

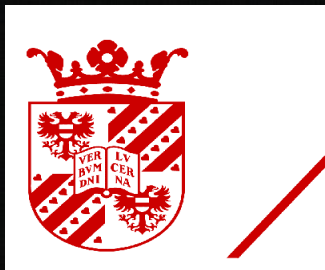
Ignoring incipient species

NAEM 2017-02-15

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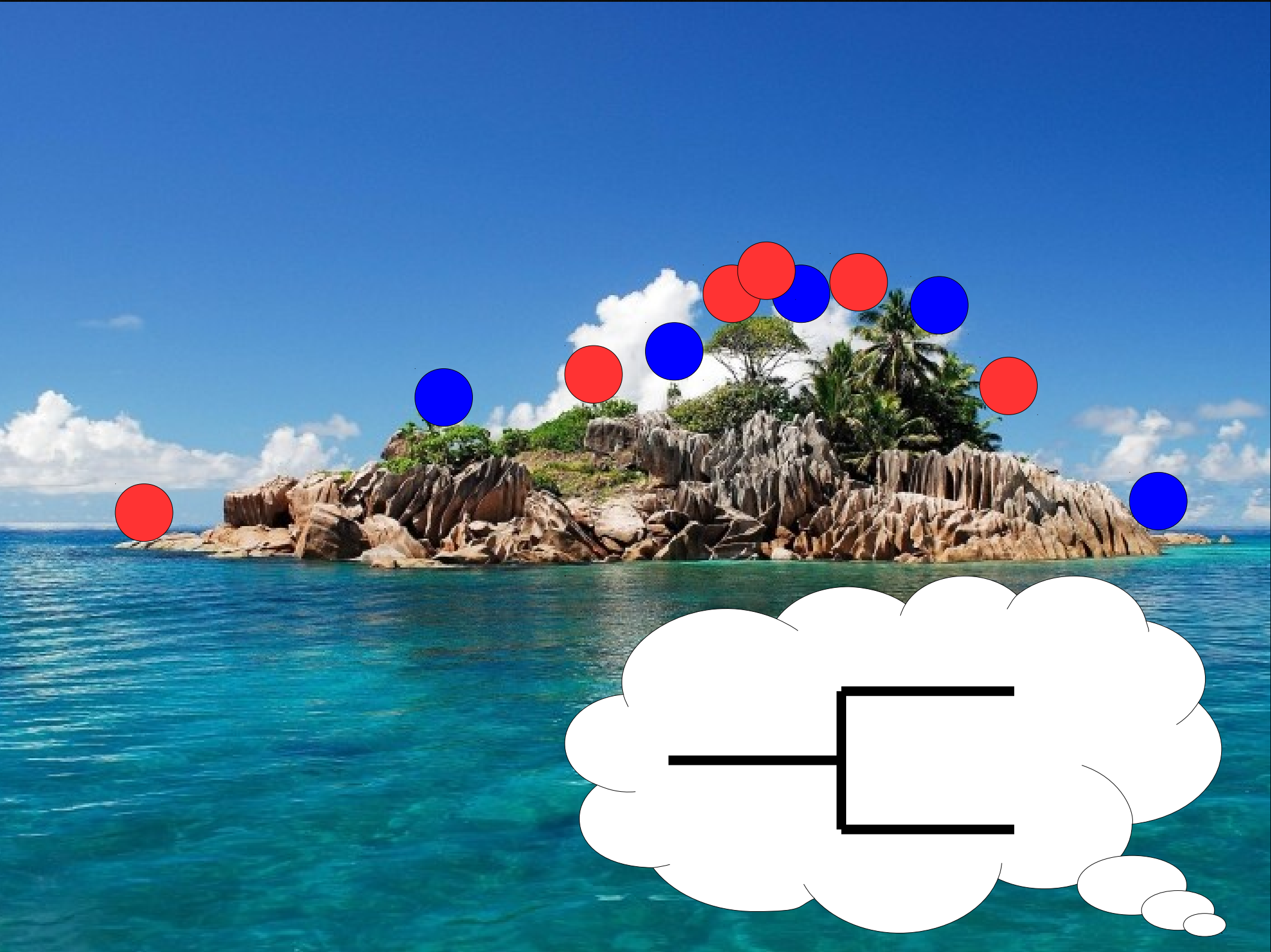
www.github.com/richelbilderbeek/Science





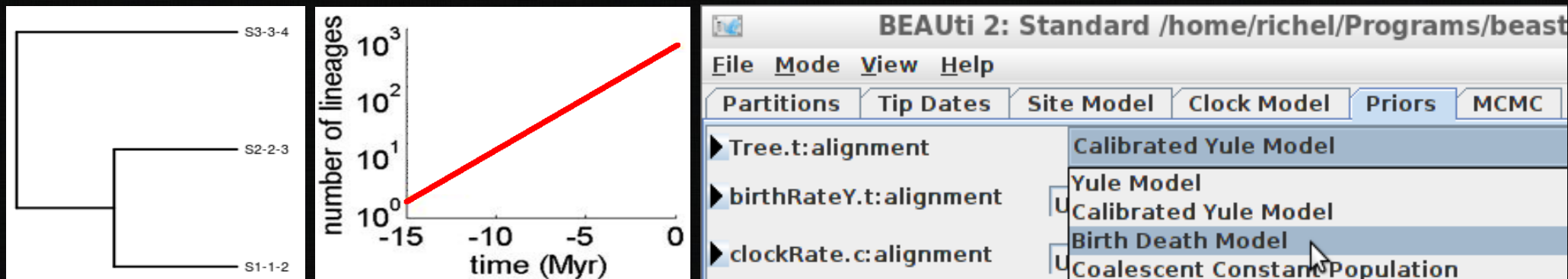




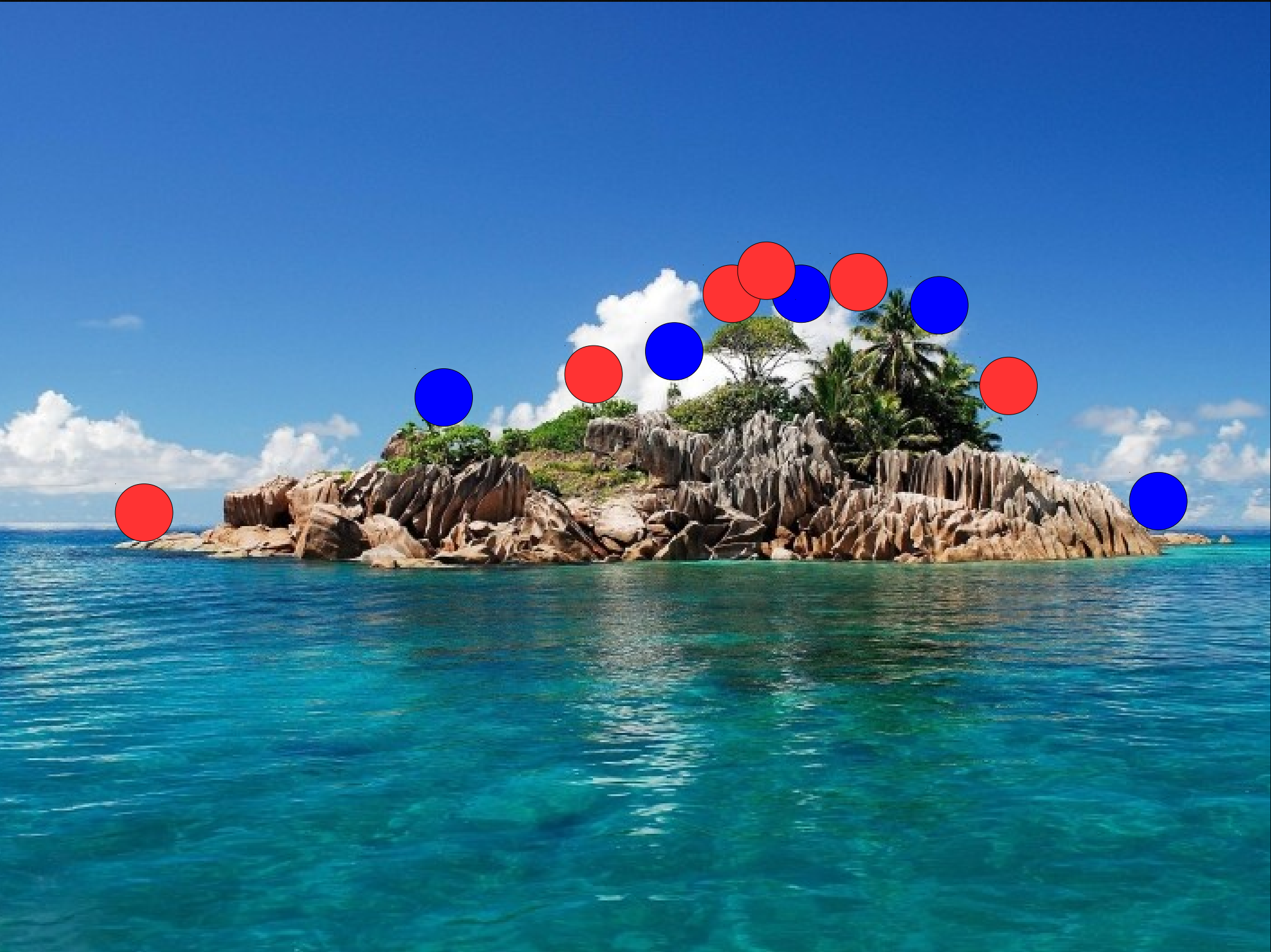


Birth Death model [1]

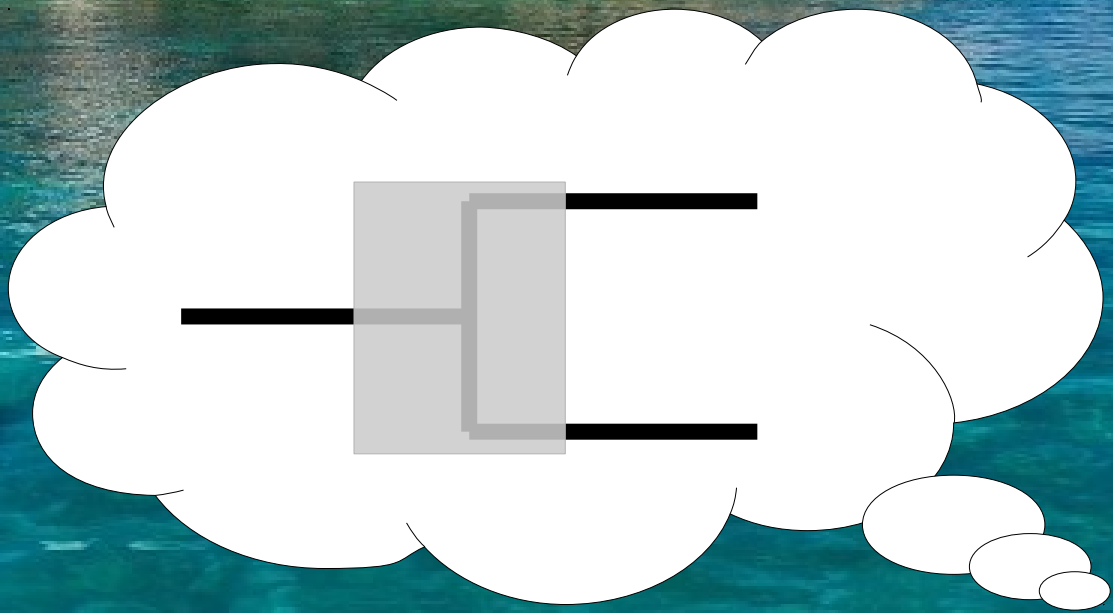
- All species are 'good' species
- Constant rate for speciation and extinction
- Number of species grows exponentially
- Widely used as prior in tools



[1] Nee et al., 1994

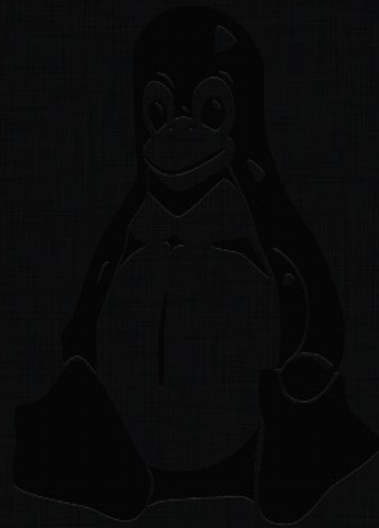




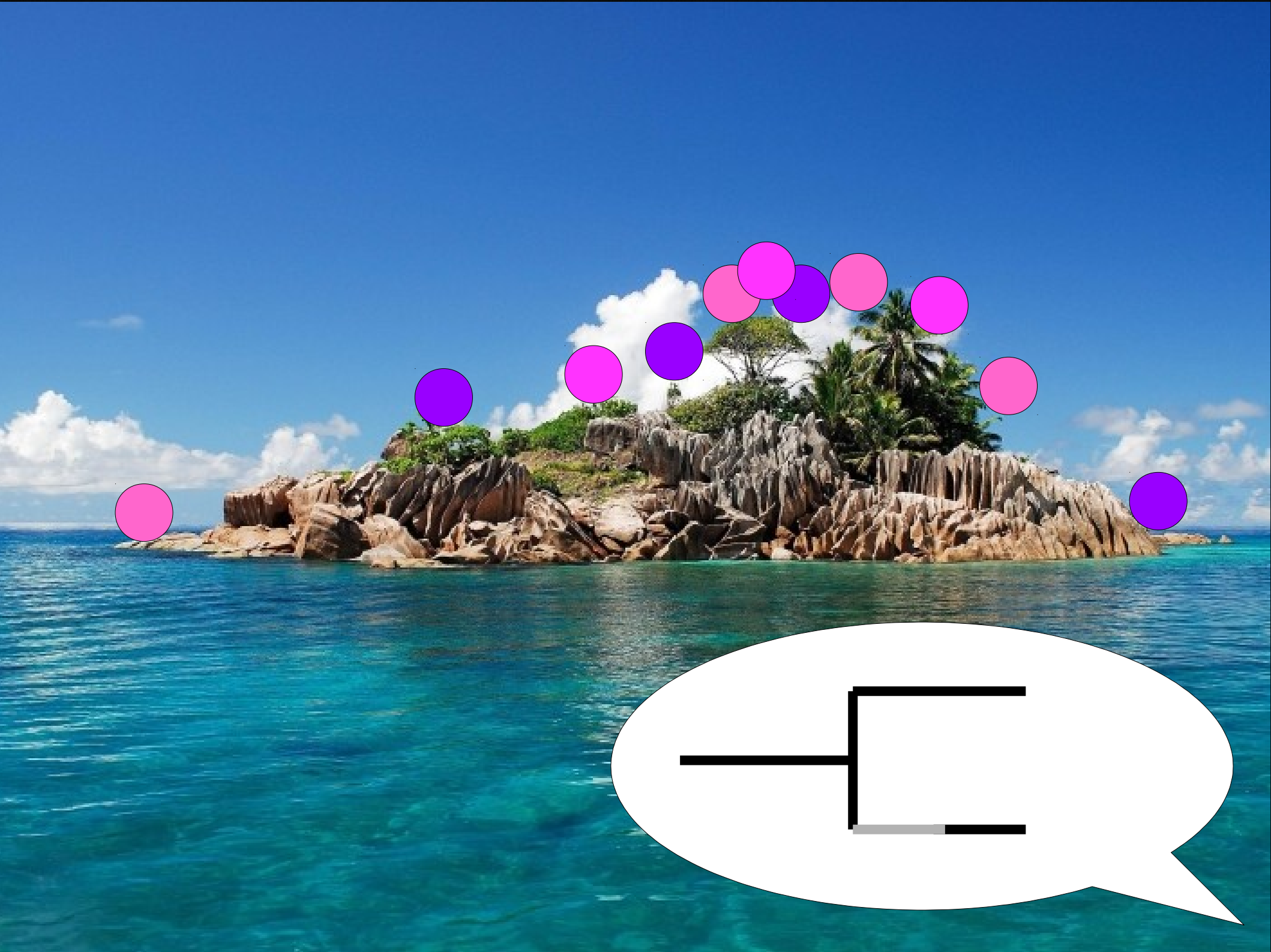


Research question

What is the effect of ignoring incipient* species ?

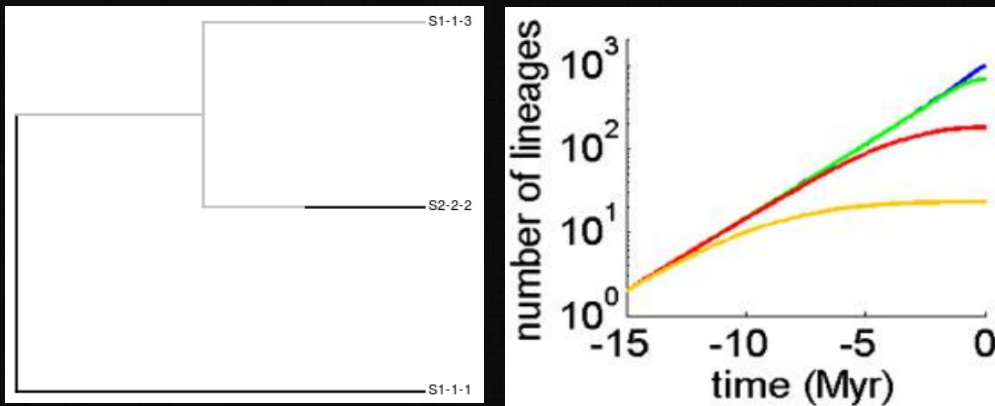


(*) A (possibly) future good species



Protracted speciation [1]

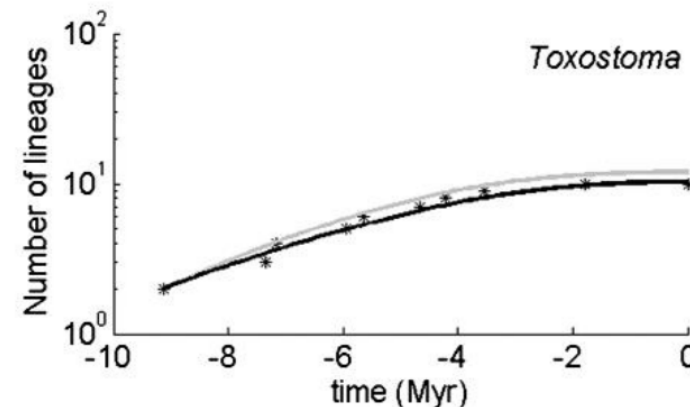
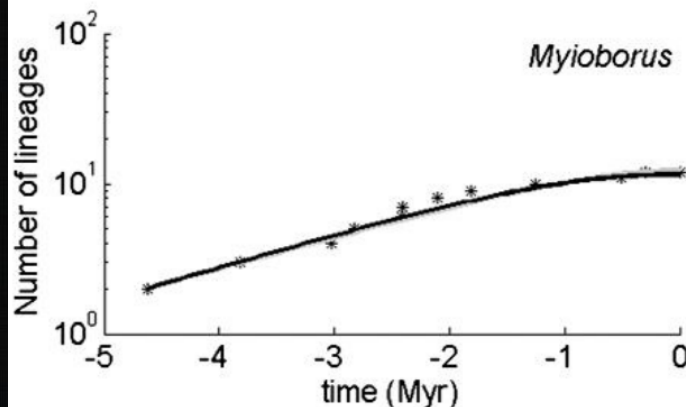
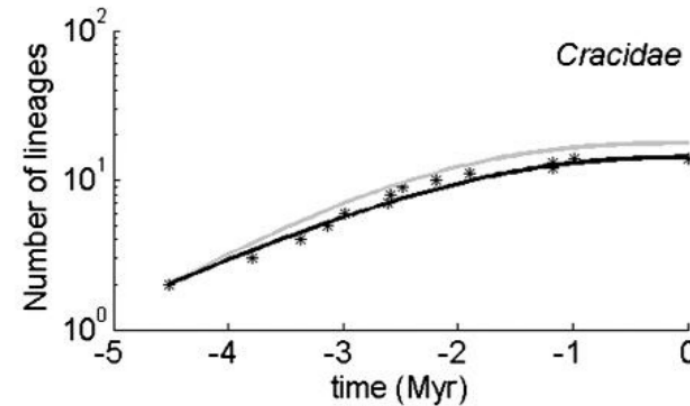
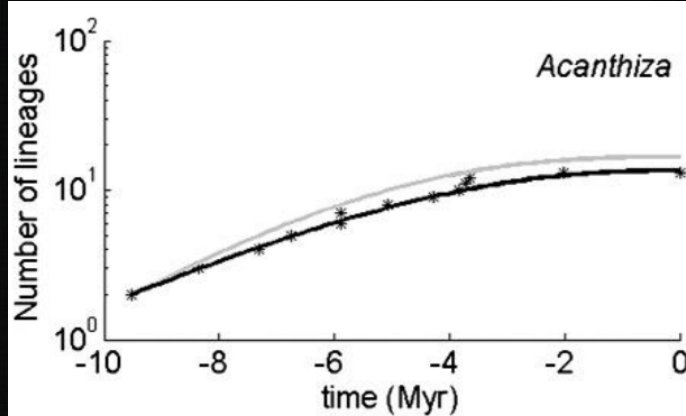
- Extension of BD model
- New species start as incipient
- Speciation completion rate
 - Incipient \rightarrow good
 - Falls back to BD if SCR equals infinity
- Number of lineages towards the present flattens off



[1] Etienne & Rosindell, 2012

PBD in nature

Acanthiza nana,
Yellow
Thornbill



Crax daubentoni,
Yellow-
knobbed
Curassow



Myioborus torquatus,
Collared
Whitestart



Toxostoma rufum,
Brown
Thrasher

Etienne & Rosindell, 2012

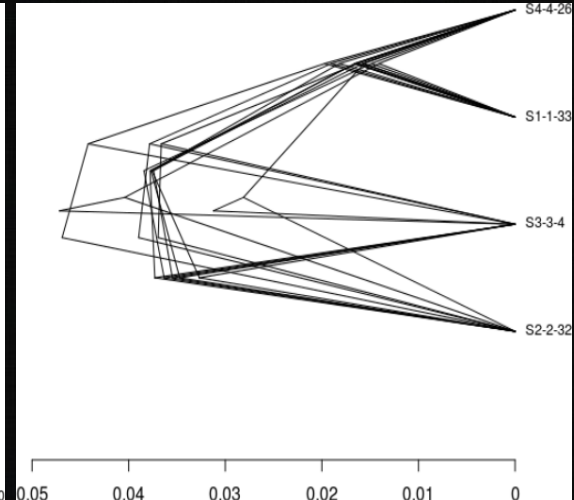
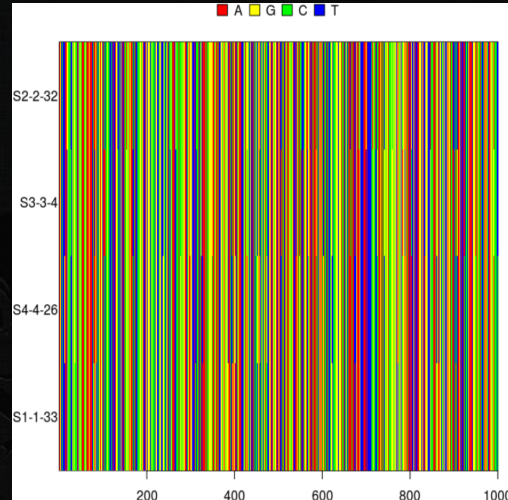
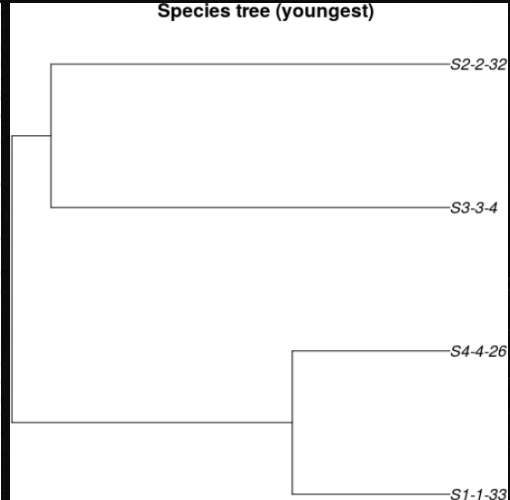
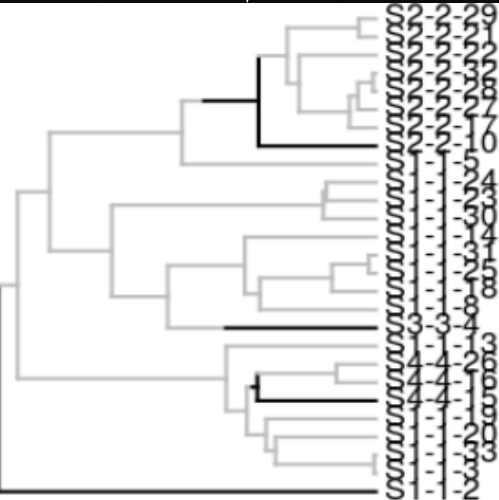
Research question

What is the effect of ignoring incipient* species ?

What if a BD model is assumed to make inferences about a PBD reality?

(*) A (possibly) future good species

Approach



Simulate an
incipient
species tree

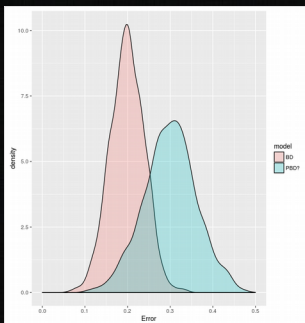
Sample species
trees

PBD

Simulate DNA
alignments

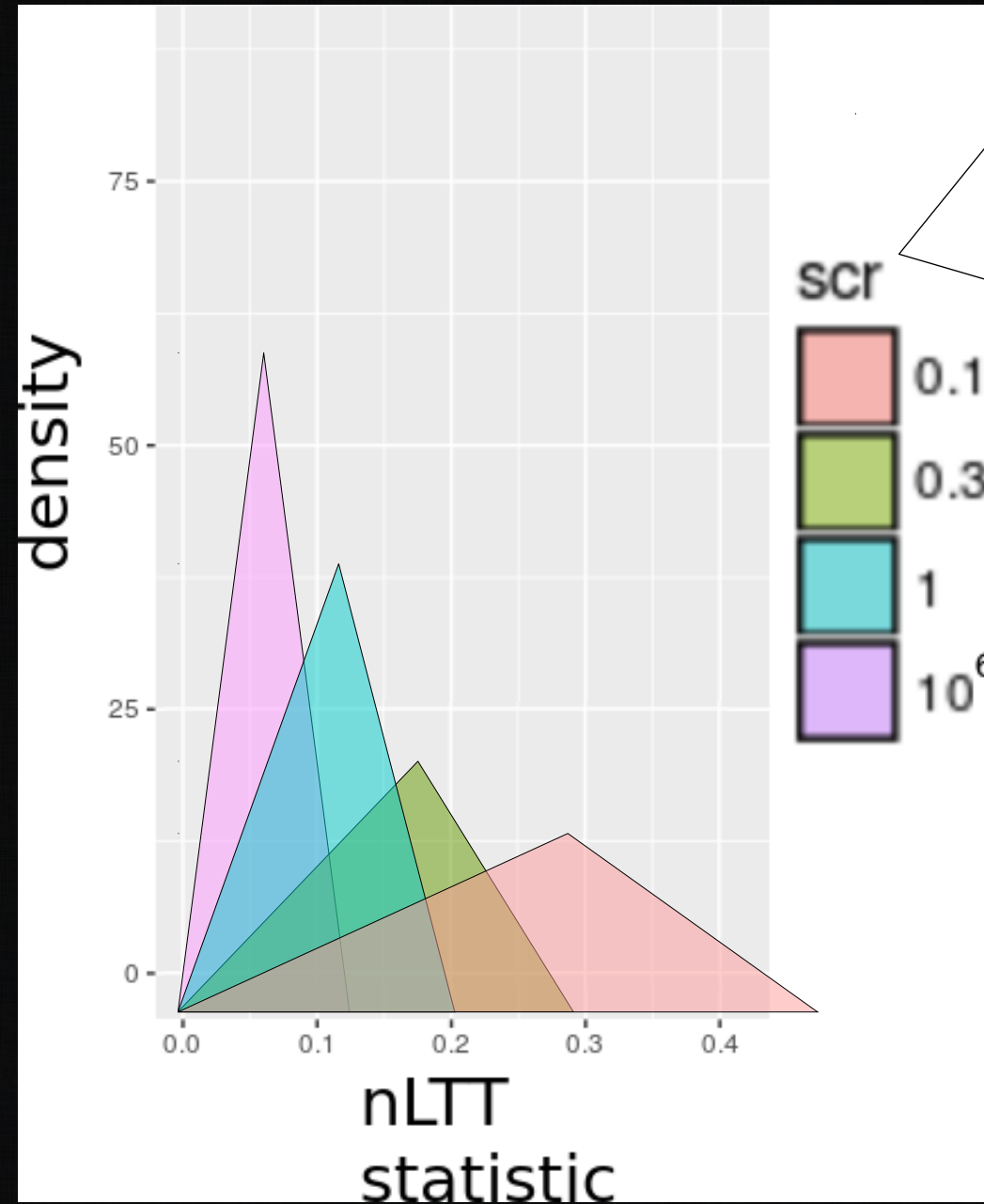
Infer species
tree posterior
(BEAST2)

BD
prior



Measure difference/error (nLTT statistic)

Effect of SCR, prediction

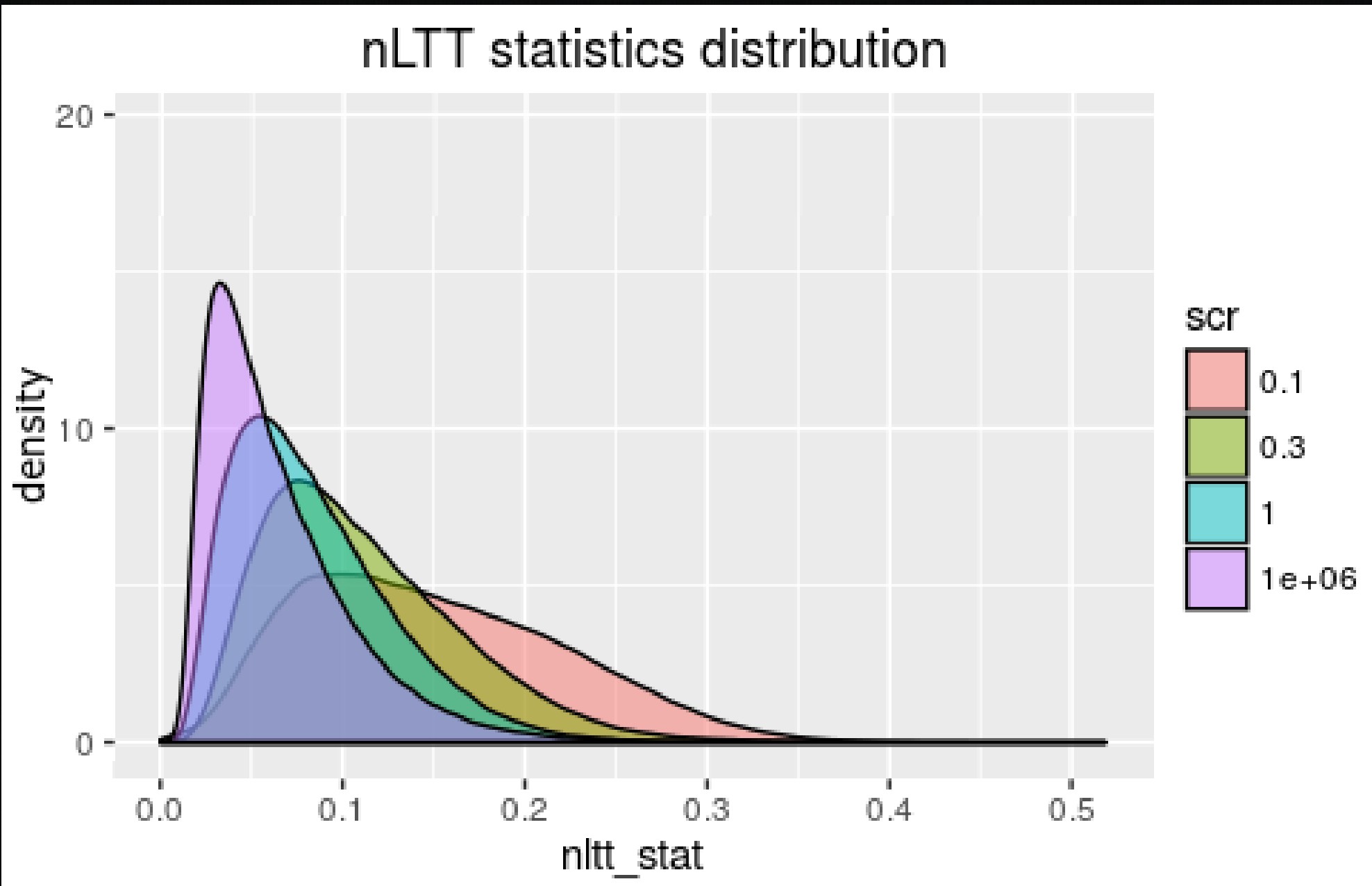


Speciation Completion Rate

Protracted Birth-Death

Birth-Death (BD) model

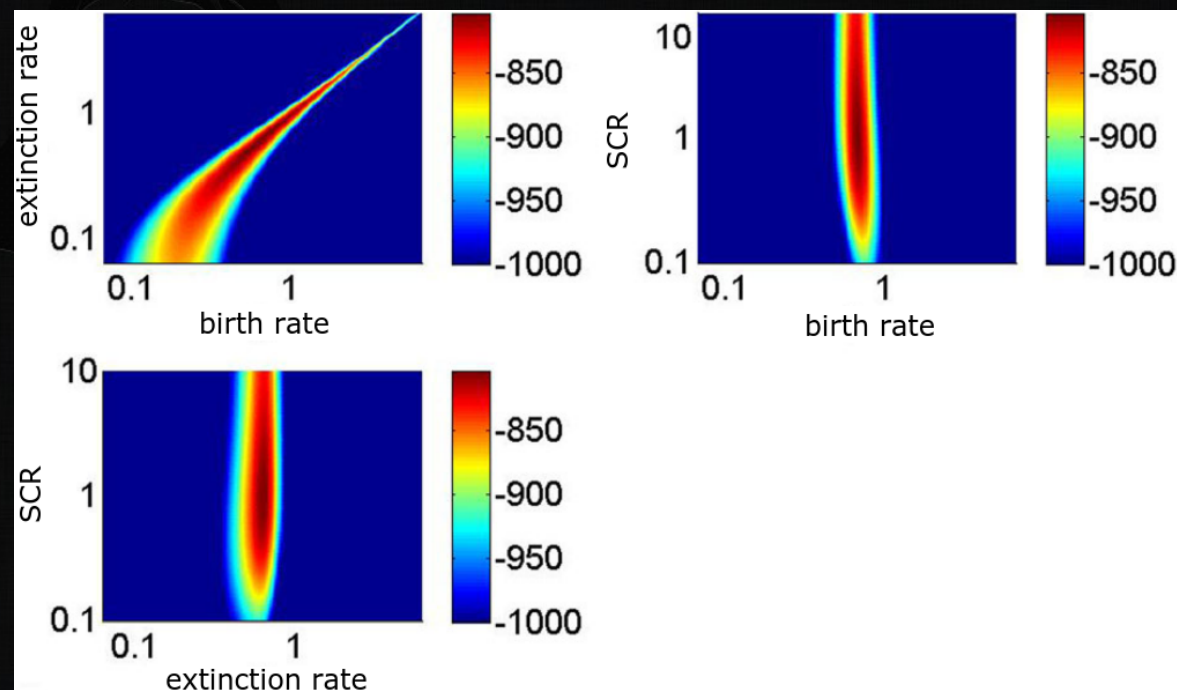
Effect of SCR, measured



SCRs in nature

- Birds: 0.04-0.89
- Primates: around 1

Data set	λ_2 (Myr ⁻¹)
<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

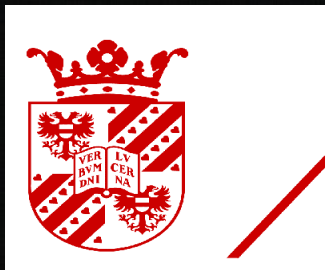
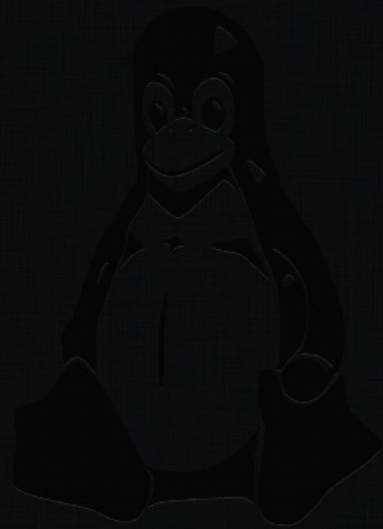
- Low SCR increases the error made in inference by a BD prior
- For primates ($SCR \approx 1$): good enough
- For birds ($SCR < 1$): maybe not
- Higher extinction rates reduces error (not shown)

Discussion

- Factorial setup of all parameters failed for some combinations for unknown reasons
 - Only one speciation initiation rate
- Other summary statistics
 - gamma, Δr , NRBS
- Redo my research:
 - www.GitHub.com/richelbilderbeek
 - wiritttes: simulation
 - wiritttea: analysis

Acknowledgements

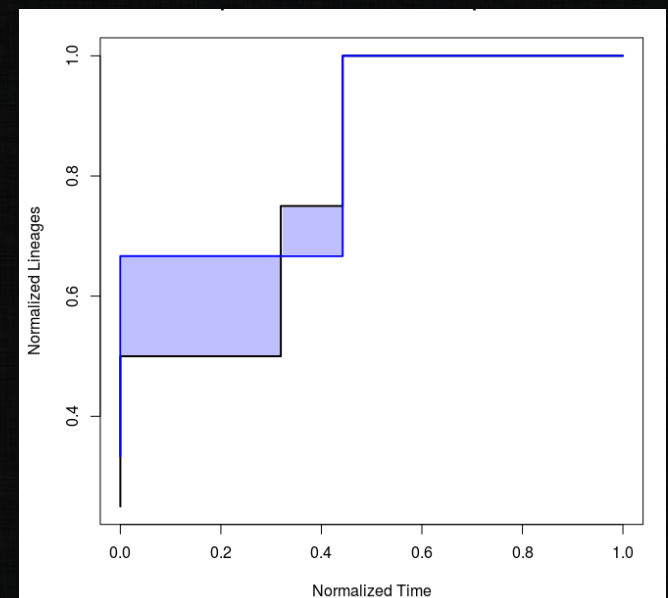
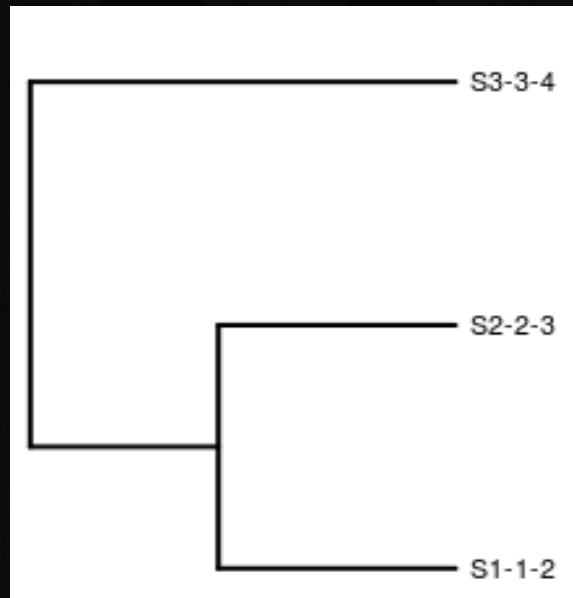
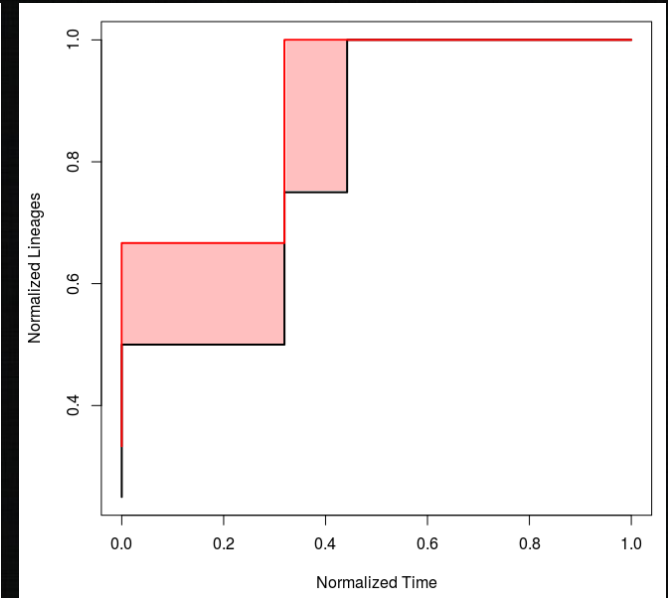
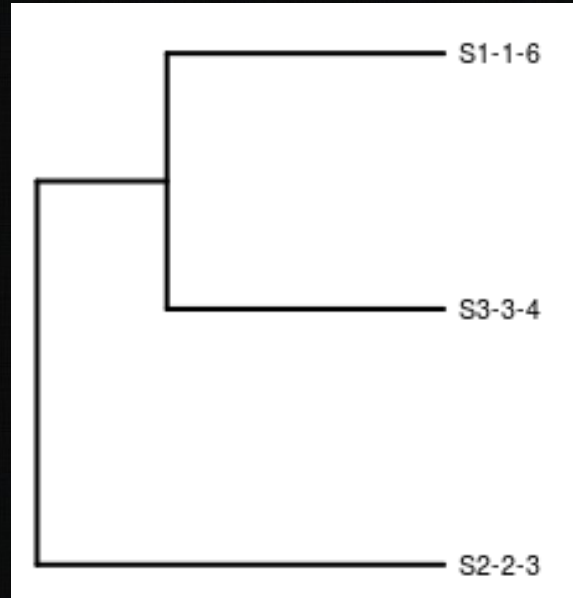
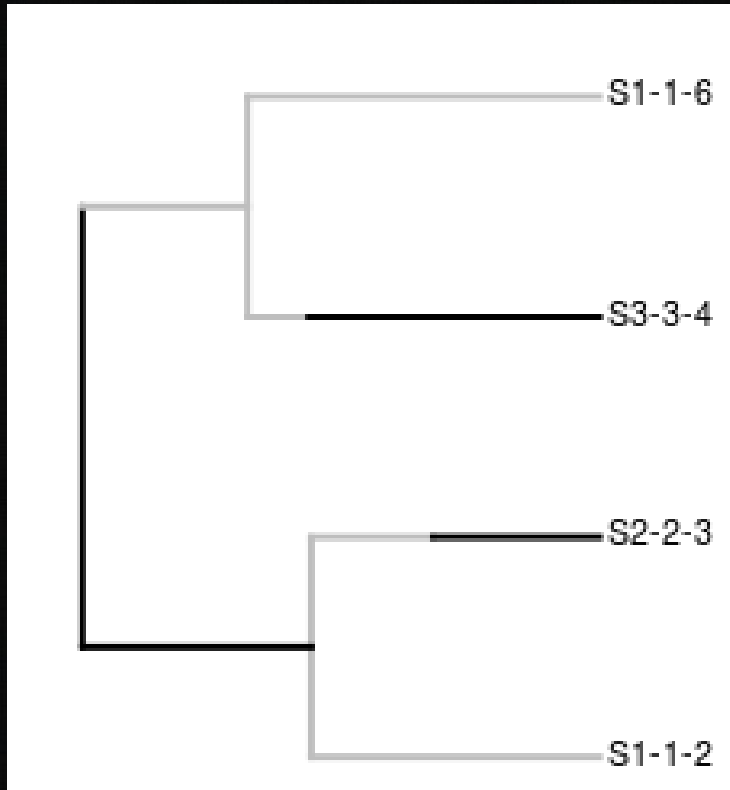
- Rampal Etienne
- Jolien Gay
- Femke Thon



Questions?

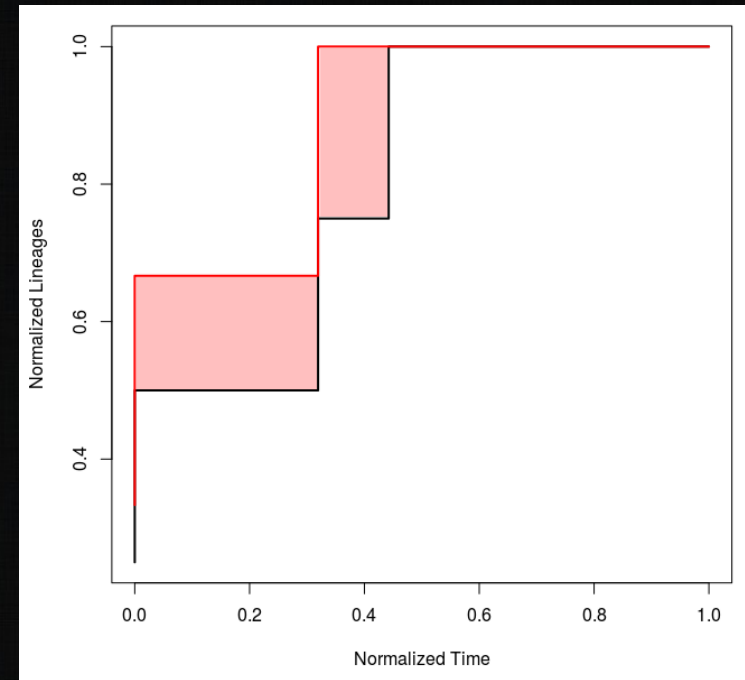
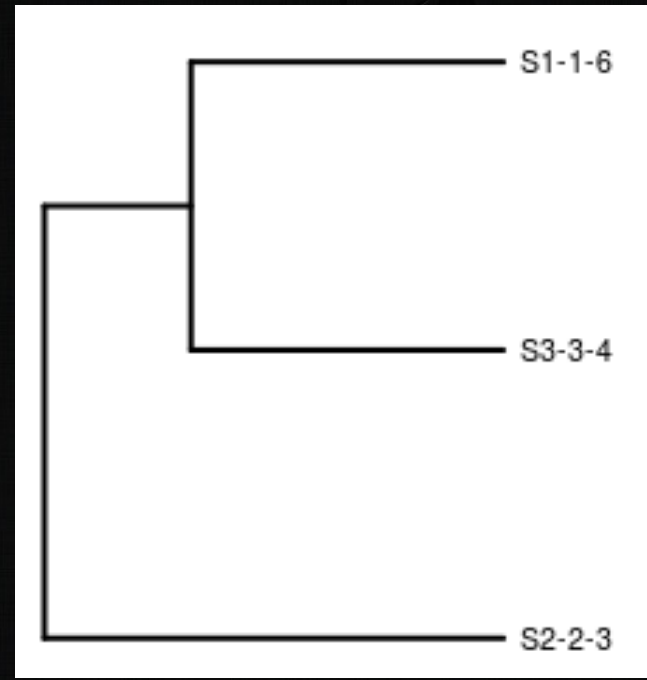
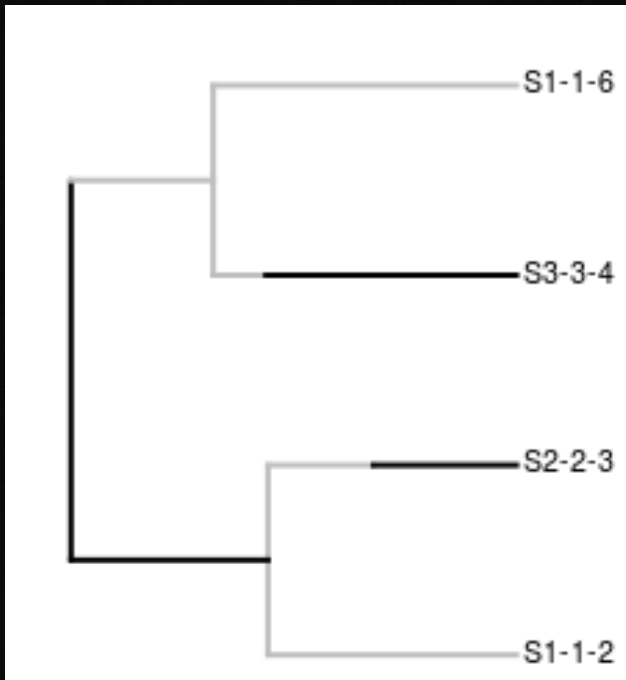


Simulated truth

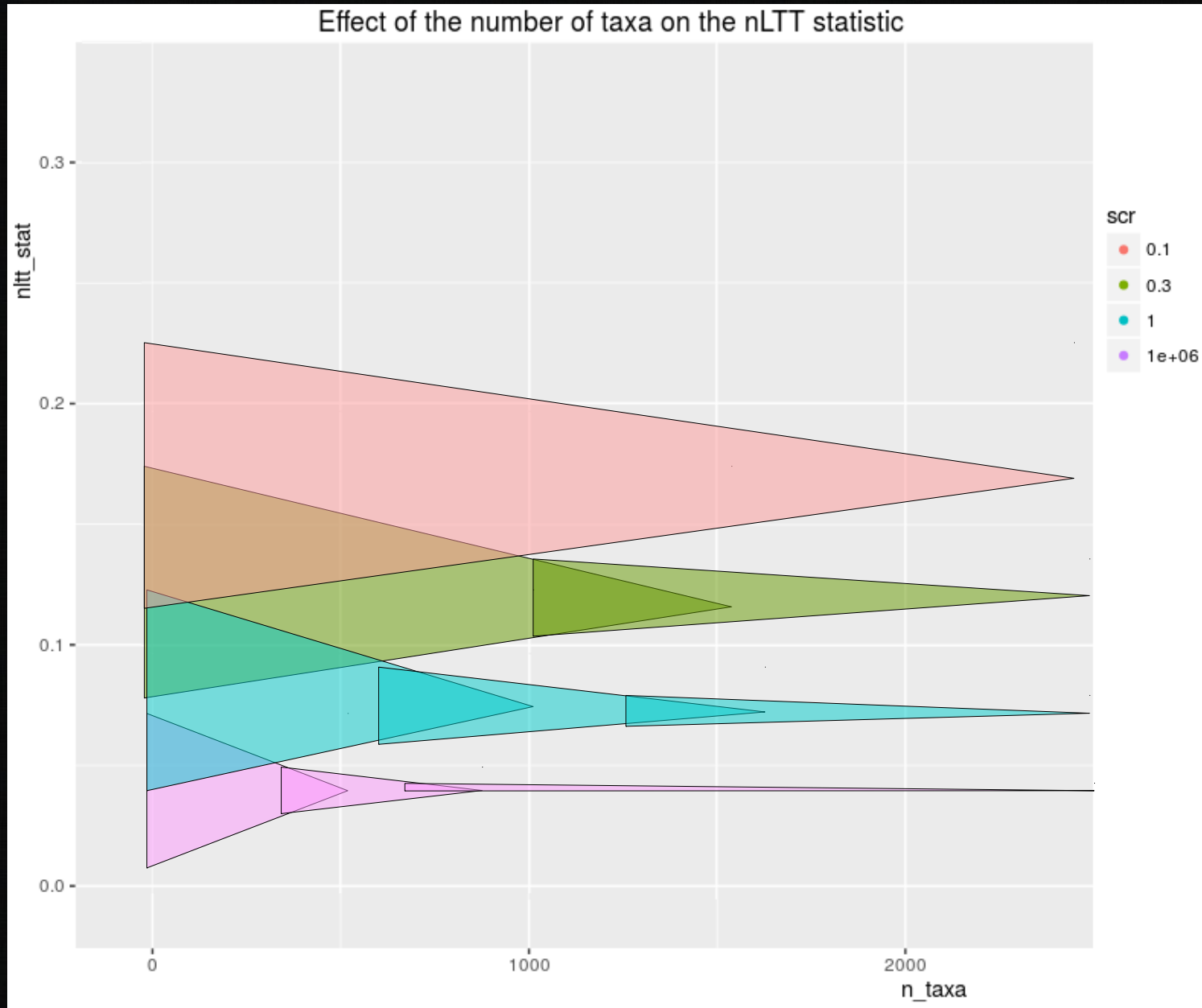


nLTT statistic [1]

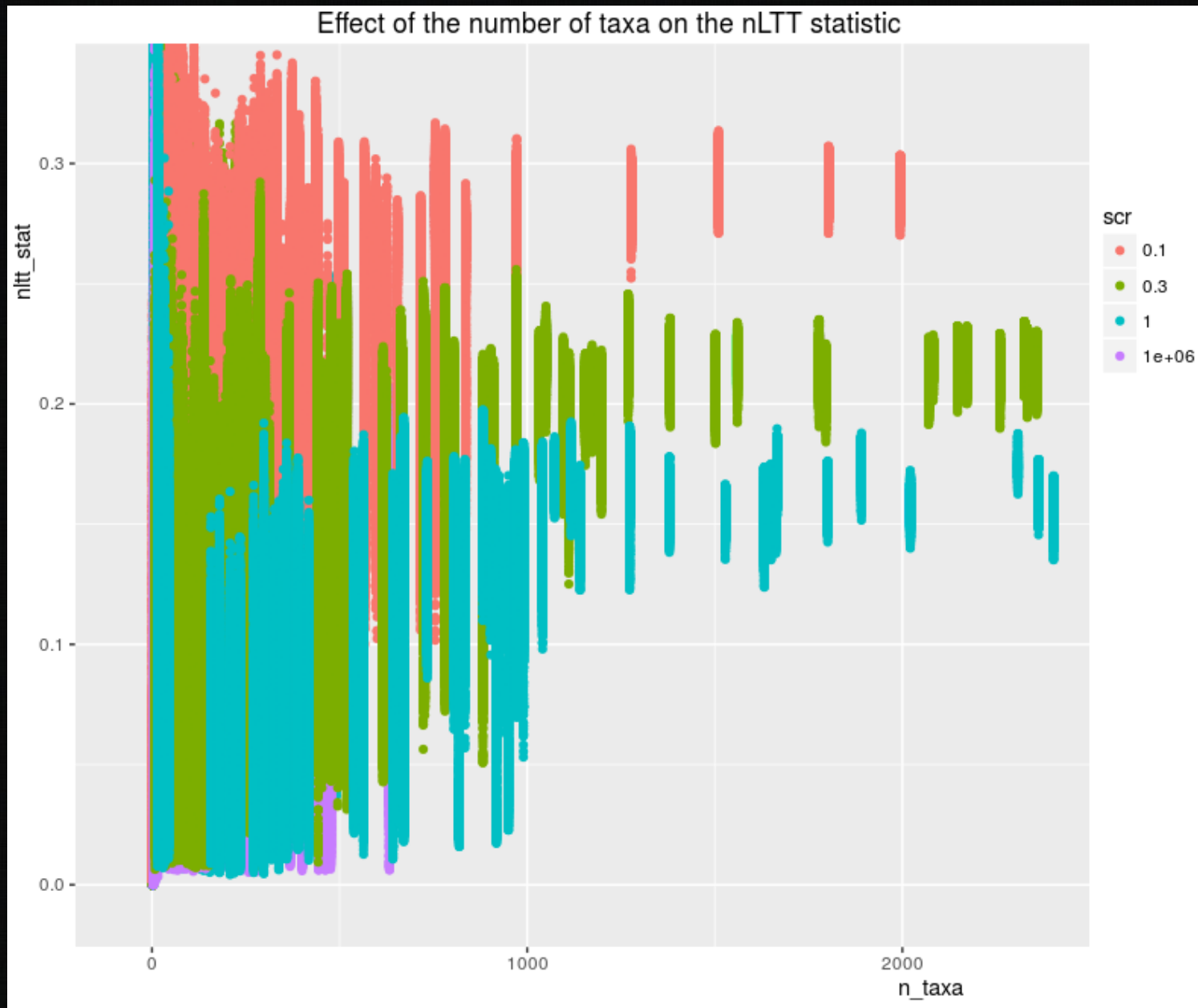
- Quantify difference between two phylogenies



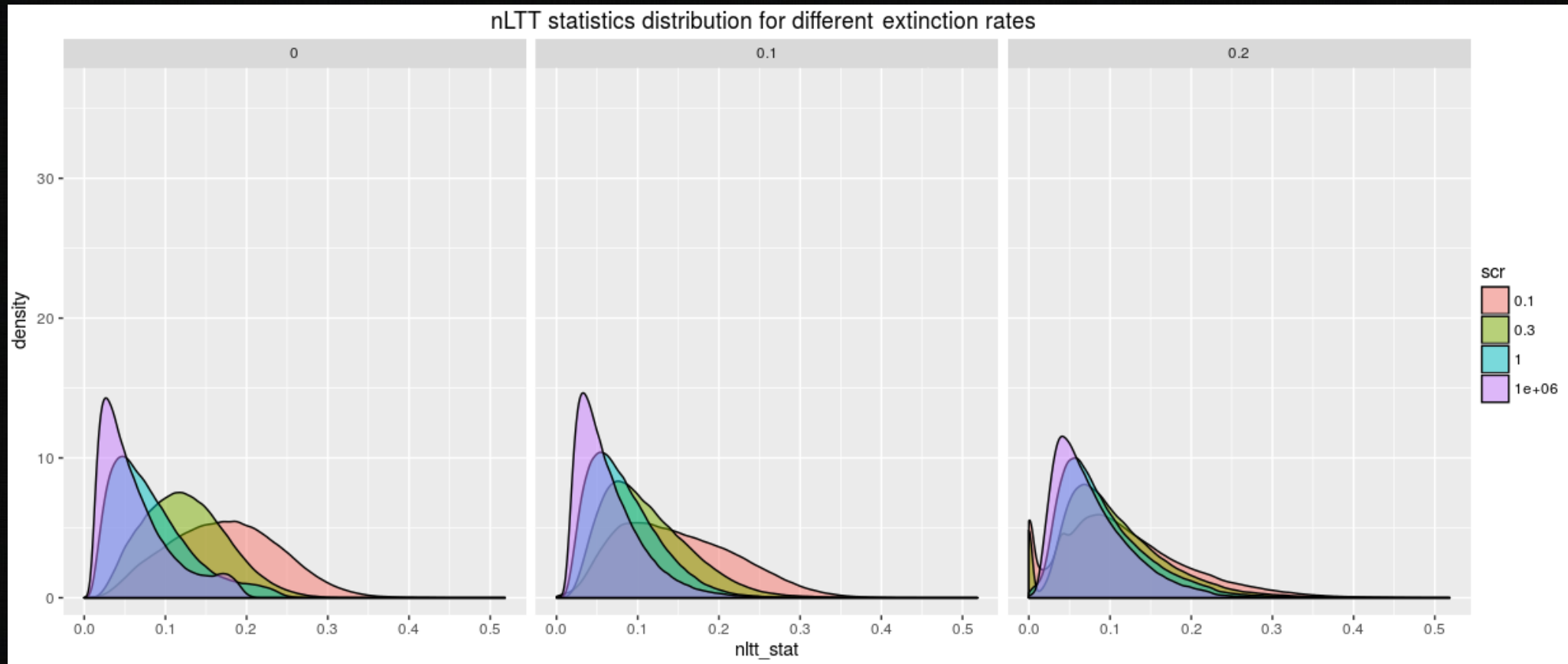
Effect of #taxa, expected



Effect of #taxa, measured



Extinction rates



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

