

Gambling with Australian brachiopods

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Gambler's Ruin

Definition

Given infinite time, all gambler's go bust.

Death of a taxon

Taxa as gamblers

All taxa, given infinite time, go extinct.

Question

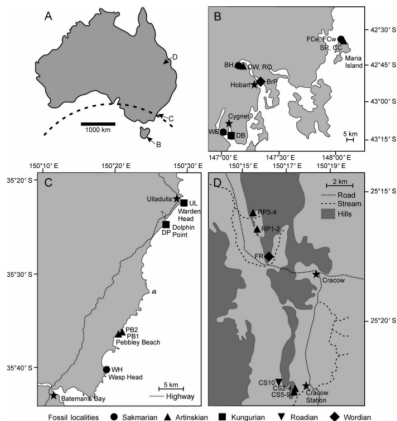
Why do taxa go extinct at **different rates**?

Enter brachiopods



(Immersion Imagery, Shutterstock; Wikimedia)

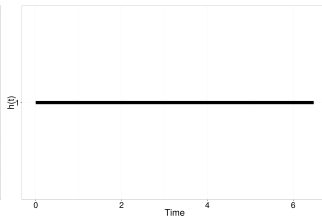
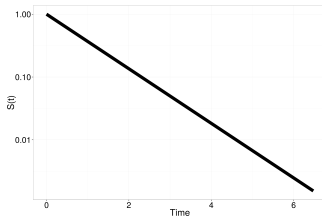
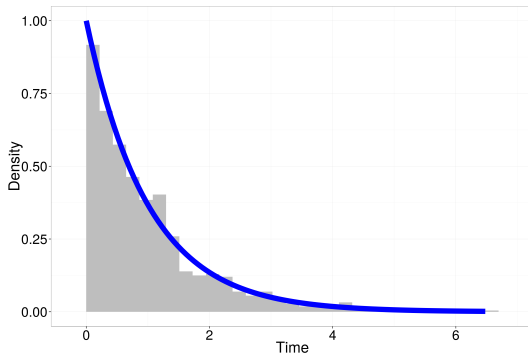
System details



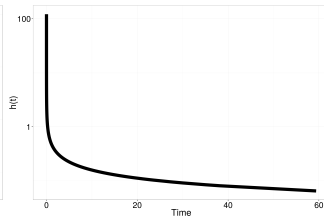
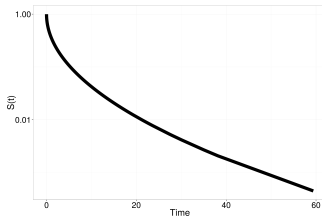
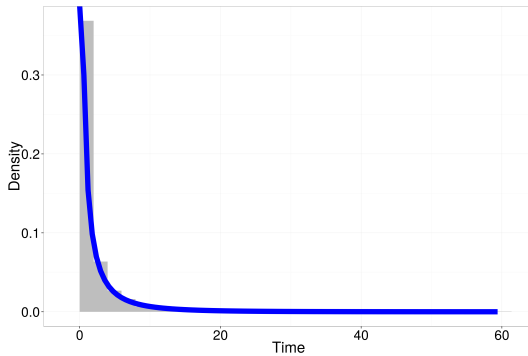
(Clapham and James 2008 *Palaeos*)

- ▶ Australian Permian
 - ▶ range in/out taxa right censored
- ▶ predictors
 - ▶ substrate probability (fully Bayesian approach)
 - ▶ onshore/offshore
 - ▶ body size (Payne *et al.* 2014 *Proc. B*)
 - ▶ occupancy (see Vilhena *et al.* 2014 *Nature Com.*)

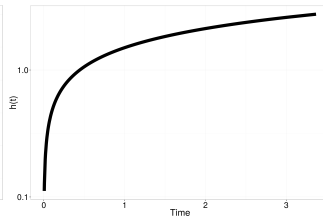
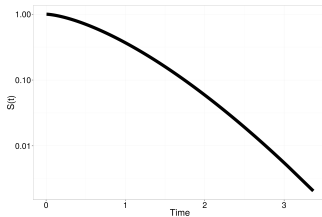
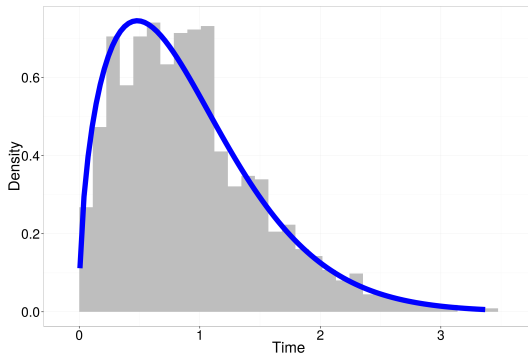
Survival analysis



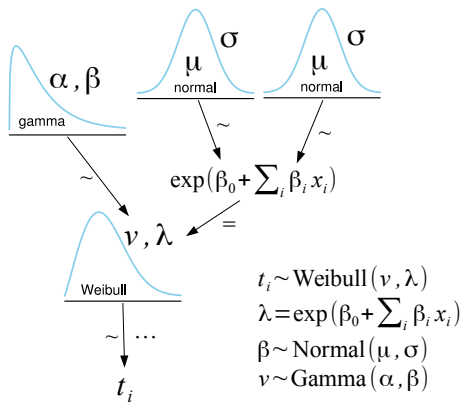
Survival analysis



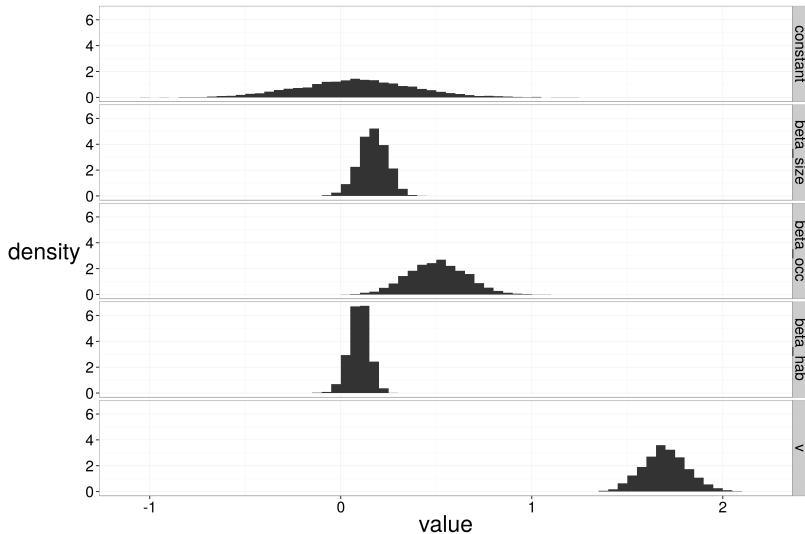
Survival analysis



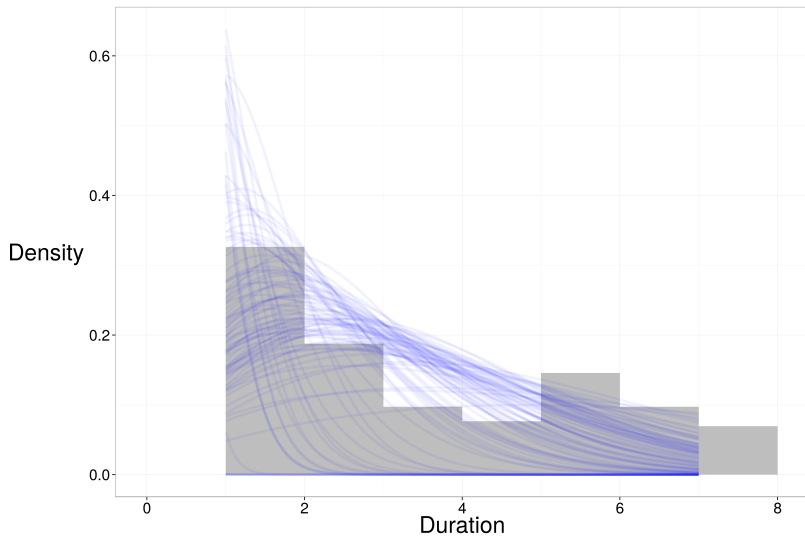
Bayesian model structure



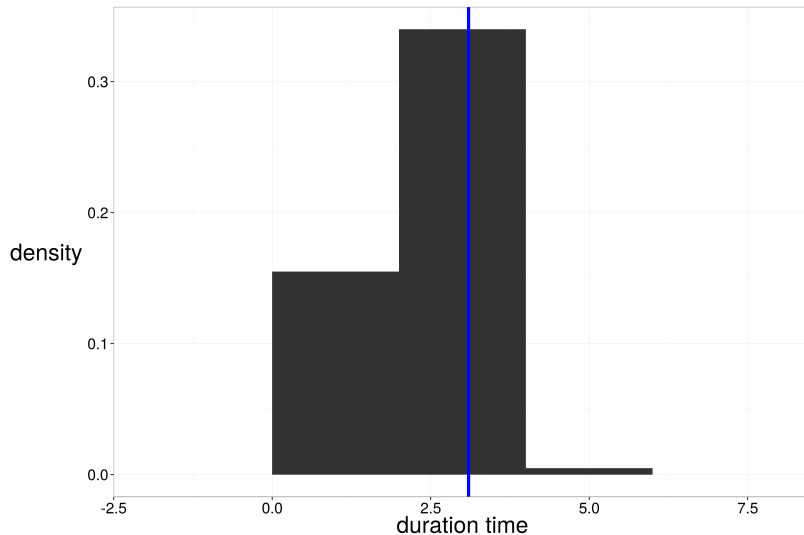
Parameter marginal posteriors



Durations



Posterior predictive check: mean duration



State of knowledge

Preliminary conclusions

Very little evidence for age-independent extinction.

Occupancy has largest effect.

Modeling improvements

Major roadblock

HEAVY TAILS

- ▶ sampling distribution choice
- ▶ robust/different priors
- ▶ non-linear/heterogeneous variance
- ▶ sampling

- ▶ New Zealand record (FRED)
- ▶ improved paleoenvironment reconstructions
- ▶ affixing strategy information

Remember...

Analysis is a narrative

- ▶ fit model
- ▶ evaluate model
- ▶ improve model/include more information

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