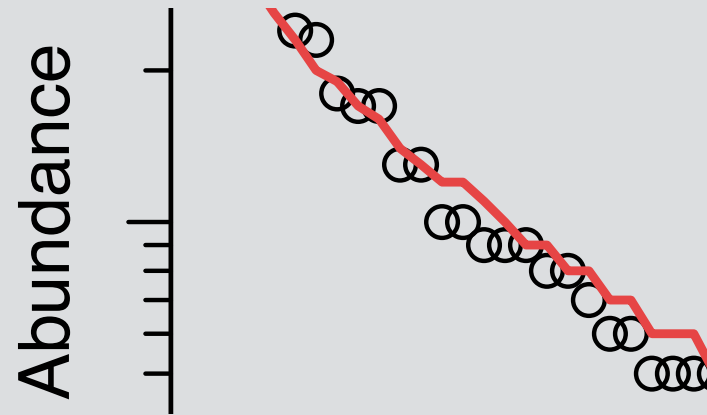


Felling SAD?

$$\int_{\theta} p(n \mid \theta) f(\theta) d\theta$$

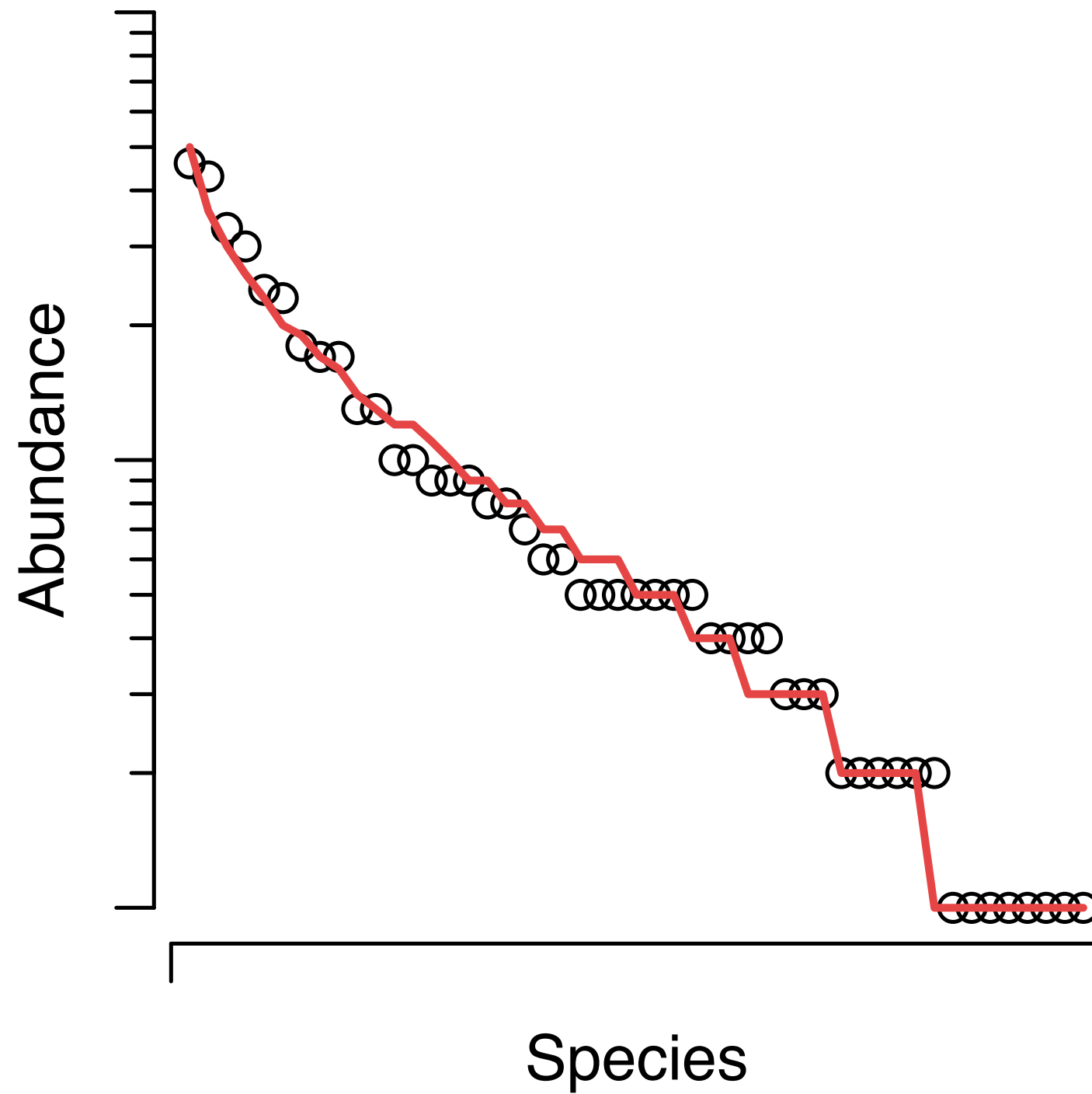


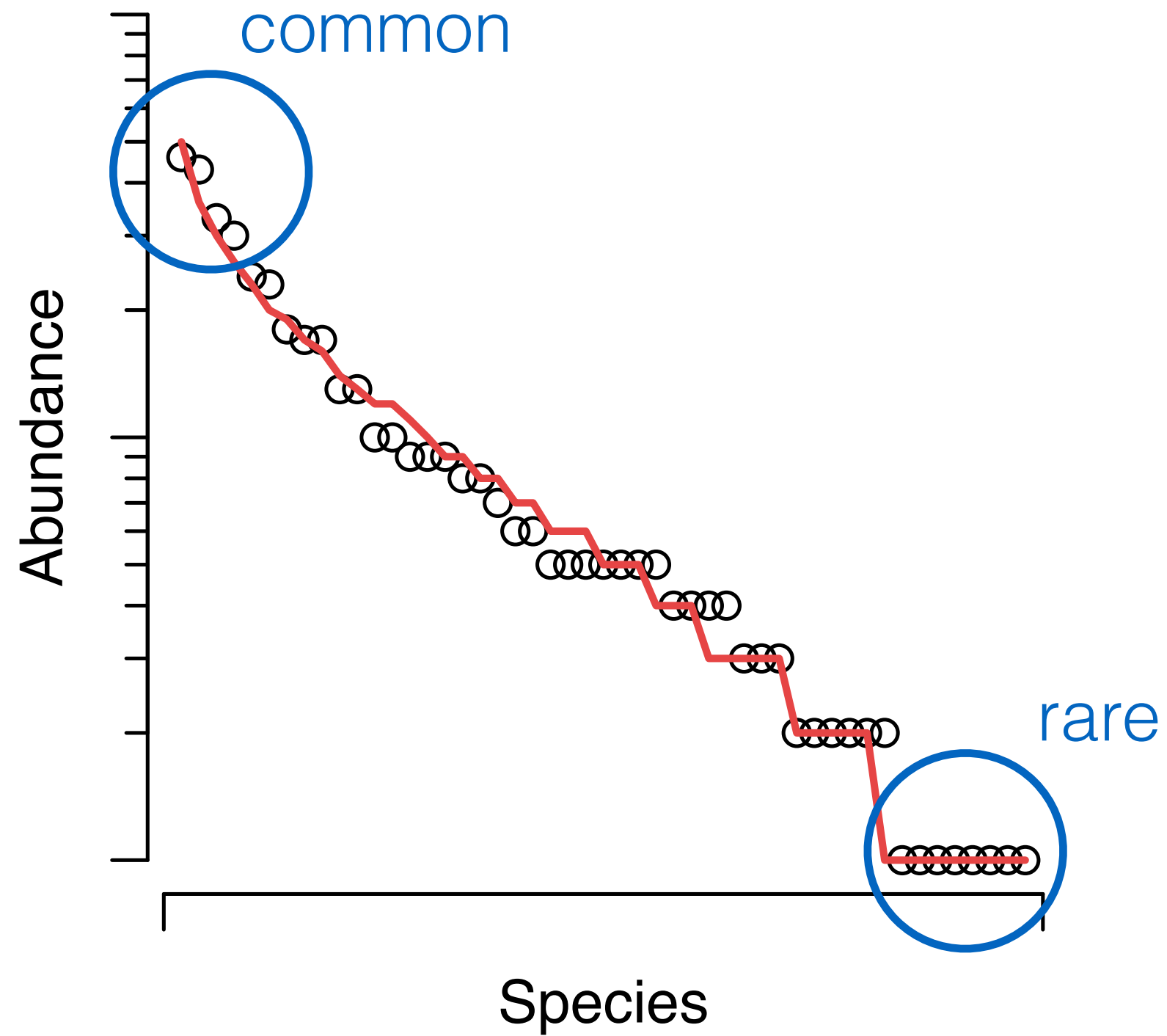
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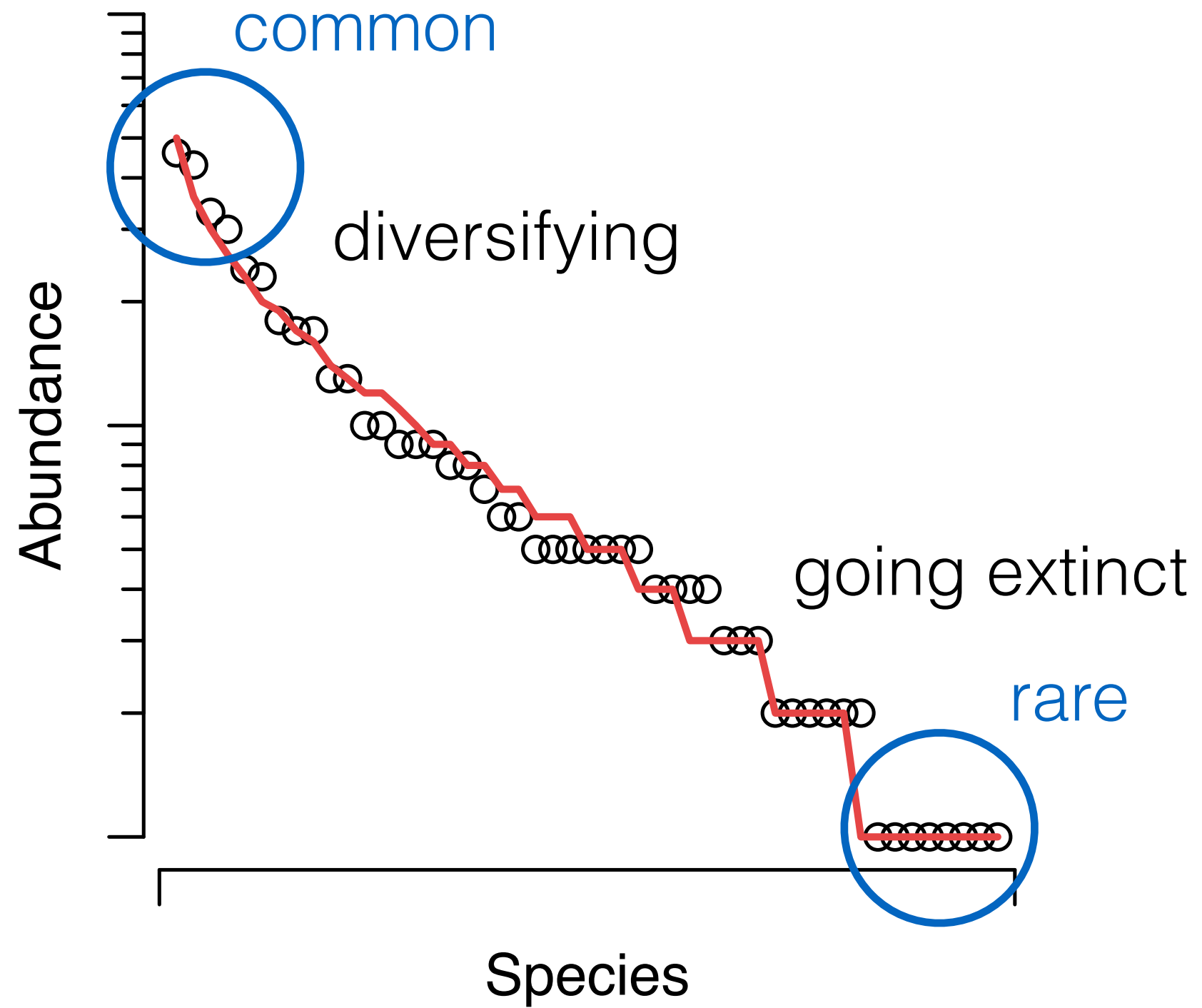
Andy Rominger

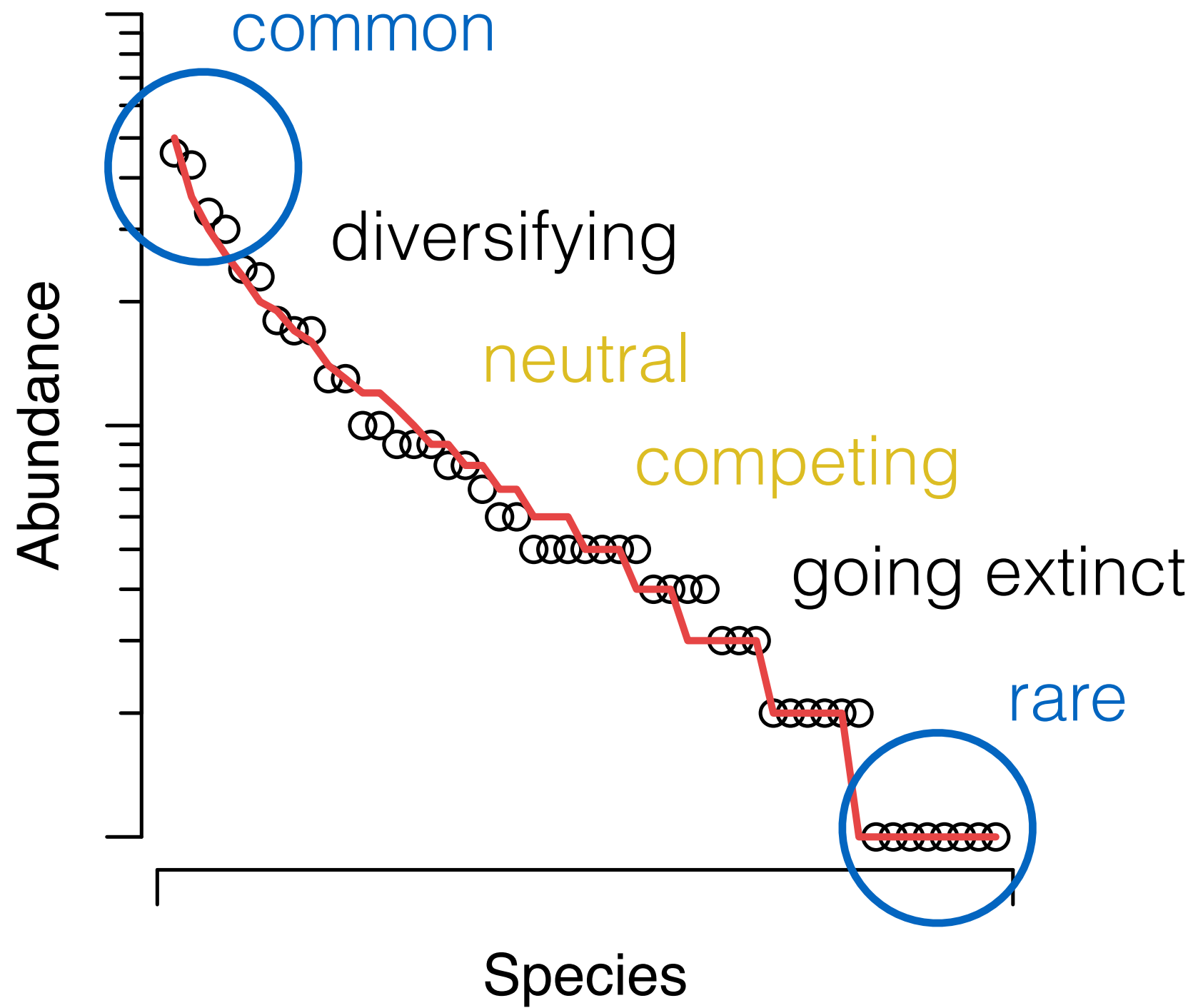
nature.berkeley.edu/~rominger

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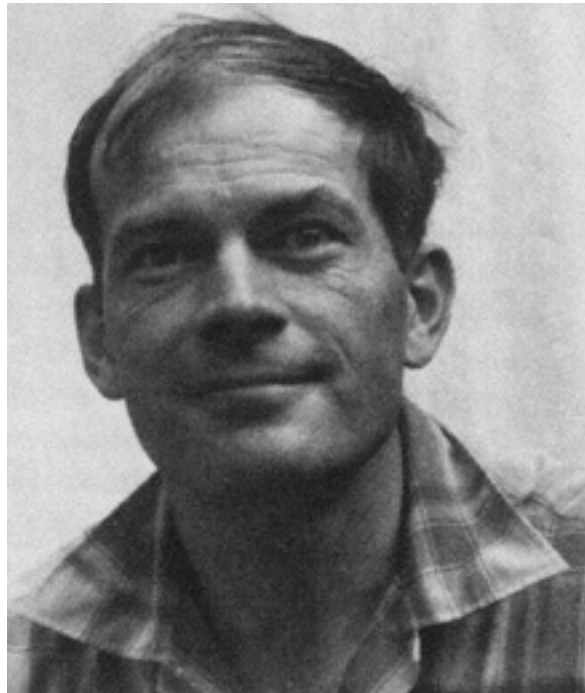


log-series



R. A. Fisher

broken stick



R. H. MacArthur

neutral



S. P. Hubbell

lognormal

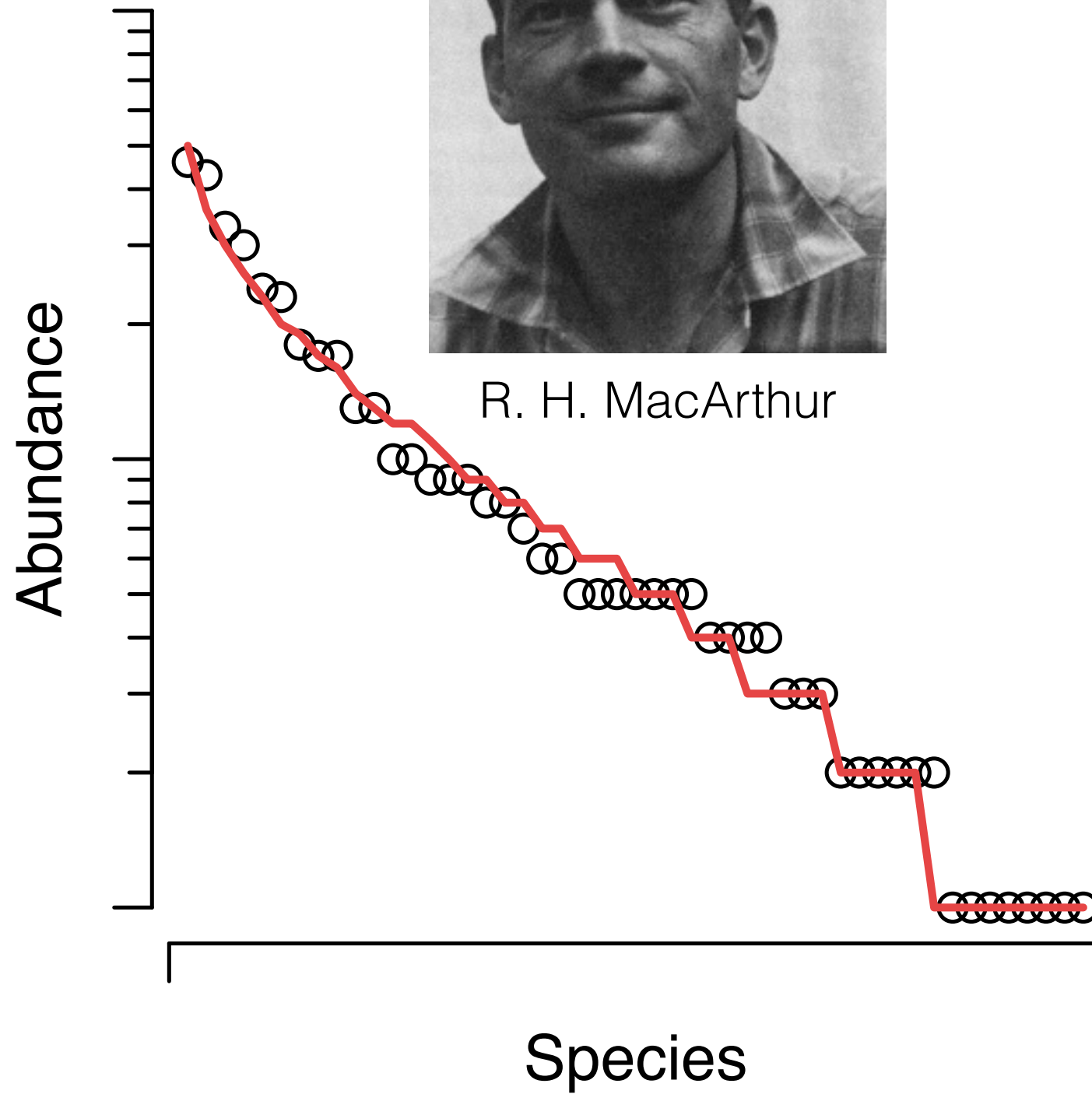


F. W. Preston

max ent



J. Harte



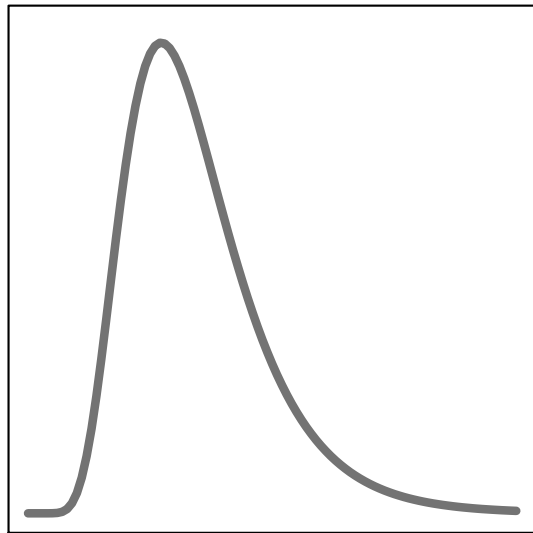
Latent distribution

Poisson sampling

Limits

log-normal

Probability density

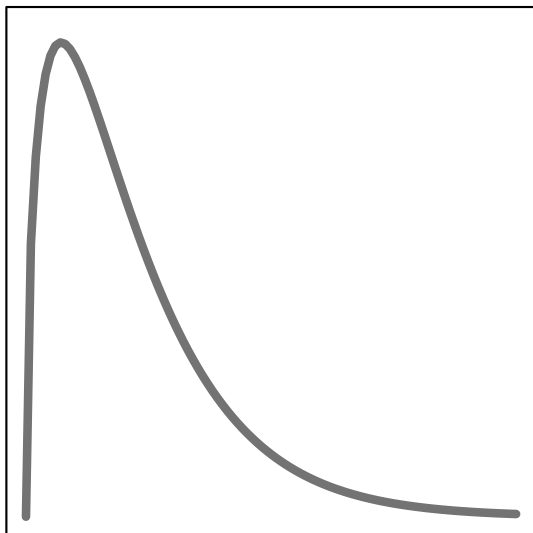


Latent abundance

Poisson
log-normal

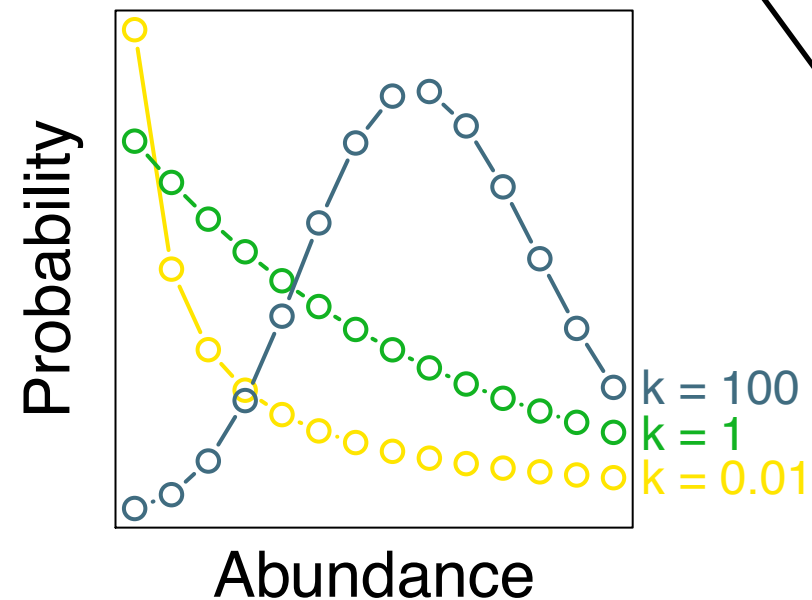
gamma

Probability density



Latent abundance

negative binomial



Poisson
 $k \rightarrow \infty$

geometric
(broken stick)
 $k = 1$

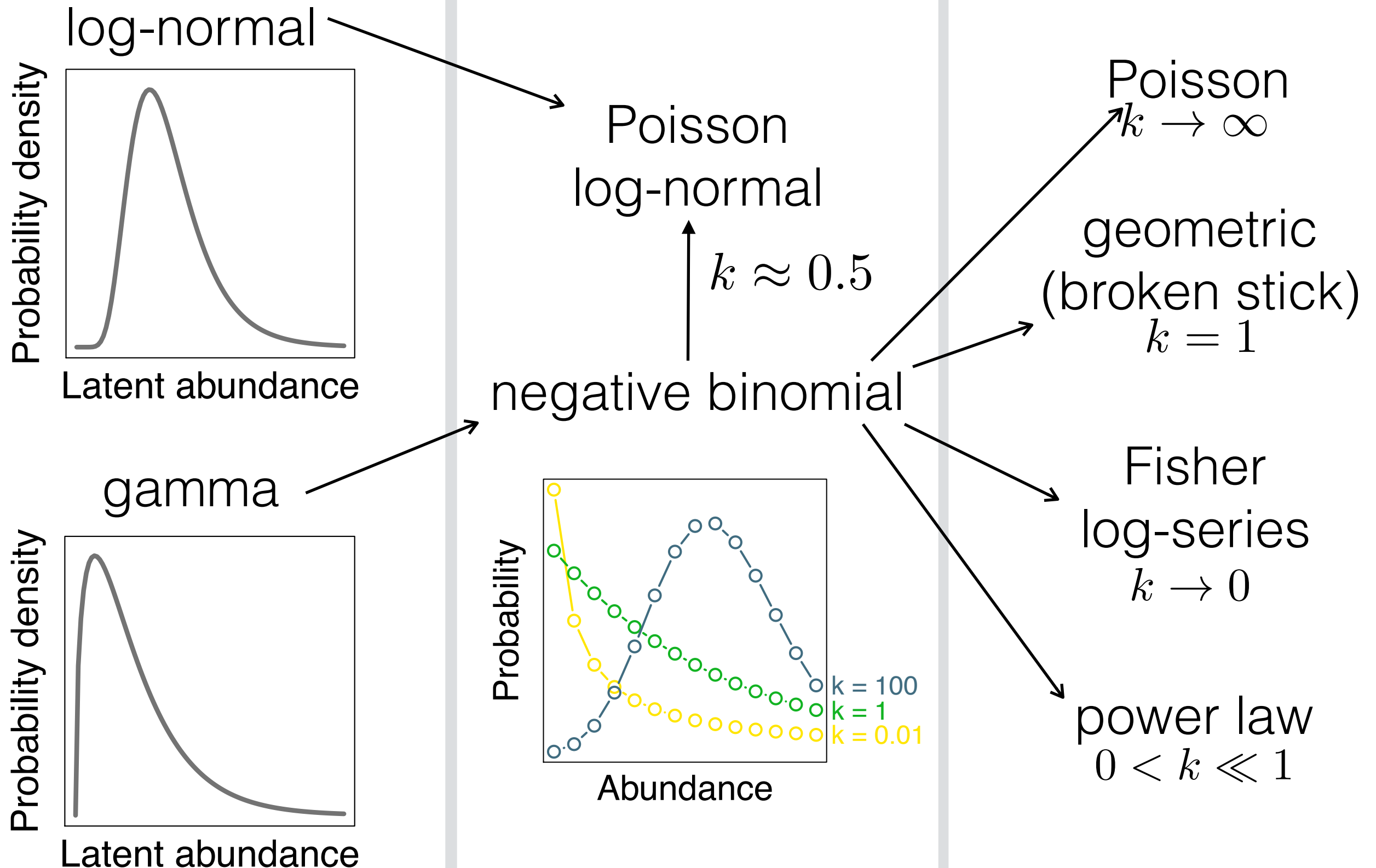
Fisher
log-series
 $k \rightarrow 0$

power law
 $0 < k \ll 1$

Latent distribution

Poisson sampling

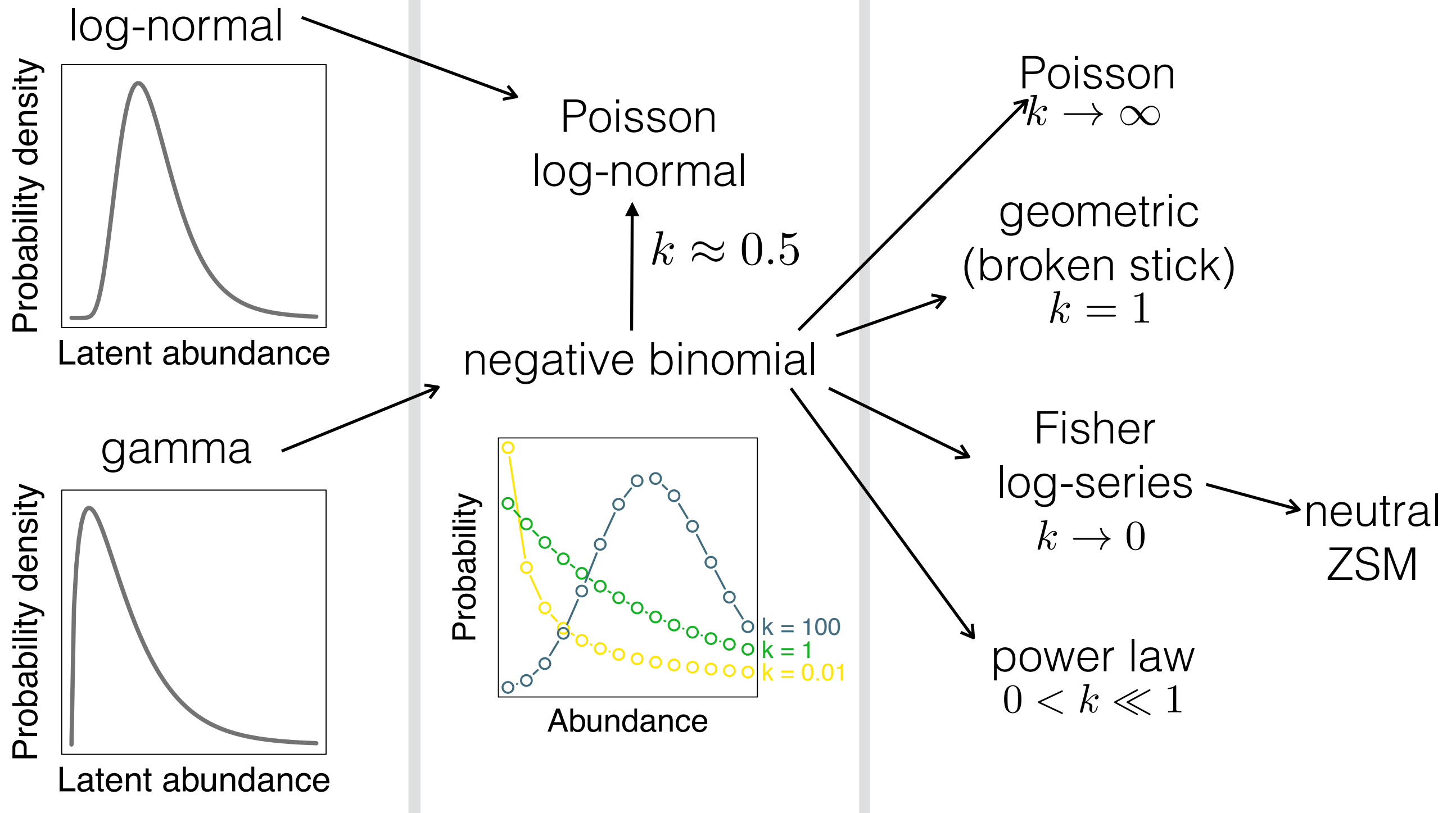
Limits



Latent distribution

Poisson sampling

Limits



More sampling theories: Green & Plotkin (2007) *Ecol. Lett.*; Conlisk *et al.* (2010) *Oikos*

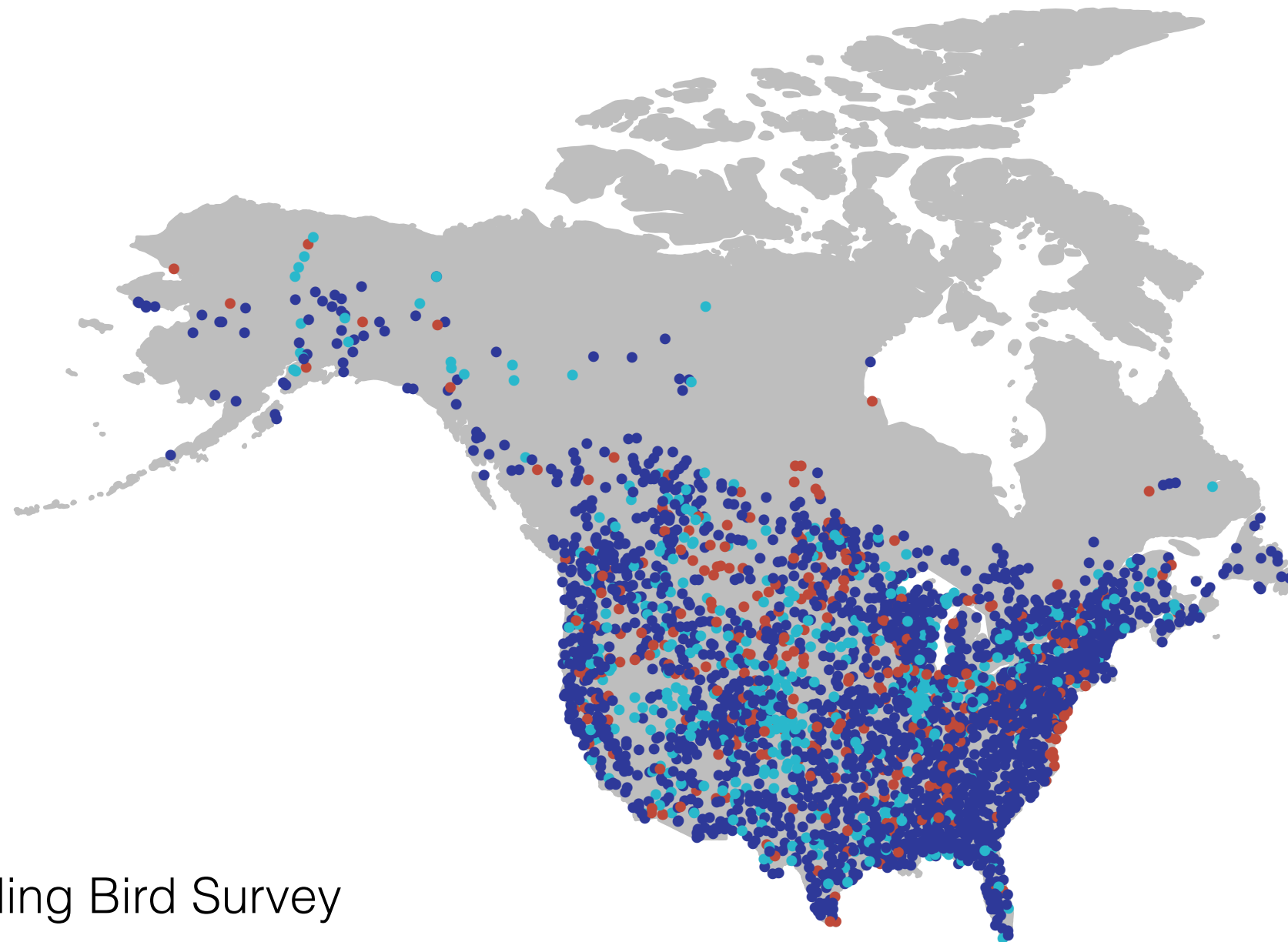
Pois log-
lognorm series

neg binom

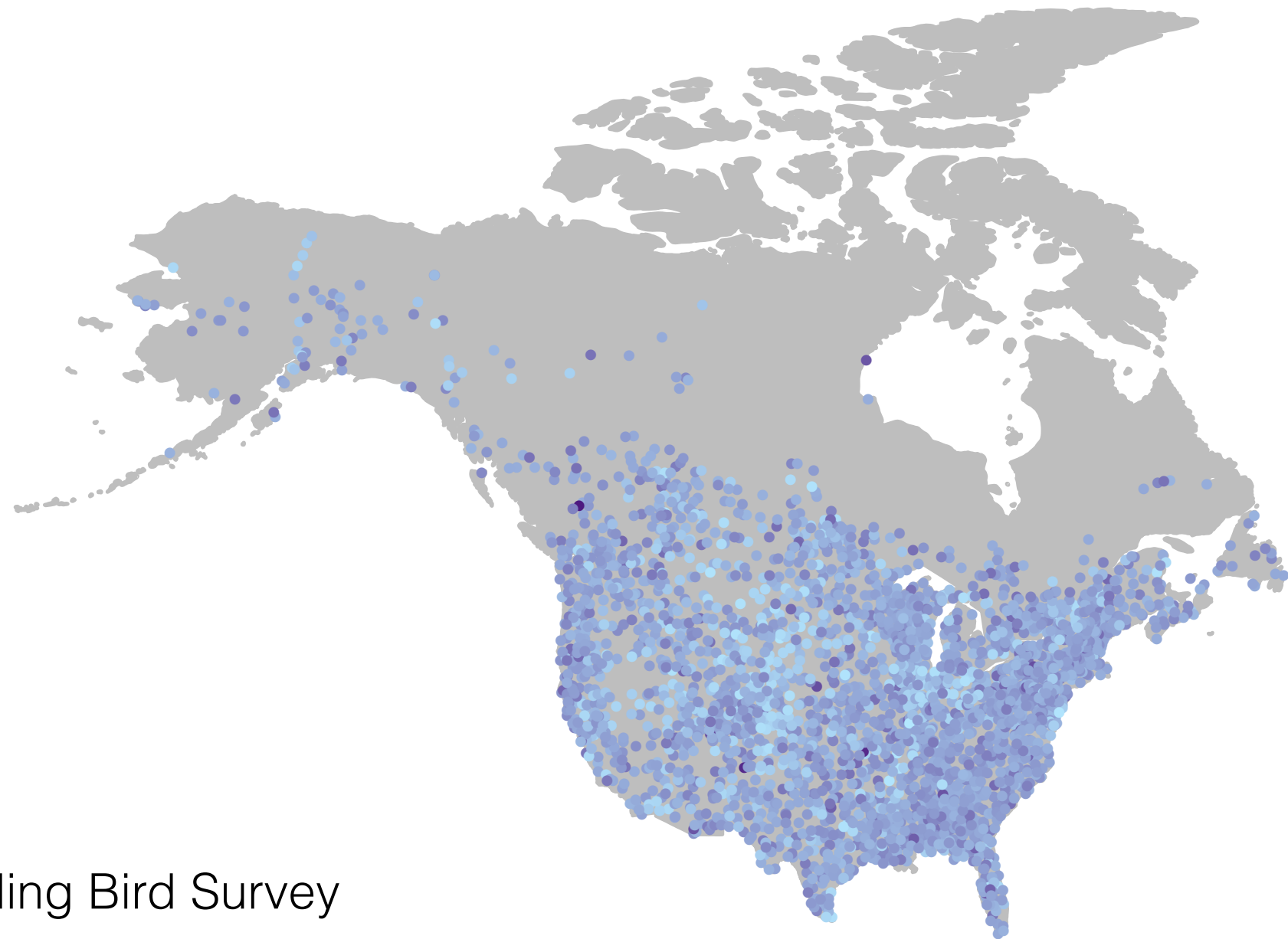
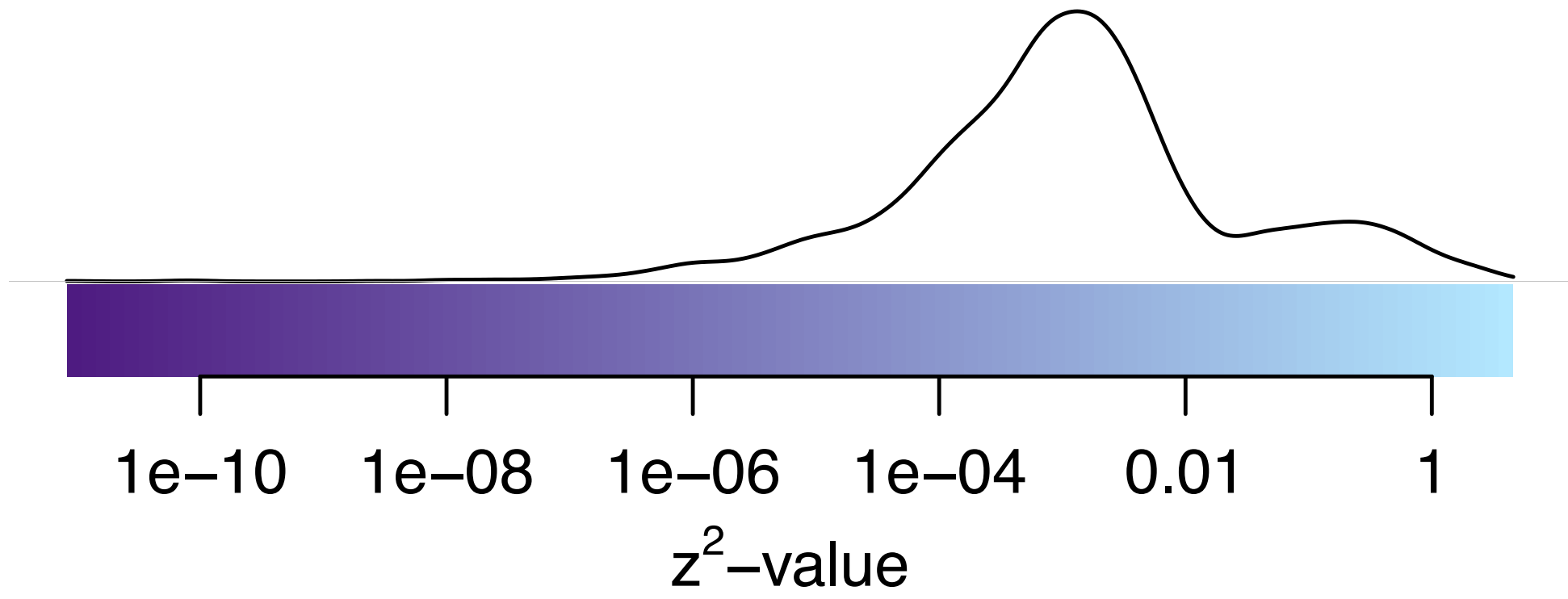
343

439

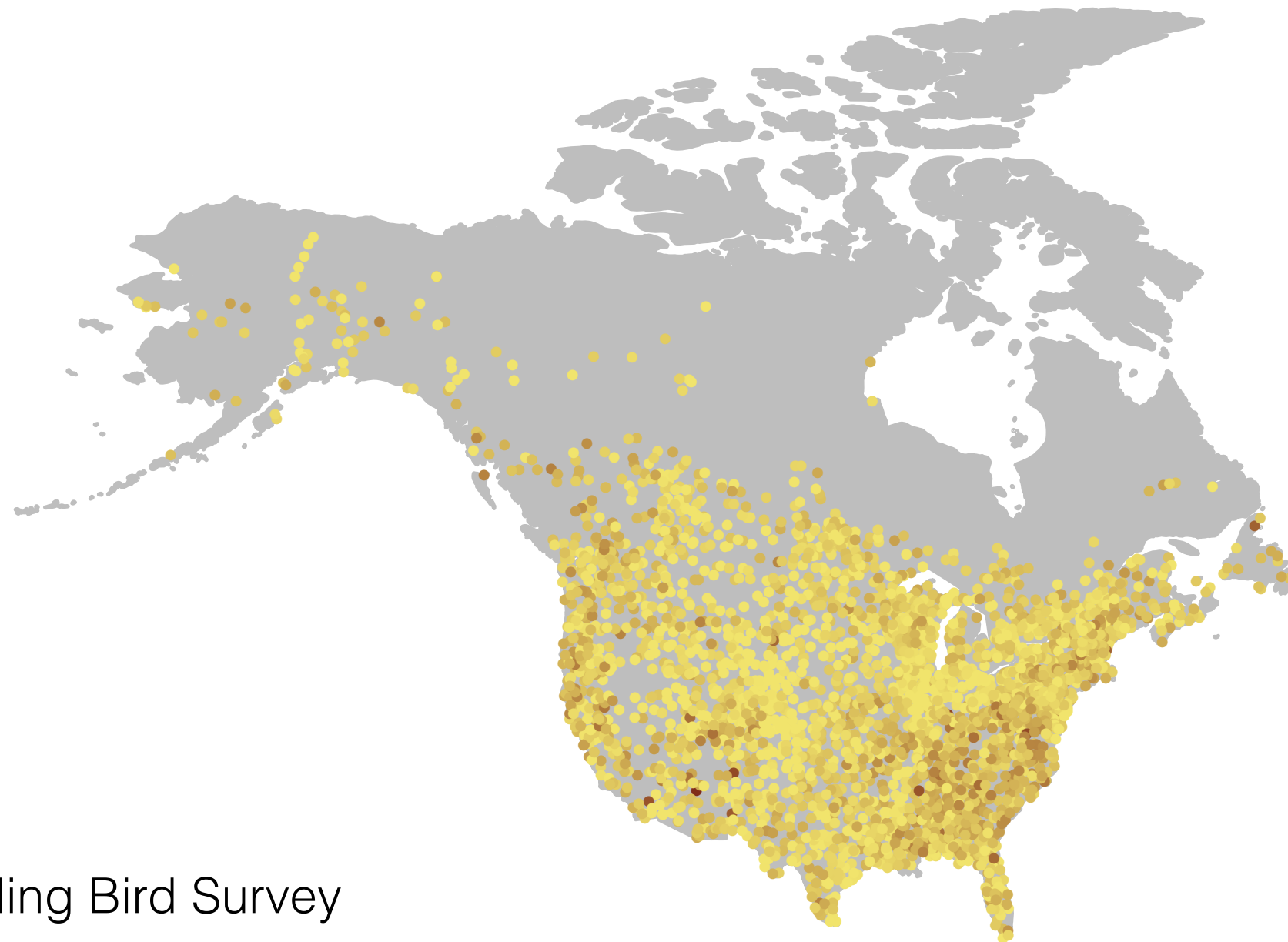
2176



data from Breeding Bird Survey

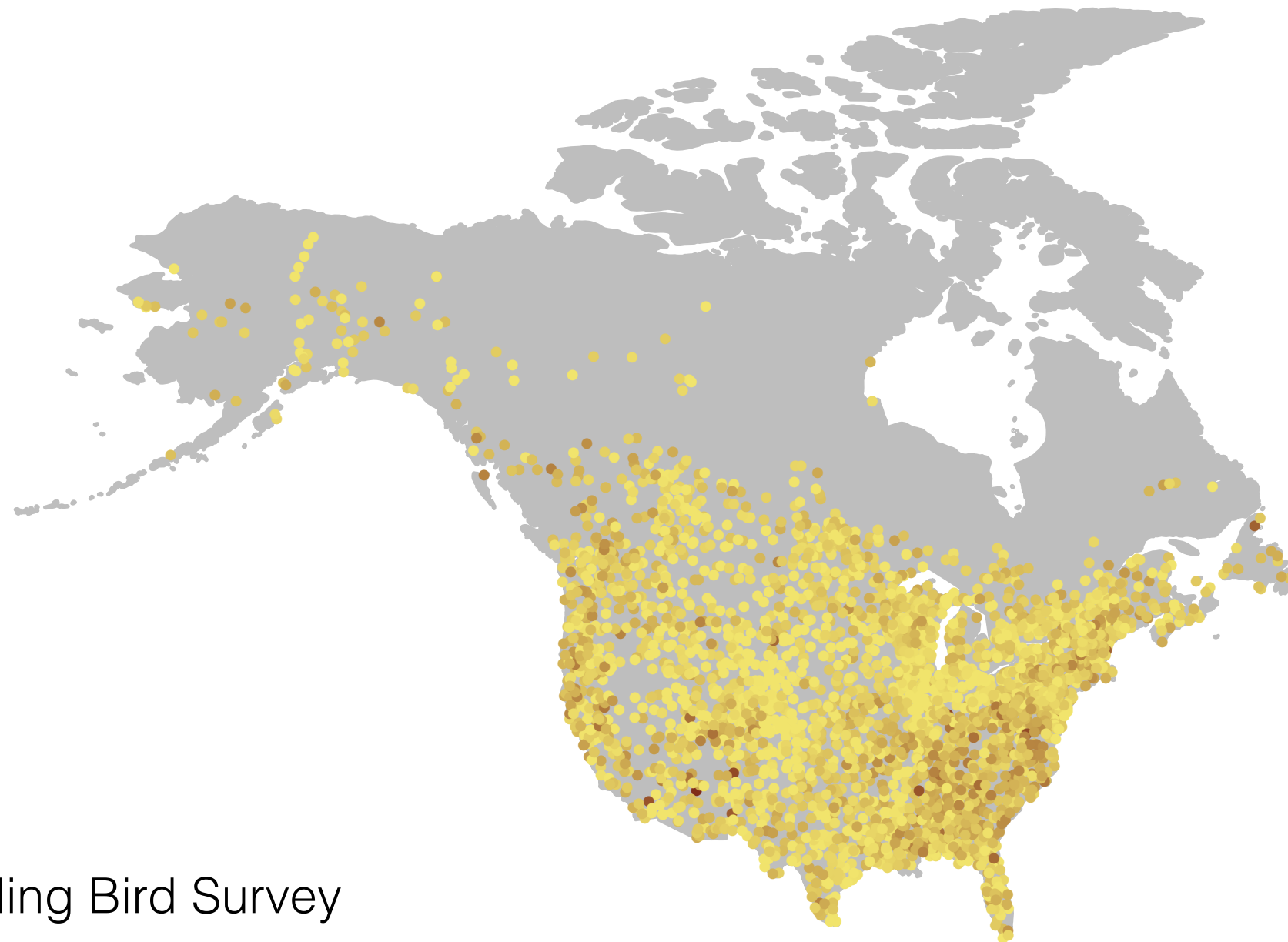


data from Breeding Bird Survey



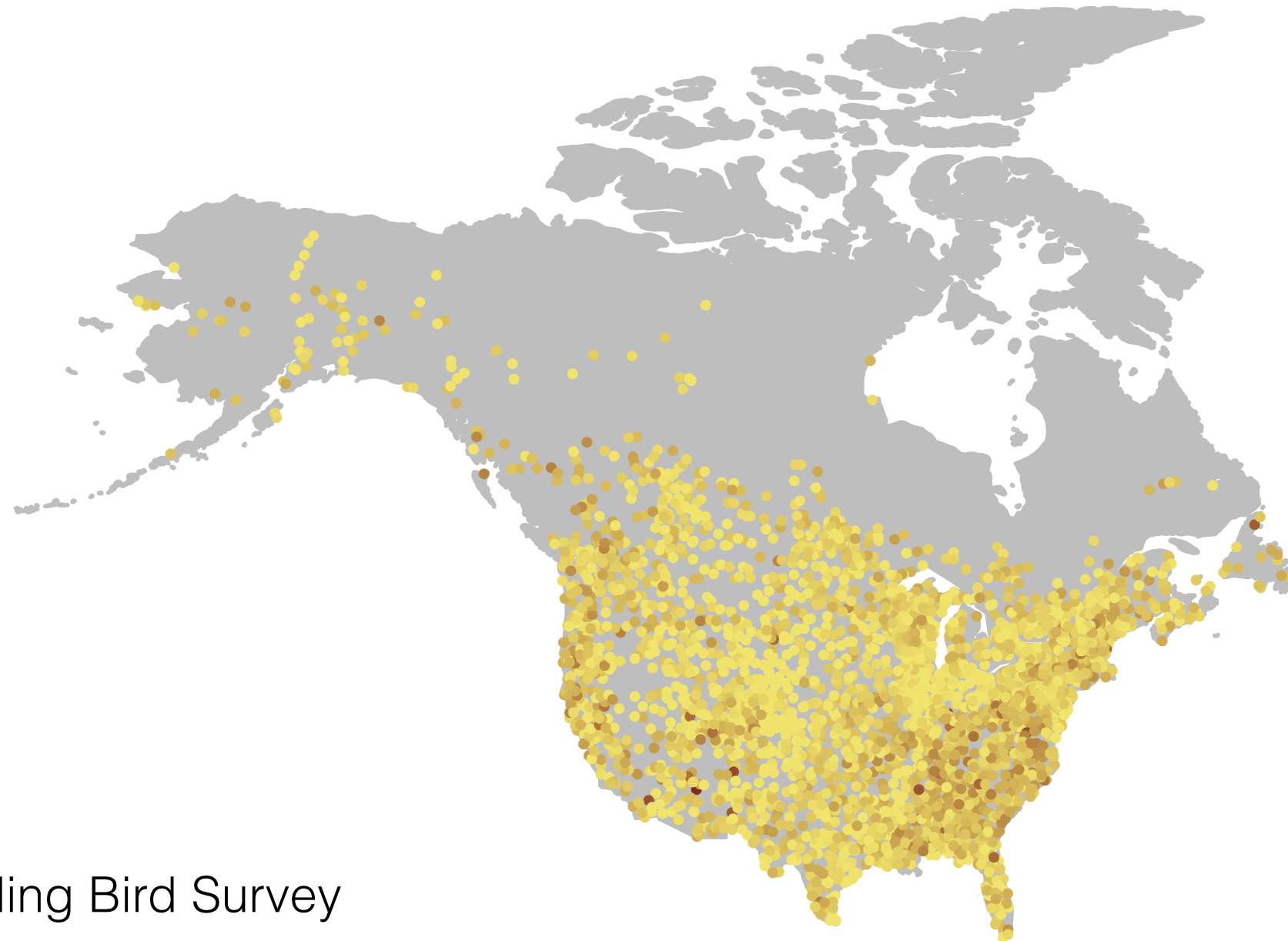
data from Breeding Bird Survey

Predicted by: environment? landuse? evolutionary history?



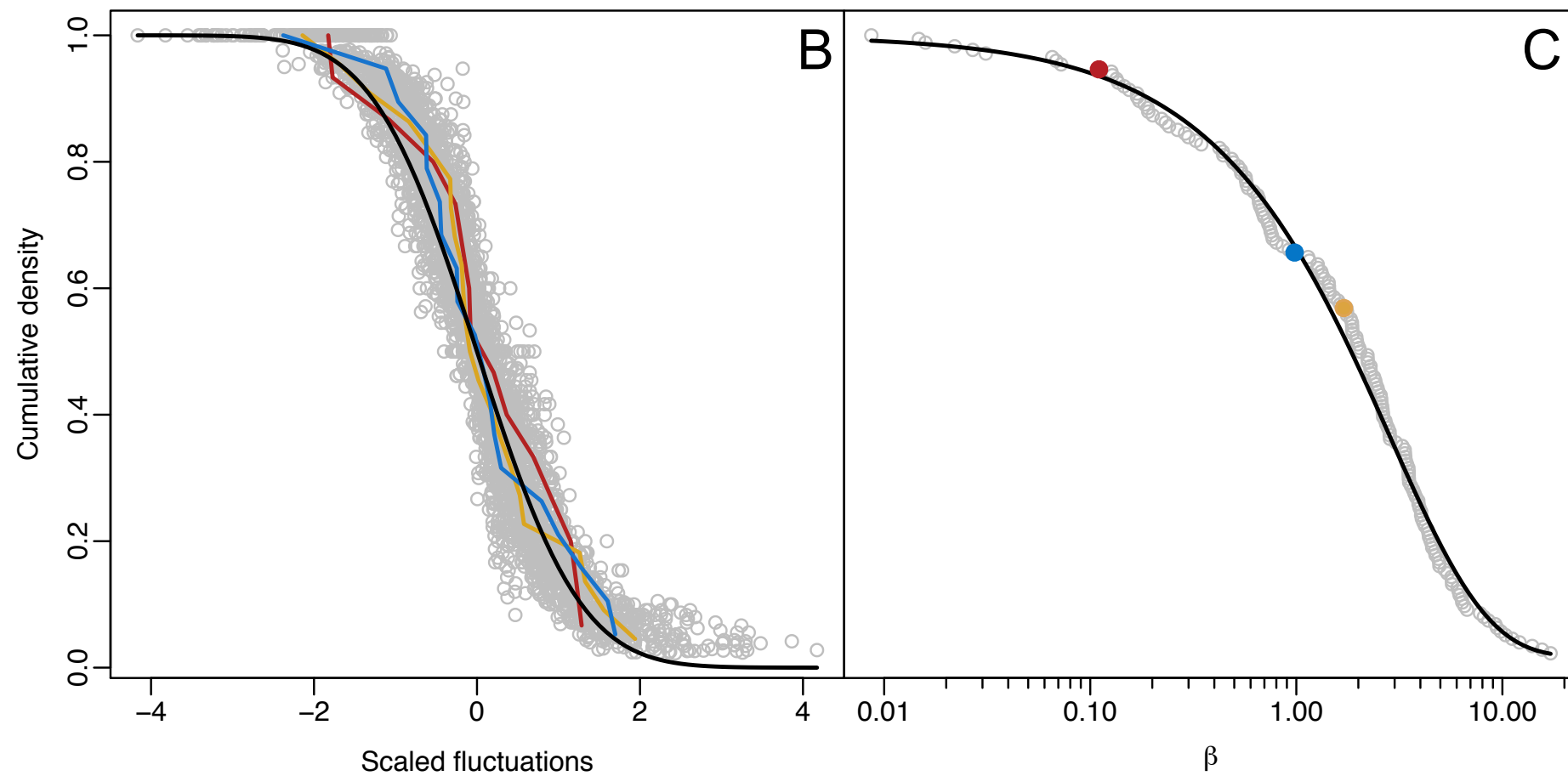
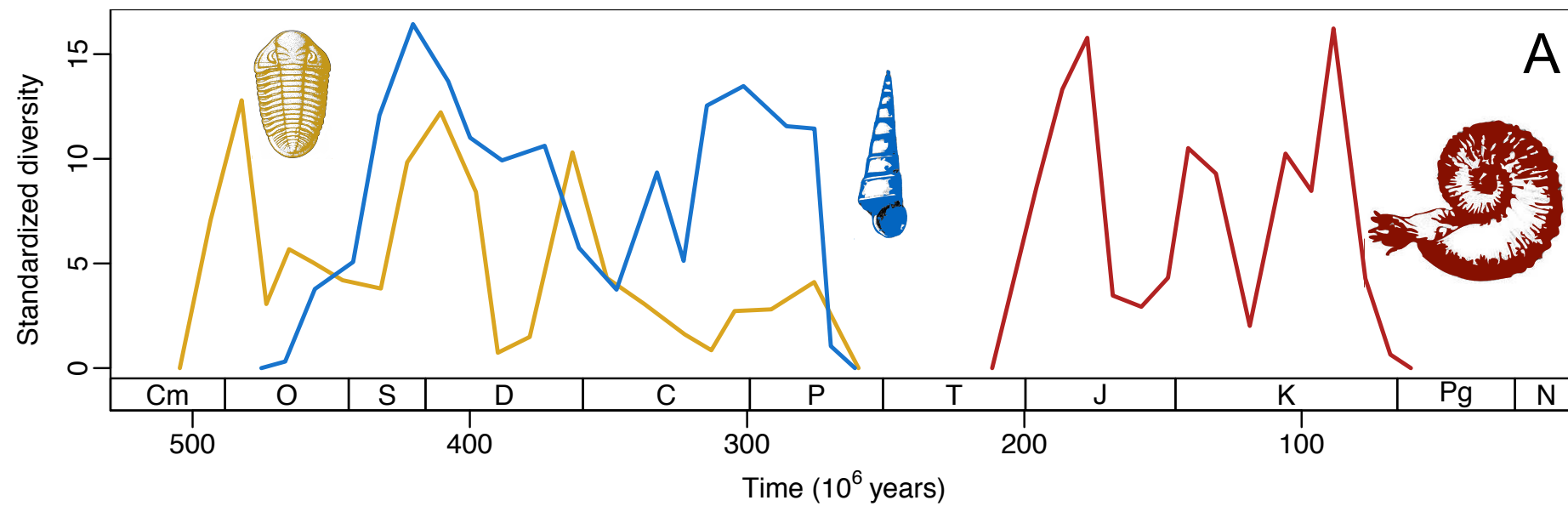
data from Breeding Bird Survey

Predicted by: environment? landuse? evolutionary history?
Why Gamma?



data from Breeding Bird Survey

Why Gamma?



Why Gamma?

Ideal biodiversity law:

$$S_0 \propto E_0 \log N_0$$

Why Gamma?

Ideal biodiversity law:

$$S_0 \propto E_0 \log N_0$$

Maximizing information entropy:

$$\begin{aligned} E[x] &= c_1 \\ E[\log(x)] &= c_2 \end{aligned}$$

Why Gamma?

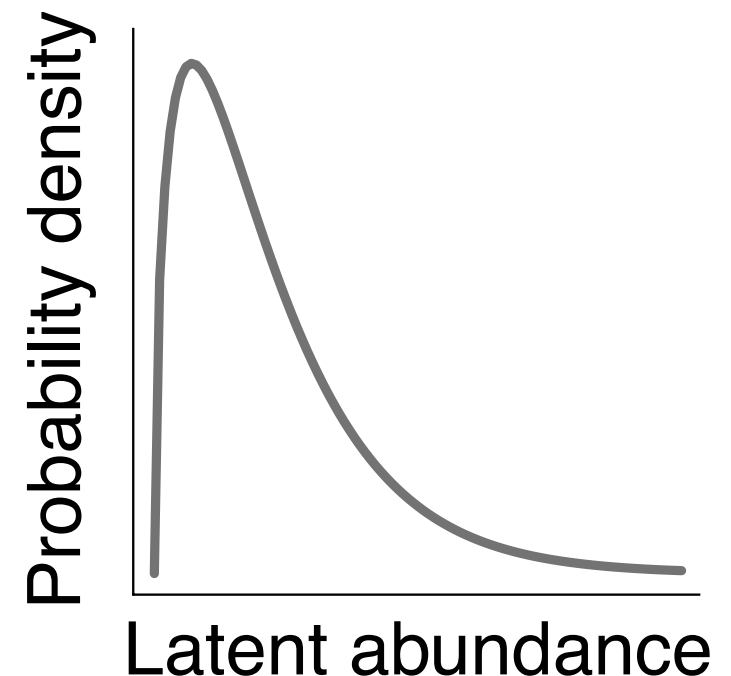
Ideal biodiversity law:

$$S_0 \propto E_0 \log N_0$$

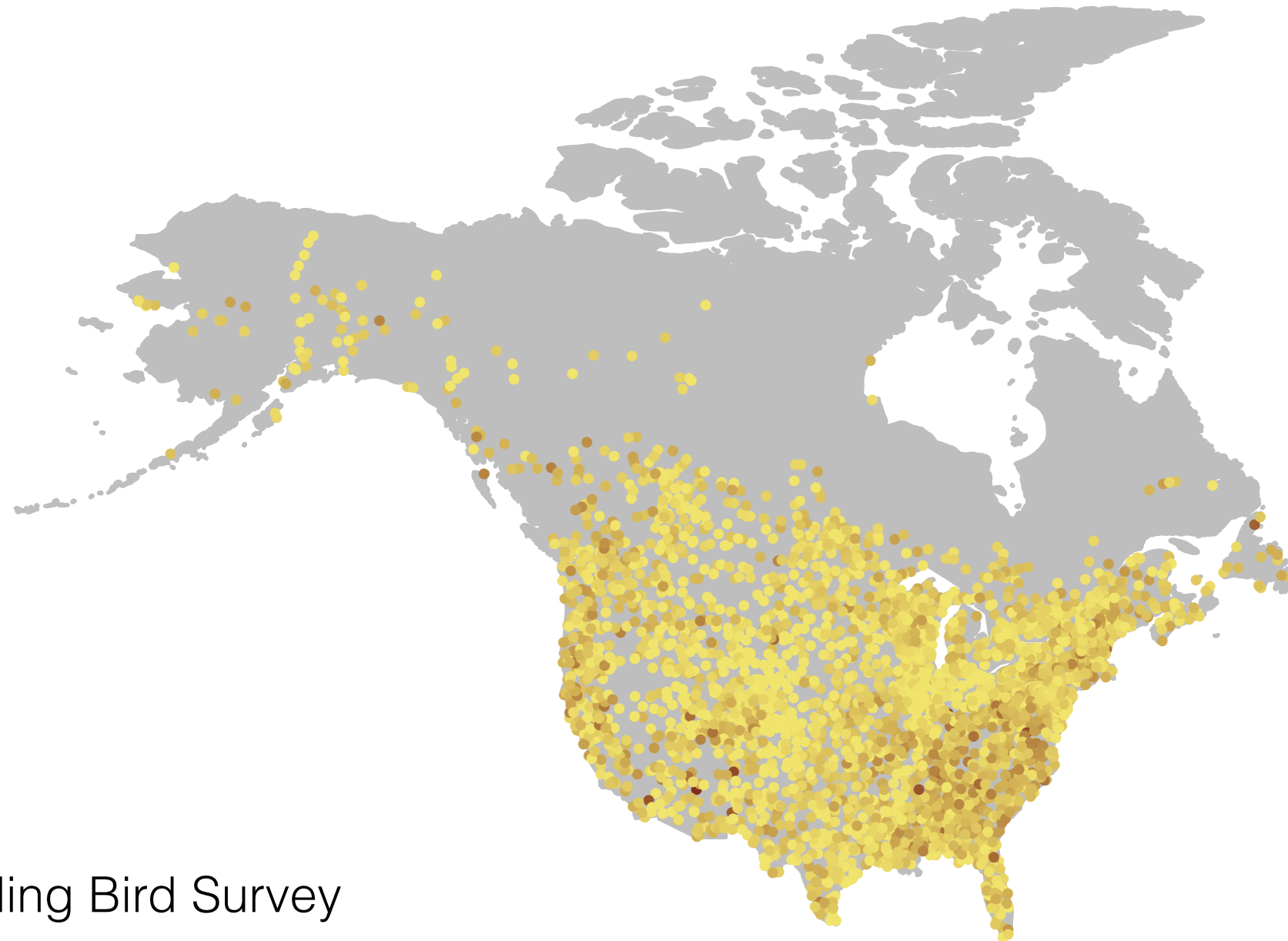
Maximizing information entropy:

$$\begin{aligned} E[x] &= c_1 \\ E[\log(x)] &= c_2 \end{aligned}$$

$$\Gamma(k(c_1, c_2), \theta(c_1, c_2))$$

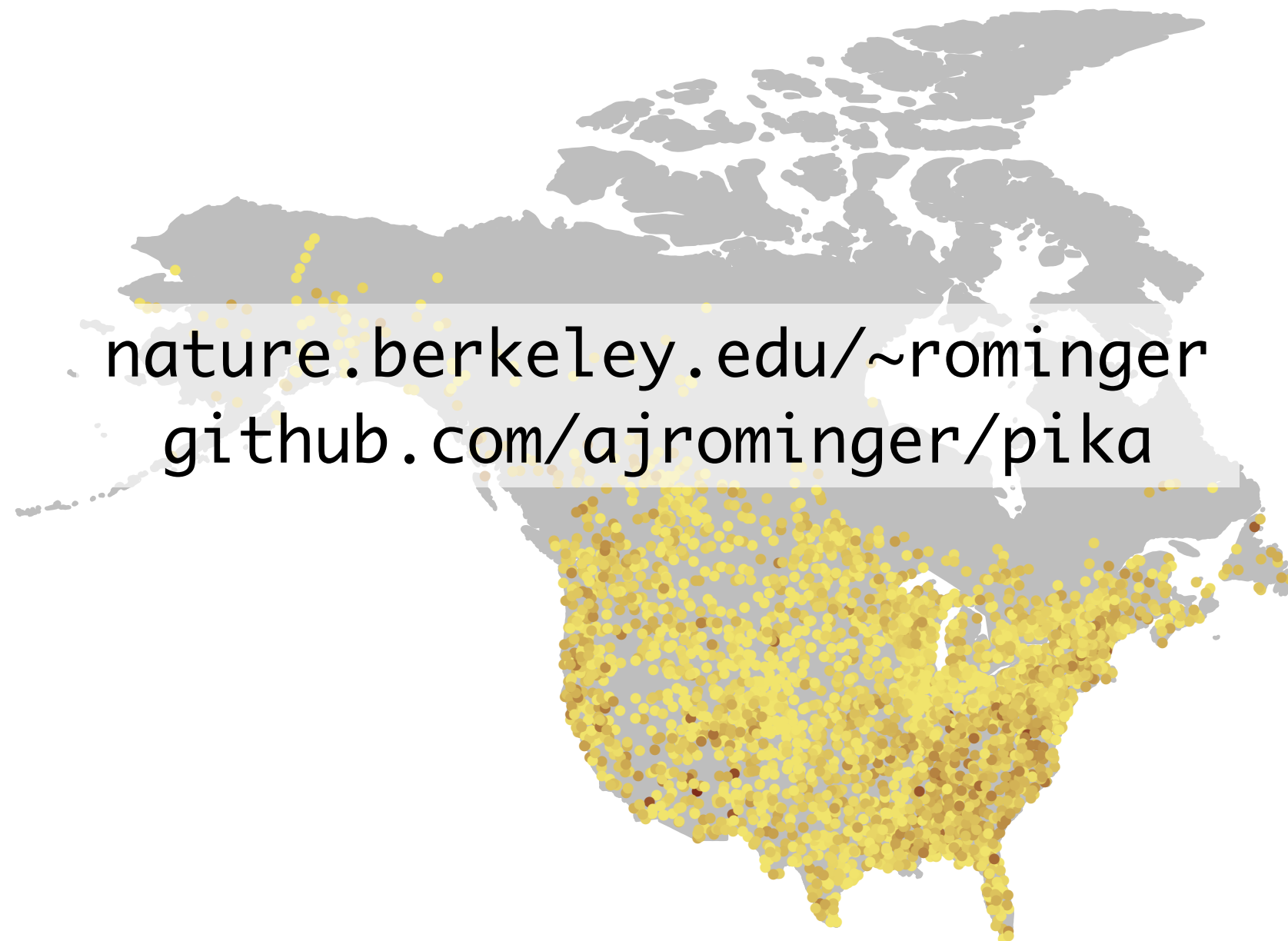


Metrics to forecast into the future



data from Breeding Bird Survey

Thanks! Questions?



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