SNAPP

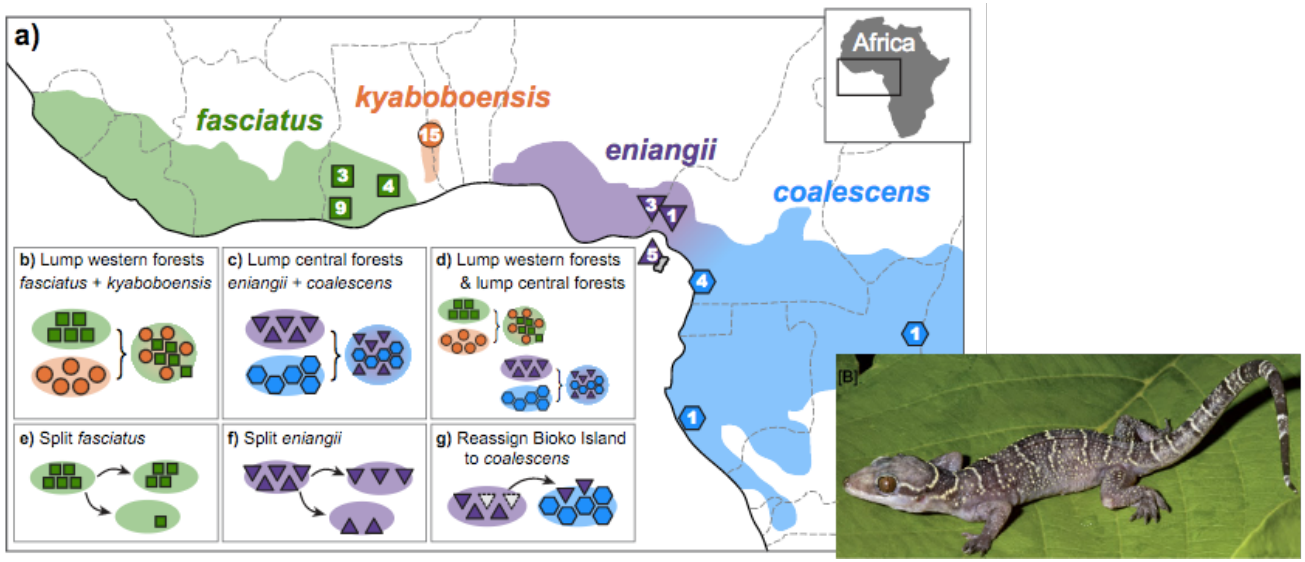
- Empirical mutation rates – use "Calc mutation rates" button
- Pay attention to values in "prior" panel – defaults are almost certainly wrong
- Start with small number of lineages, say 50, and see how SNAPP behaves scaling things up
  NB: In diploid data, each sequence counts as 2 lineages!
- Threads can help or hinder – experiment to see how many for your data

How to do species delimitation?

Bayesian Factor Delimitation

- consider different species assignments in a multi species coalescent analysis
- use path sampling to calculate marginal likelihoods (MLs)
- determine Bayes factors from MLs
- BFD for *BEAST, BFD* for SNAPP

Fujita et al, Trends Eco & Evo, 2012, Leach et al, Sys Bio, 2014 , model-selection, SNAPP



How to do species delimitation?

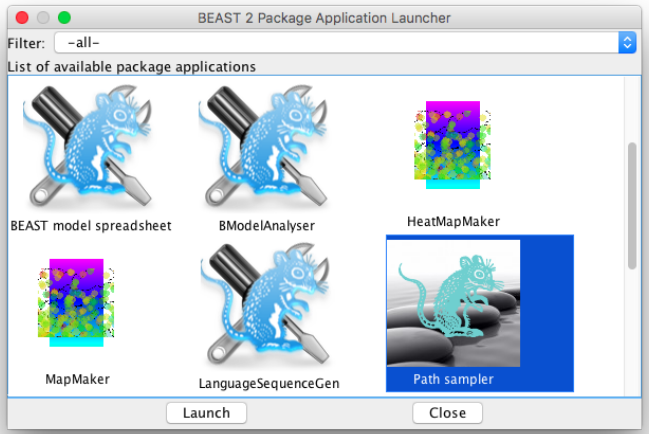
STACEY: Species Tree And Classification Estimation, Yarely

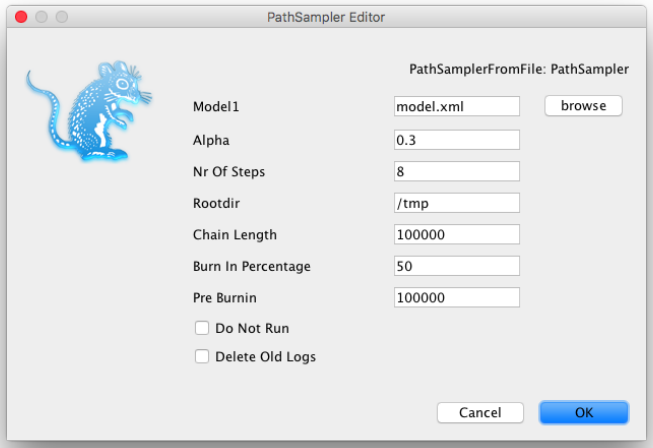
- joint estimate of species tree and species assignment
- considers a species everything joined with branch lengths $< \epsilon$
- faster than *BEAST: integrates out population sizes + better MCMC operators (but keep an eye on StartBeast2)

Jones, Journal of Mathematical Biology, 2016, STACEY

Path sampling/Stepping stone in practice

Set up through XML or GUI





Creates subdirectory structure, one for each step containing all log files.

Path sampling/Stepping stone in practice

Set up through command line

- to list BEAST apps in Windows:
  `\path\to\appstore -list`
  OSX, Linux:
  `/path/to/appstore -list`
- To show `PathSampler` options:
  `/path/to/appstore -PathSampler -help`
- To set up `PathSampler` analysis:
  `/path/to/appstore PathSampler -nrOfSteps 64 -rootdir dir/withs/steps -burnInPercentage 50 -model beast.xml`

Path sampling/Stepping stone in practice

To set up on a HPC cluster

- Set up locally, using 'doNotRun' flag = true
- Move steps to cluster, and run steps in paralel there
- Estimate ML using `PathSampleAnalyser` – available via BEAST appstore/BEAUti File/AppLauncher menu

```
/path/to/appstore PathSampleAnalyser -nrOfSteps 64 -rootdir
dir/withs/steps -burnInPercentage 50
```

Path sampling/Stepping stone in practice

Hacking the XML:

```
<run spec="beast.inference.PathSampler"
     chainLength="1000" alpha="0.3"
     rootdir="/home/desktop/BFD*-tutorial/runA/"
     doNotRun="true" deleteOldLogs="true" nrOfSteps="24">
```

```
cd $(dir)
java -cp $(java.class.path) beast.app.beastapp.BeastMain \
  $(resume/overwrite) -java -seed $(seed) beast.xml
```

```
<mcmc ...
```

Edit script for clusters, e.g. add `load module java`
Run beast on XML with say 8 threads to create 8 run files for starting jobs