What is the minimum viable population size of each mammal and bird species?
Using population viability analysis to derive species-specific probabilities of persistence

Level: Master
Start: Any time
Project form: Population viability analysis
Supervision: Koen Kuipers and Jelle Hilbers
Contact: koen.kuipers@ru.nl, jelle.hilbers@ru.nl

Background
Small populations are at a high risk of extinction due to environmental and demographic stochasticity and successful conservation efforts maintain viable species populations. However, the minimum viable population (MVP; the population size below which extinction risks are unacceptably high) are modulated by species traits (Fig. 1) (Hilbers et al., 2017). In order to evaluate whether conservation efforts sufficiently protect species (e.g., via minimum area requirements) and to identify species populations at risk of extinction, we need to know species MVPs (Verboom et al., 2014; Williams et al., 2022). However, a database of species-level MVPs is currently missing.

Aim and approach
In this internship, you will derive mammal or bird species-level MVPs based on population viability analysis and species traits (e.g., species body mass and population density) (Hilbers et al., 2017; Santini et al., 2022). You will use population viability analysis to simulate population dynamics multiple times to estimate the probability of population extinction after a certain amount of time. This is used to derive an MVP required to stay below a certain probability of population extinction after a certain amount of time. The results can be used to evaluate which species populations are at risk of extinction and to derive species-specific minimum area requirements for conservation planning based on species MVP and population densities.

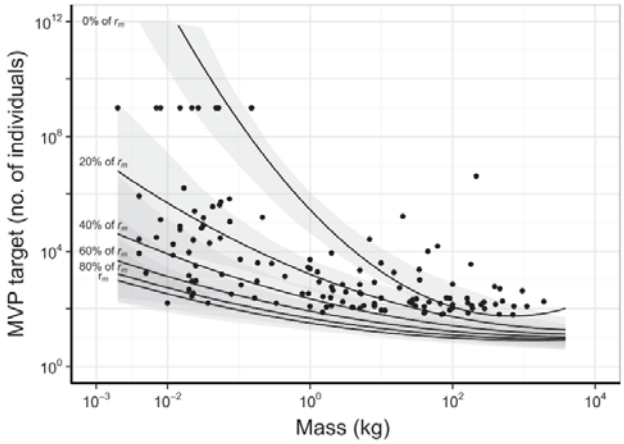

Figure 1. Minimum viable population by body mass and at different reproduction rates (r_m) (Hilbers et al., 2017).

Literature

Hilbers, J. P., Santini, L., Visconti, P., Schipper, A. M., Pinto, C., Rondinini, C., & Huijbregts, M. A. J. (2017). Setting population targets for mammals using body mass as a predictor of population persistence. *Conservation Biology*, *31*(2), 385–393. https://doi.org/10.1111/cobi.12846

Santini, L., Bénitez-López, A., Dormann, C., & Huijbregts, M. A. J. (2022). Population density estimates for terrestrial mammal species. *Global Ecology & Biogeography*, *March 2021*, 1–17. https://doi.org/10.1111/geb.13476

Verboom, J., Snep, R. P., Stouten, J., Pouwels, R., Pe'er, G., Goedhart, P. W., Van Adrichem, M., Alkemade4, R., & Jones-Walters, L. (2014). Using Minimum Area Requirements (MAR) for assemblages of mammal and bird species in global biodiversity assessments. *Statutory Research Tasks Unit for Nature & the Environment (WOT Natuur & Milieu)*, *33*, 1–22.

Williams, D. R., Rondinini, C., & Tilman, D. (2022). Global protected areas seem insufficient to safeguard half of the world's mammals from human-induced extinction. *Proceedings of the National Academy of Sciences*, *119*(24), 1–8. https://doi.org/10.1073/pnas.2200118119