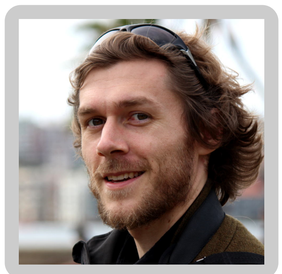


How much are wild vertebrate populations evolving right now?

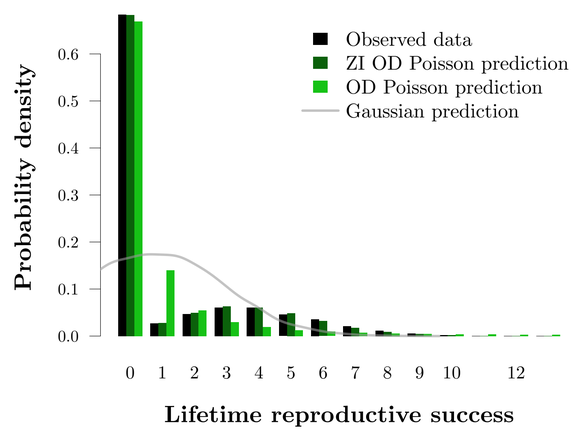
Timothée Bonnet & Loeske Kruuk
Australian National University

The big problem: We do not know how much wild organisms are currently evolving!

Fisher's fundamental theorem of natural selection states that **additive genetic variation in fitness measures evolution across all traits and all the genome**. That is just what we need*! Yet, there are few estimates in free-ranging populations, and most may be unreliable. Indeed, it is difficult to measure fitness, difficult to estimate genetic variance, statistical models tend not to fit the data, and it is unclear how to interpret estimates from generalized linear models. We assemble data from the monitoring of a dozen pedigreed populations,

Theory: How to estimate additive genetic variance in relative fitness ($V_A(\omega)$) ?

How to model fitness?

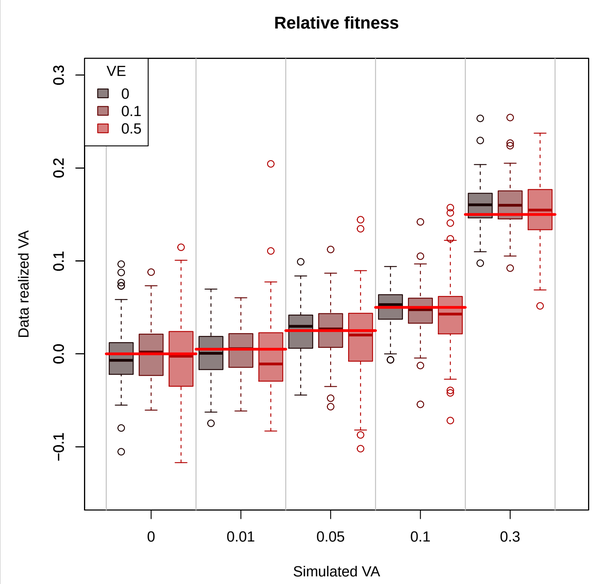


Zero-Inflated Over-Dispersed Poisson models tend to fit well lifetime fitness data.

How to estimate genetic variation?

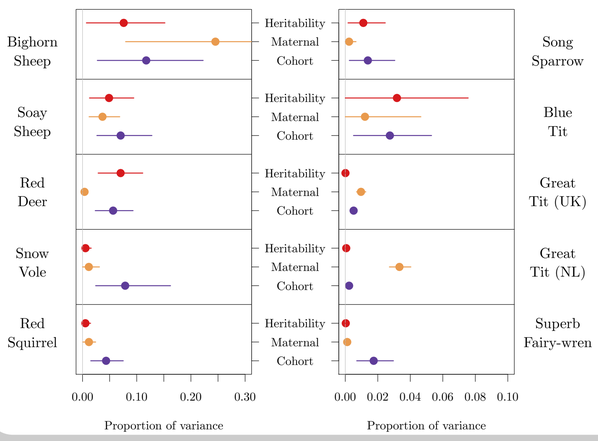
Quantitative genetic *animal models* from relatedness matrix. Estimate G-matrix for the zero-inflation and the over-dispersed Poisson.

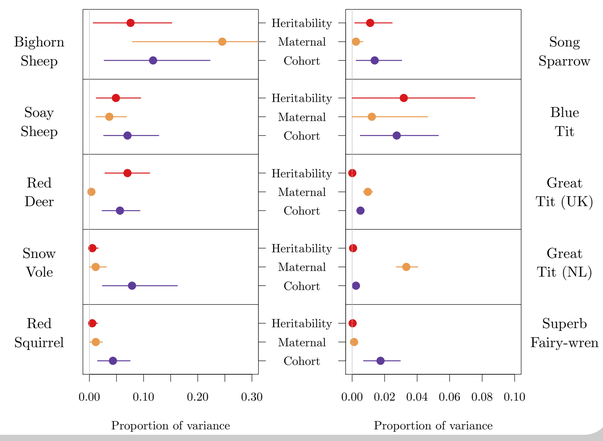
How to convert estimates to $V_A(\omega)$



Monte-Carlo integration of multivariate latent breeding values to the scale of fitness. Back-transformation matches theoretical expectation: with simulations $V_A(\omega)$ equals the increase in population growth rate.

Emperical results:





lities are small on the scale of the data... ...but that is irrelevant to the rate of evol

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Website

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* Fisher's theorem relies on stringent assumptions, or alternatively on quite a specific meaning of evolution: XXXXXXXXXXXXX XXX XXXXXXXXXXXXX. In the absence of competition and gene-by-environment interactions, $V_A(\omega)$ is also the increase in expected population growth rate. Such a clean net between evolution and demography probably never exist in nature, or not for long anyways.

R and LaTeX code

github.com/timotheenivalis/VAWisWOW