

# Empirical distributions

IMAX Tropical Rainforest, ,  
[http://www.youtube.com/watch?v=YUuA-C\\_I3DE](http://www.youtube.com/watch?v=YUuA-C_I3DE)

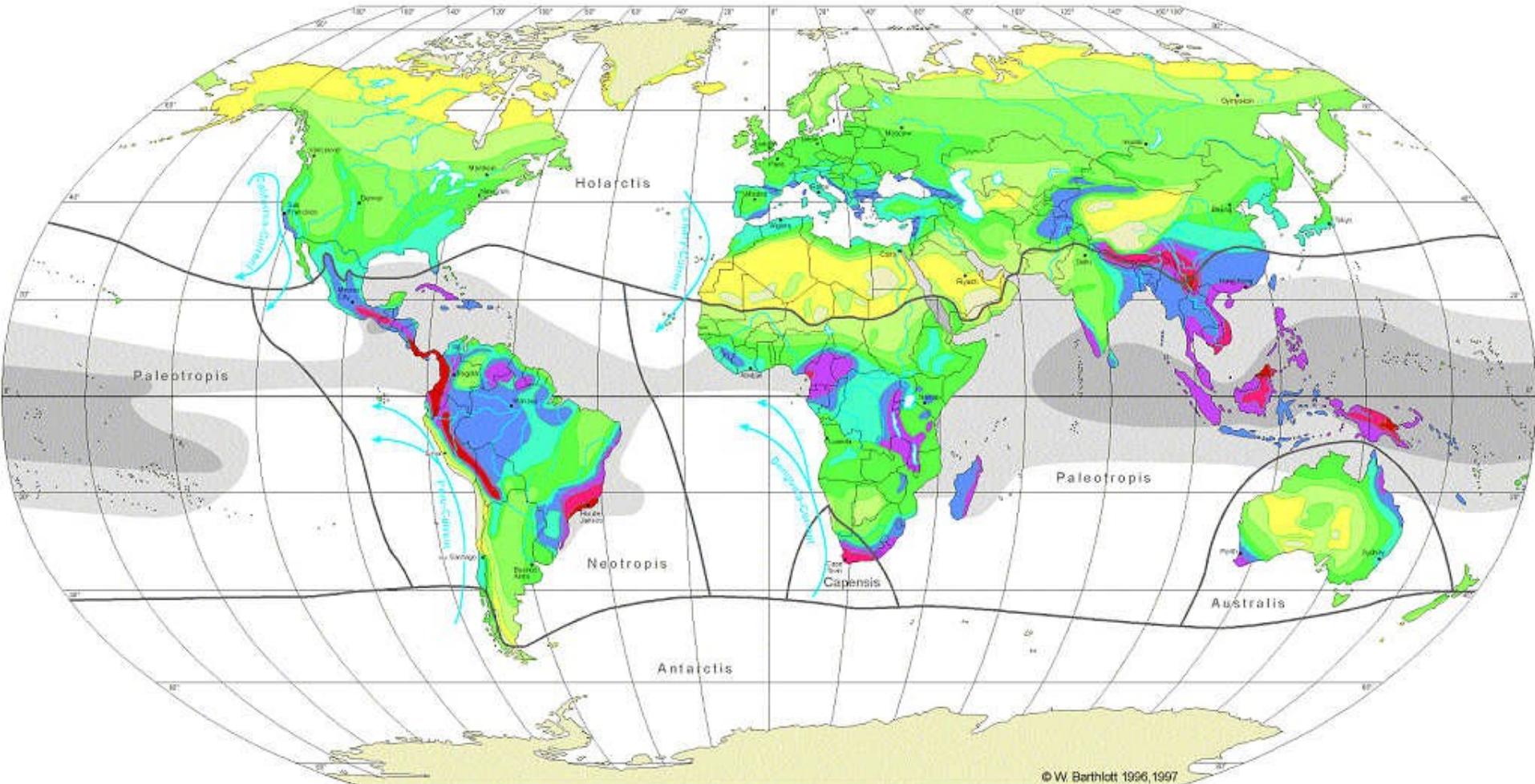
Brian O'Meara  
EEB464 Fall 2018

INHD<sup>2</sup>  
ONLY ON CABLE

## Learning objectives:

- Macroevolution is a process.
- What patterns should it describe?

# GLOBAL BIODIVERSITY: SPECIES NUMBERS OF VASCULAR PLANTS



Robinson Projection  
Standard Parallels 38°N und 38°S  
Scale 1: 130000000

Diversity Zones (DZ): Number of species per 10,000km <sup>2</sup>			
DZ 1 (<100)	DZ 5 (1000 - 1500)	DZ 9 (4000 - 5000)	sea surface temperature
DZ 2 (100 - 200)	DZ 6 (1500 - 2000)	DZ 10 (>5000)	>29°C
DZ 3 (200 - 500)	DZ 7 (2000 - 3000)		>27°C
DZ 4 (500 - 1000)	DZ 8 (3000 - 4000)		

Capensis floristic regions

sea surface temperature

>29°C

>27°C

cold currents

W. Barthlott, N. Biedinger, G. Braun  
F. Feig, G. Kier, W. Lauer & J. Mutke 1997  
modified after  
W. Barthlott, W. Lauer & A. Plaetke 1996  
Department of Botany and Geography  
University of Bonn  
German Aerospace Research Establishment, Cologne  
Cartography: M. Gref  
Department of Geography  
University of Bonn

Described living species:  
Total 1.8 million

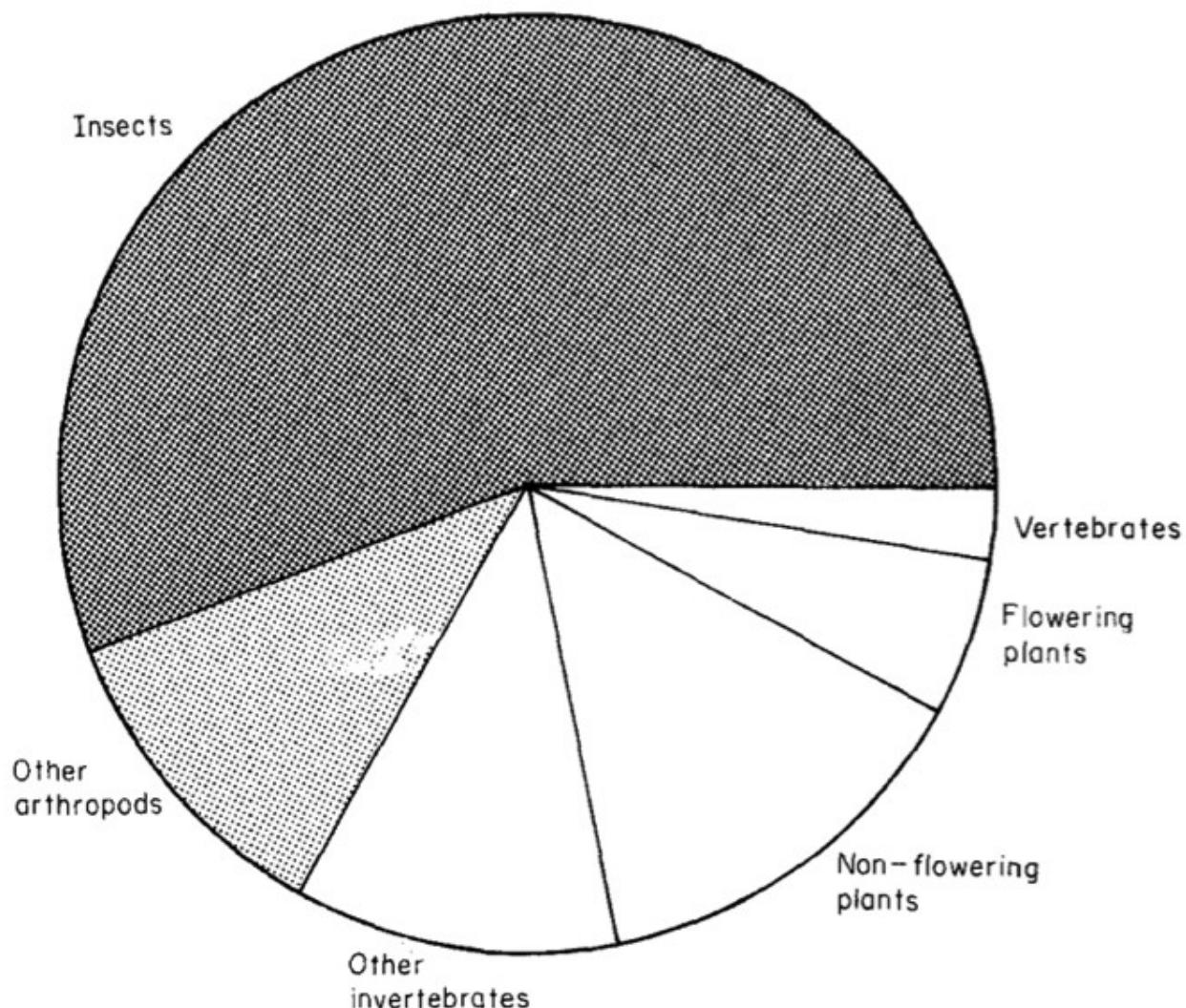
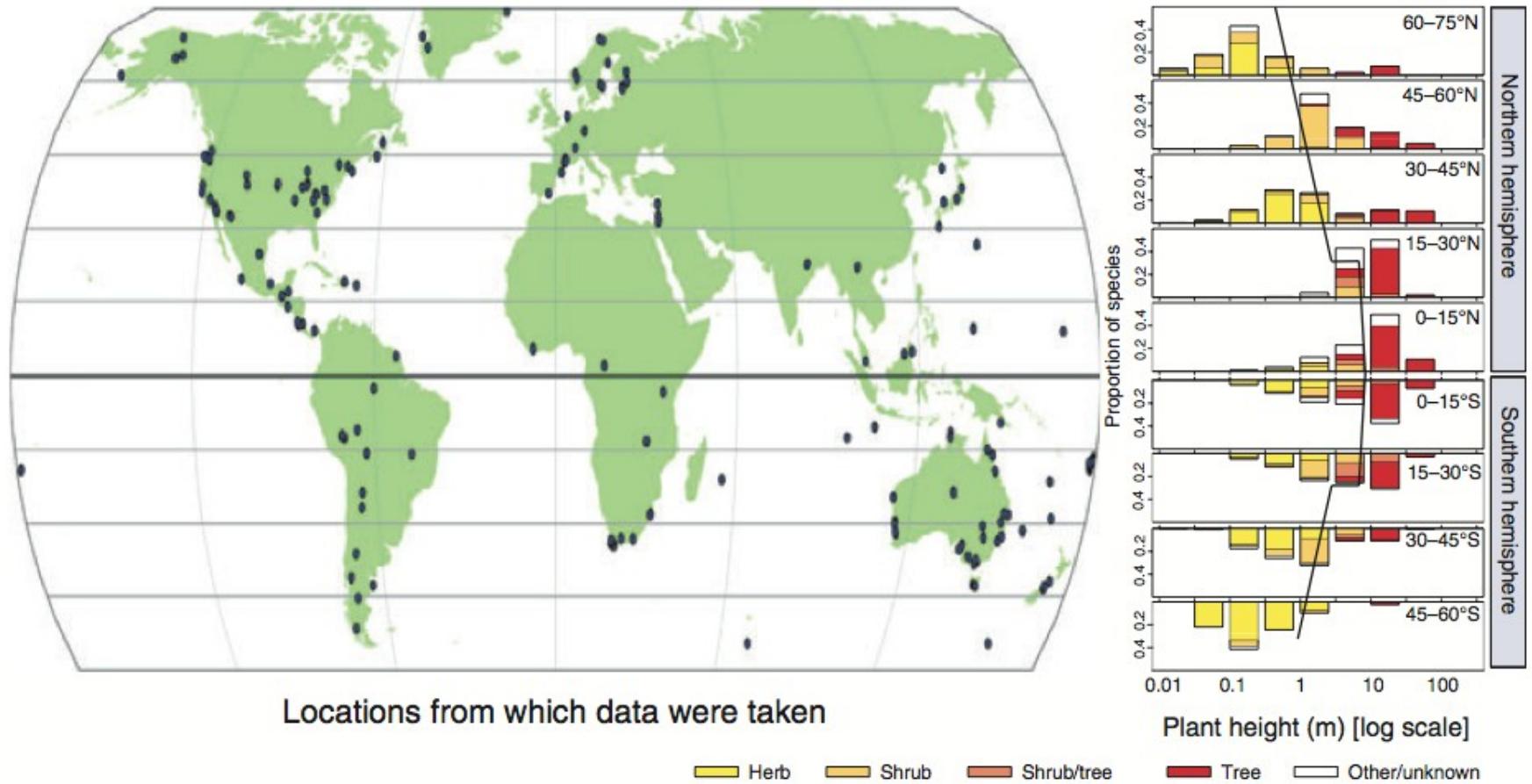


Figure 1. A pie-chart representing all of the 1.82 million described species of animals and plants divided into the major groups (data supplied by Dr N. M. Collins, Conservation Monitoring Centre, IUCN).



**Fig. 1.** Global patterns in plant height. The panel at the left shows the locations from which data were taken. The panel at the right shows the latitudinal gradient in plant height. To facilitate interpretation, we have presented the data in frequency histograms for species in each of nine latitudinal bands (these bands correspond to the latitude lines on the map on the left). However, latitude and height are continuous variables, and they were treated as such in all analyses. Data are shaded according to growth form: trees in red, shrub/trees in dark orange, shrubs in light orange, herbs in yellow and species whose growth form was unknown or difficult to classify are shown in white. The black line running across the individual height histograms shows the best-fit relationship between height and latitude.

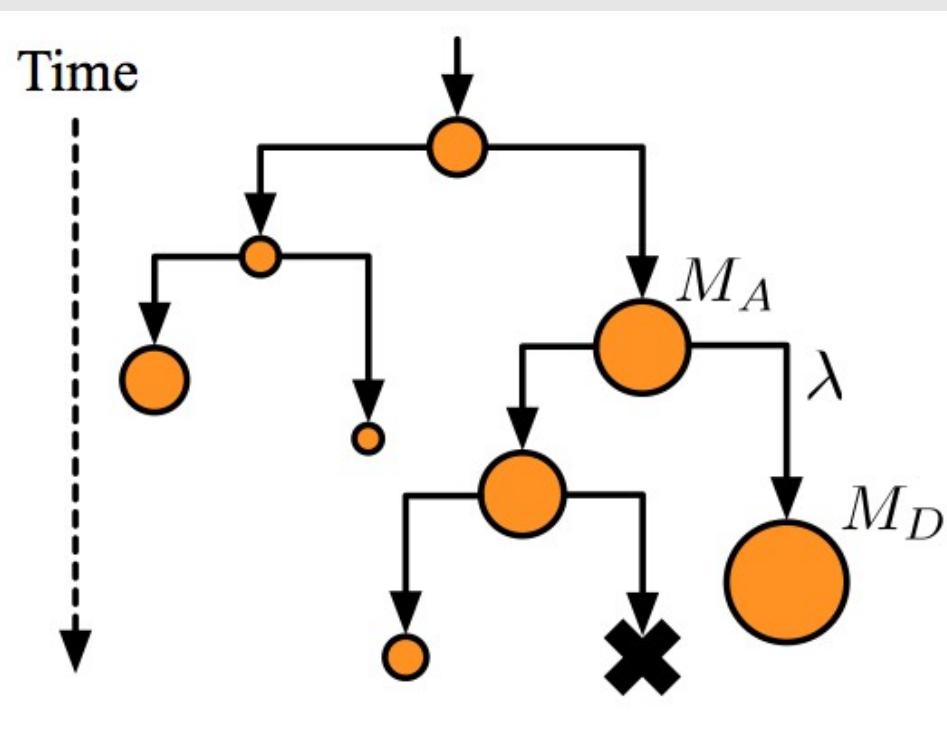
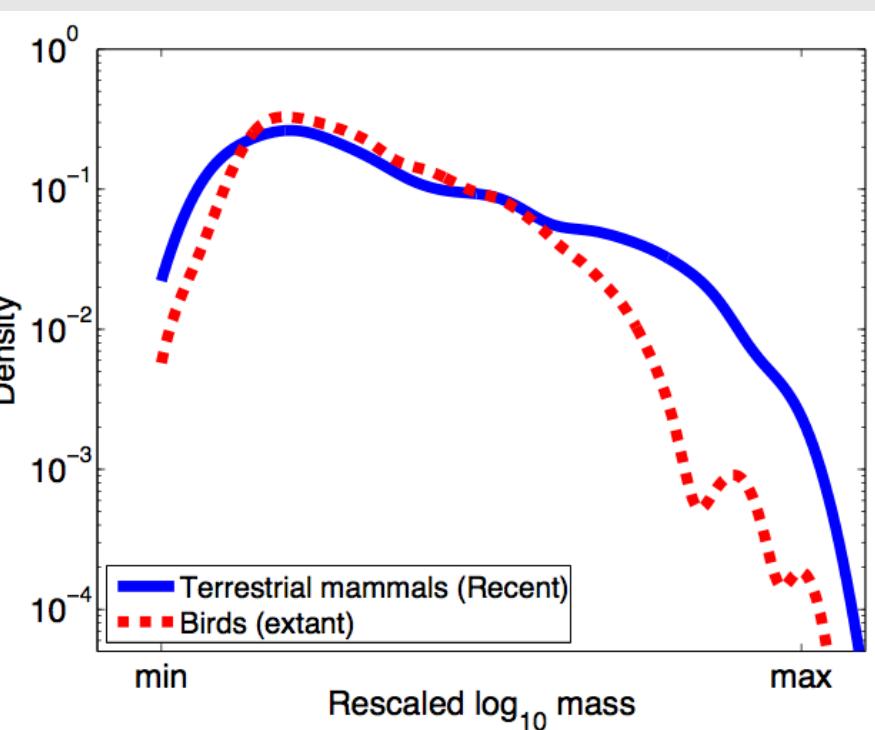
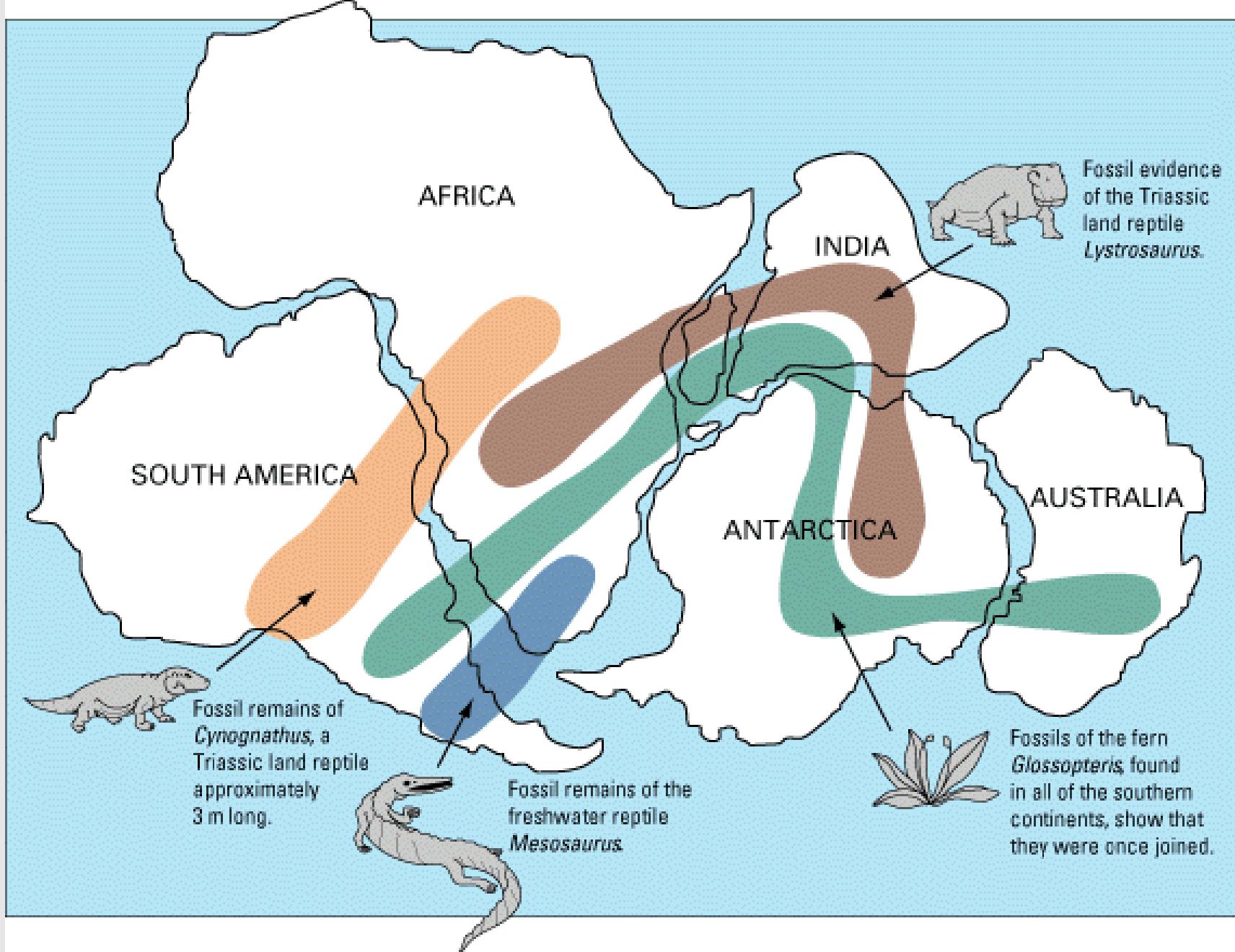


FIG. 1 (a) An illustration of the similarity of the body mass distributions for different taxonomic groups, using data for 4002 Recent terrestrial mammals (Smith et al., 2003) and 8617 extant birds (Dunning Jr., 2007). For visual clarity, the empirical distributions have been smoothed using a Gaussian kernel (Wasserman, 2006) and rescaled to lay on the same abscissa interval. (b) A schematic showing the basic clado-genetic diffusion process by which species mass varies over evolutionary time. The masses of a descendant  $M_D$  is related to the mass of its ancestor  $M_A$  by a random multiplicative factor  $\lambda$ , which represents the total selective influence on species mass from all sources, i.e.,  $M_D = \lambda M_A$ .





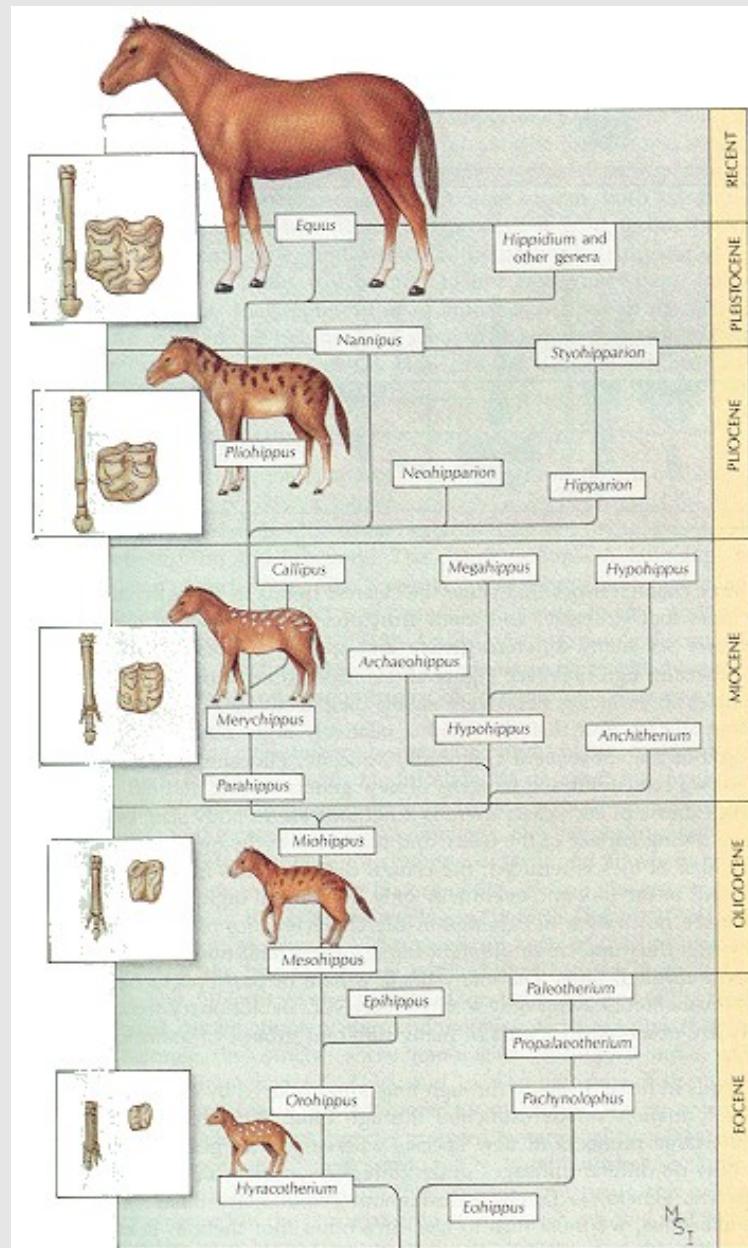
<http://www.fossilmuseum.net/plantfossils/Metasequoia/DawnRedwood.htm>



©Rasbak



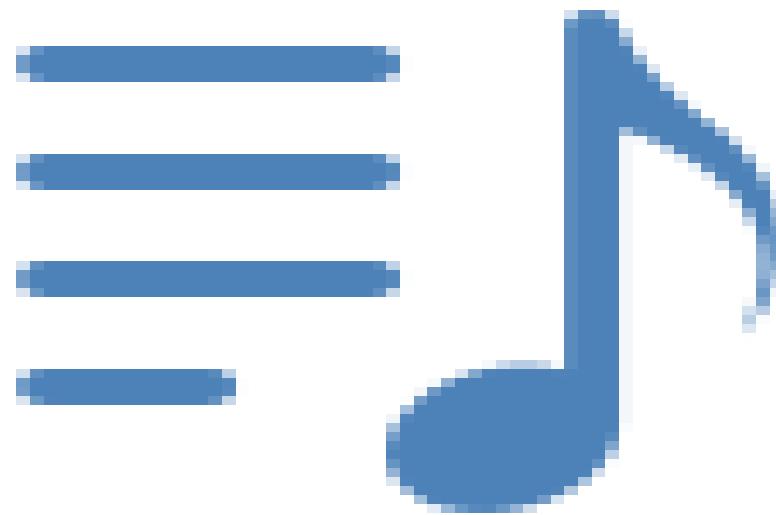
# Cope's rule



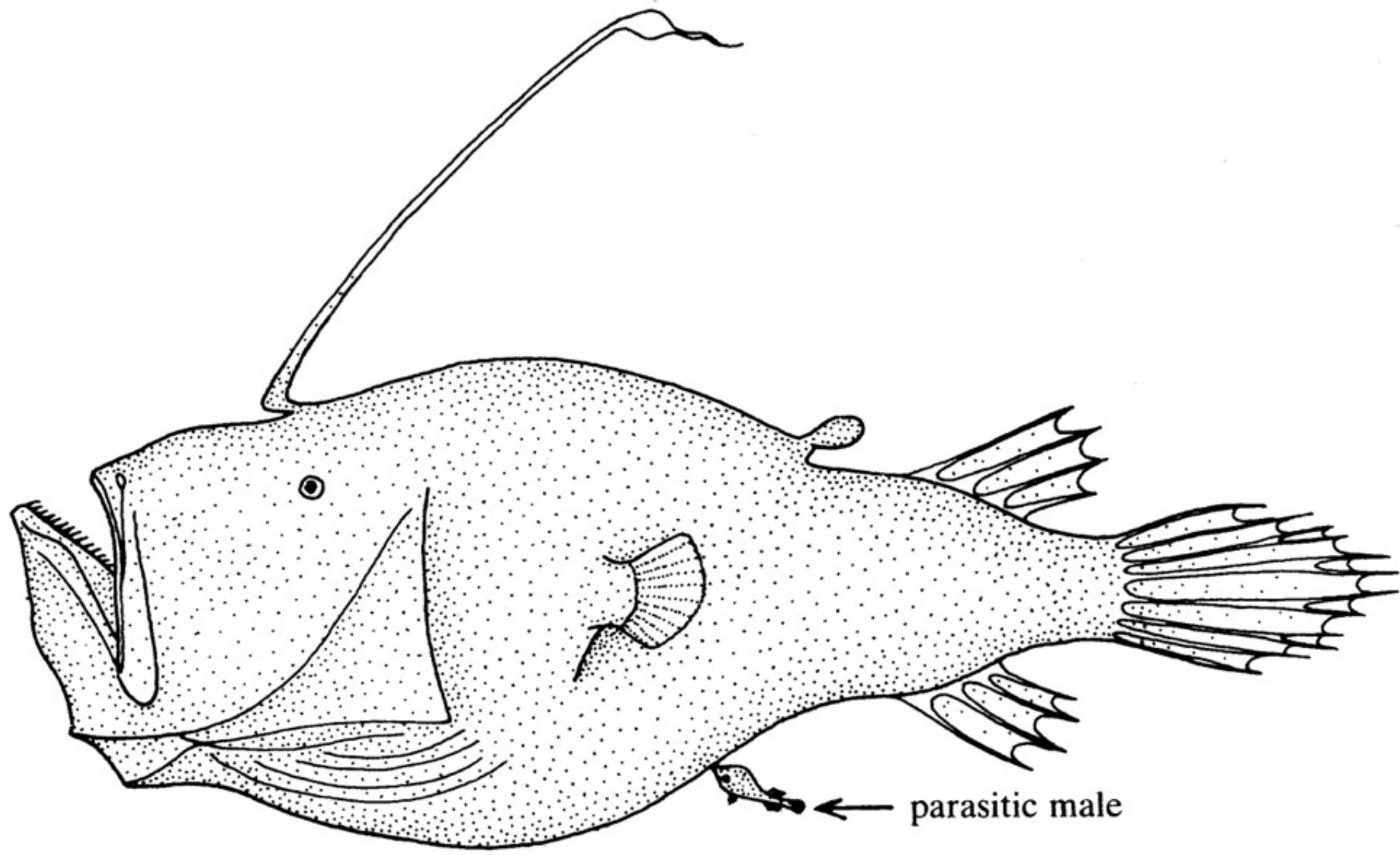
# Examples



<http://www.youtube.com/watch?v=TOC2Qc2Qedw>



<http://www.youtube.com/watch?feature=fvwp&v=TOa8y95khK8>

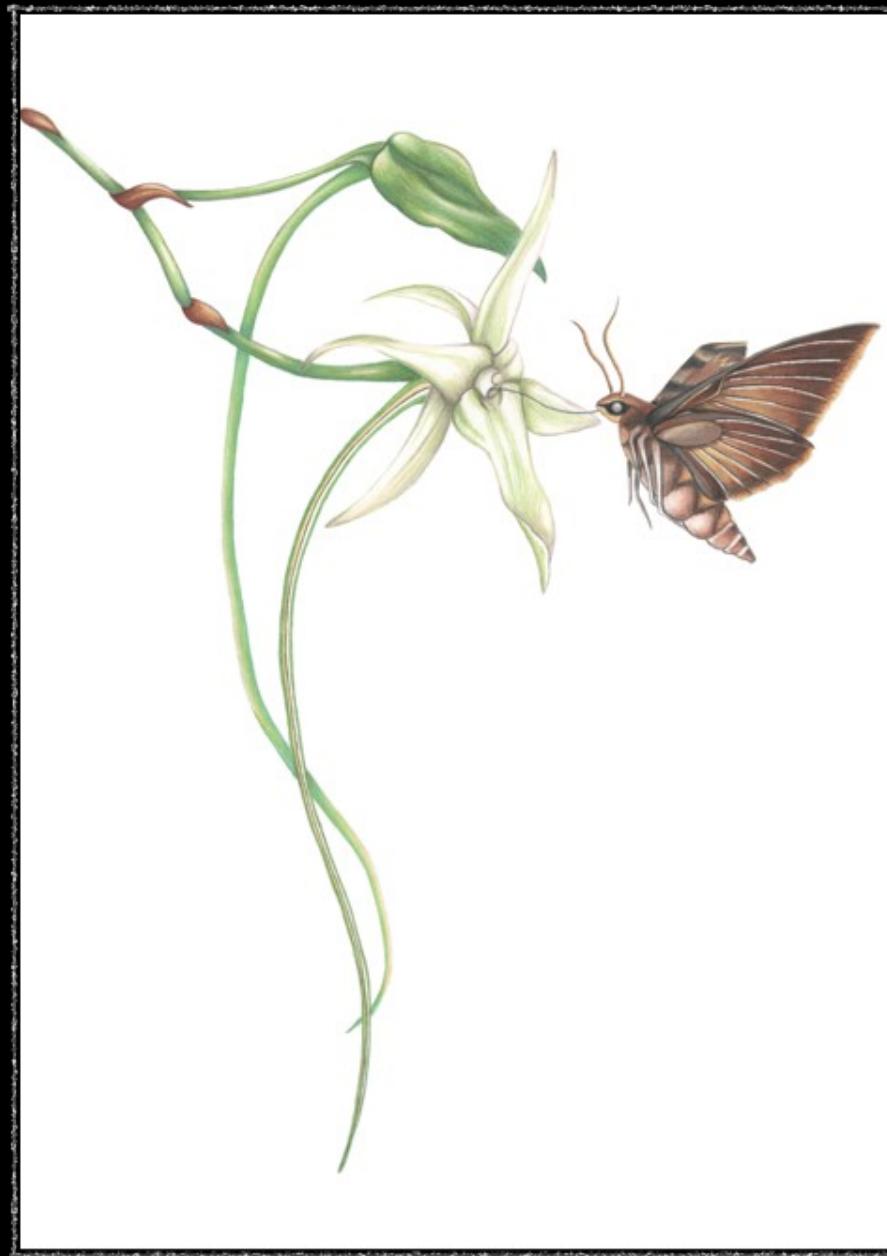


Dr Tony Ayling



[http://www.youtube.com/watch?v=L54bxmZy\\_NE](http://www.youtube.com/watch?v=L54bxmZy_NE) : BBC Planet Earth





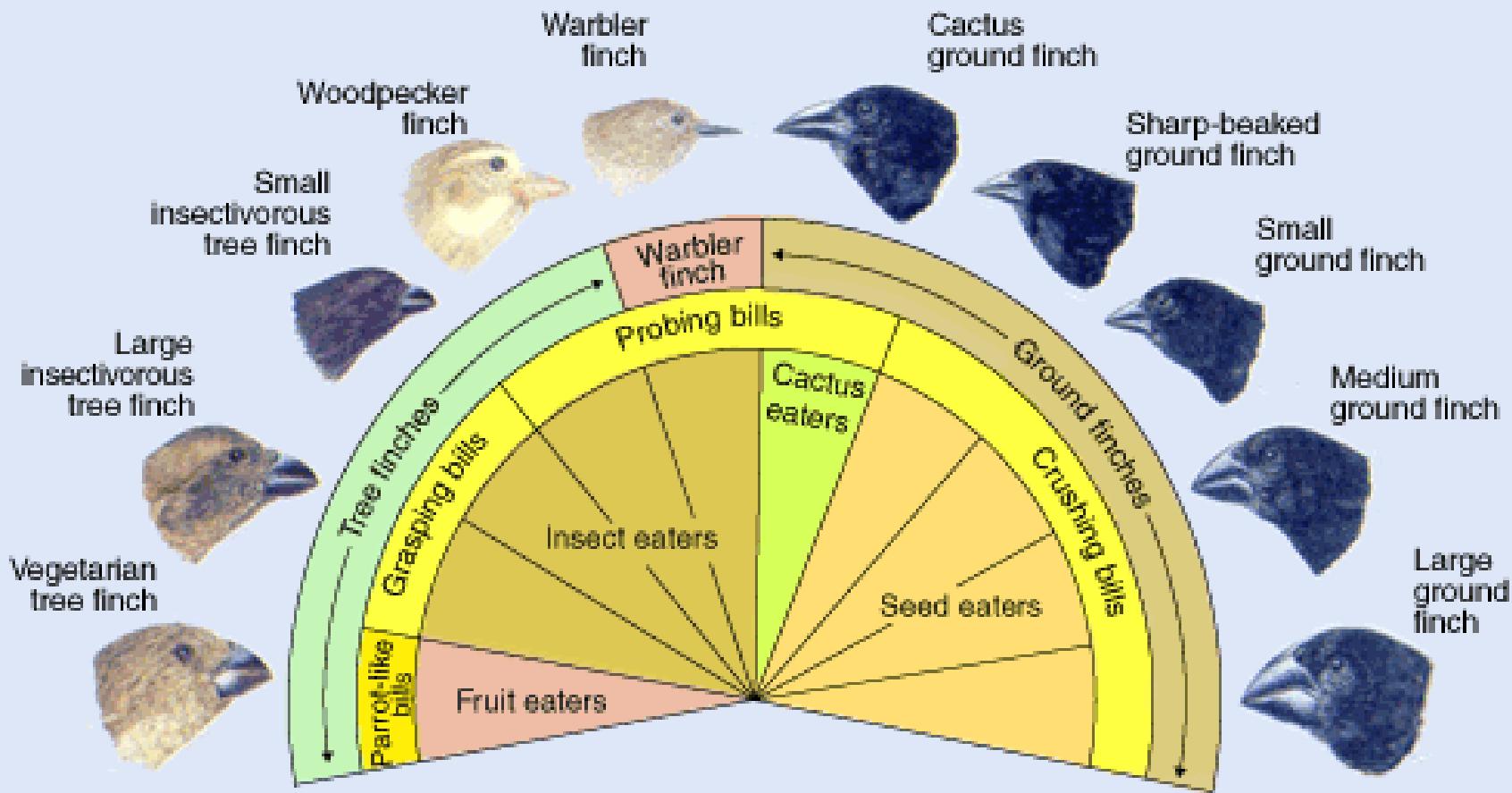
<http://www.racheldiazbastian.com>

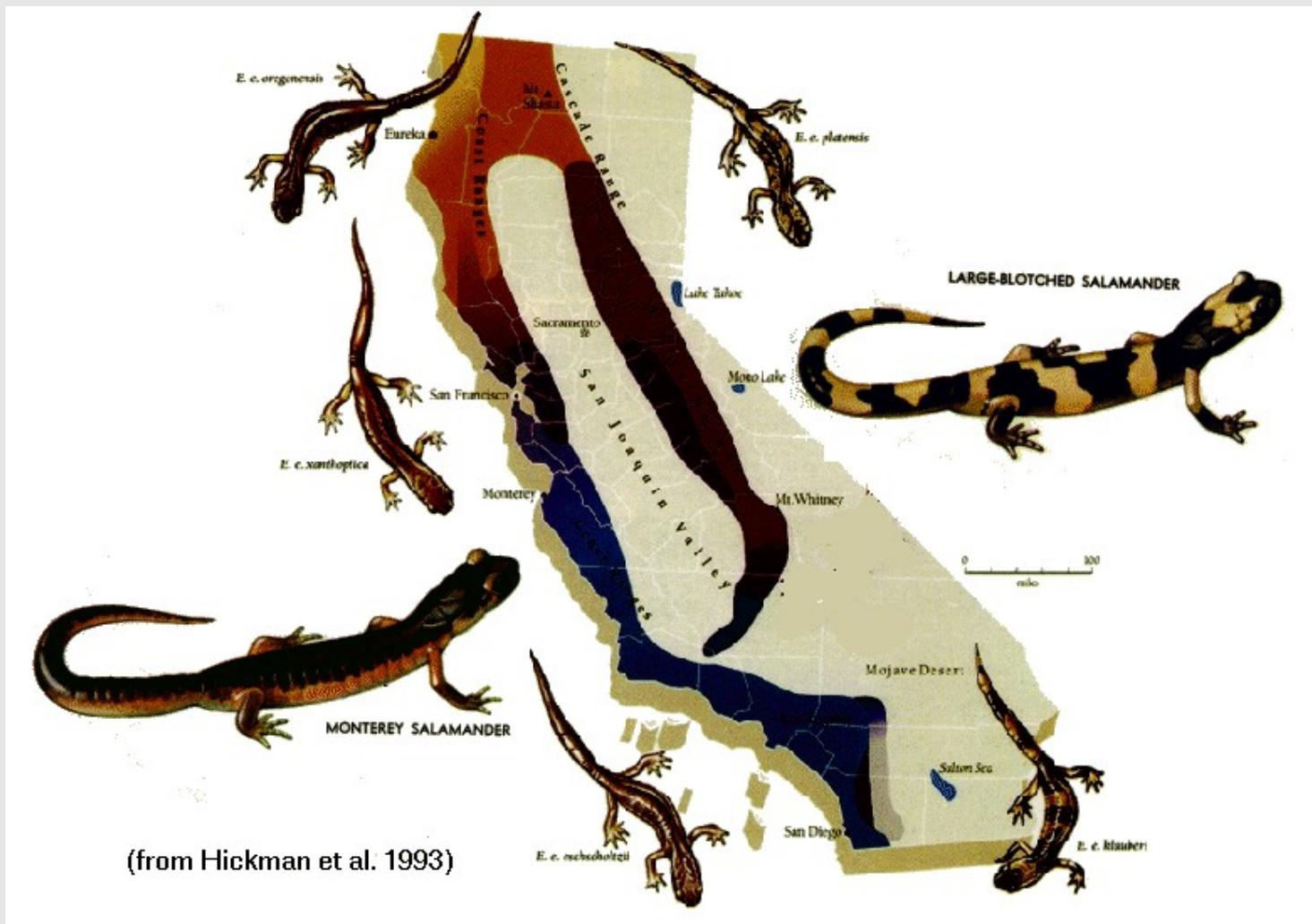


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## Marsupial mammals

**Plantigale**



**Marsupial mole**



**Sugar glider**



## Eutherian mammals

**Deer mouse**



**Mole**



**Flying squirrel**

