

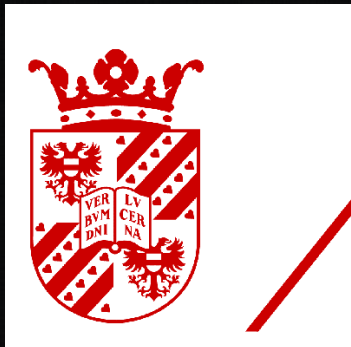
# Ignoring incipient species

TRES meeting 2017-02-13

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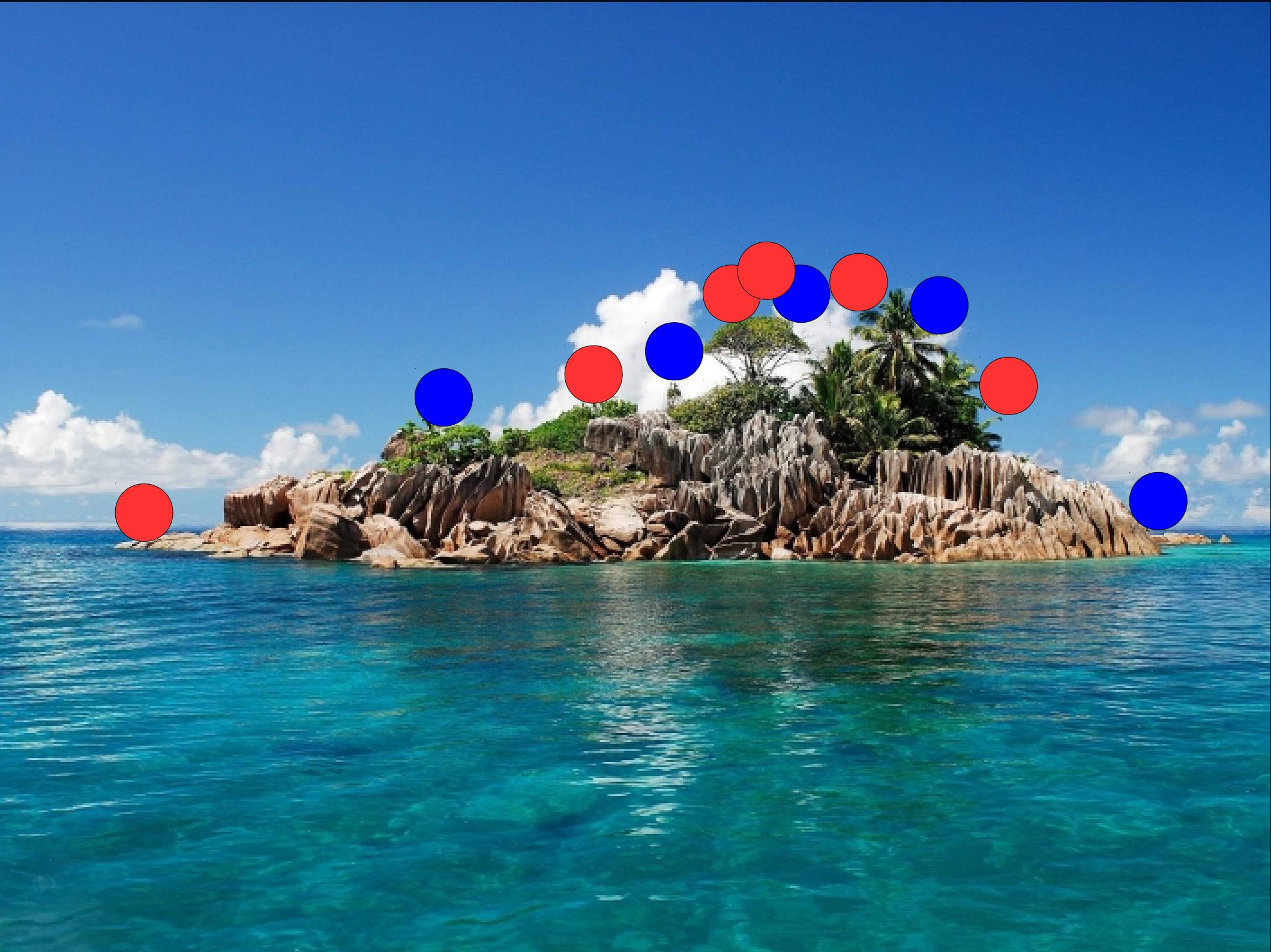
[www.github.com/richelbilderbeek/Science](http://www.github.com/richelbilderbeek/Science)

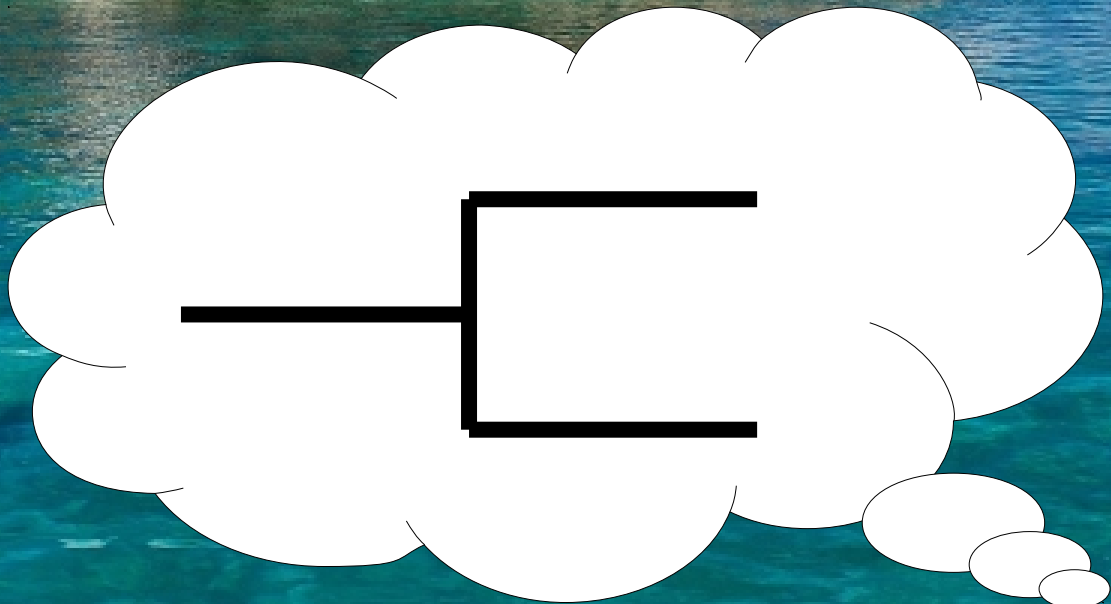
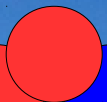
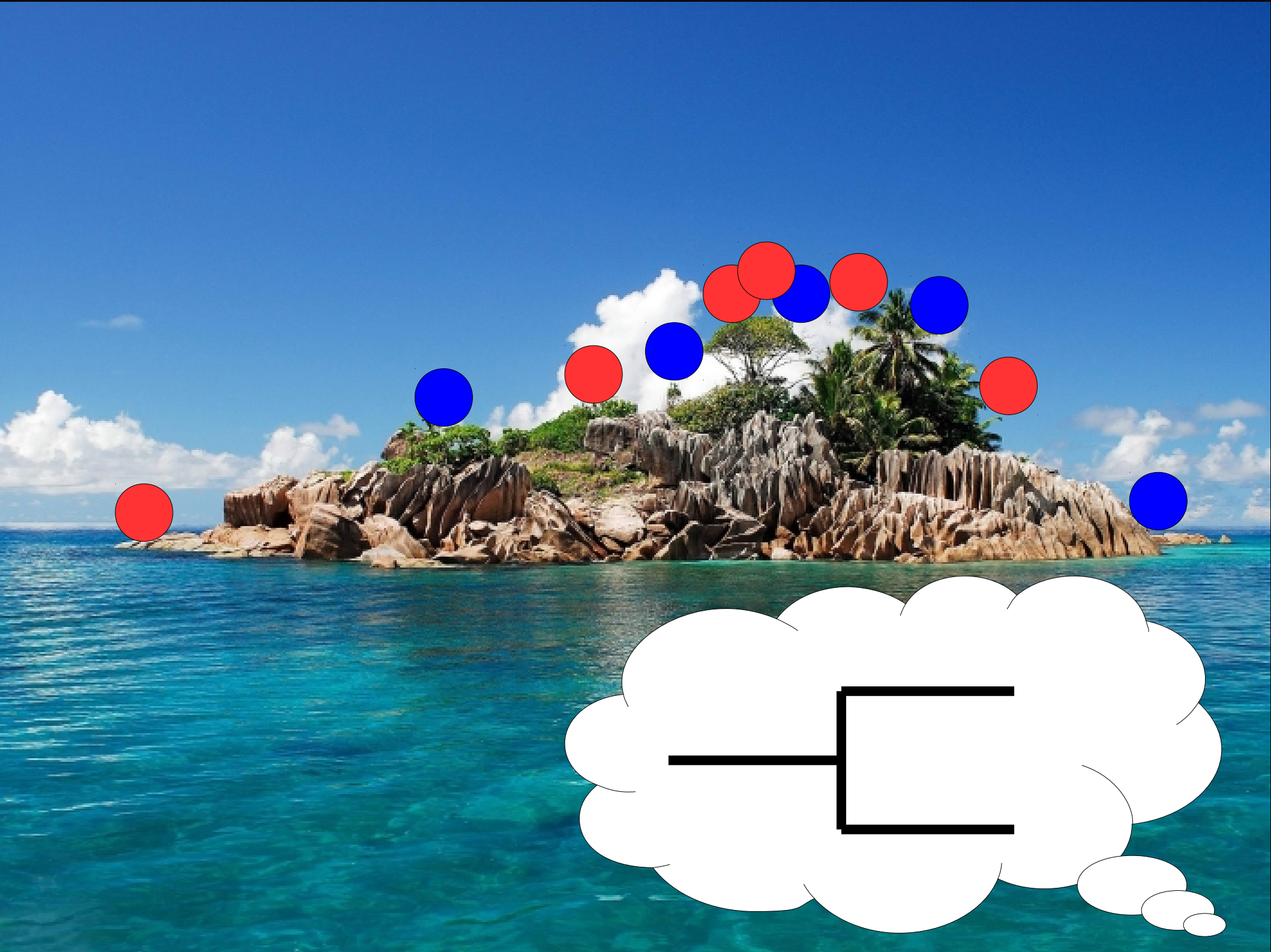




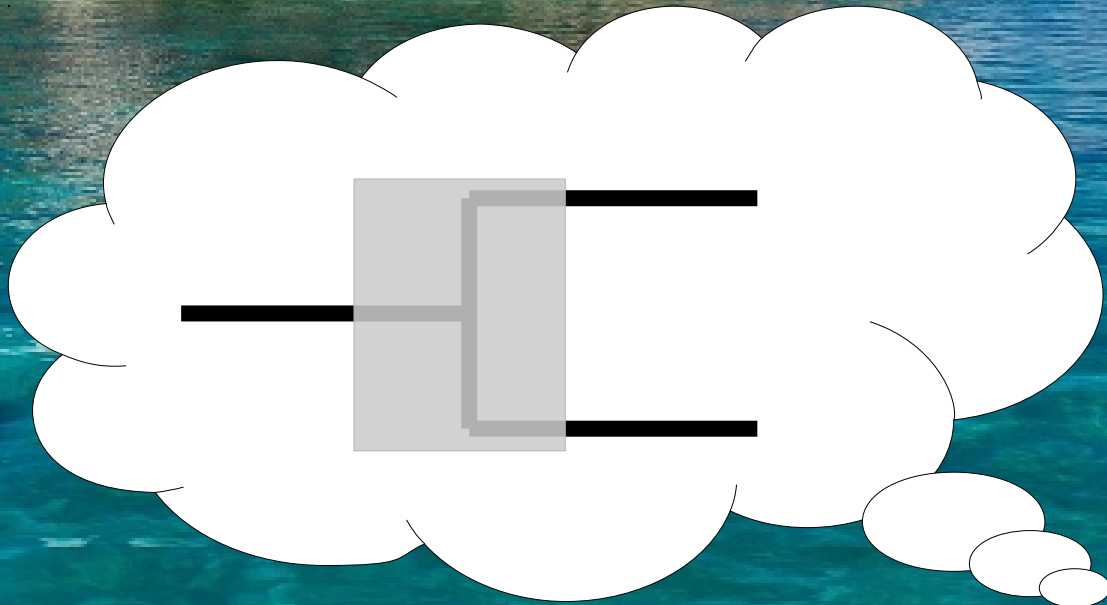
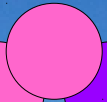














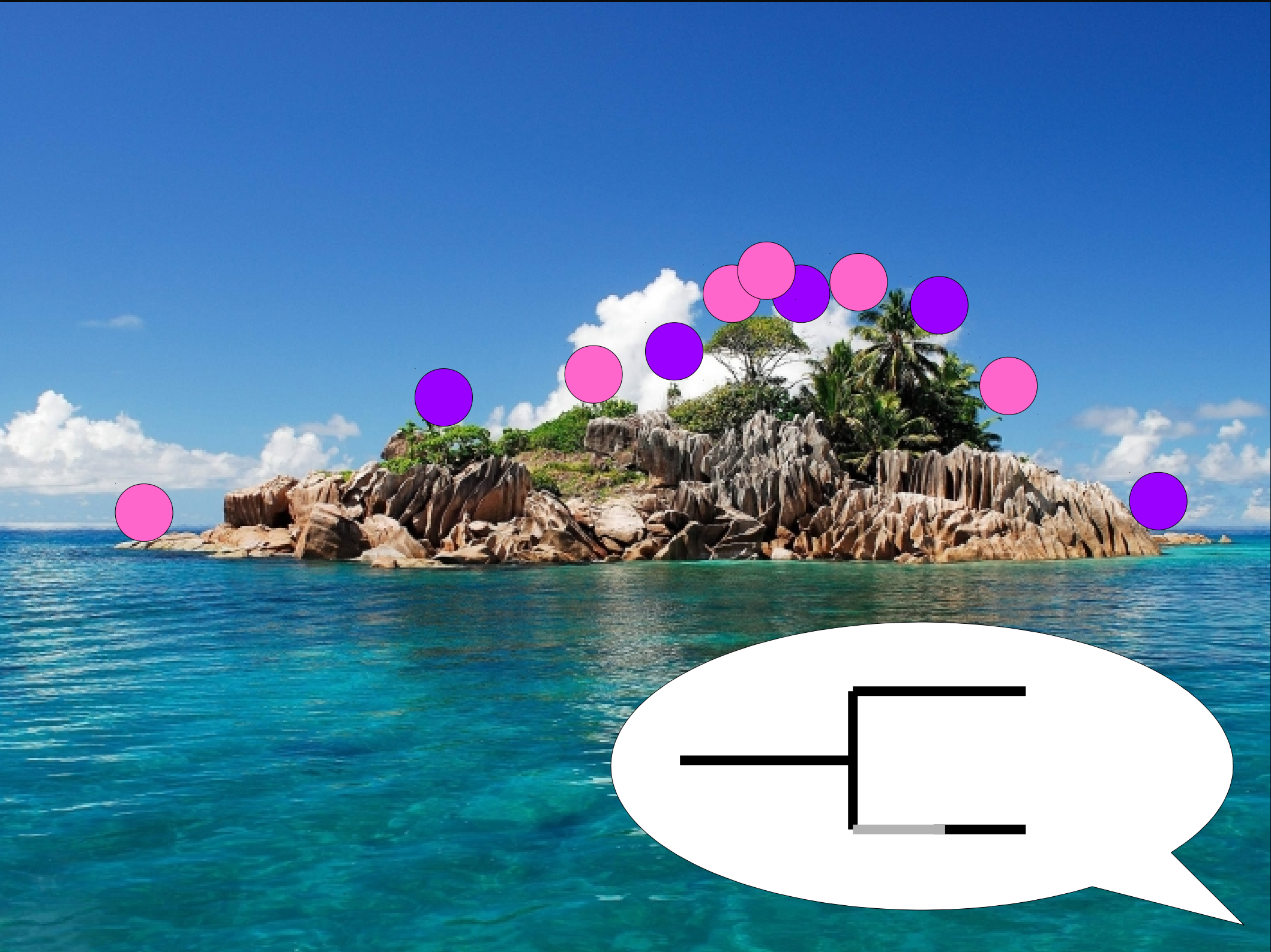
# Research question

- What is the effect of ignoring the phase in which species are being formed?

How long does that phase last?

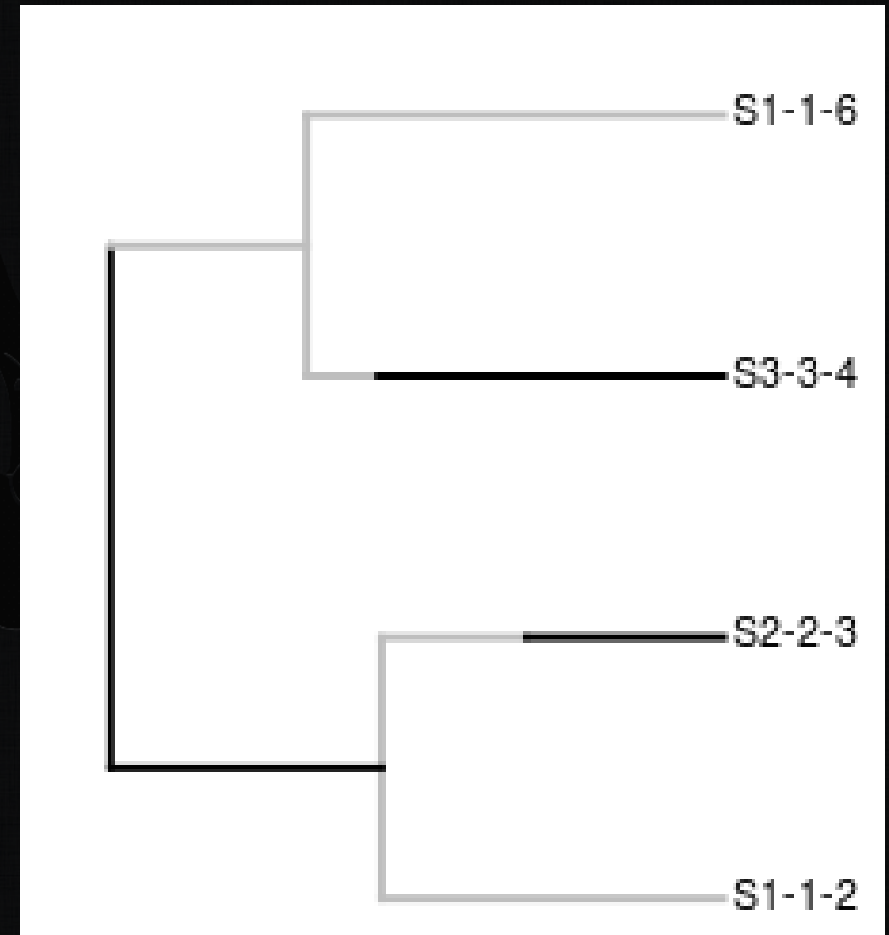
Which species lived when?





# Protracted speciation [1]

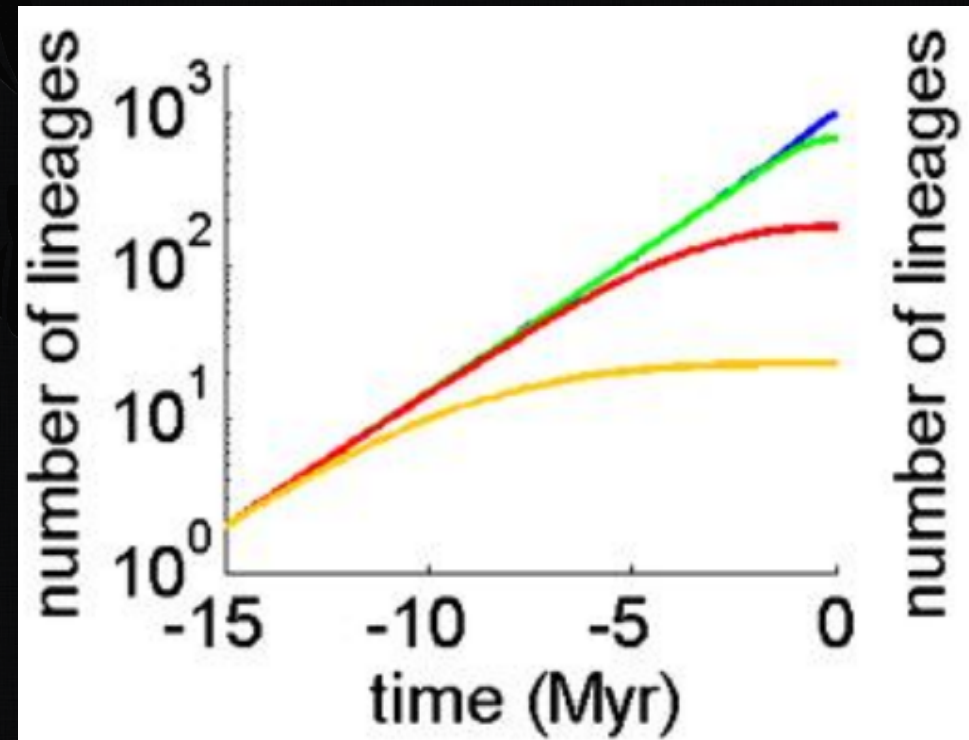
- Extension of Birth-Death (BD) model [2]
- New species are incipient
- Speciation completion rate
  - Incipient  $\rightarrow$  good
  - BD if infinite





# Protracted speciation

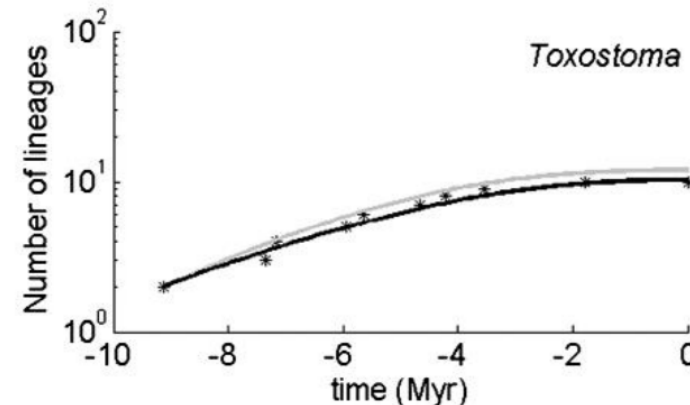
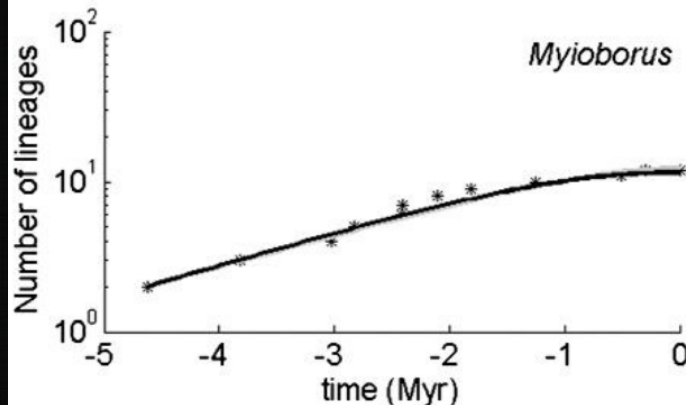
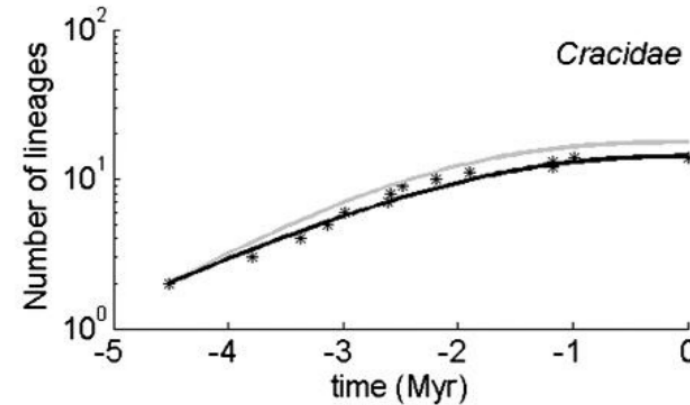
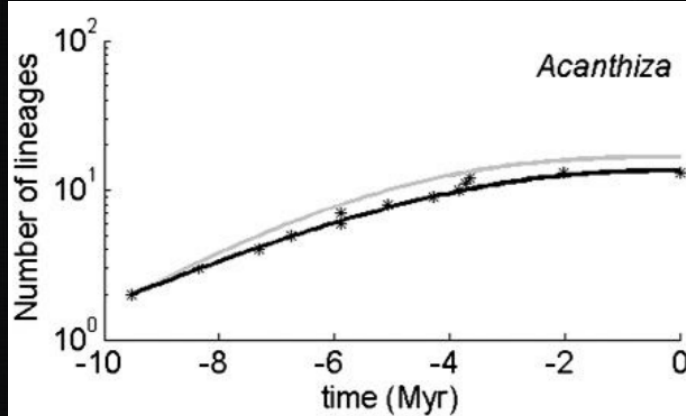
- Number of lineages towards the present flattens of
- Difference between two (n)LTT plots: nLTT statistic [1]





# PBD in nature

*Acanthiza nana*,  
Yellow  
Thornbill



*Crax daubentoni*,  
Yellow-  
knobbed  
Curassow



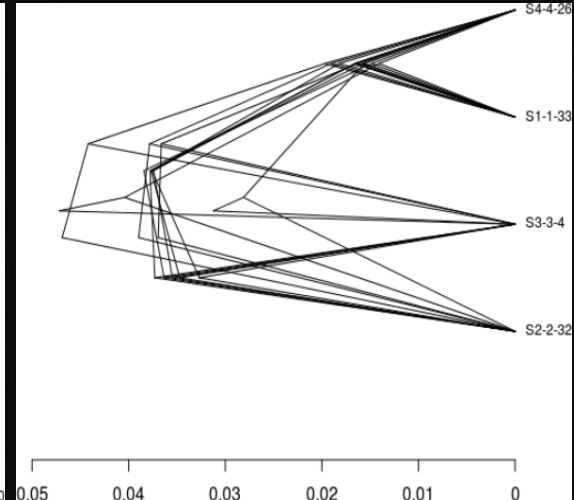
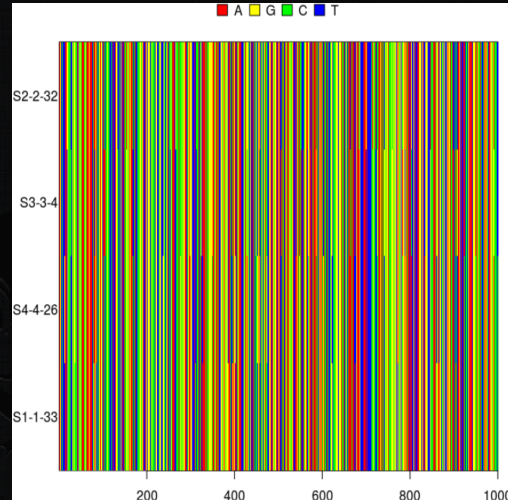
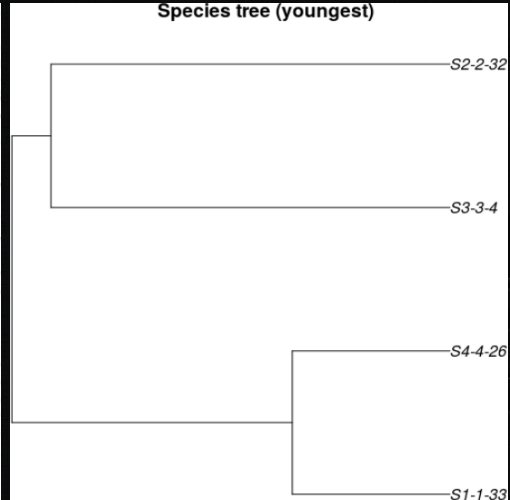
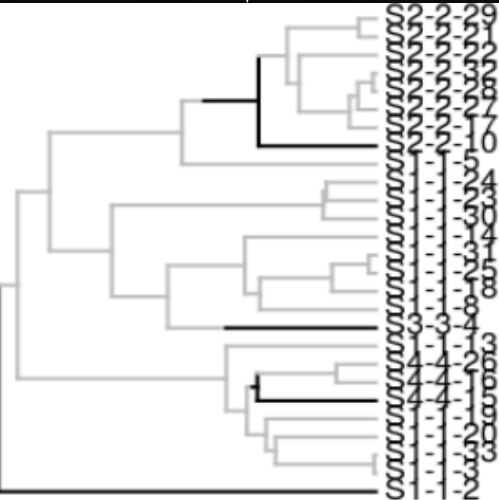
*Toxostoma rufum*,  
Brown  
Thrasher



*Myioborus torquatus*,  
Collared  
Whitestart

*Etienne & Rosindell, 2012*

# Approach



Simulate an  
incipient  
species tree

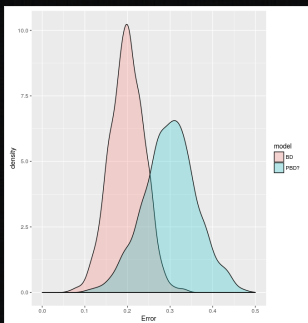
Sample species  
trees

PBD

Simulate DNA  
alignments

Infer species  
tree posterior  
(BEAST2)

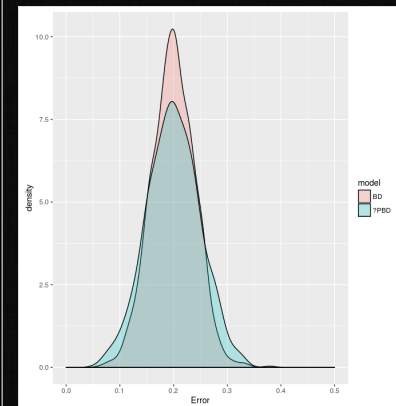
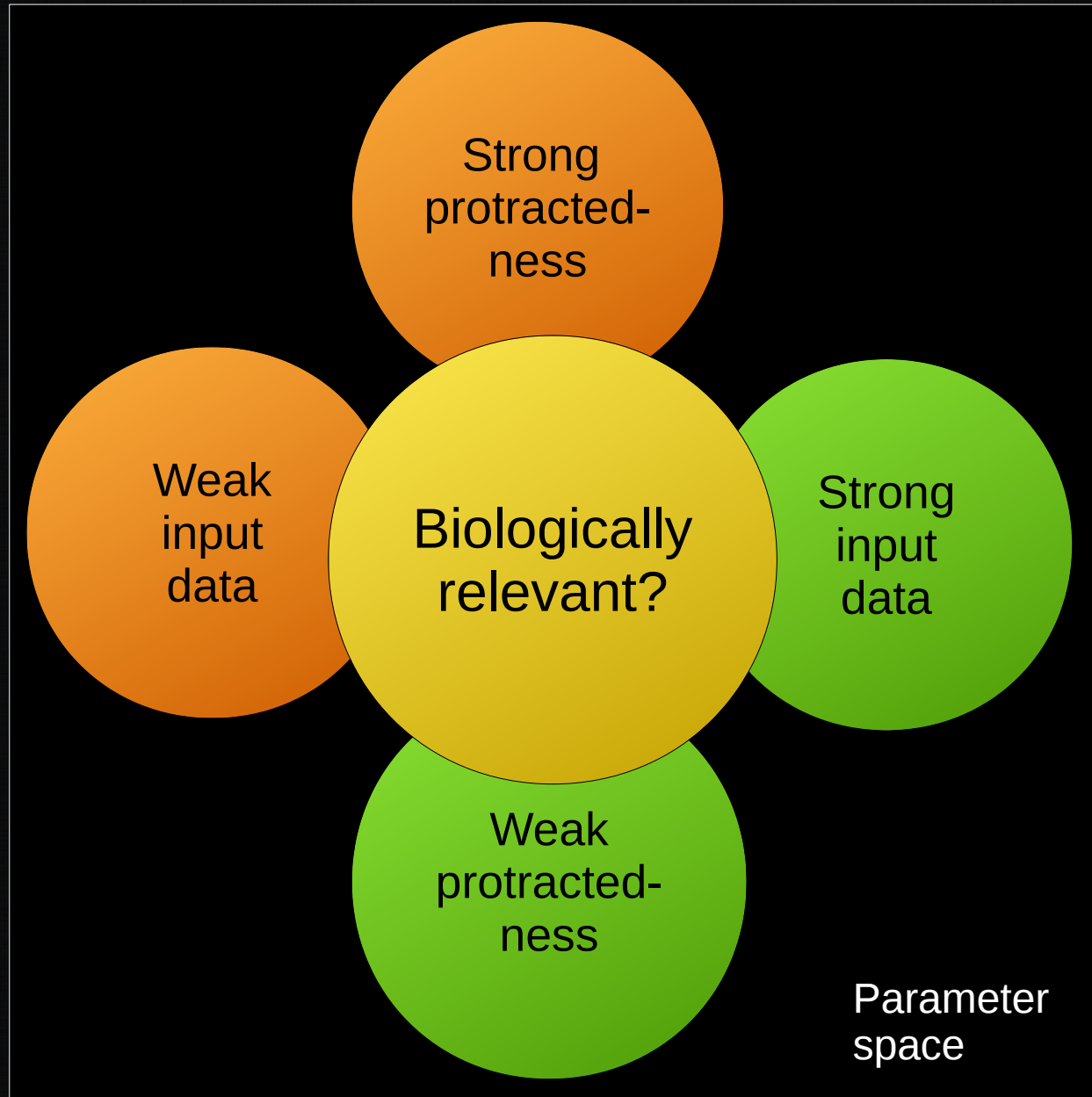
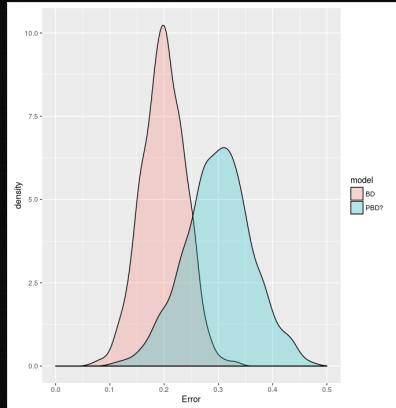
BD  
prior



Measure difference/error (nLTT statistic)

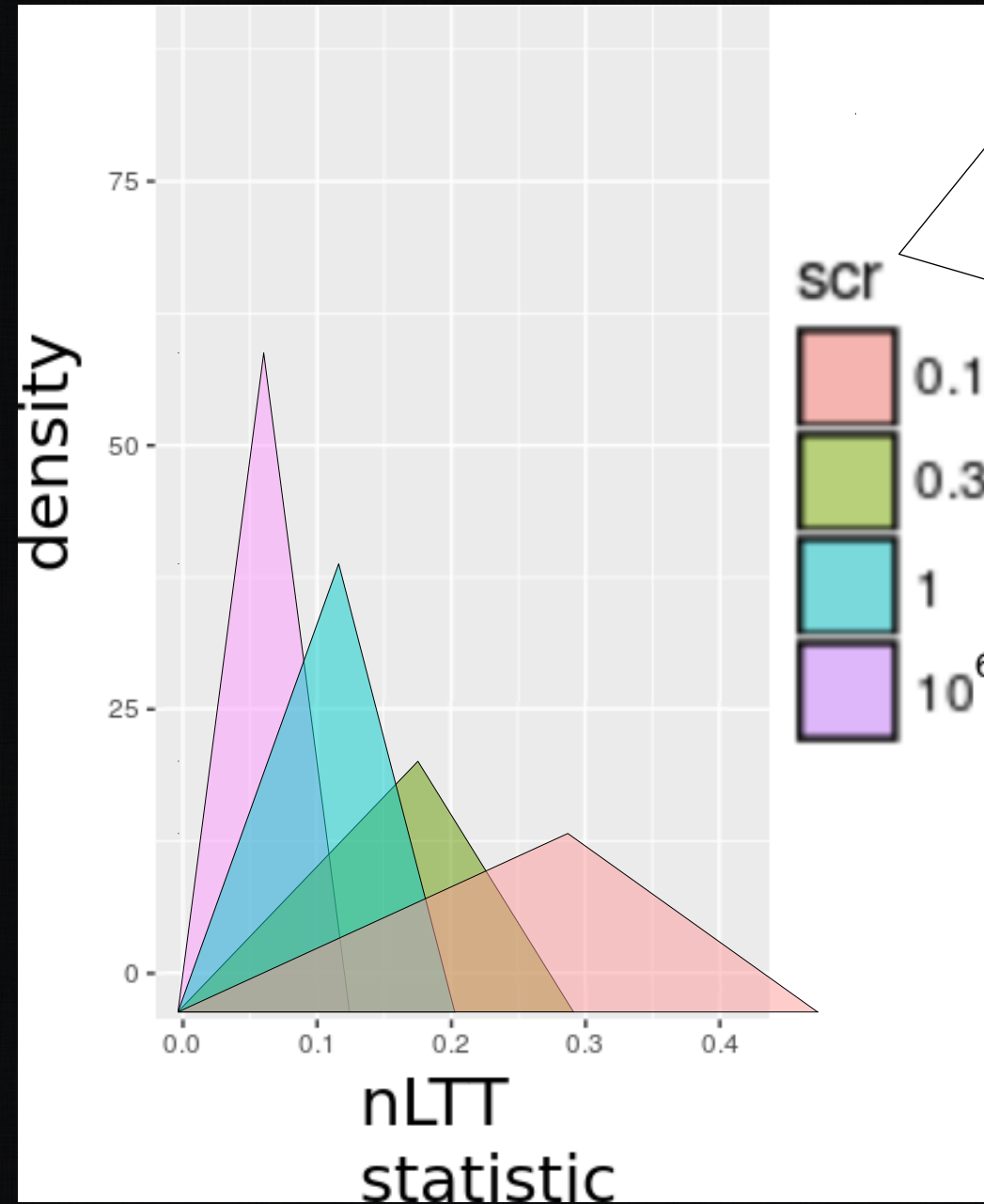


# Predictions





# Effect of SCR, prediction

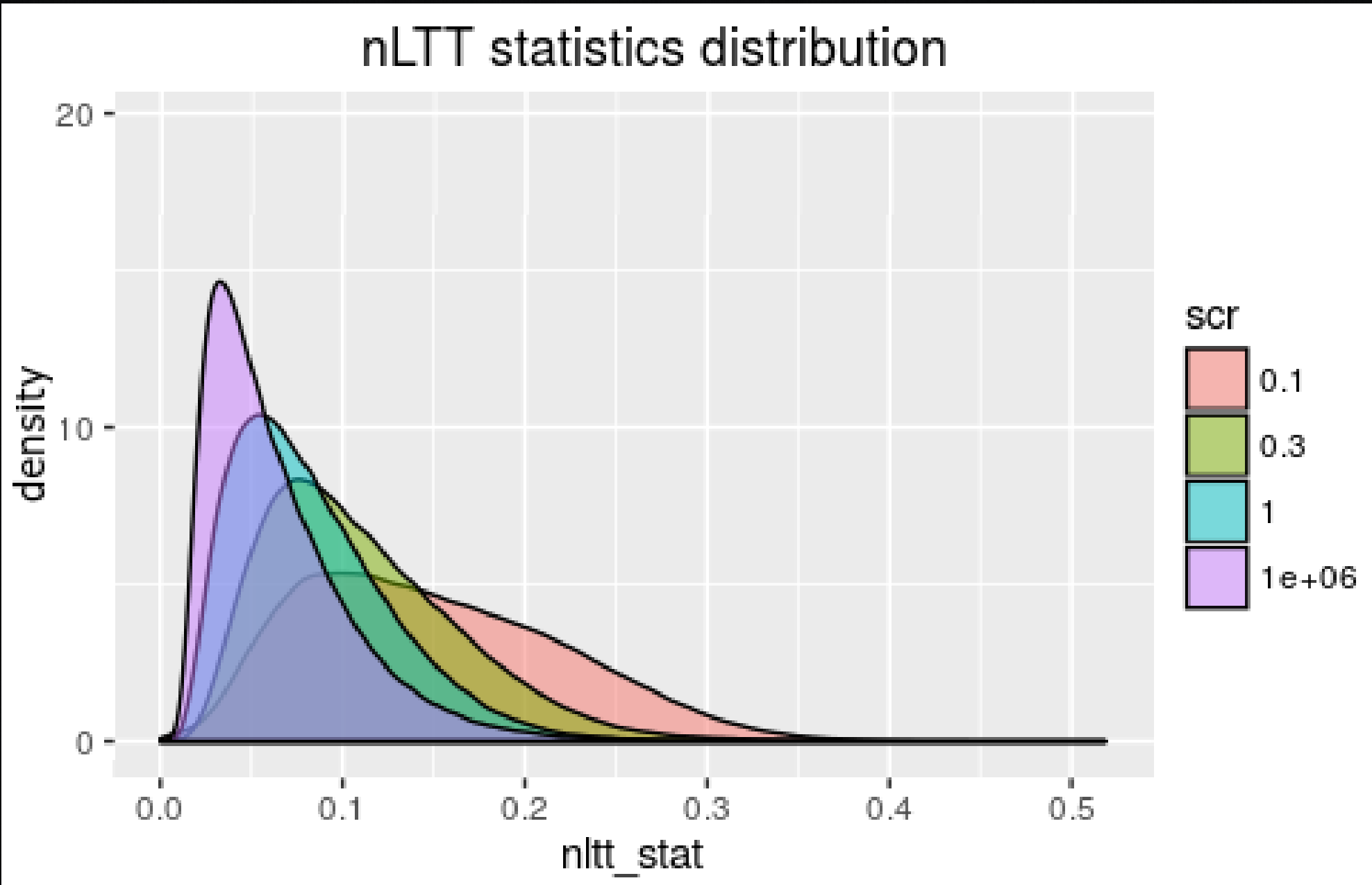


Speciation Completion Rate

Protracted Birth-Death

Birth-Death (BD) model

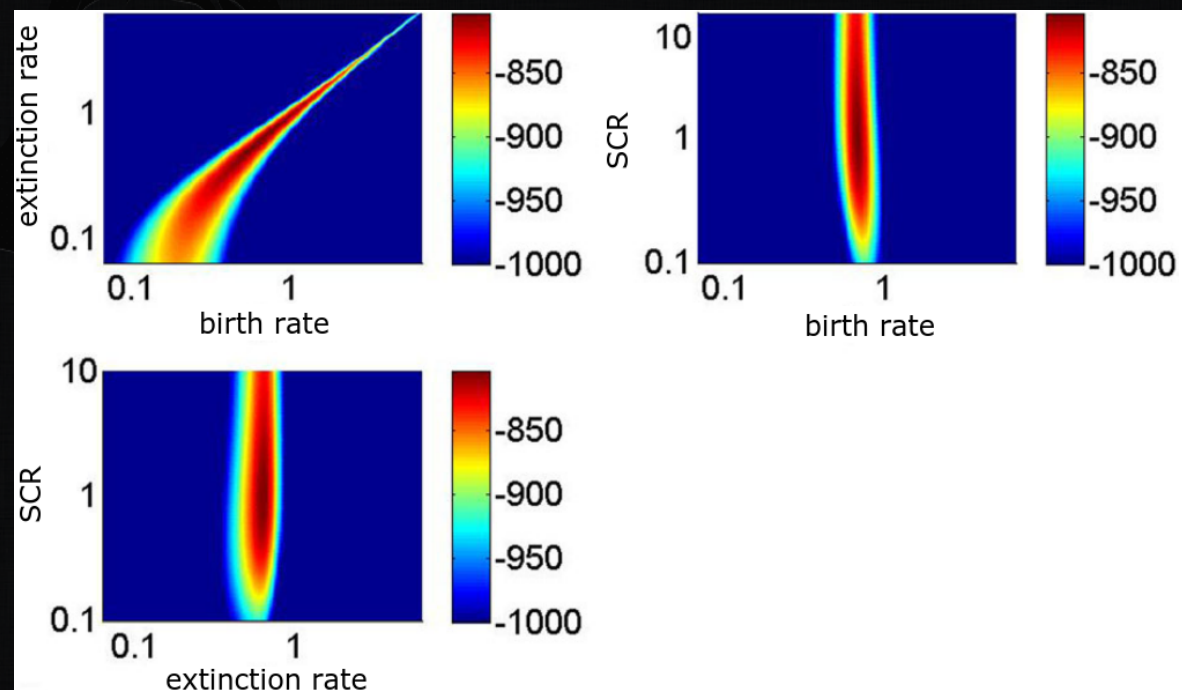
# Effect of SCR, measured



# SCRs in nature

- Birds: 0.04-0.89
- Primates: around 1

Data set	$\lambda_2$ (Myr <sup>-1</sup> )
<i>Acanthiza</i>	0.07
<i>Cracidae</i>	0.16
<i>Myioborus</i>	0.39
<i>Toxostoma</i>	0.06



Adapted from Etienne et al., 2014



# Conclusion

- Low SCR increases the error made in inference by a BD prior
- For primates ( $SCR \approx 1$ ): good enough
- For birds ( $SCR < 1$ ): maybe not
- Lower extinction rates reduces error (not shown)

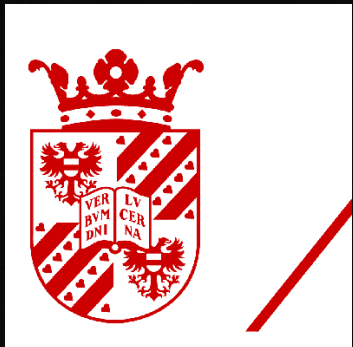
# Discussion

- Factorial setup of all parameters failed for some combinations for unknown reasons
  - Only one speciation initiation rate
- Other summary statistics
  - gamma,  $\Delta r$ , MRBS
- Redo my research:
  - [www.github.com/richelbilderbeek](https://www.github.com/richelbilderbeek)
    - wiritttes: simulation
    - wiritttea: analysis



# Acknowledgements

- Rampal Etienne
- Jolien Gay
- Femke Thon

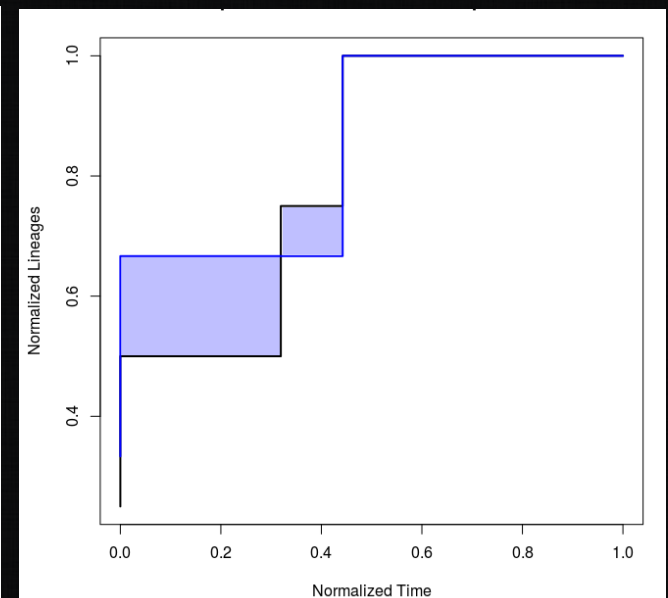
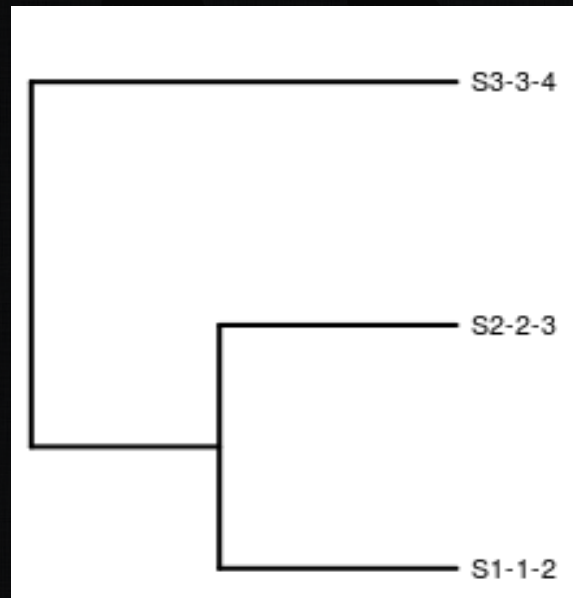
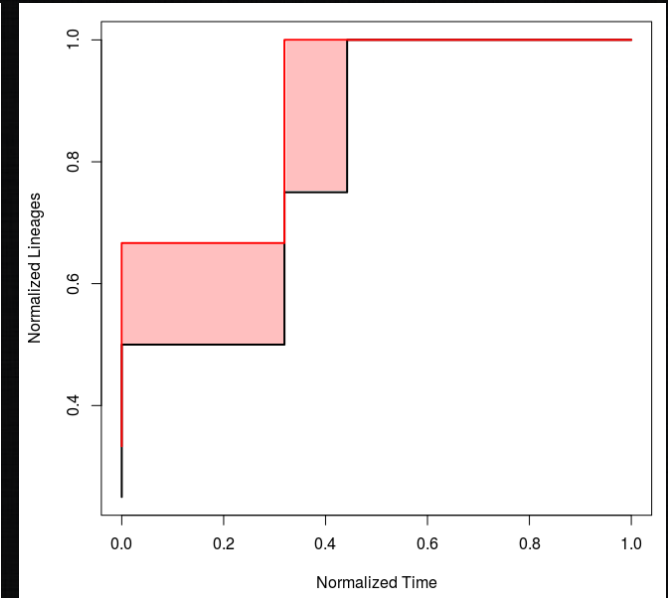
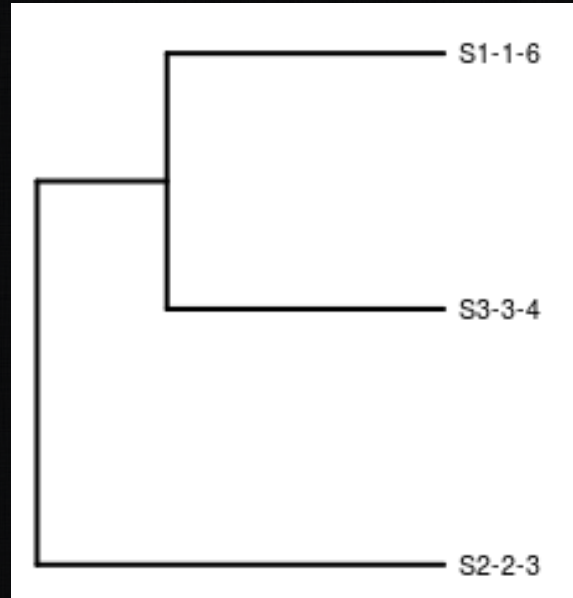
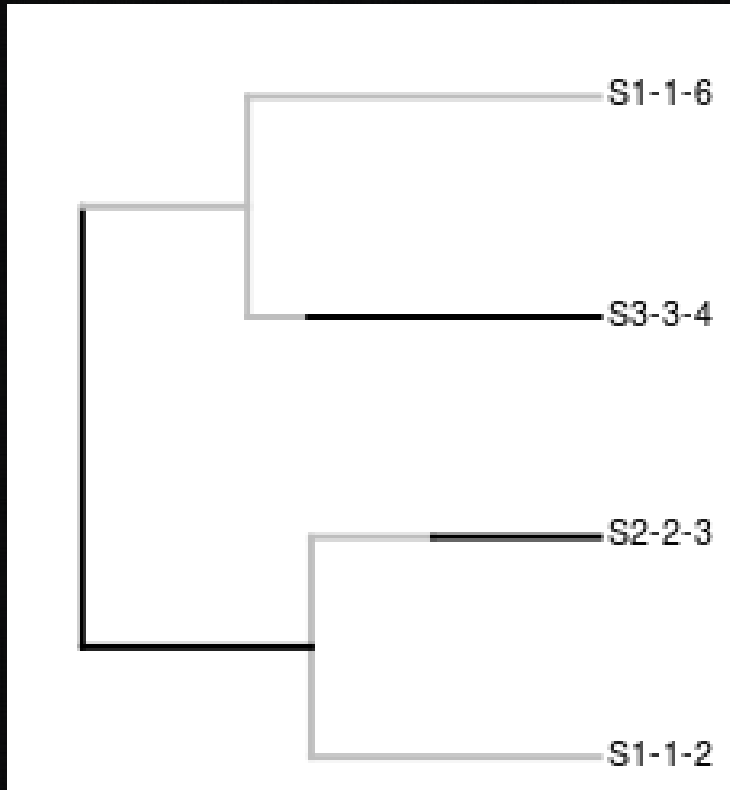




# Questions?

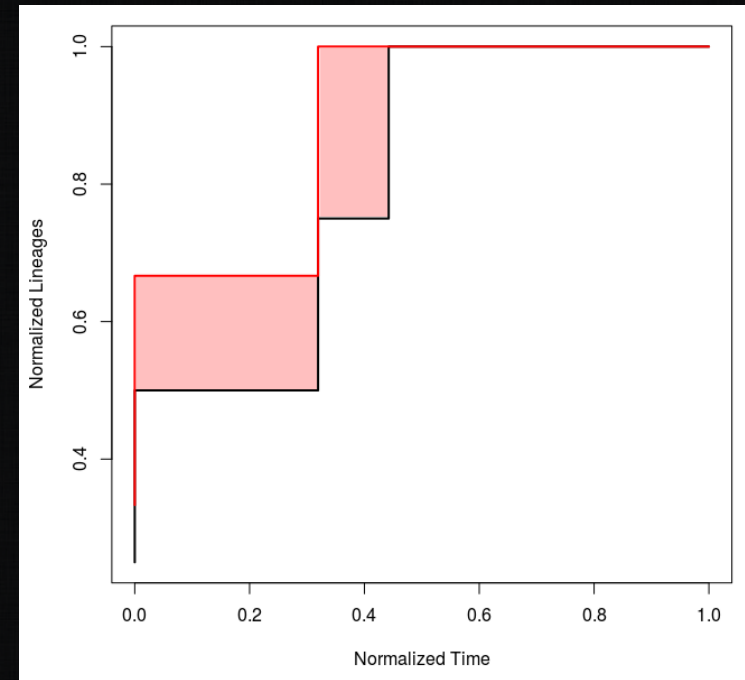
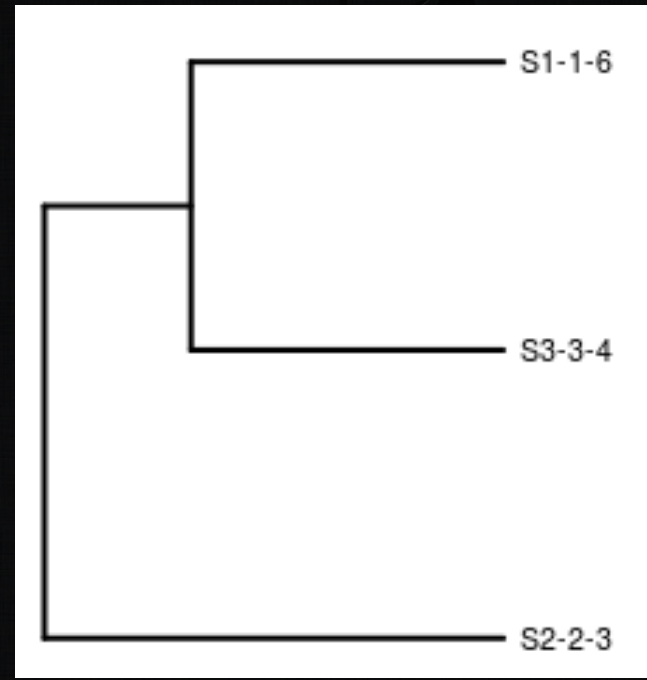
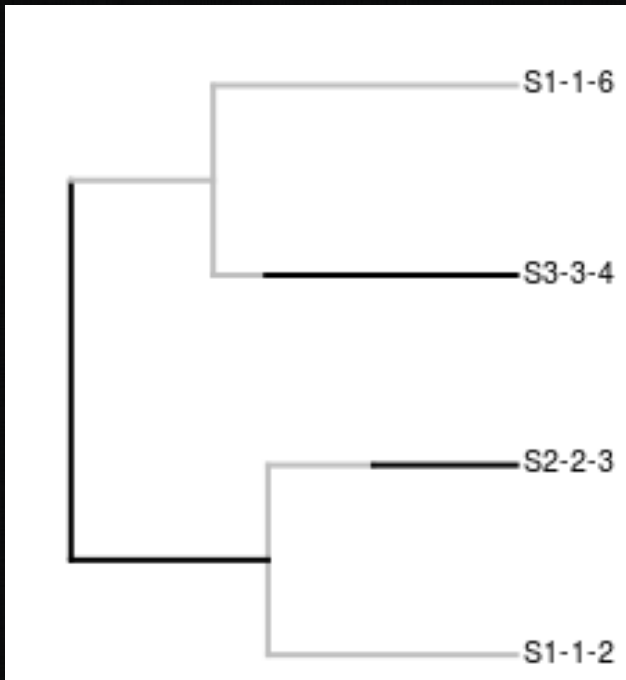


# Simulated truth



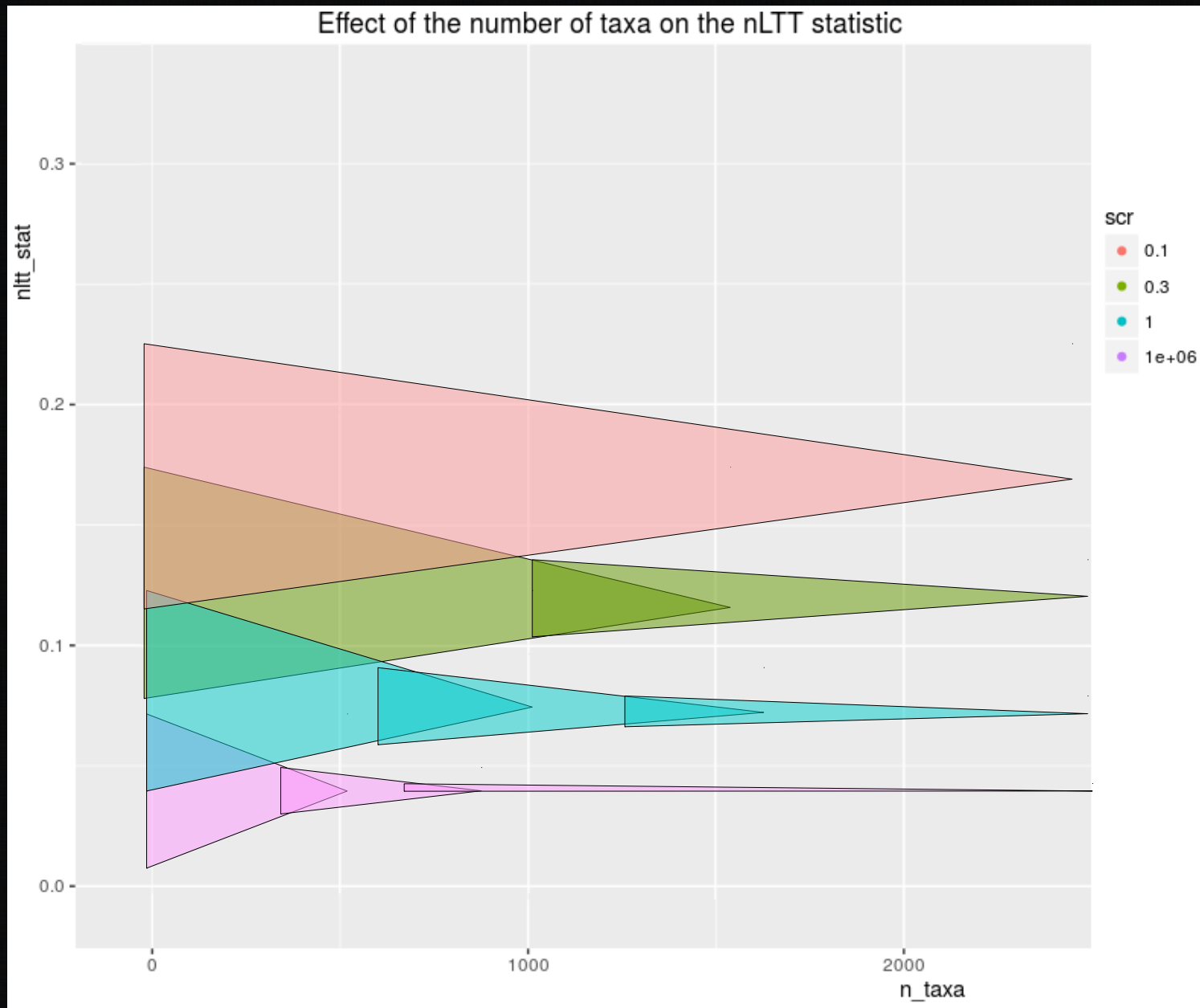
# nLTT statistic [1]

- Quantify difference between two phylogenies

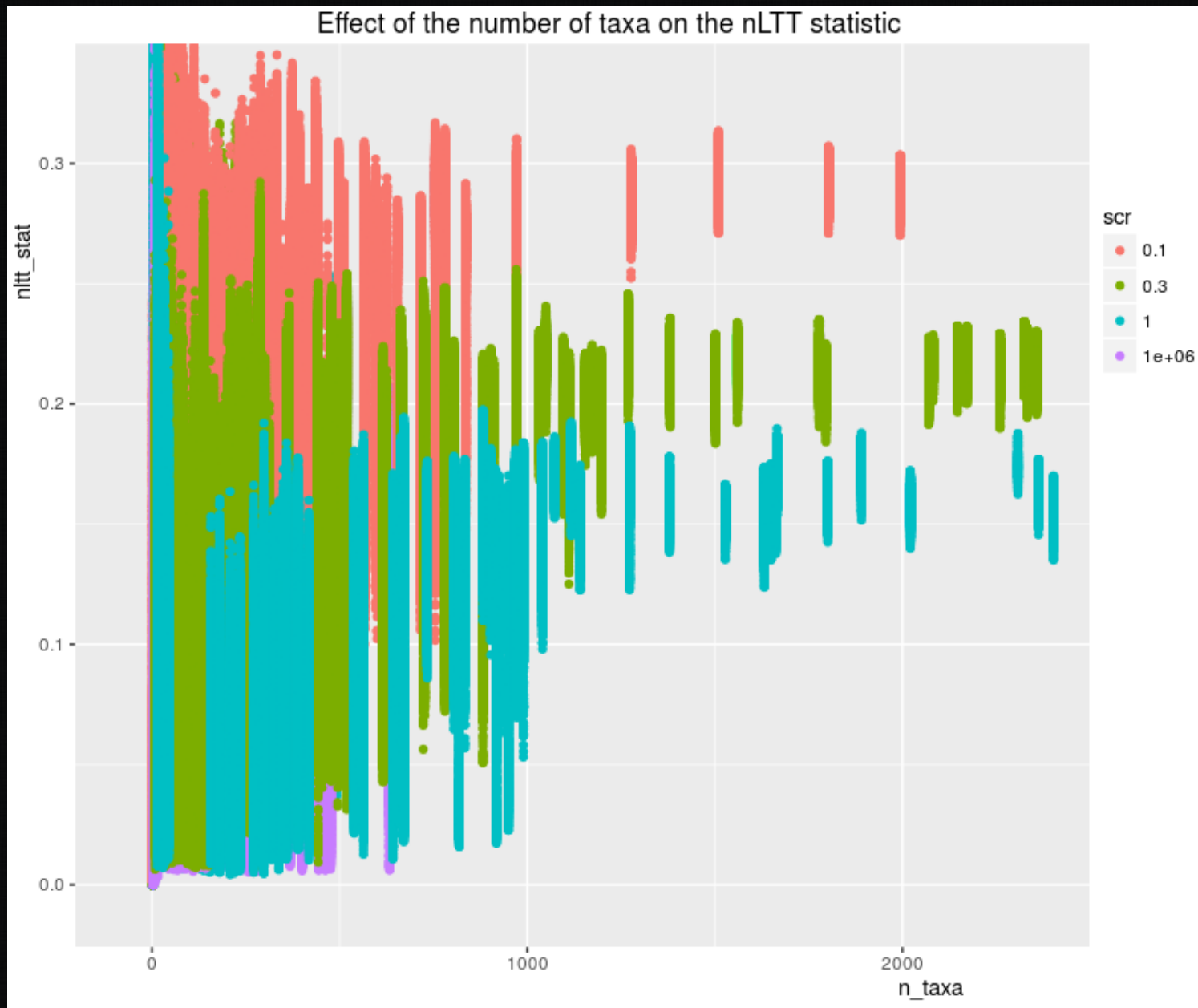




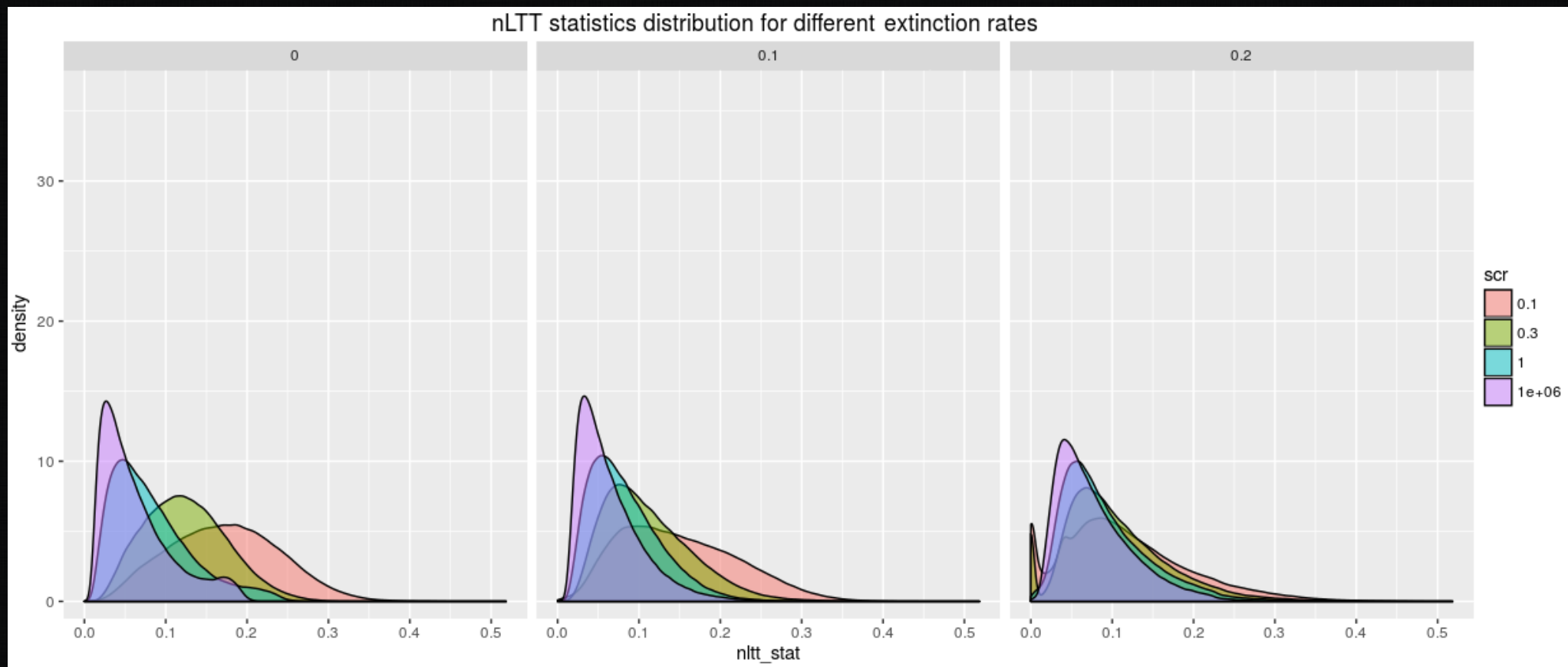
# Effect of #taxa, expected



# Effect of #taxa, measured



# Extinction rates





nLTT statistics distribution for different speciation initiation (rows) and extinction rates (columns)

