

# Death and Taxa

time-invariant differences in mammal species durations

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The Paleobiology Database  
revealing the history of life



## Question

Why do taxa go extinct at different rates?

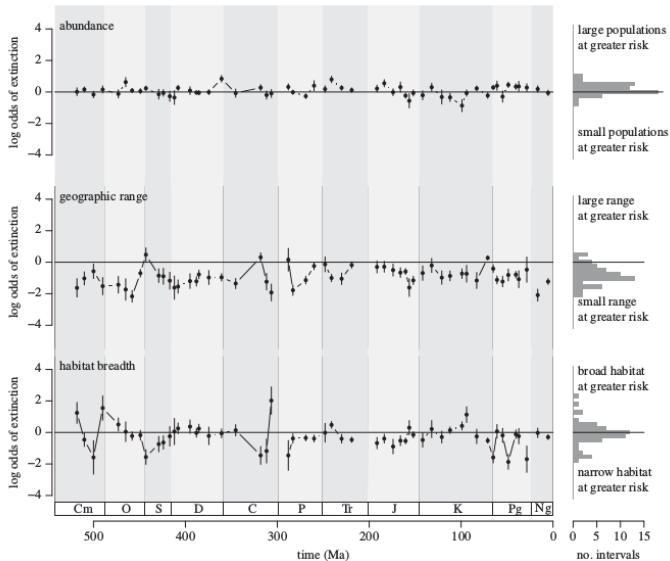
## Motivating questions

- ▶ How do mammal species traits affect extinction risk?
  - ▶ How do shared time of origination or evolutionary history relate to extinction risk?
- ▶ How do my findings compare to current risk factors?
- ▶ Is species extinction risk age-independent?

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# Relationship between range size and extinction risk



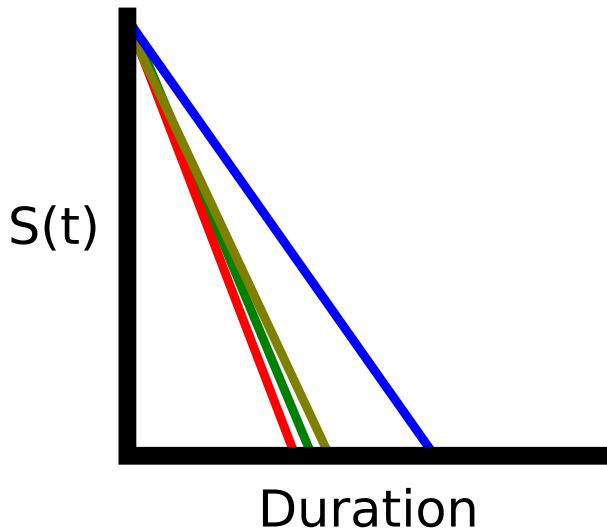
(Harnik and Simpson 2013 *Proc B*)

# Survival of the unspecialized

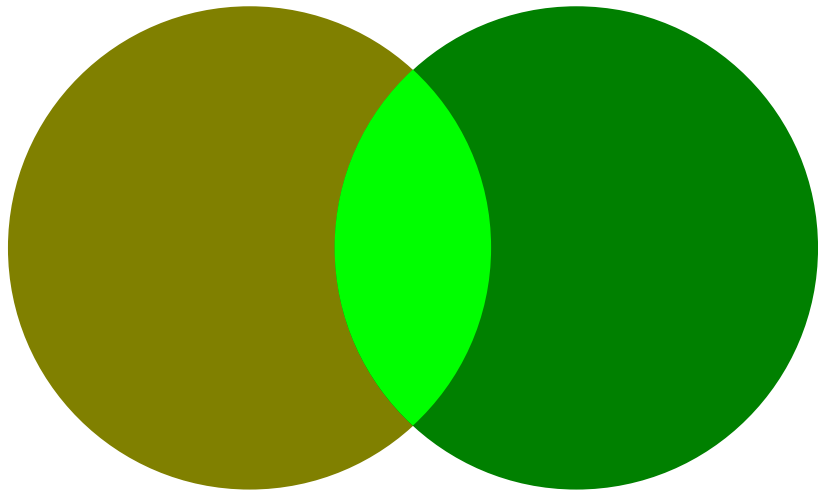
*When related phyla die out . . . more specialized phyla tend to become extinct before less specialized. This phenomenon is also far from universal, but it is so common that it does deserve recognition as a rule or principle in evolutionary studies: **the rule of the survival of the relatively unspecialized.***

*(Simpson, 1944, Tempo and Mode of Evolution, p. 143)*

# Hypotheses of effects of dietary category

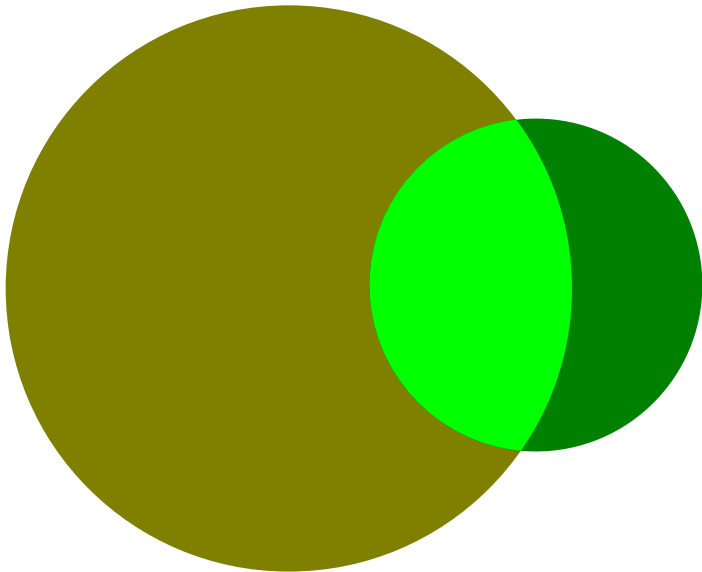


# Hypotheses of effects of locomotor category

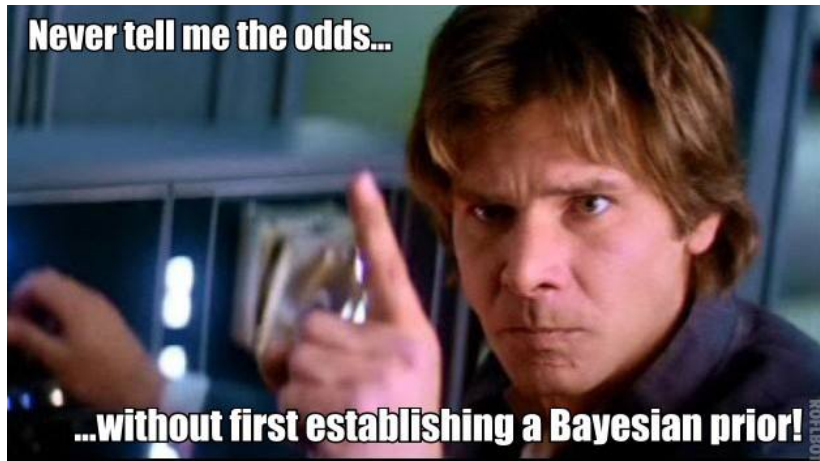




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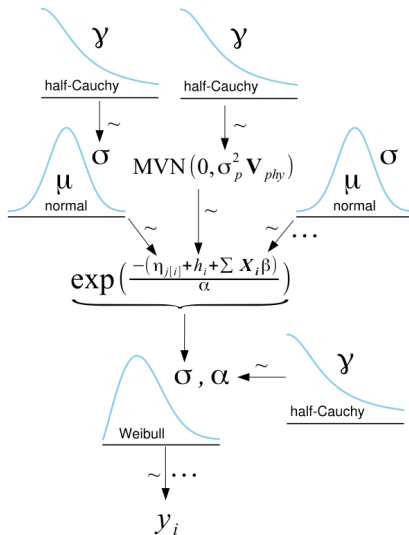


# Hierarchical Bayesian modeling approach

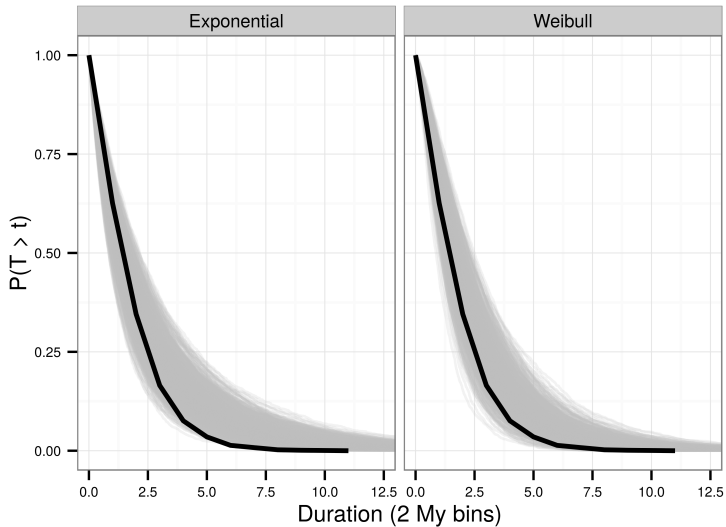


([www.countbayesie.com](http://www.countbayesie.com))

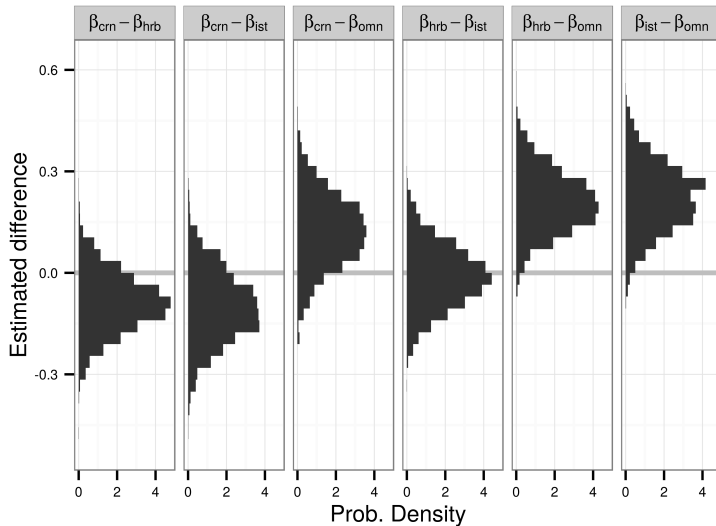
# Survival model diagram



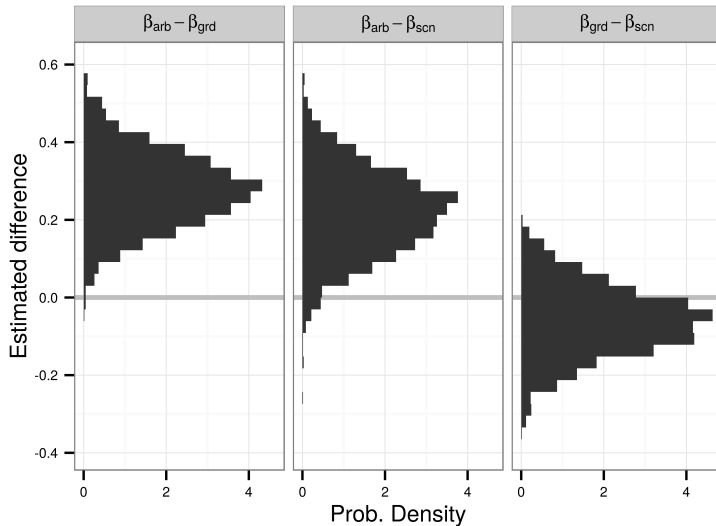
# Pattern of species survival under two models



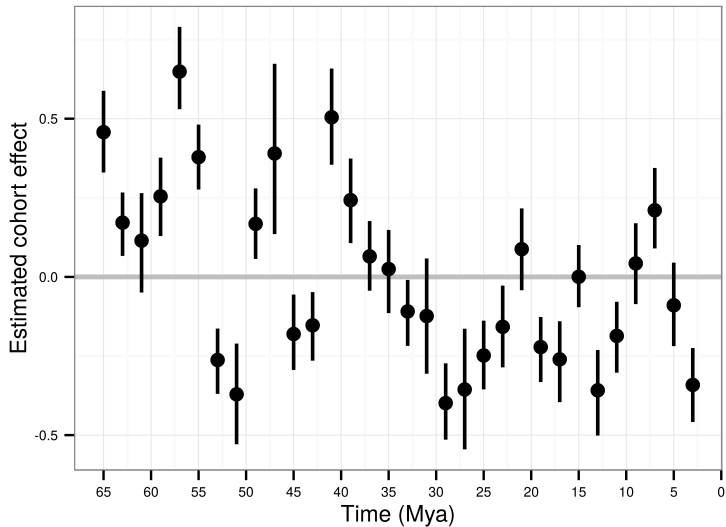
# Effect of dietary category on extinction risk



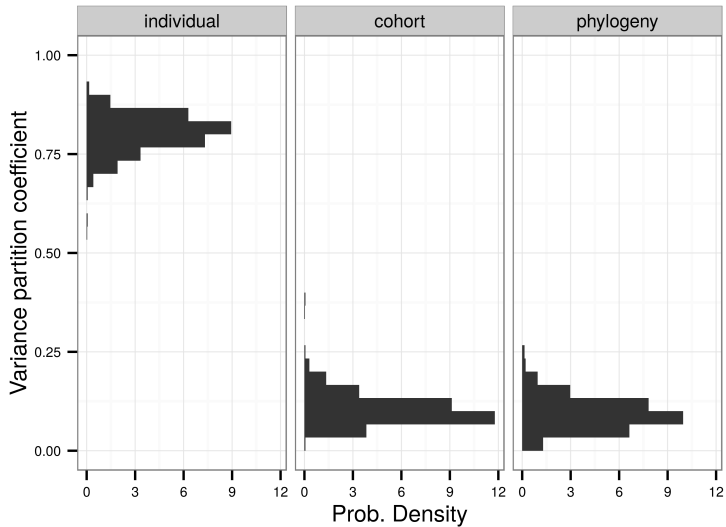
# Effect of locomotor category on extinction risk



# Difference in risk between origination cohorts



# Three sources of variance





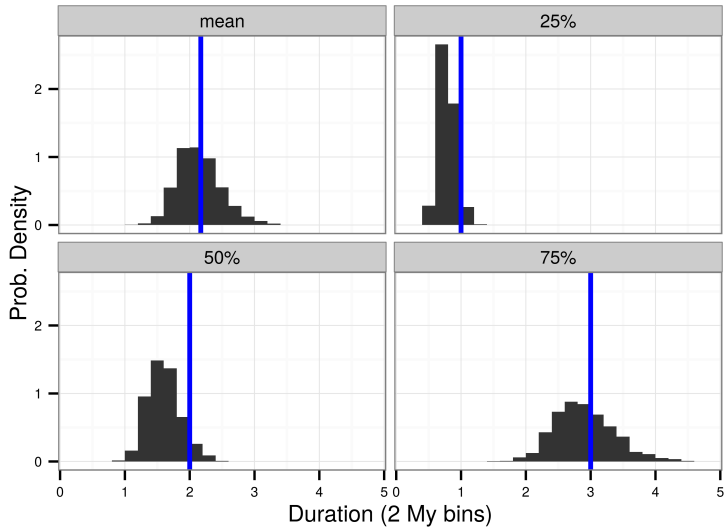
## Conclusions

- ▶ Survival of the unspecialized as time-invariant generalization.
- ▶ Decrease in extinction risk with time.
  - ▶ Both cohort/temporal and phylogenetic effect.
- ▶ Some incongruence with risk factors in the Recent.
  - ▶ e.g. effect of body size, trophic category, phylogenetic clustering.

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# Further posterior predictive checks



# Concerns regarding estimation of $\alpha$

