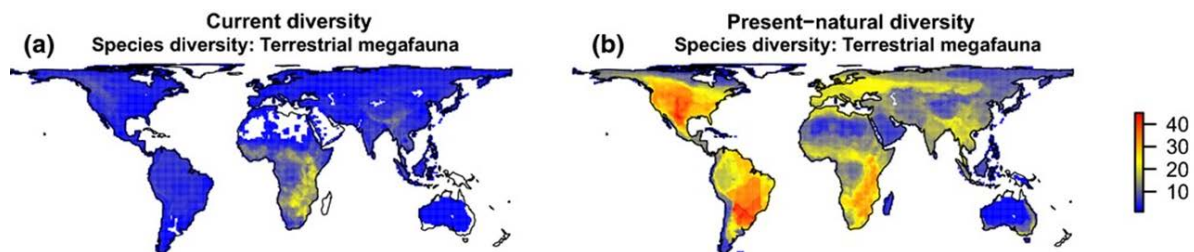


Figure 1. Comparison between mammal megafauna species richness maps based on (a) current species ranges and (b) estimated potential natural species ranges by Faurby and Svenning (2015).

Literature

- Faurby S, Davis M, Pedersen RØ, Schowaneck S, Antonelly A, Svenning J-C. 2018. PHYLACINE 1.2: the phylogenetic atlas of mammal macroecology. *Ecology* **99**:2626.
- Faurby S, Svenning JC. 2015. Historic and prehistoric human-driven extinctions have reshaped global mammal diversity patterns. *Diversity and Distributions* **21**:1155–1166.
- IUCN. 2022. The IUCN Red List of Threatened Species. Version 2022-1. Available from <https://www.iucnredlist.org> (accessed June 9, 2022).
- Ramankutty N, Foley JA, Hall F, Gollatz G, Meeson B, Los S, Brown de Colstoun E, Landis D. 2010. ISLSCP II Potential Natural Vegetation cover. Oak Ridge, Tennessee, USA. Available from <https://doi.org/10.3334/ORNLDACC/961>.
- Santini L, Benítez-López A, Maiorano L, Čengić M, Huijbregts MAJ. 2021. Assessing the reliability of species distribution projections in climate change research. *Diversity and Distributions* **27**:1035–1050. Available from <https://onlinelibrary.wiley.com/doi/10.1111/ddi.13252>.