

**Supplementary File 3 for:**

**INFERRING ANCESTRAL RANGE RECONSTRUCTION  
ON TRILOBITE RECORDS: A STUDY-CASE BASED ON  
*METACRYPHAEUS* (PHACOPIDA, CALMONIIDAE)**

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This file contains the results of the biogeographic (ancestral area reconstruction and biogeographic stochastic mapping) analyses. The following data is presented:

**Table 1.** Pairwise comparison of the results of the ancestral area reconstructions of nested DEC models on tree 2.

**Table 2.** Summary of BSM counts based on DEC M2 model showing the mean, standard deviations (SD), and percentage of different types of biogeographic events.

**Table 3.** Counts (and standard deviations in parentheses) of dispersal events averaged across 100 biogeographic stochastic mappings based on the biogeographic history of *Metacrypheus* according to DEC M2 model. (A) Bolivia and Peru, (B) Paraná Basin, (C) South Africa, (D) Falkland Islands, and (E) Parnaíba Basin.

**Figure 1.** Time scaled tree 1 employed in the biogeographic analyses.

**Figure 2.** Time scaled tree 2 employed in the biogeographic analyses.

**Figures 3-8.** BioGeoBEARS output containing the results of the ancestral area reconstructions on tree 1.

**Figure 9.** Histogram of events counts based on biogeographic stochastic mapping on tree 1.

**Figures 10-15.** BioGeoBEARS output containing the results of the ancestral area reconstructions on tree 2.

**Figure 16.** Histogram of events counts based on biogeographic stochastic mapping on tree 2.

**Appendix 1.** Plots of 100 BSMs on tree 1.

**Appendix 2.** Plots of 100 BSMs on tree 2.

**Table 1.** Pairwise comparison of the results of the ancestral area reconstructions of nested DEC models on tree 2.

Alternative Model	LnL	DF	Null Model	LnL	DF	Likelihood Ratio Test <i>p</i>
DEC+w	-34.43	3	DEC	-32.95	2	0.31
DEC+w+j	-29.90	4	DEC+w	-32.43	3	0.024

**Table 2.** Summary of BSM counts based on DEC M2 model showing the mean, standard deviations (SD), and percentage of different types of biogeographic events.

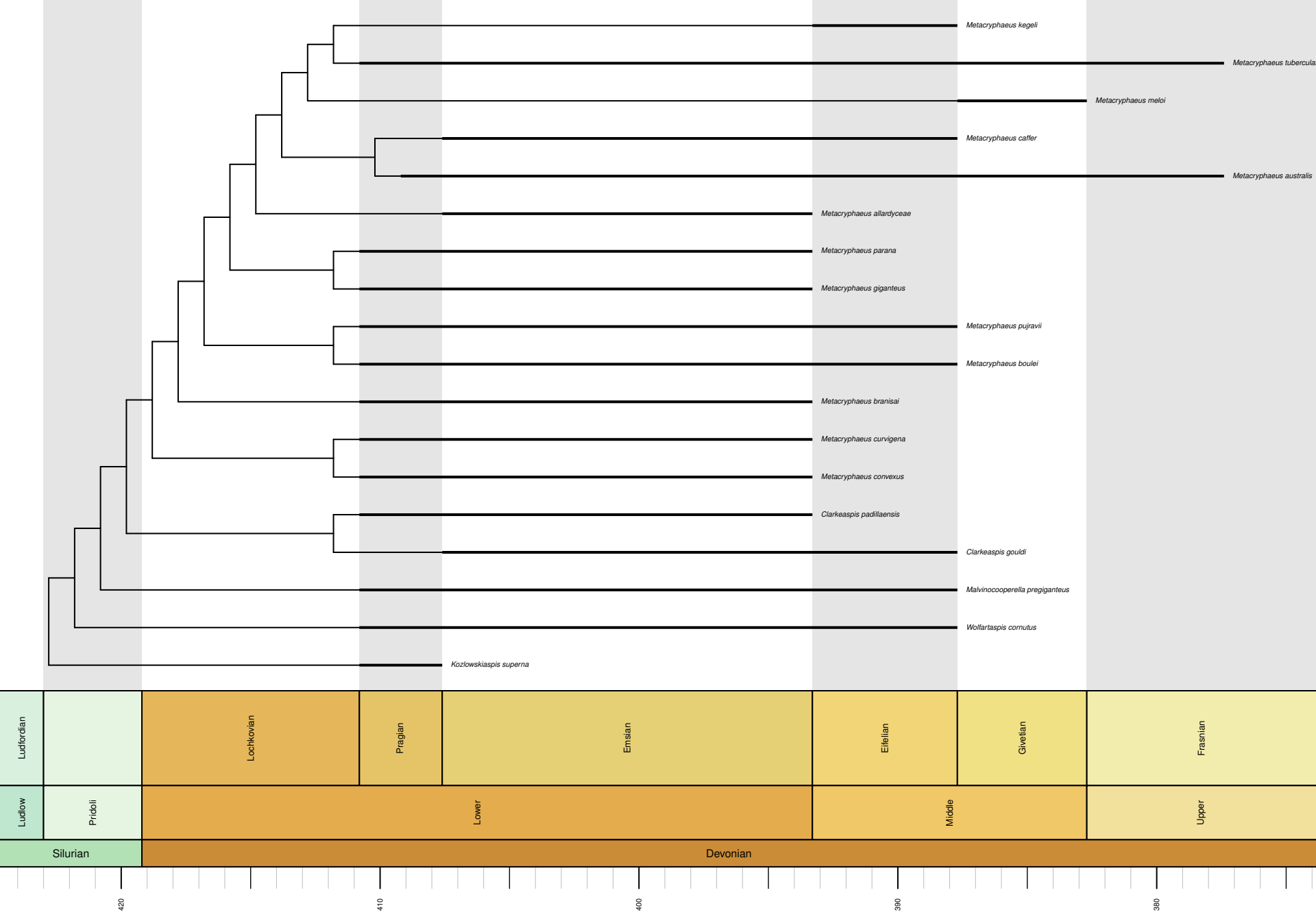
Type	Mean (SD)	%
range contractions (e)	0 (0)	0.0%
range expansion (d)	2.72 (0.65)	13.8%
founder events (j)	3.92 (1.58)	19.9%
all dispersals	6.64 (1.10)	33.7%
sympatry (y)	11.07 (0.82)	56.1%
subset speciation (s)	1.29 (1.12)	6.5%
vicariance (v)	0.72 (0.65)	3.6%

**Table 3.** Counts (and standard deviations in parentheses) of dispersal events averaged across 100 biogeographics stochastic mappings based on the biogeographic history of *Metacrypheus* according to DEC M2 model. (A) Bolivia and Peru, (B) Paraná Basin, (C) South Africa, (D) Falkland Islands, and (E) Parnaíba Basin.

	A	B	C	D	E
A	0 (0)	2.51 (0.56)	0.09 (0.29)	0.67 (0.47)	1.46 (0.52)
B	0.41 (0.67)	0 (0)	0.87 (0.34)	0.31 (0.46)	0.01 (0.10)
C	0.05 (0.22)	0.14 (0.35)	0 (0)	0.02 (0.14)	0 (0)
D	0.01 (0.10)	0.05 (0.22)	0.04 (0.20)	0 (0)	0 (0)
E	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

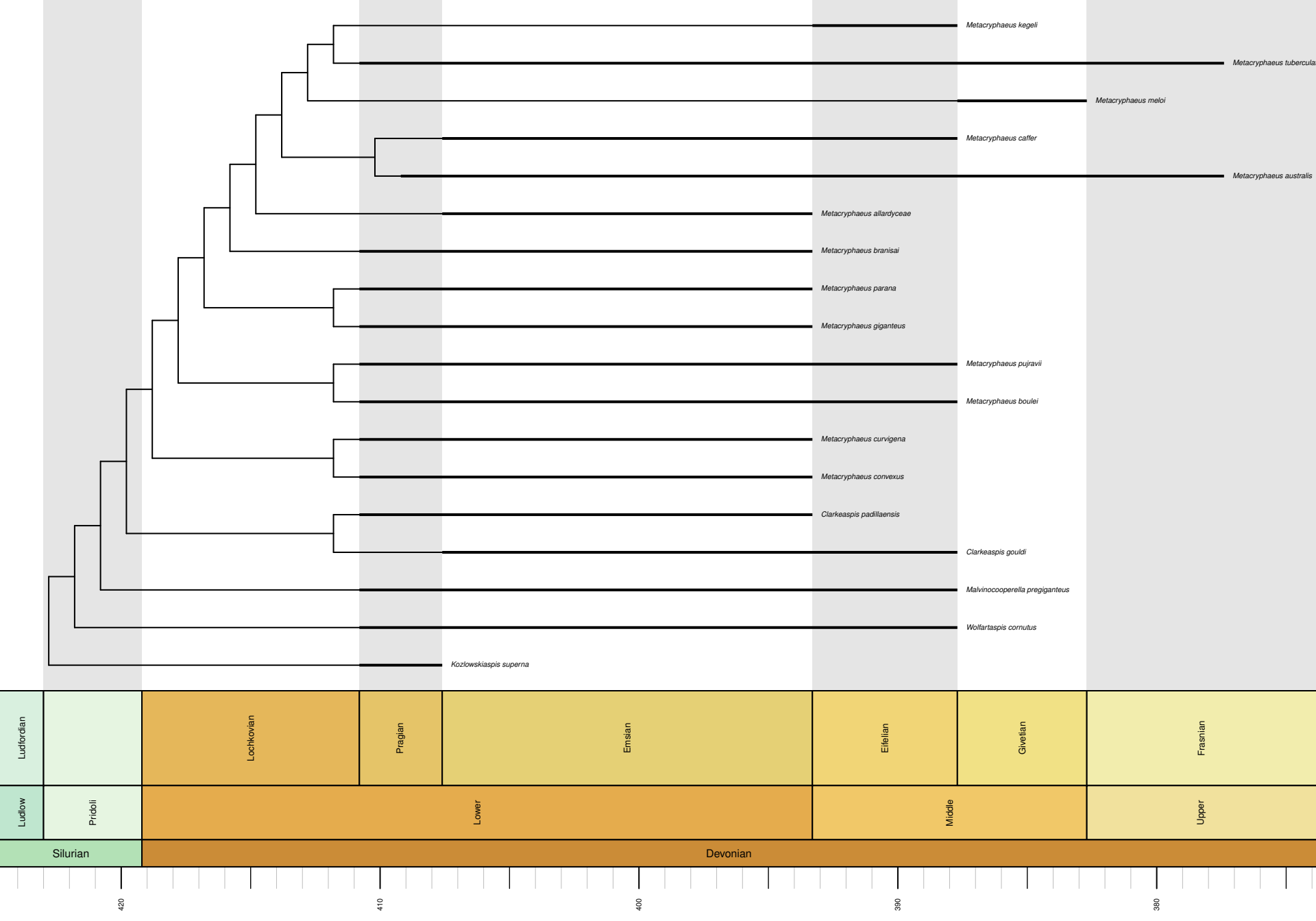
**Carbonaro et al. 2018.** *Inferring ancestral range reconstruction on trilobite records: a study-case based on Metacryphaeus (Phacopida, Calmoniidae)*

**Figure 1.** Time scaled tree 1 employed in the biogeographic analyses.



**Carbonaro et al. 2018.** *Inferring ancestral range reconstruction on trilobite records: a study-case based on Metacryphaeus (Phacopida, Calmoniidae)*

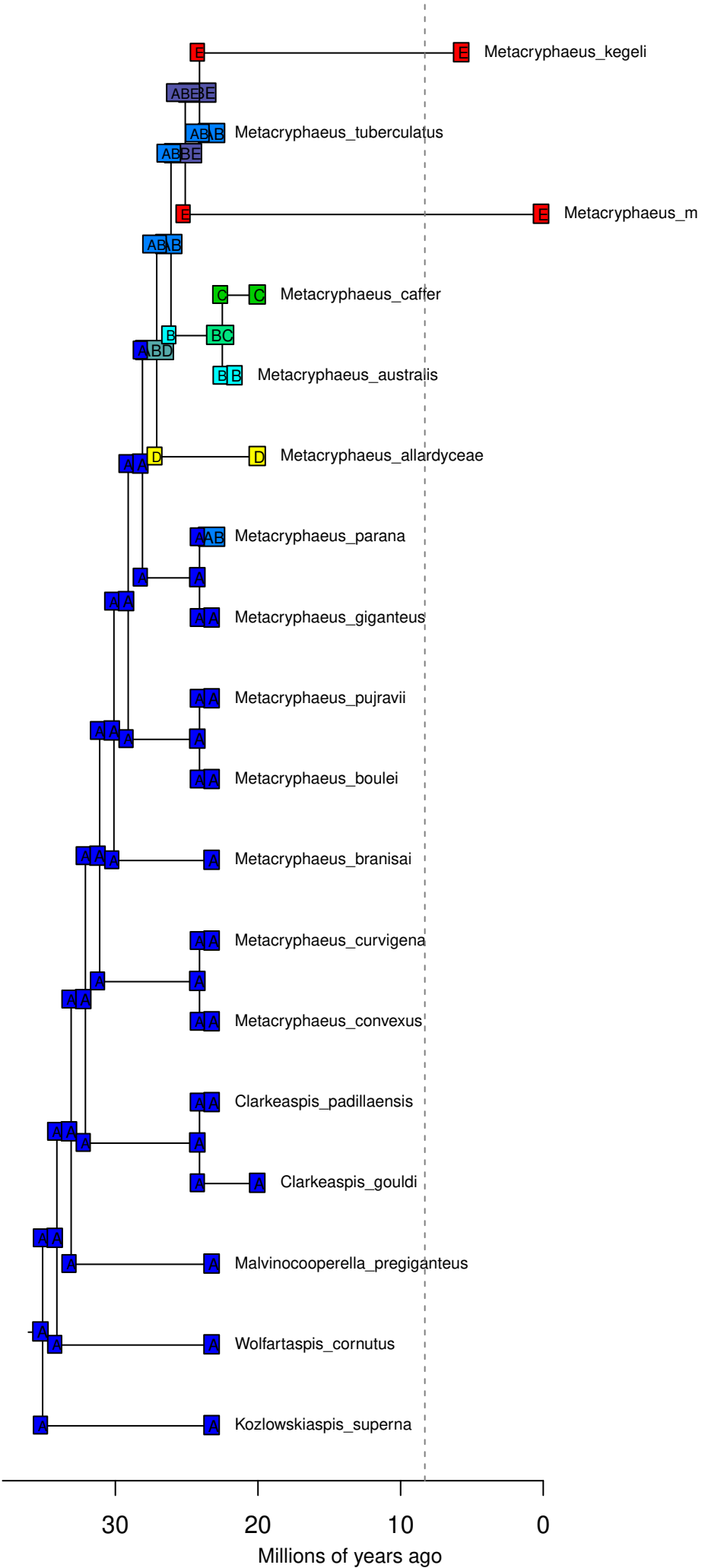
**Figure 2.** Time scaled tree 2 employed in the biogeographic analyses.



**Carbonaro et al. 2018.** *Inferring ancestral range reconstruction on trilobite records: a study-case based on Metacryphaeus (Phacopida, Calmoniidae)*

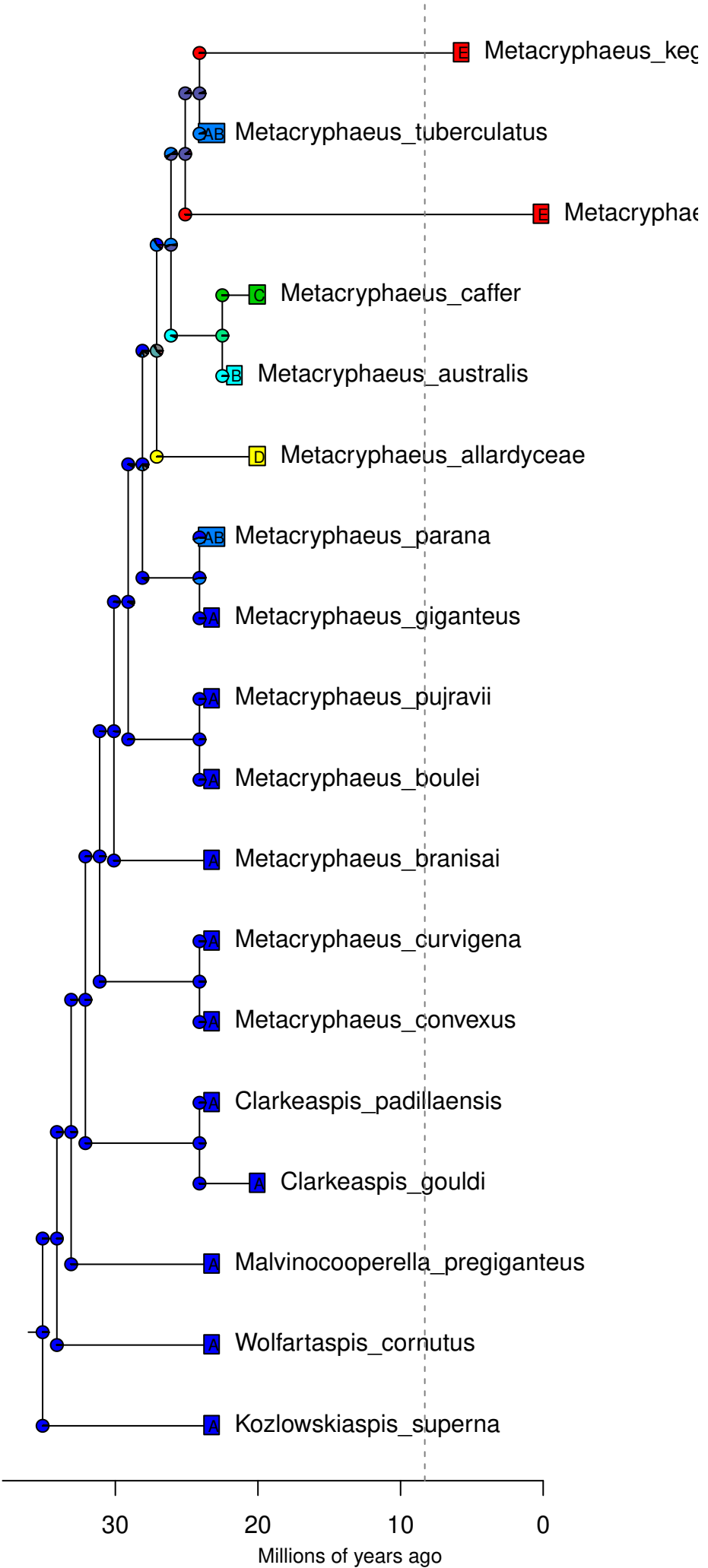
**Figures 3-8.** BioGeoBEARS output containing the results of the ancestral area reconstructions on tree 1.

DEC M0 (w=1, j=0) on Metacryphaeus  
ancstates: global optim, 3 areas max. d=0.0175; e=0; j=0; w=1; LnL=-32.98

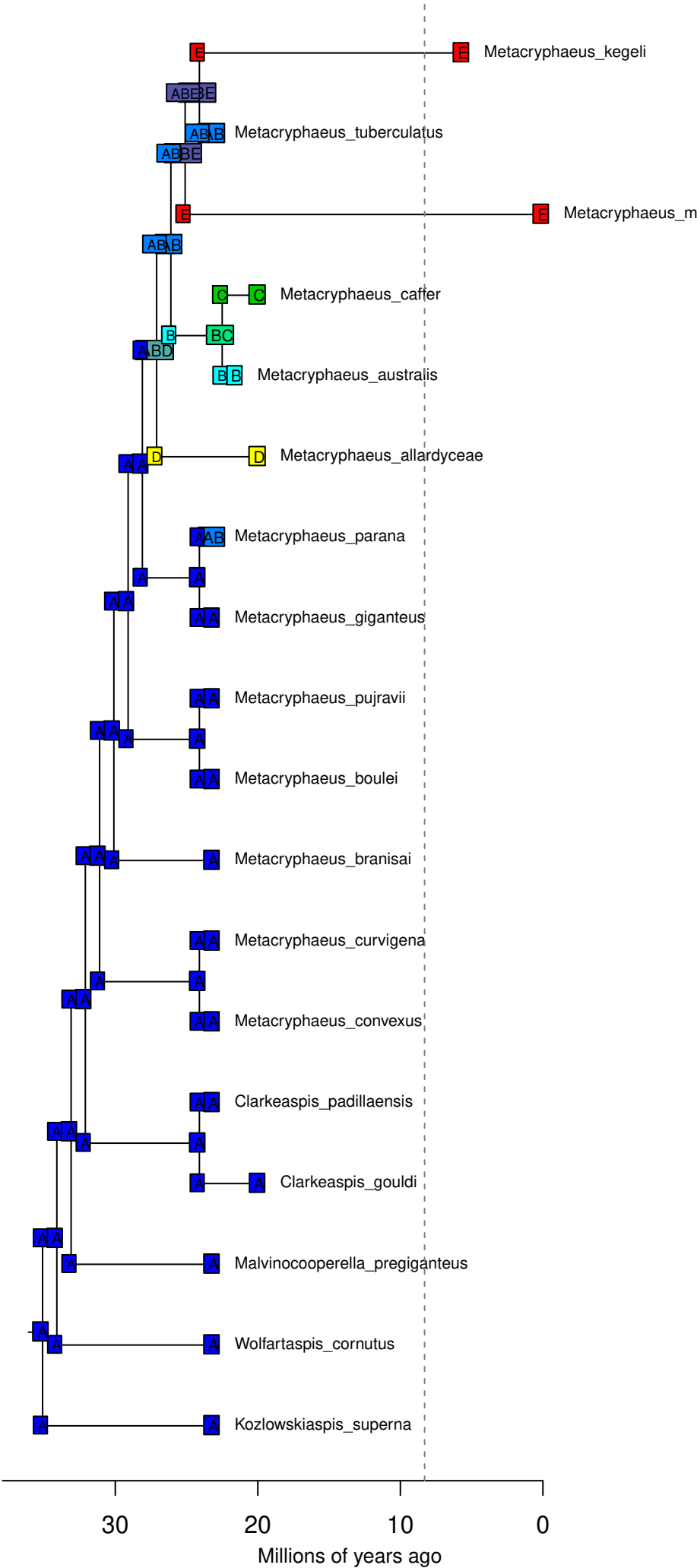




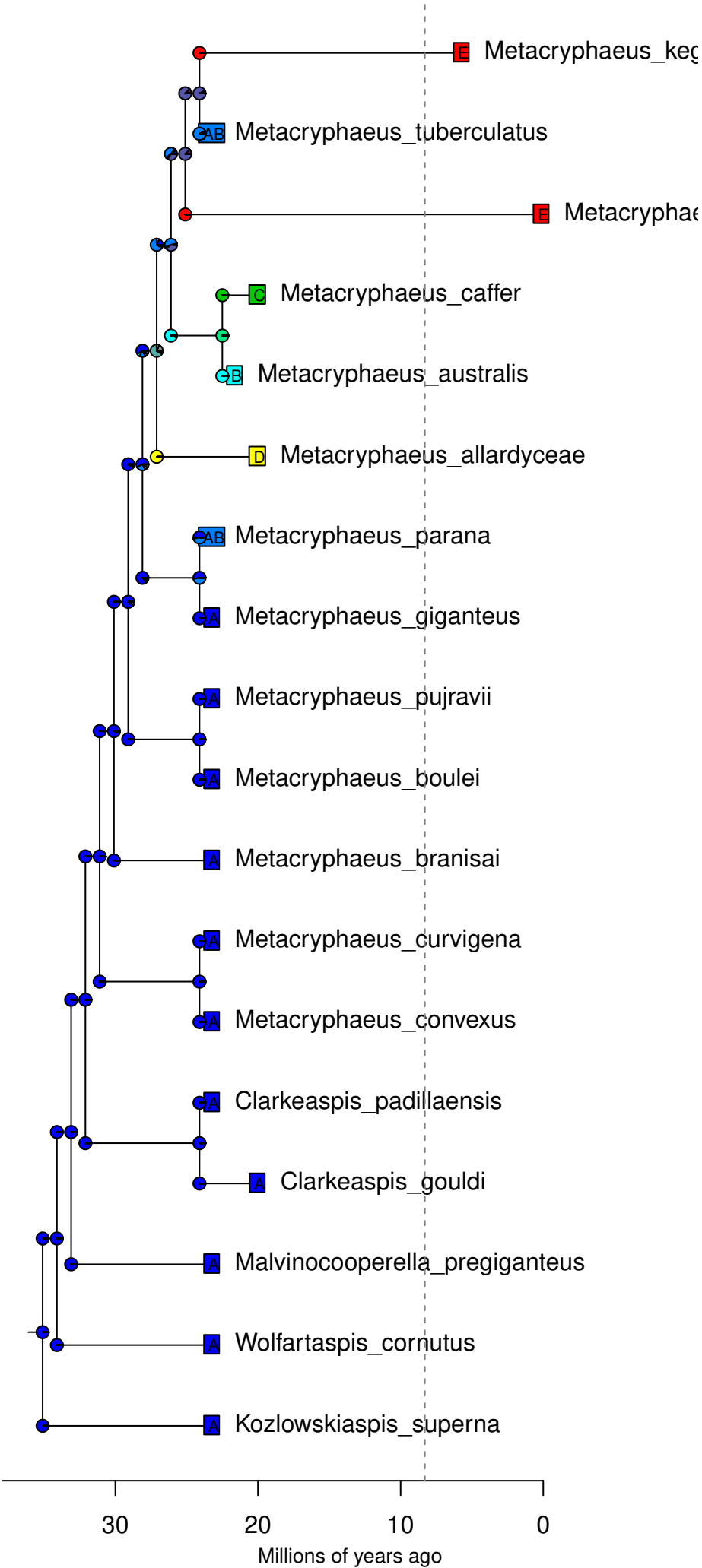
DEC M0 (w=1, j=0) on Metacryphaeus  
ancstates: global optim, 3 areas max. d=0.0175; e=0; j=0; w=1; LnL=-32.98



DEC M1 (w=free, j=0) on Metacryphaeus  
ancstates: global optim, 3 areas max. d=0.0288; e=0; w=2.7362; j=0; LnL=-32.41



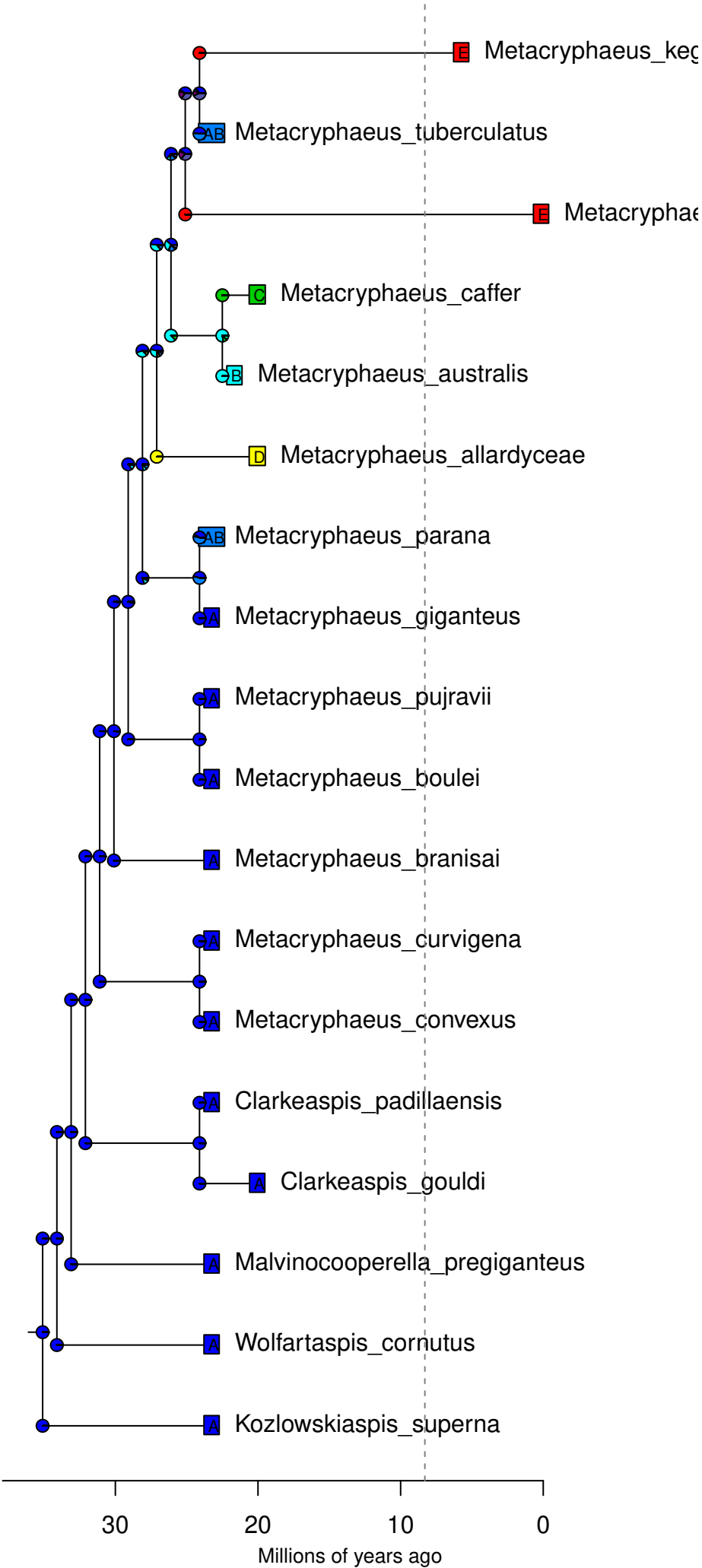
DEC M1 (w=free, j=0) on Metacrypheaus  
ancstates: global optim, 3 areas max. d=0.0288; e=0; w=2.7362; j=0; LnL=-32.41



DEC M2 (w=free, j=free) on Metacrypheaus  
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87

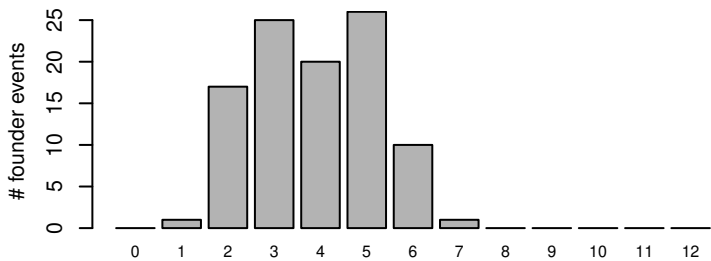
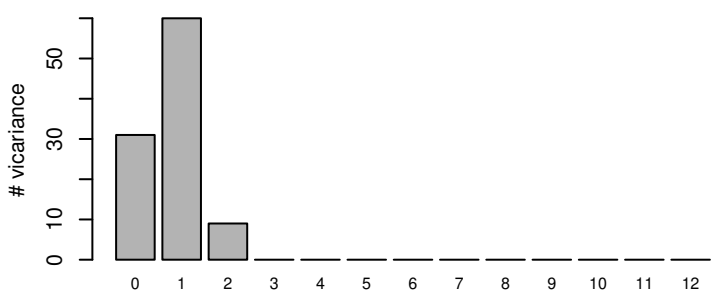
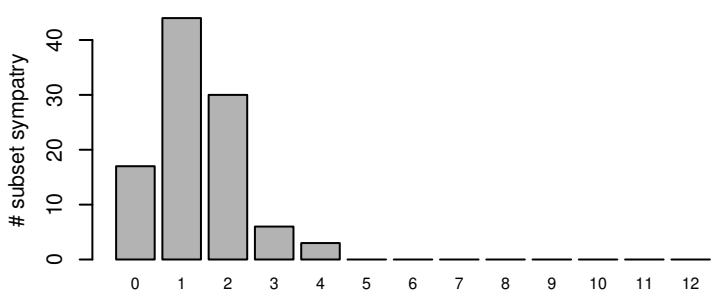
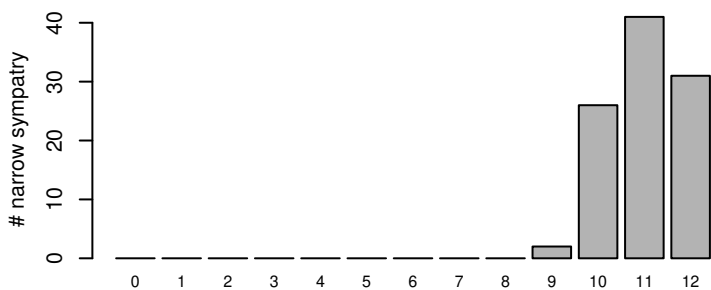
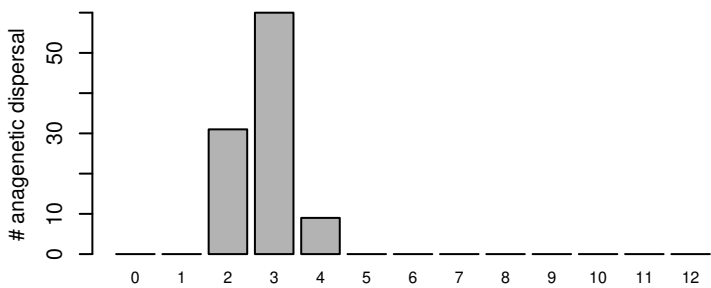


DEC M2 (w=free, j=free) on Metacrypheaus  
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



**Carbonaro et al. 2018.** *Inferring ancestral range reconstruction on trilobite records: a study-case based on Metacryphaeus (Phacopida, Calmoniidae)*

**Figure 9.** Histogram of events counts based on biogeographic stochastic mapping on tree 1.



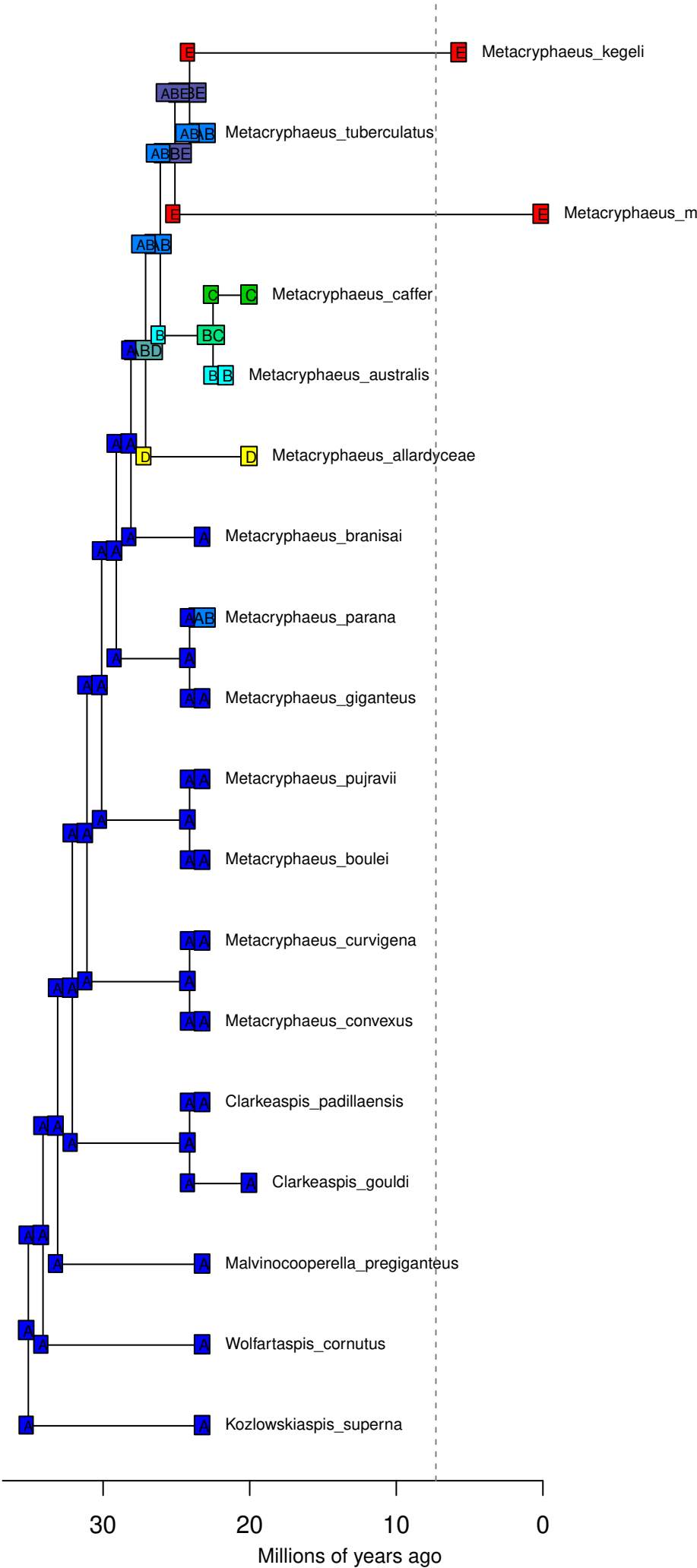
Event counts in each of 100 BSMs

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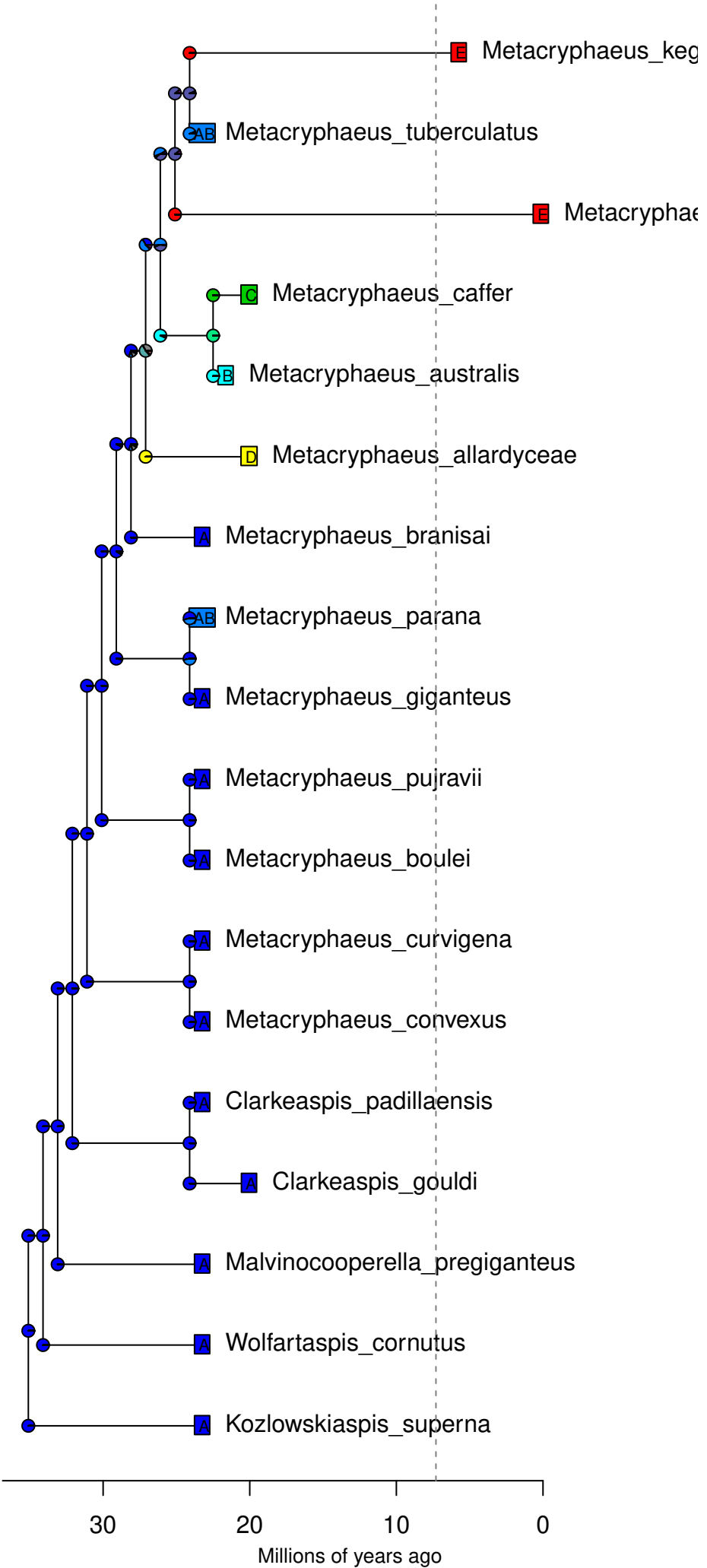
**Figures 10-15.** BioGeoBEARS output containing the results of the ancestral area reconstructions on tree 2.



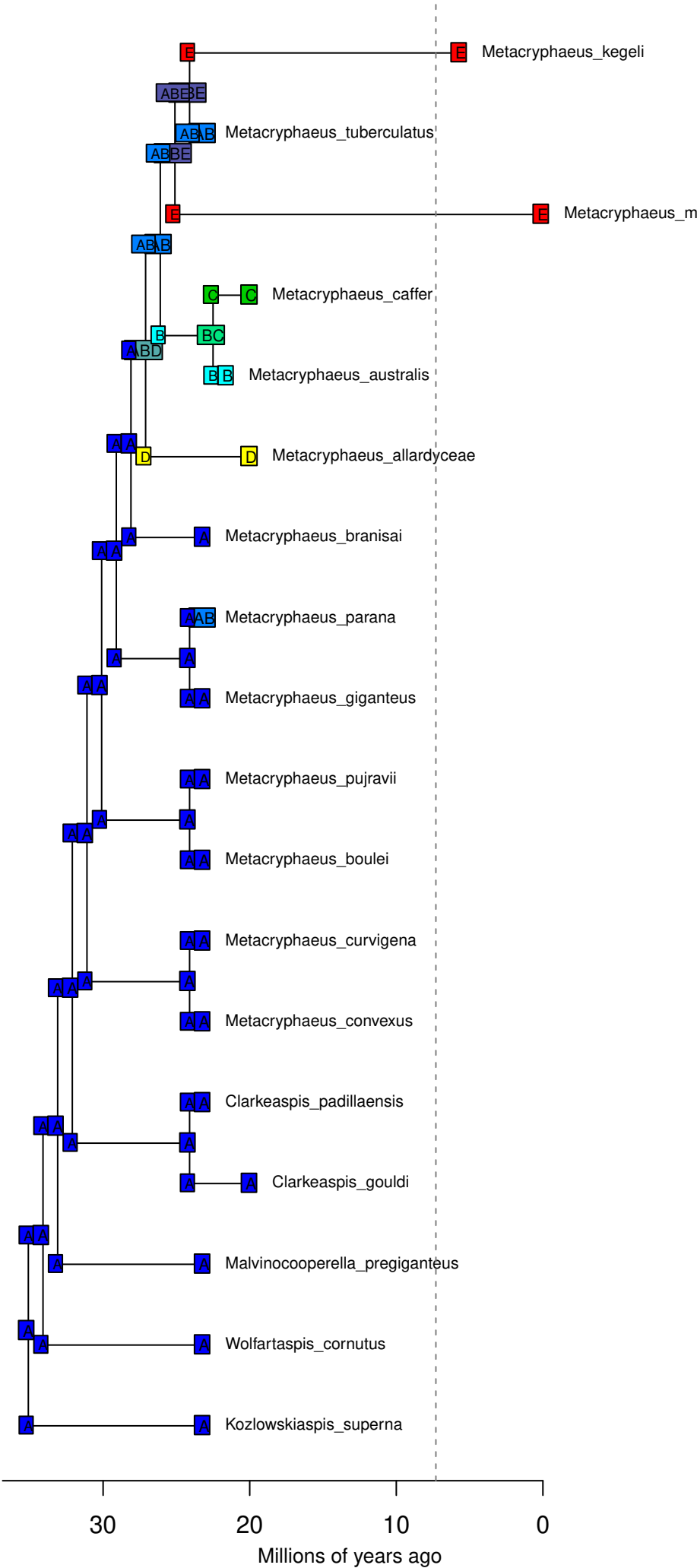
DEC M0 (w=1, j=0) on Metacryphaeus  
ancstates: global optim, 3 areas max. d=0.0175; e=0; j=0; w=1; LnL=-32.95



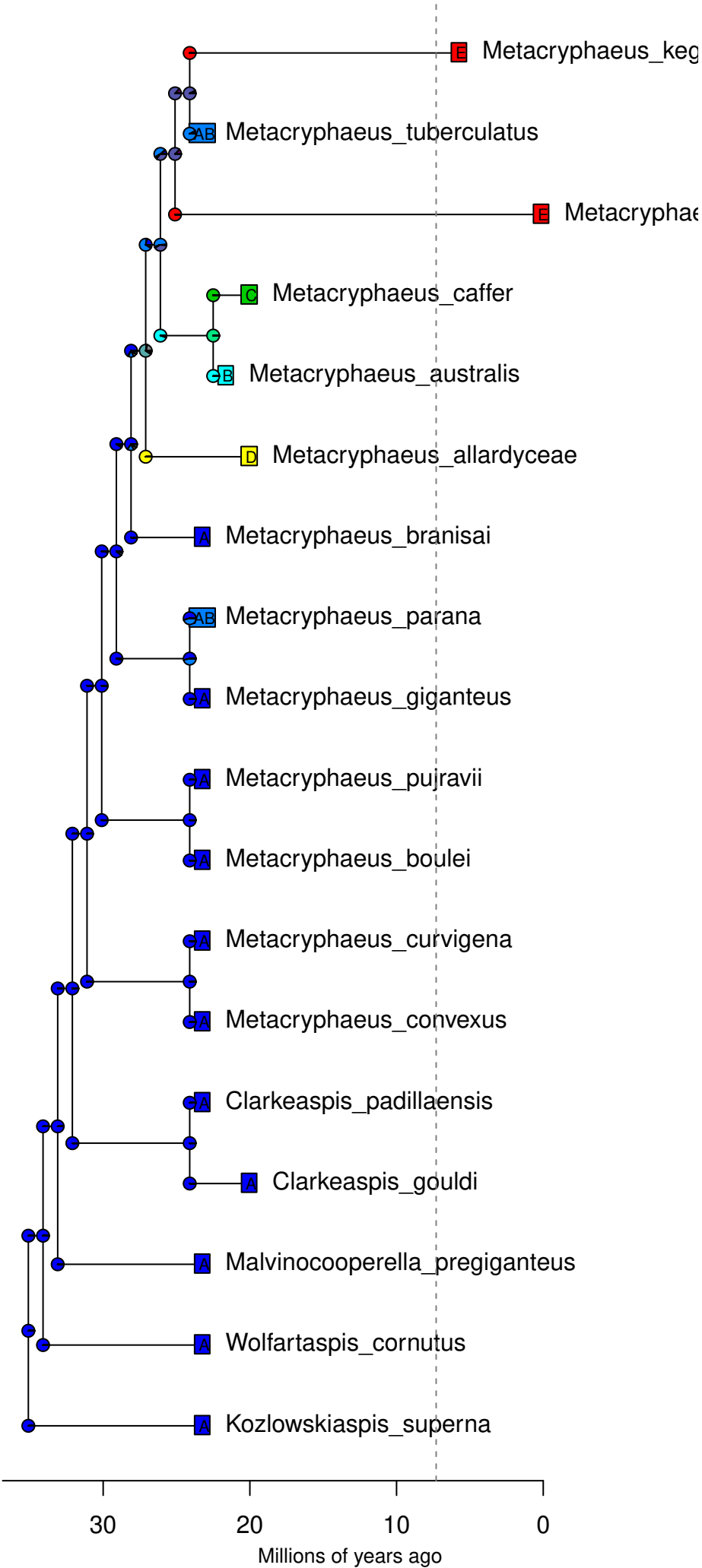
DEC M0 (w=1, j=0) on Metacryphaeus  
ancstates: global optim, 3 areas max. d=0.0175; e=0; j=0; w=1; LnL=-32.95



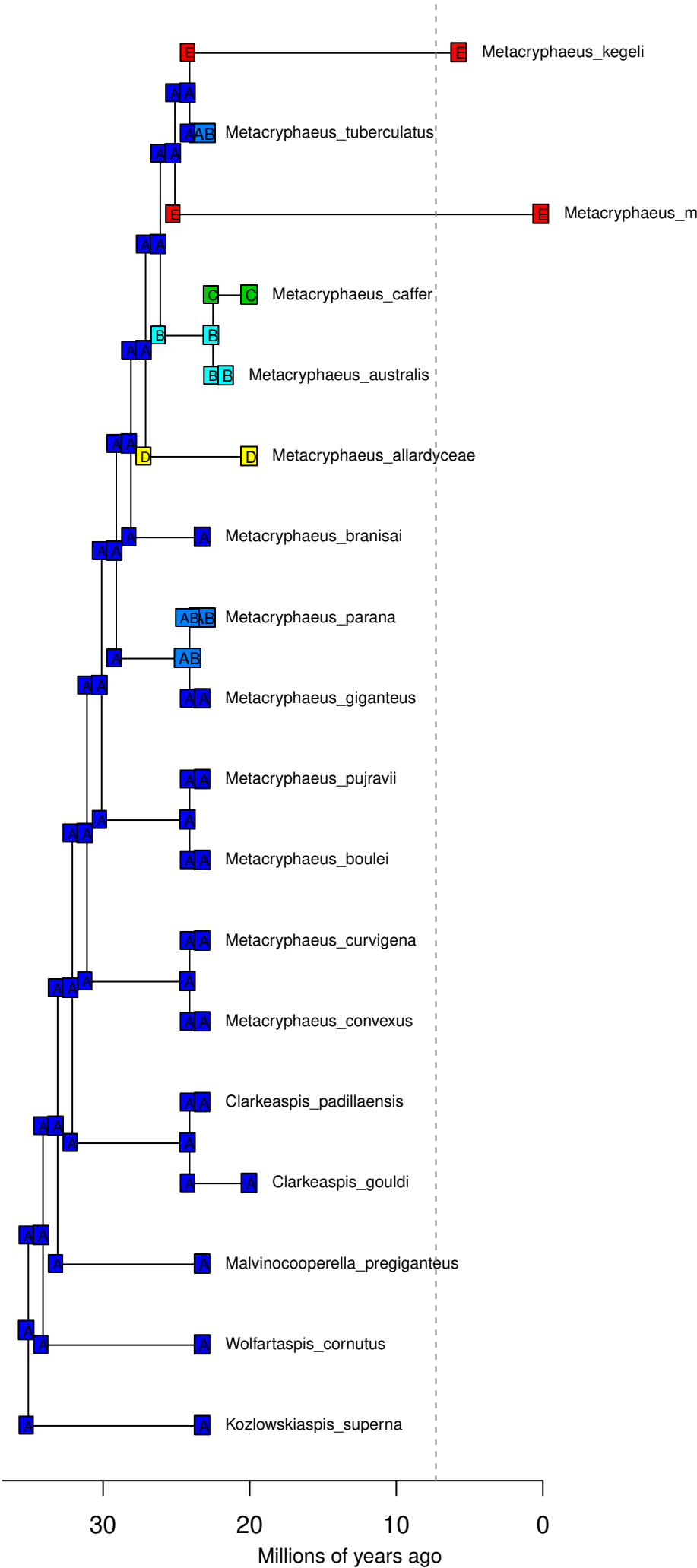
DEC M1 (w=free, j=0) on Metacrypheaus  
ancstates: global optim, 3 areas max. d=0.0288; e=0; w=2.7406; j=0; LnL=-32.43



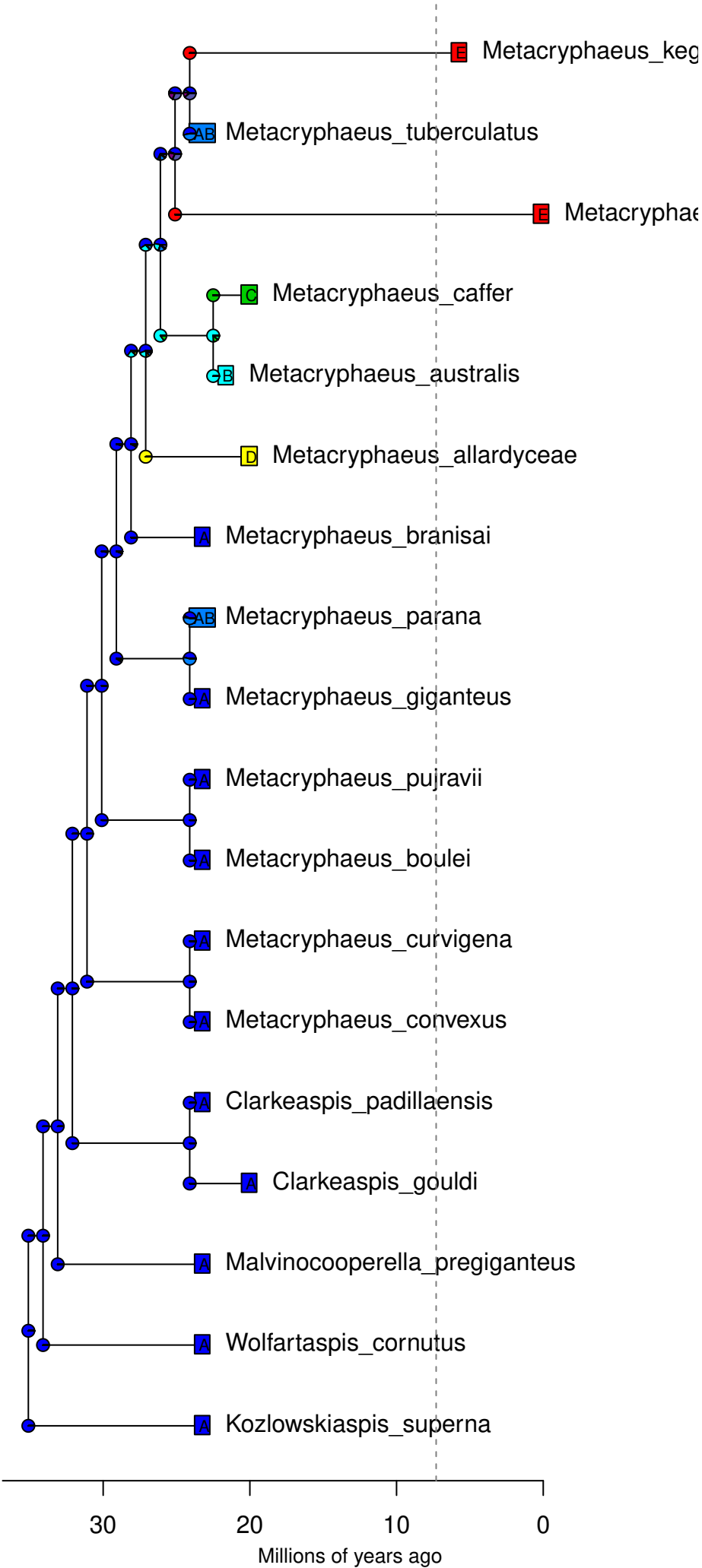
DEC M1 (w=free, j=0) on Metacrypheus  
ancstates: global optim, 3 areas max. d=0.0288; e=0; w=2.7406; j=0; LnL=-32.43



DEC M2 (w=free, j=free) on Metacryphaeus  
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90

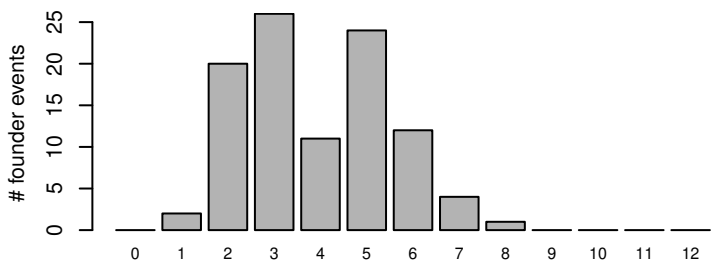
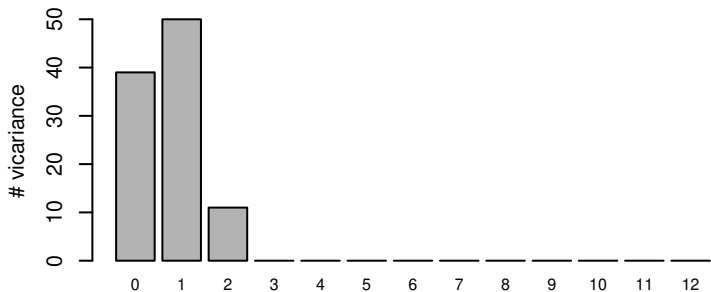
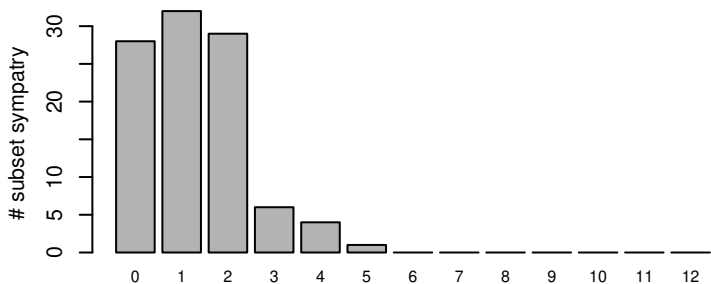
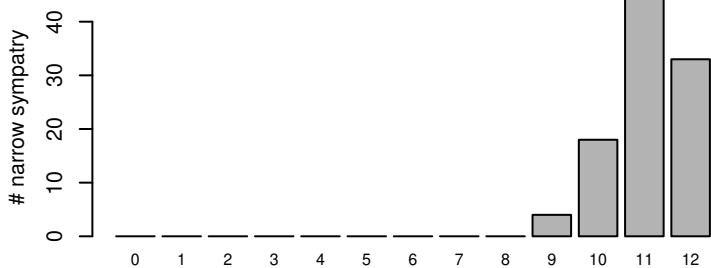
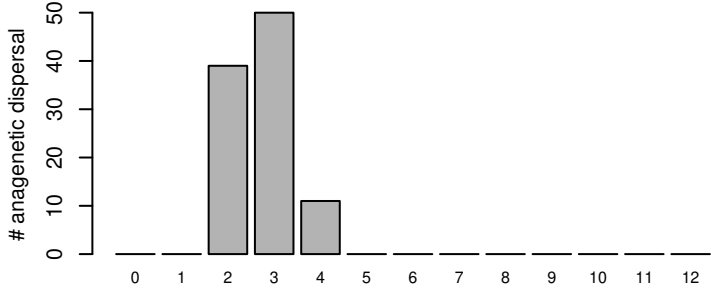


DEC M2 (w=free, j=free) on Metacrypheaus  
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



**Carbonaro et al. 2018.** *Inferring ancestral range reconstruction on trilobite records: a study-case based on Metacryphaeus (Phacopida, Calmoniidae)*

**Figure 16.** Histogram of events counts based on biogeographic stochastic mapping on tree 2.



Event counts in each of 100 BSMs

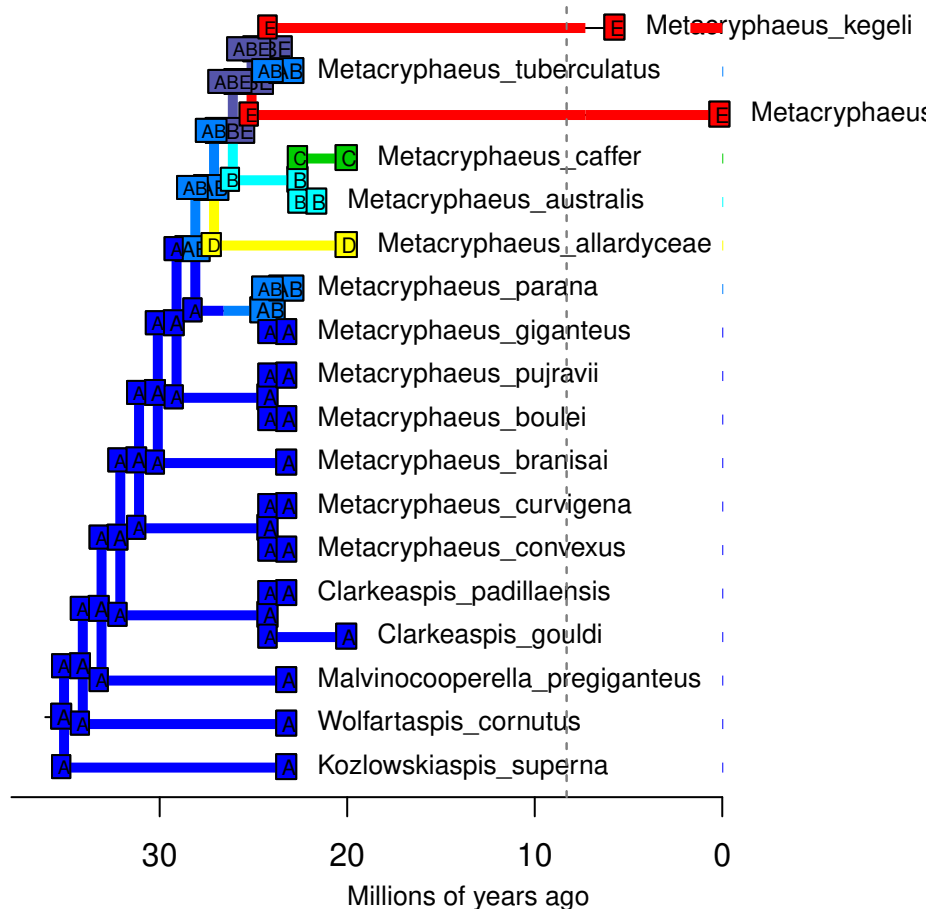


**Carbonaro et al. 2018.** *Inferring ancestral range reconstruction on trilobite records: a study-case based on Metacryphaeus (Phacopida, Calmoniidae)*

**Appendix 1.** Plots of 100 BSMs on tree 1.

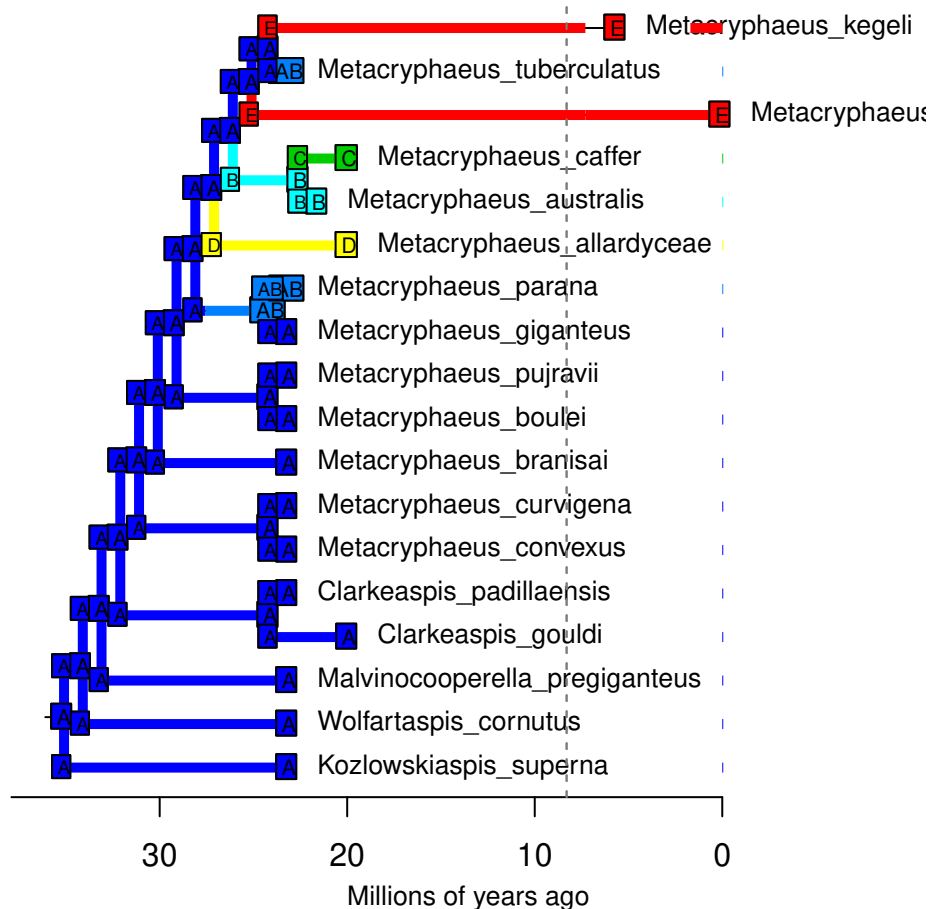
# DECwj – Stochastic Map #1/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



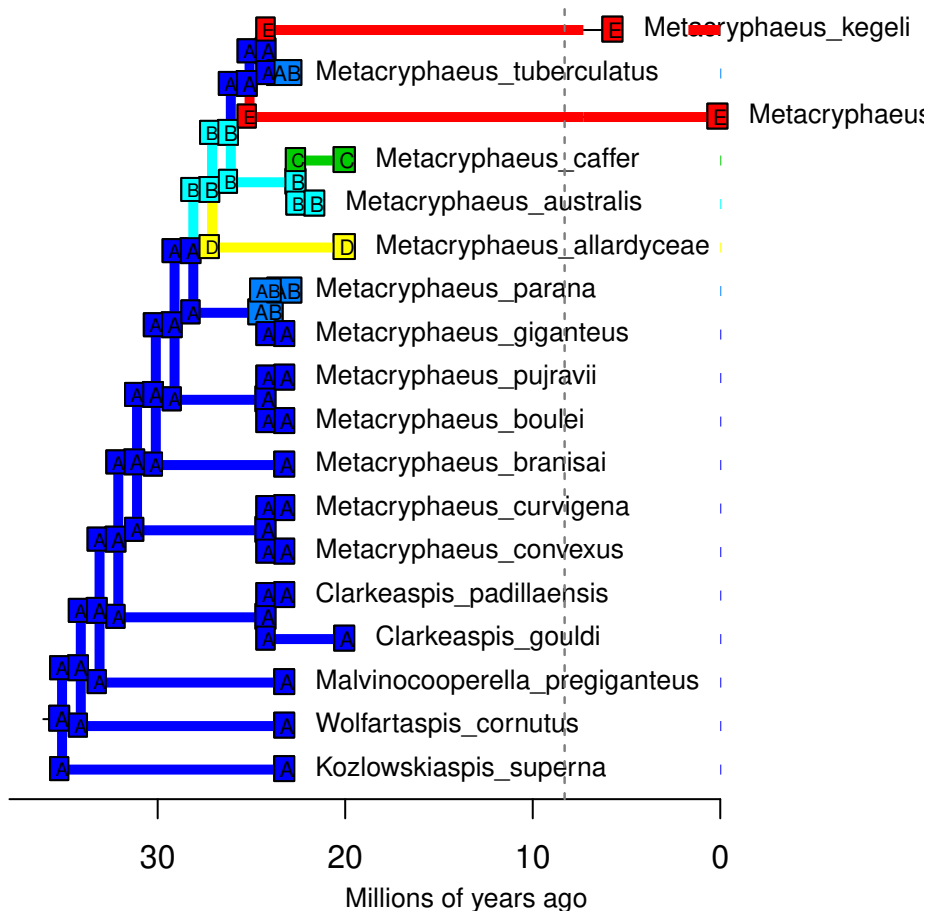
# DECwj – Stochastic Map #2/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



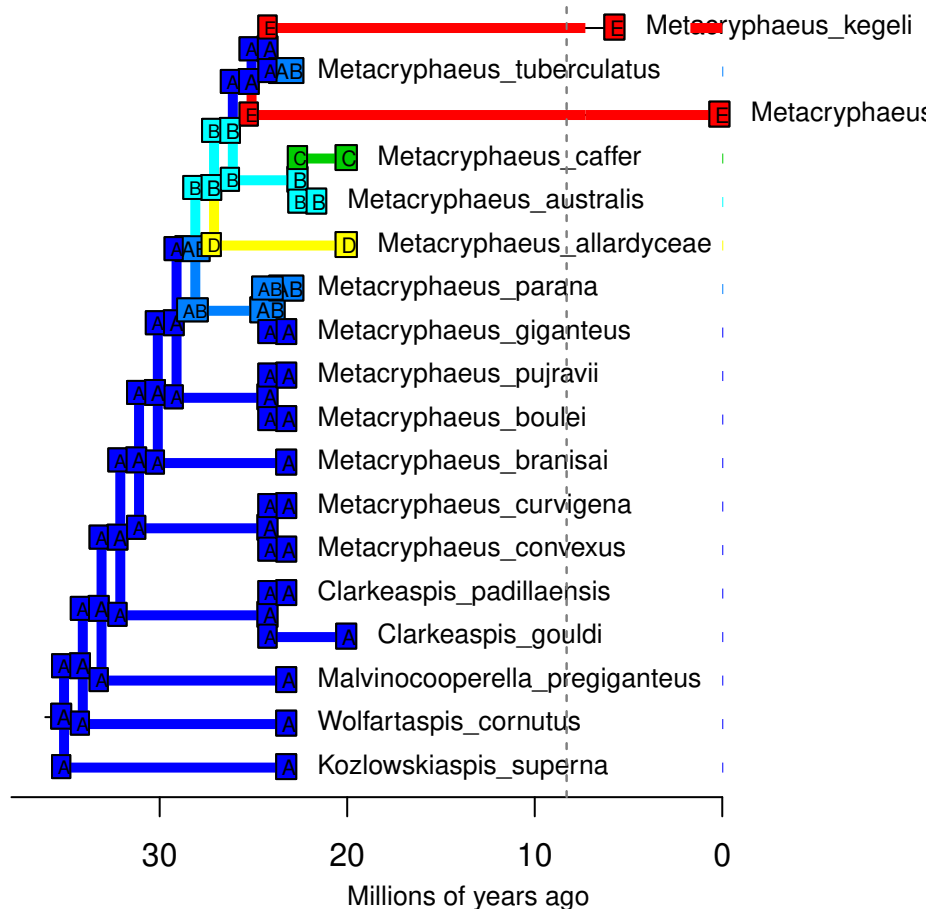
# DECwj – Stochastic Map #3/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



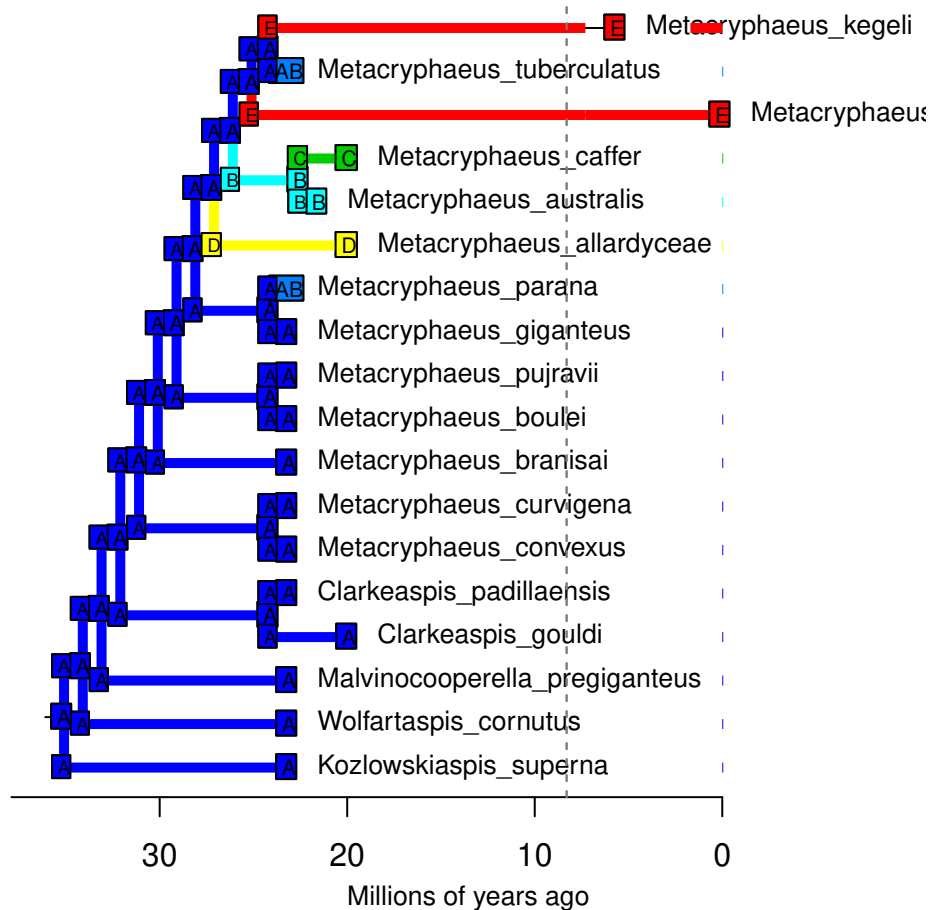
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ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



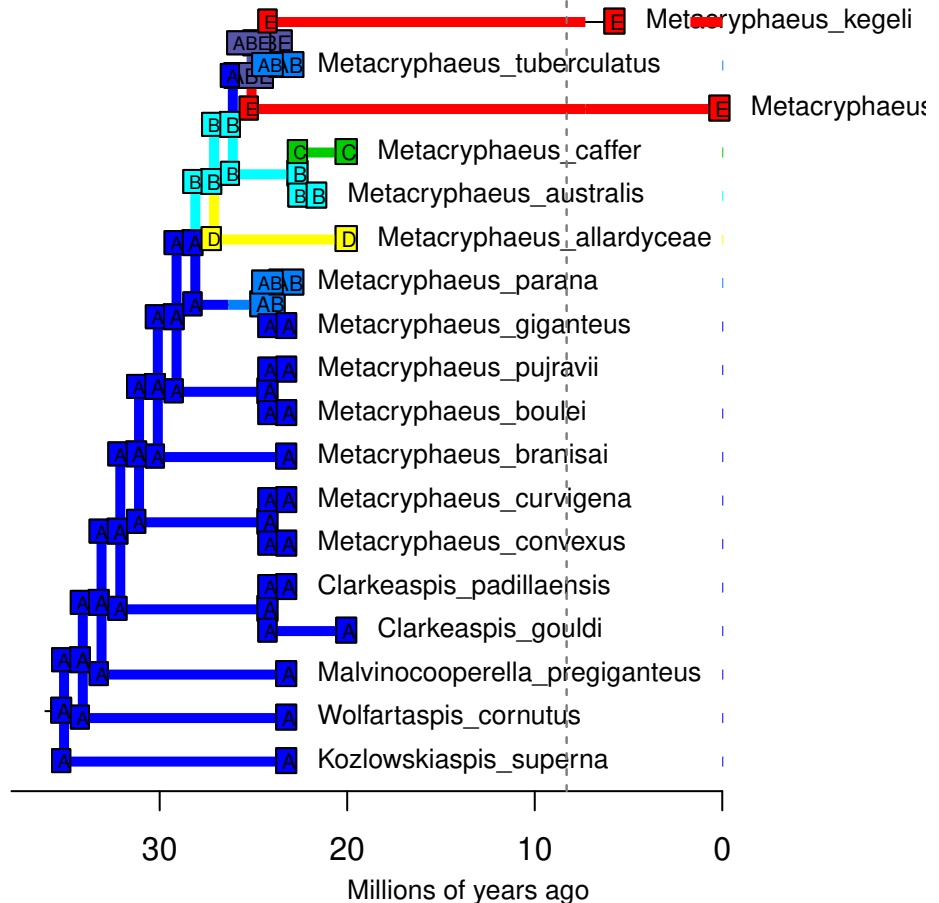
# DECwj – Stochastic Map #5/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



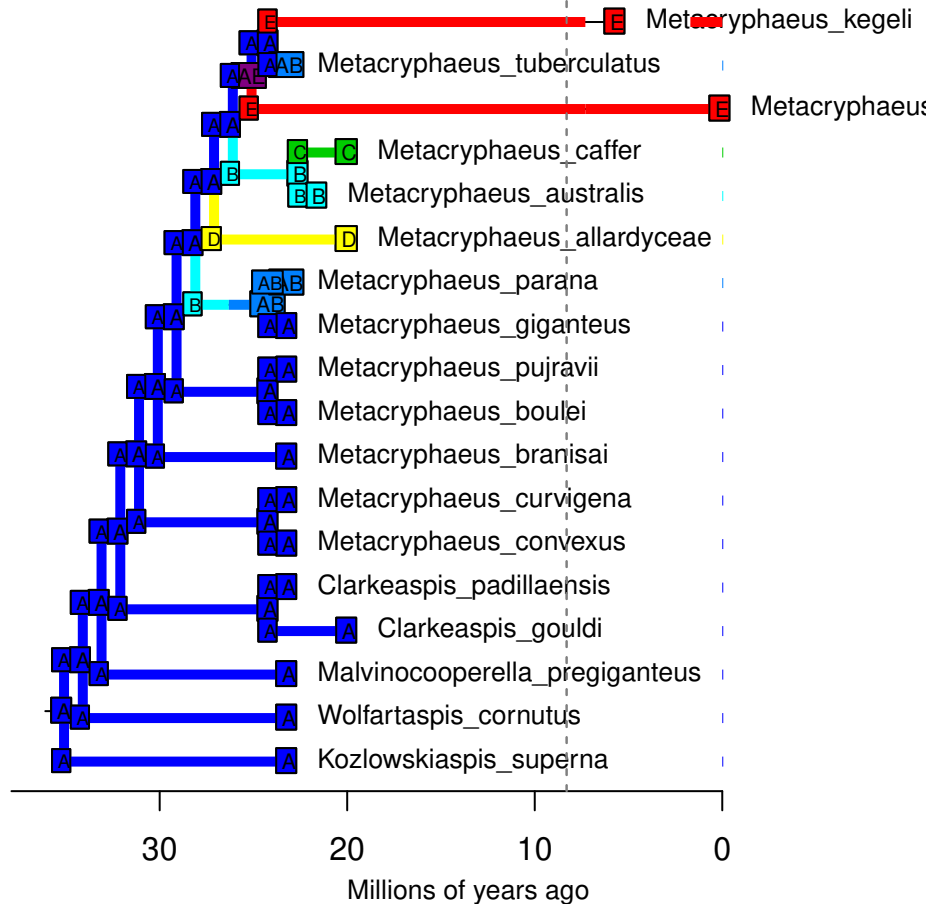
# DECwj – Stochastic Map #6/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #7/100

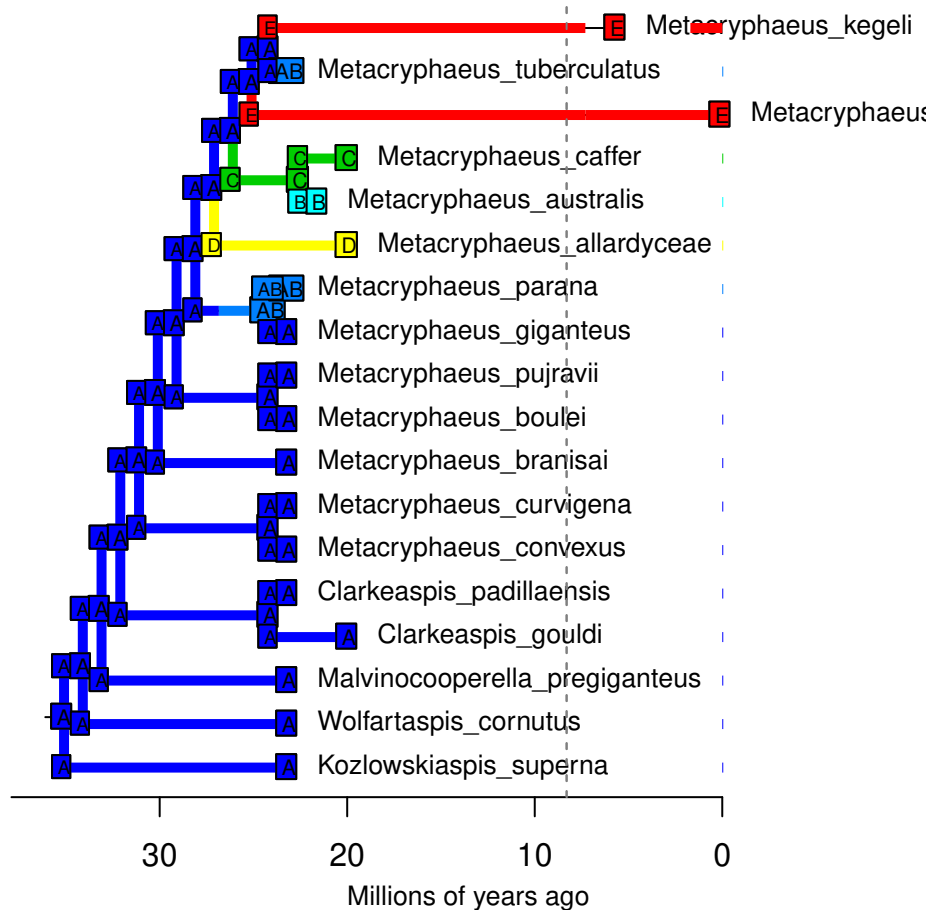
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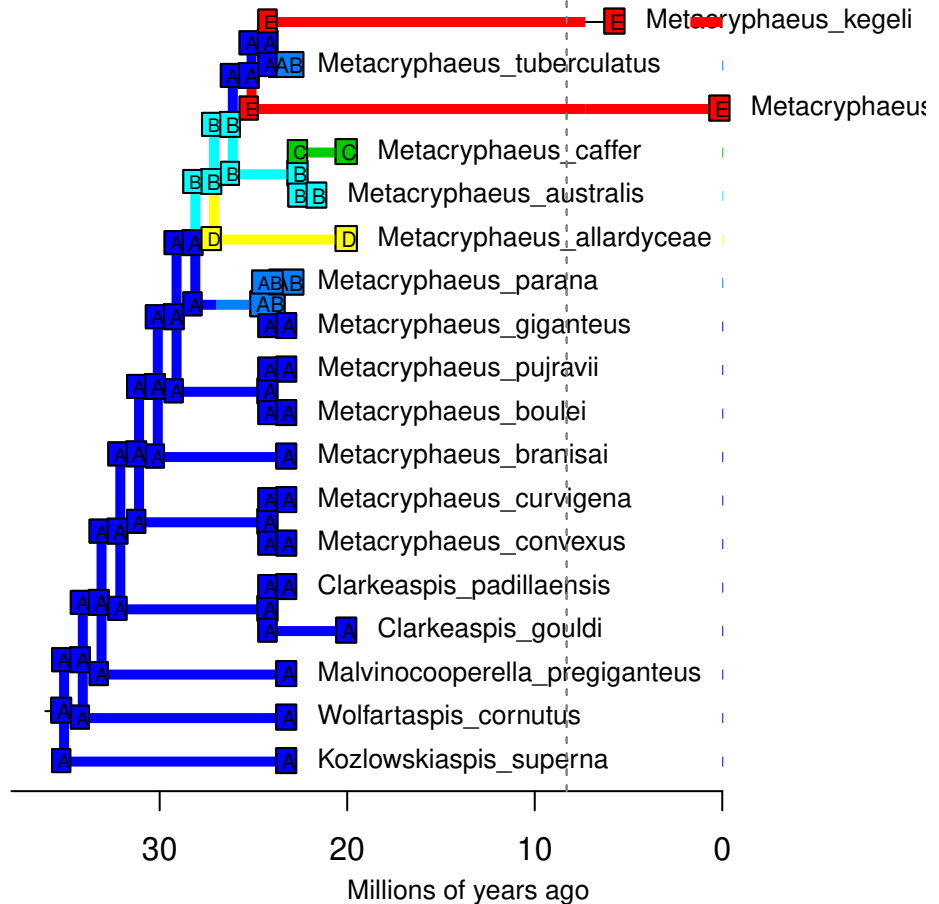
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ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



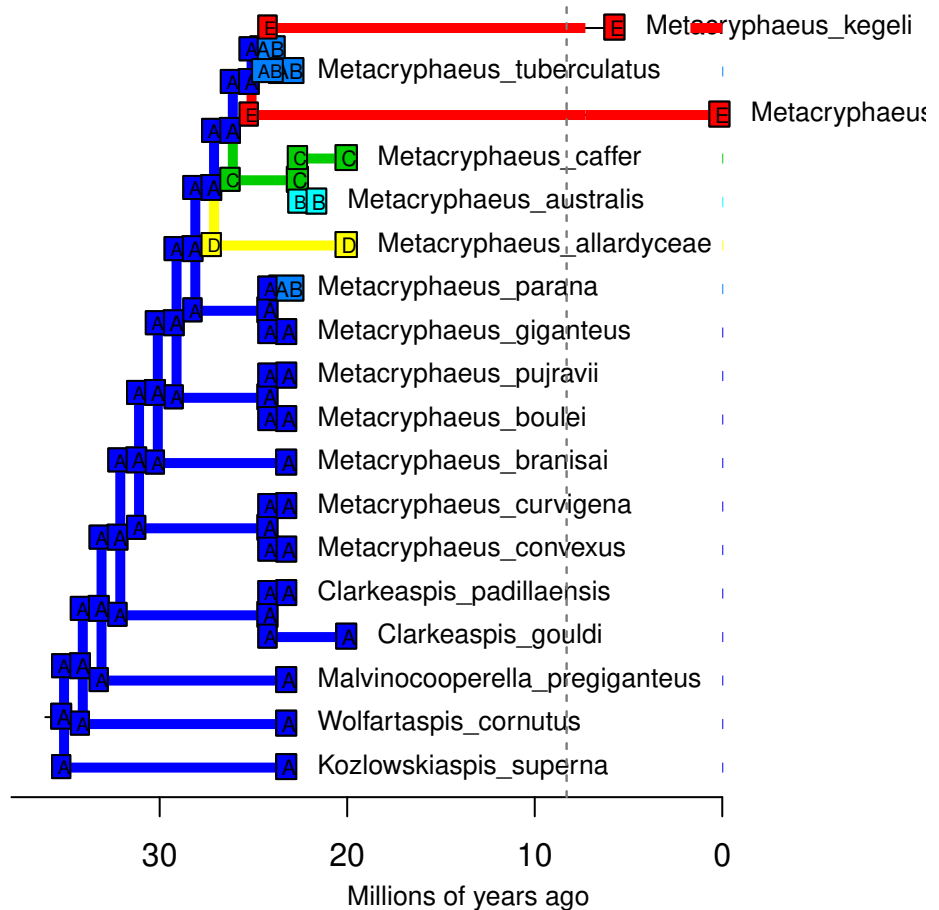
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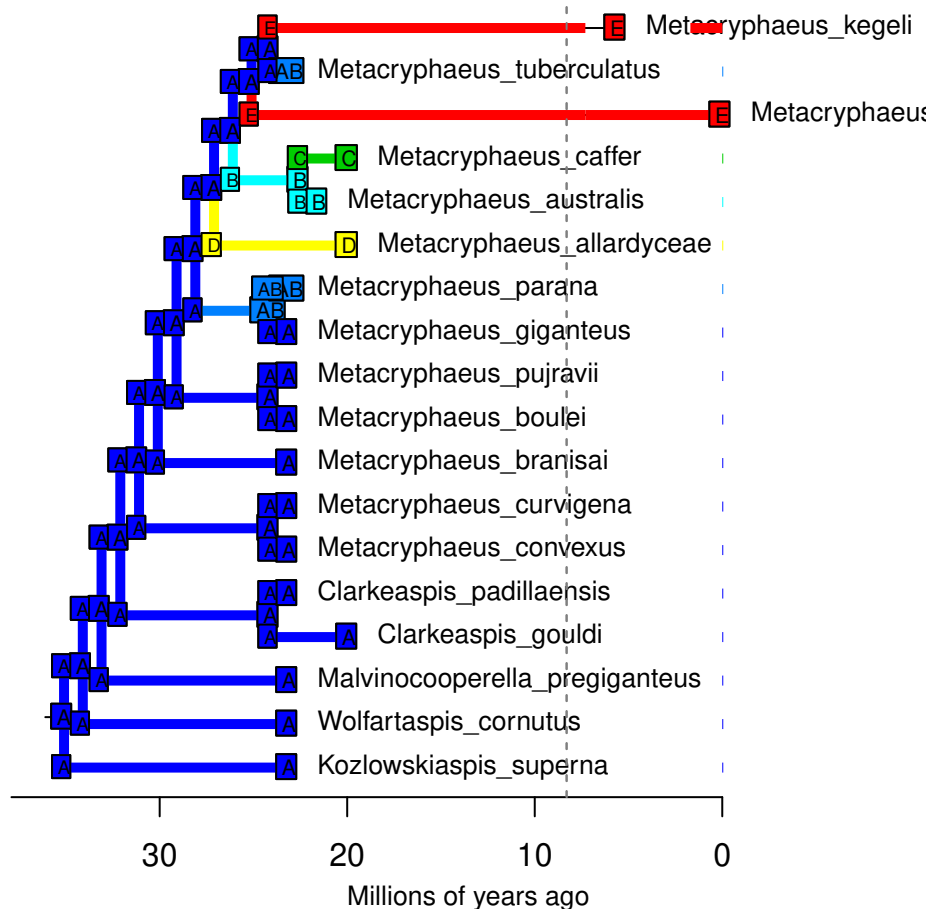
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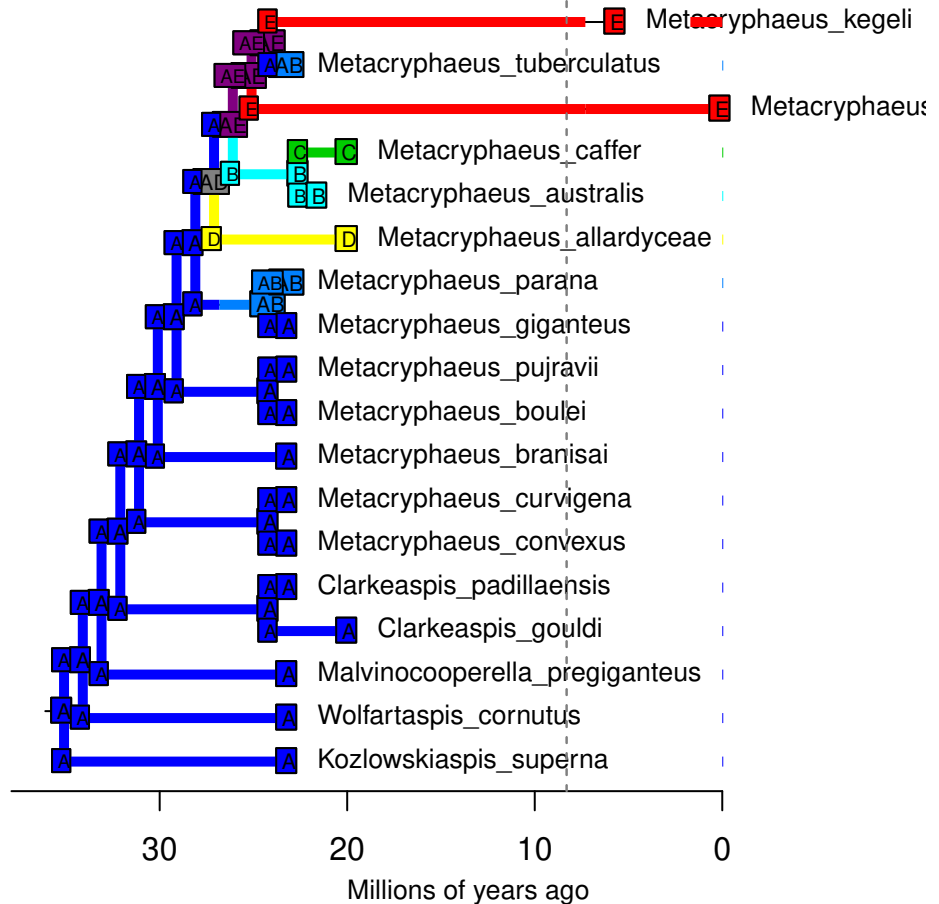
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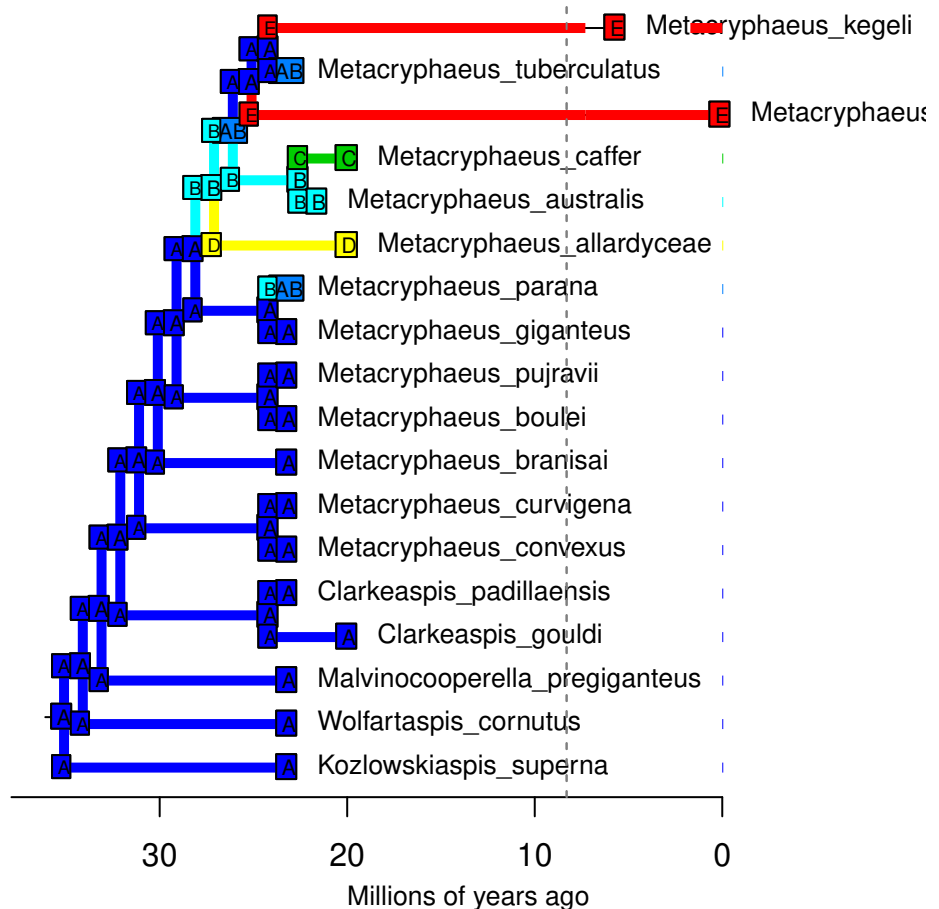
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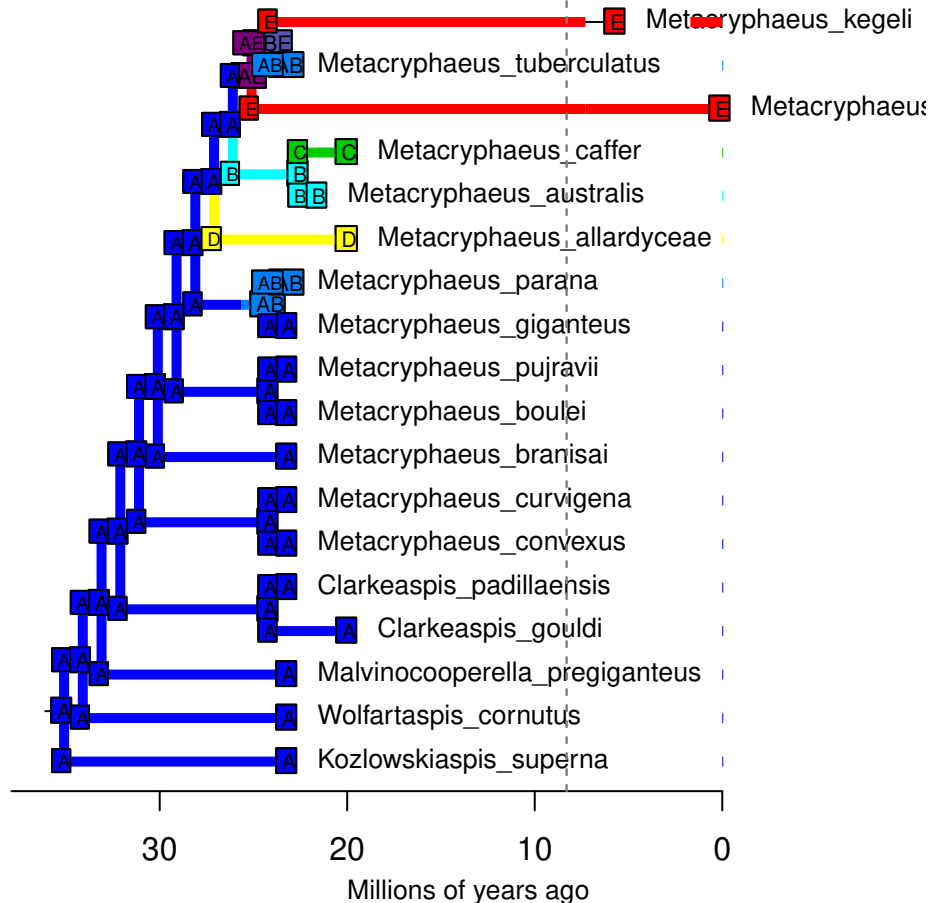
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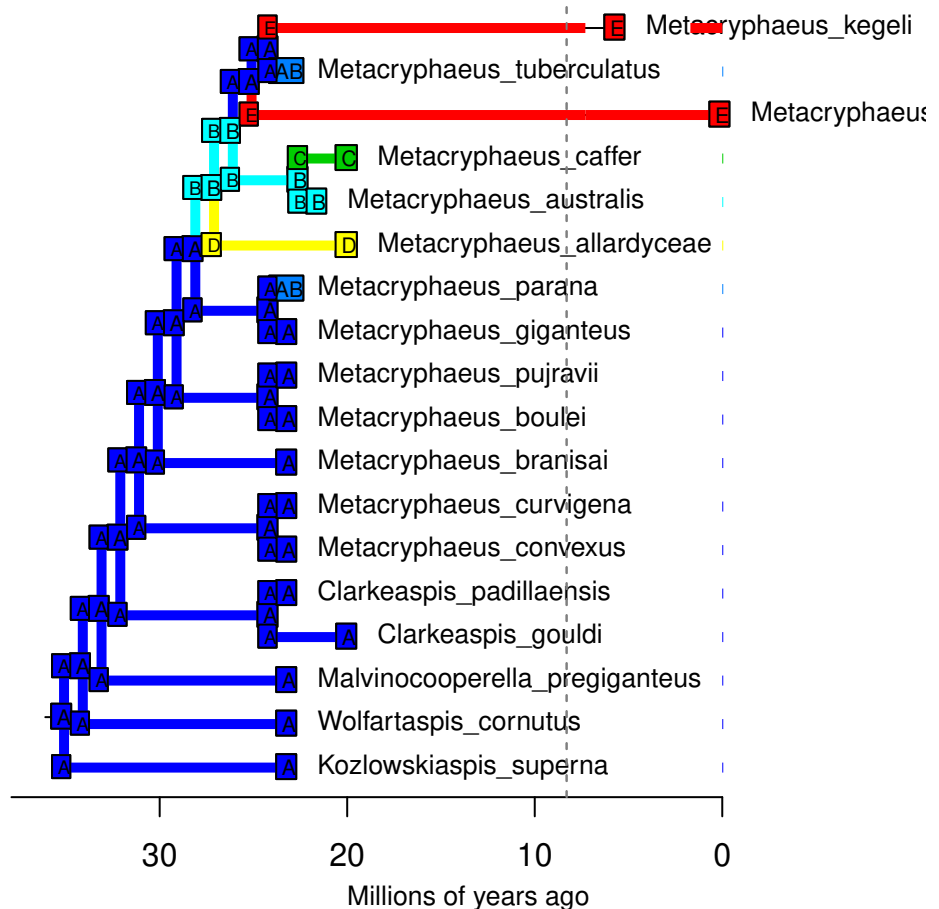
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# DECwj – Stochastic Map #15/100

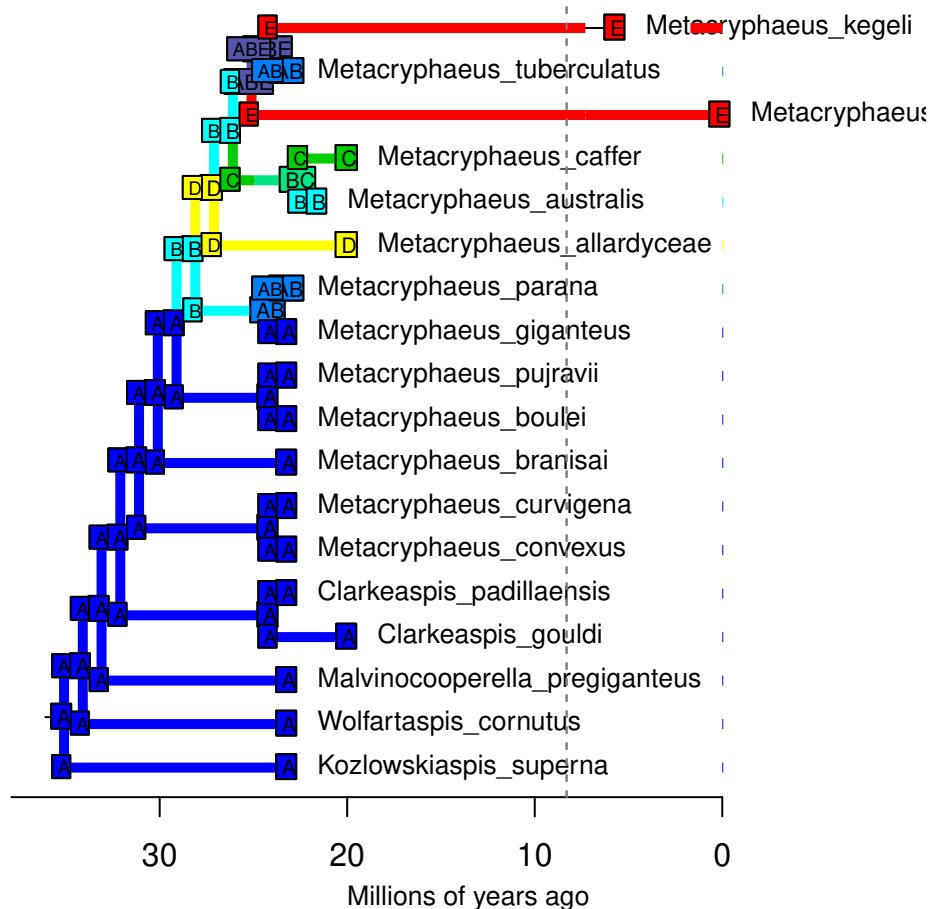
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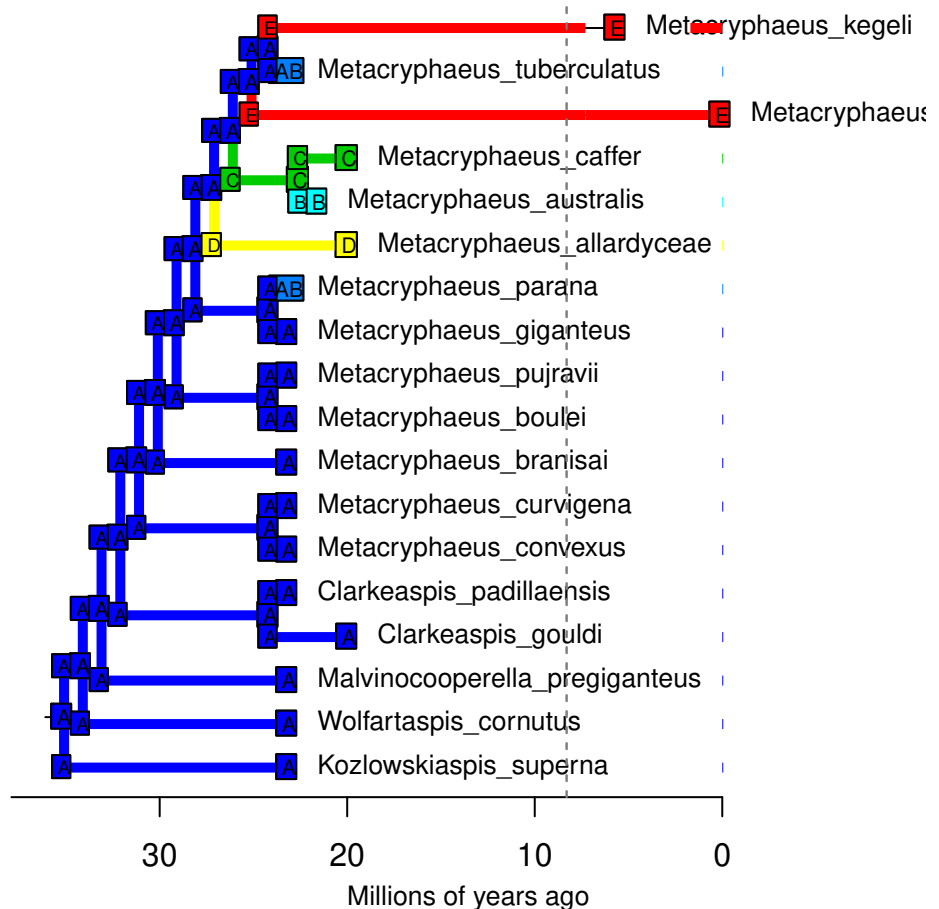
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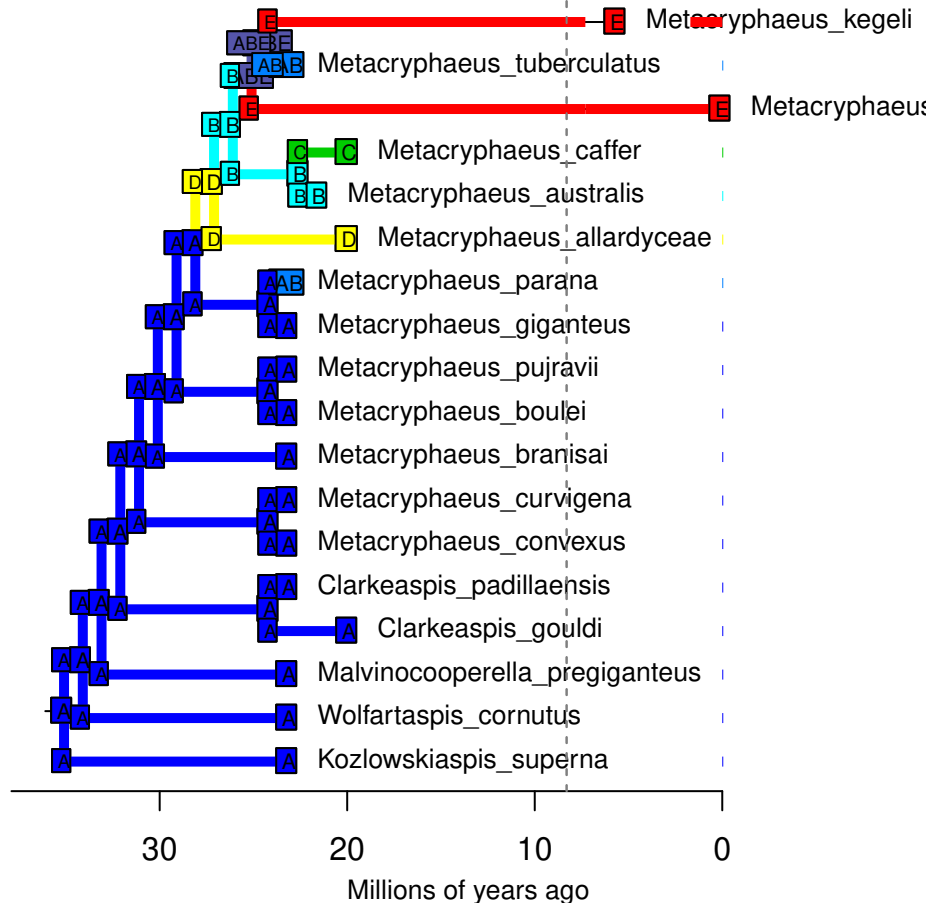
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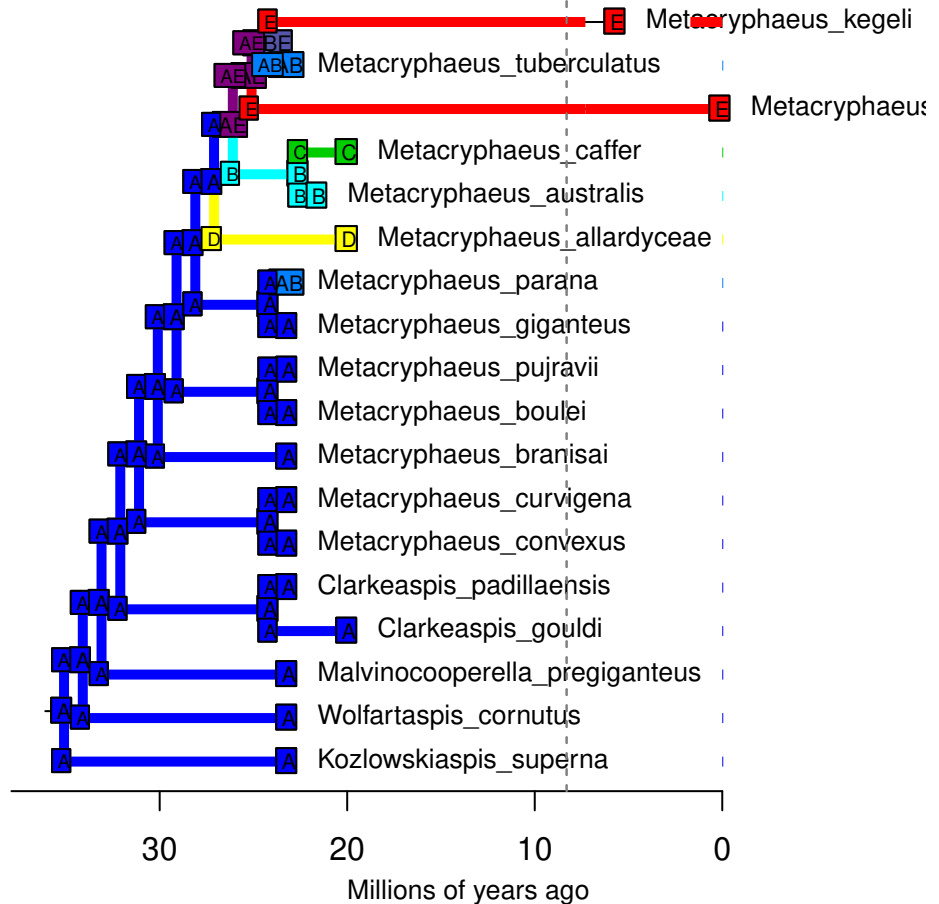
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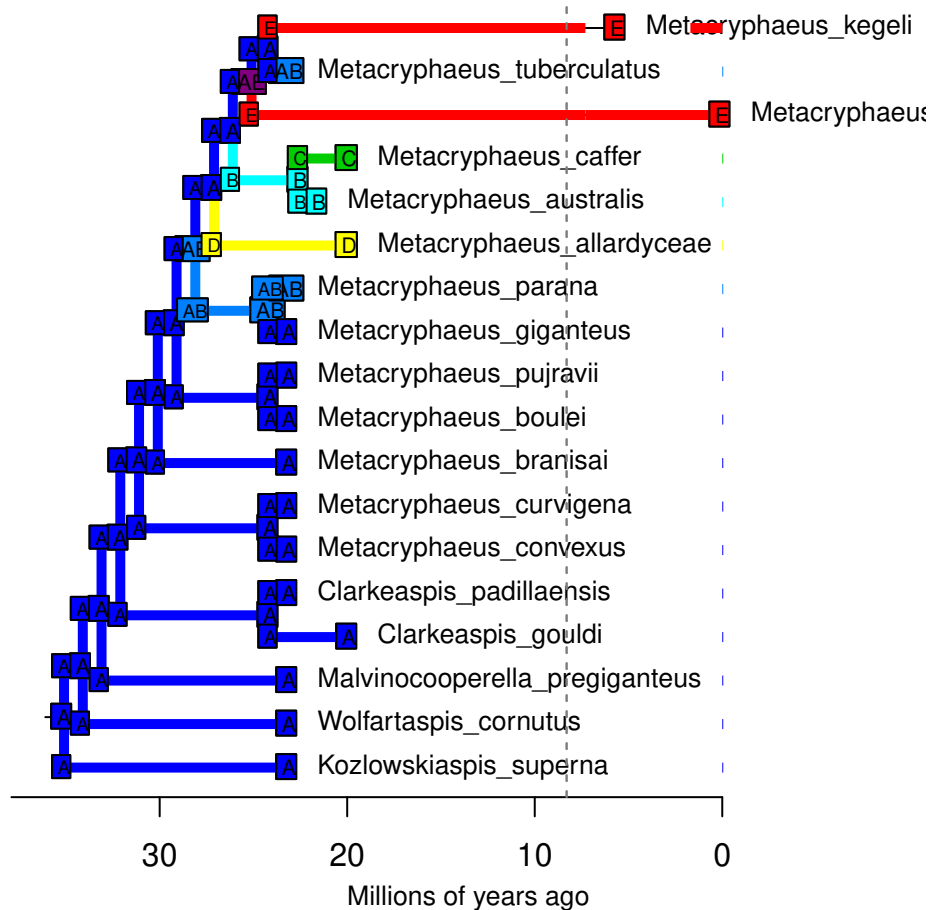
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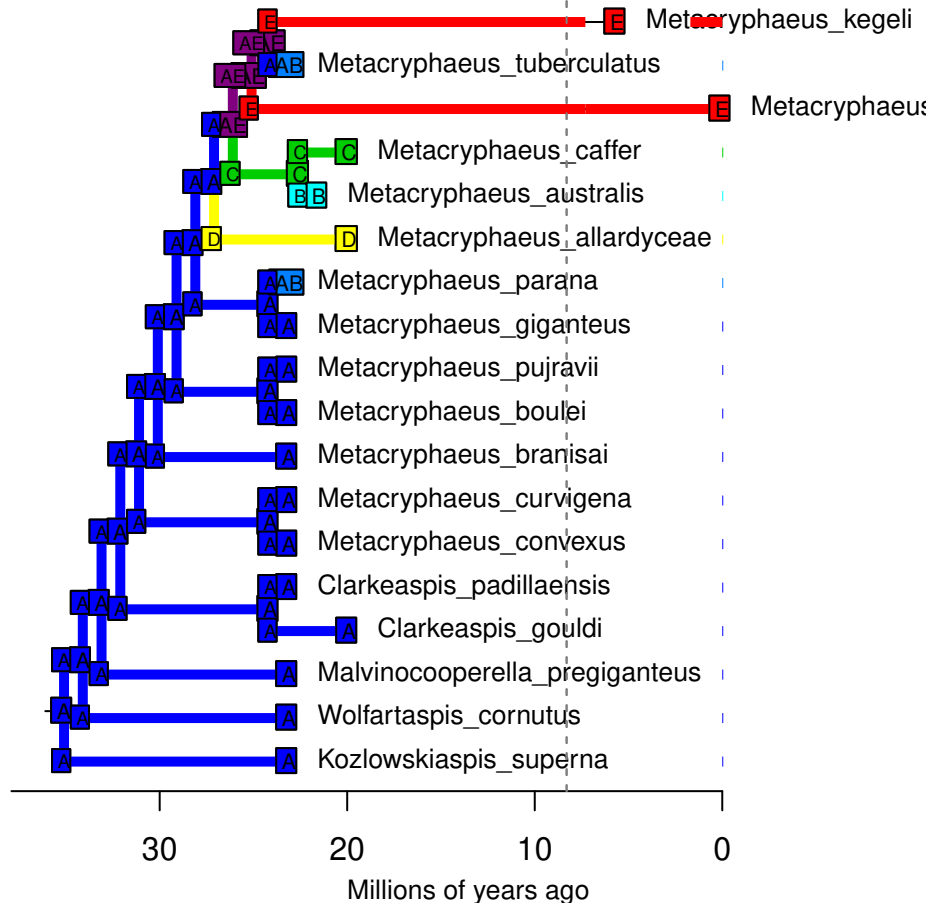
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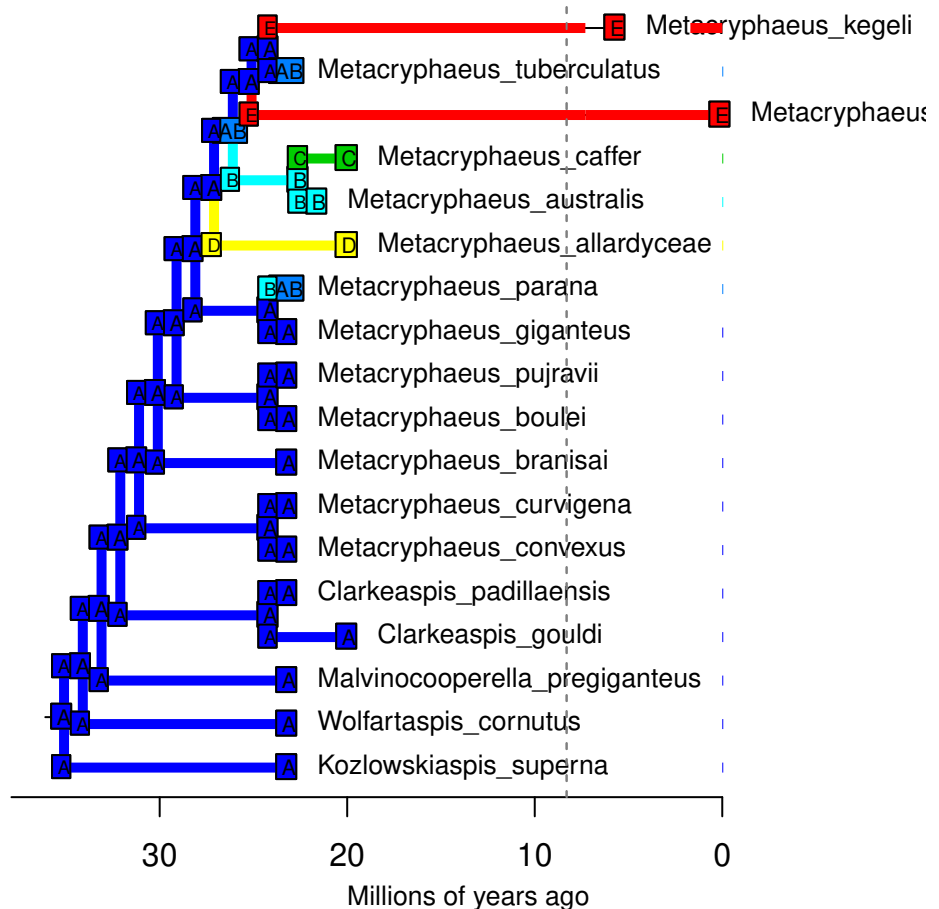
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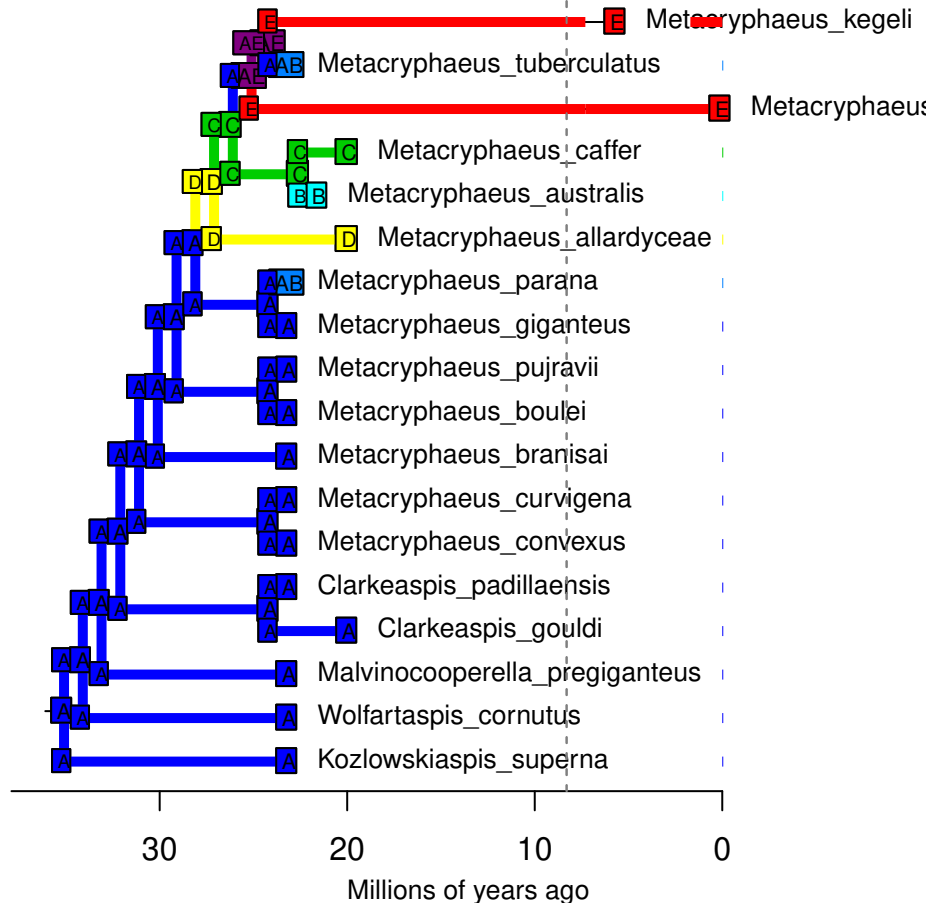
# DECwj – Stochastic Map #22/100

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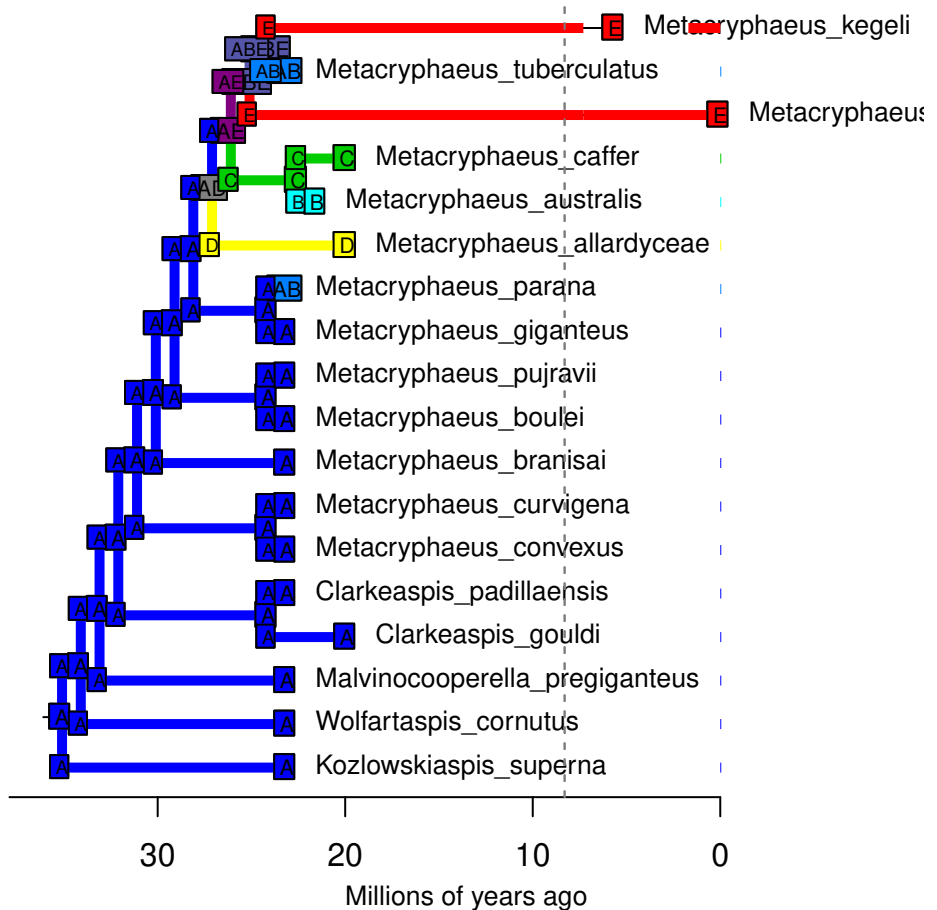
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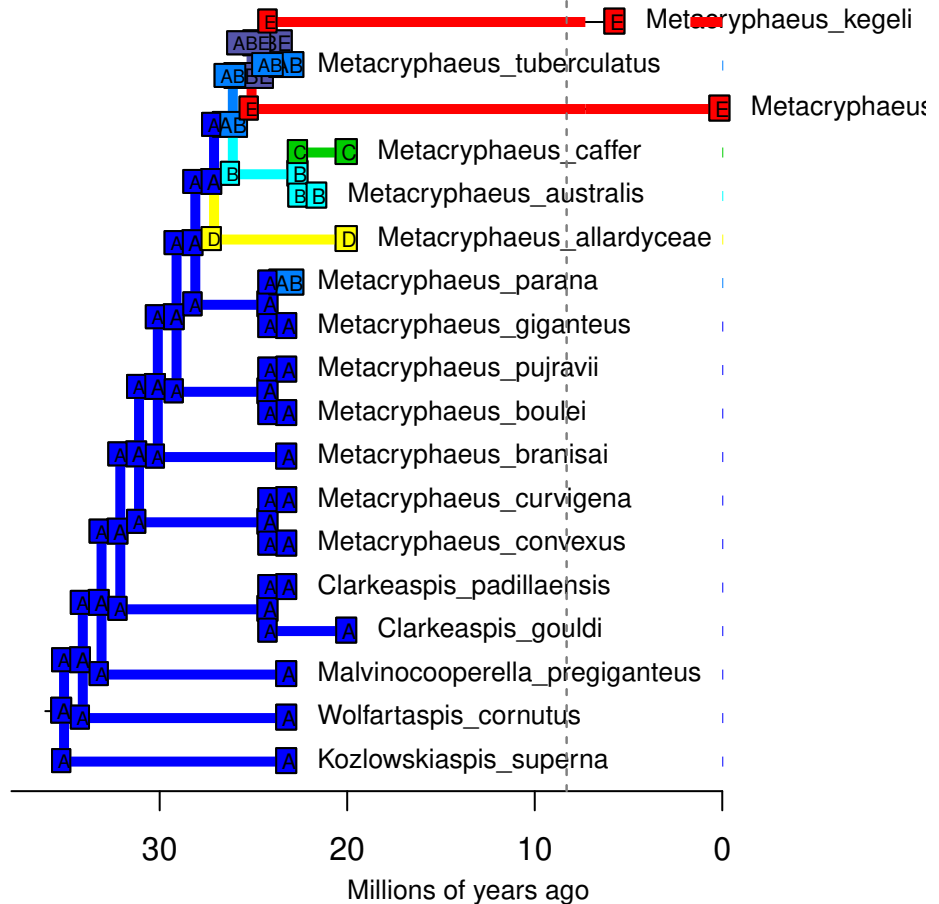
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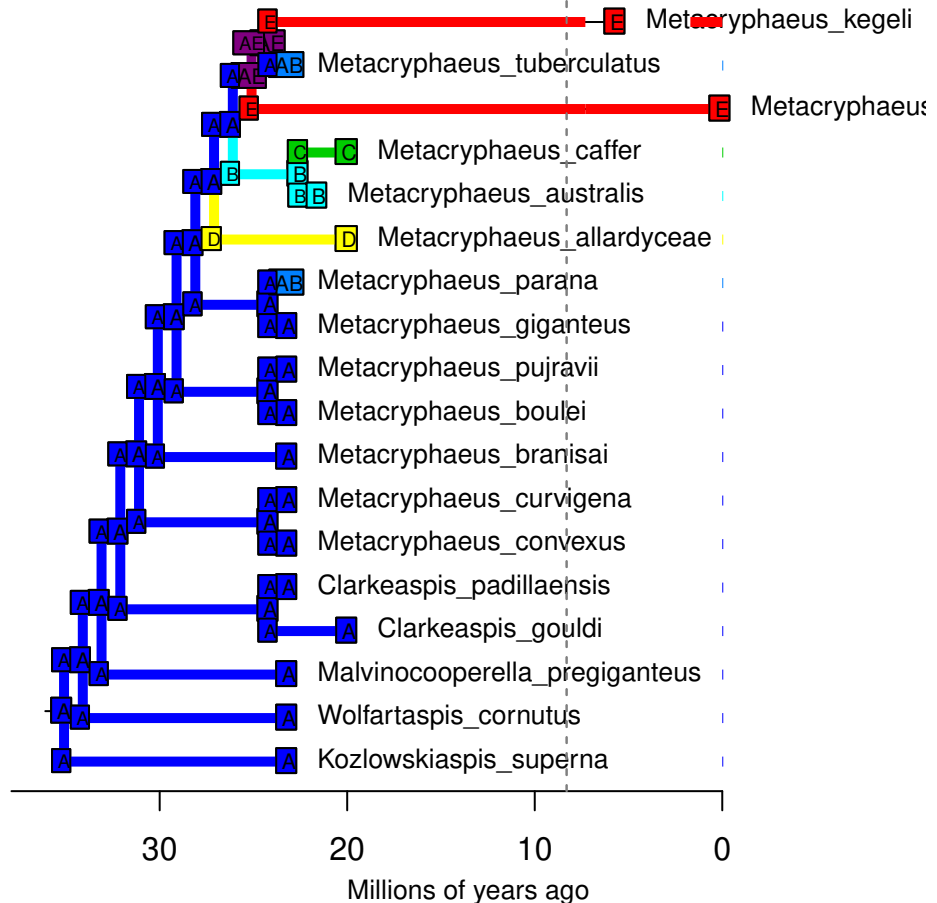
# DECwj – Stochastic Map #25/100

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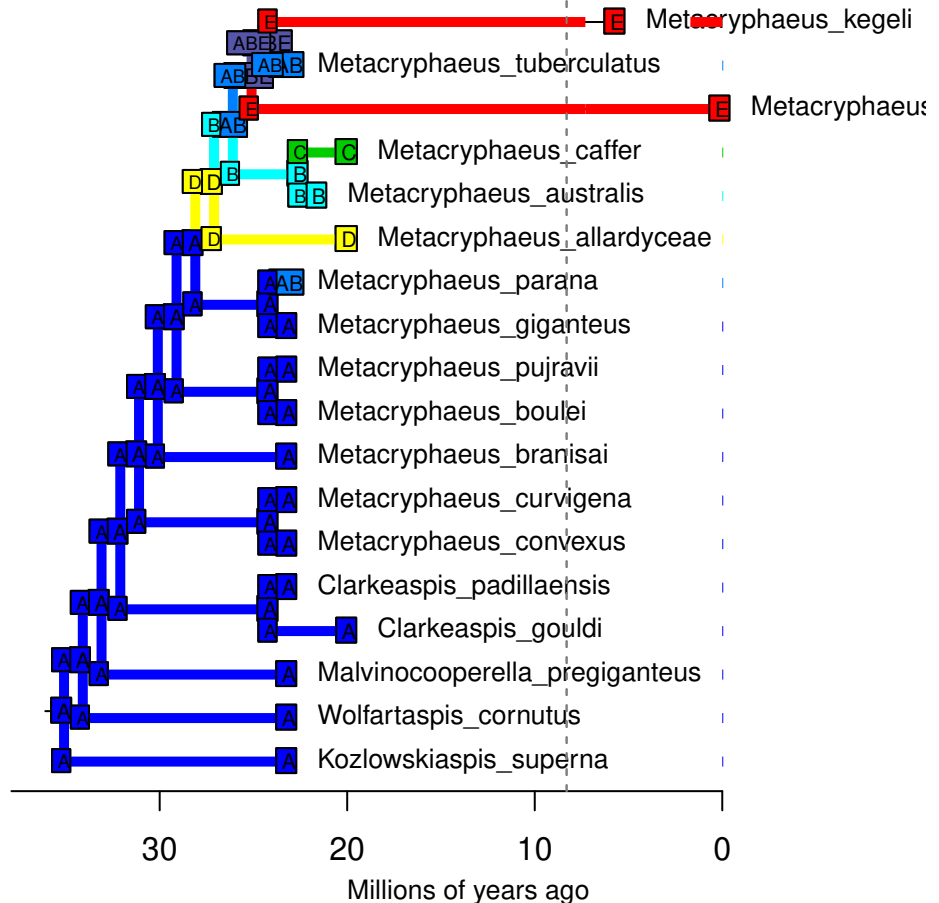
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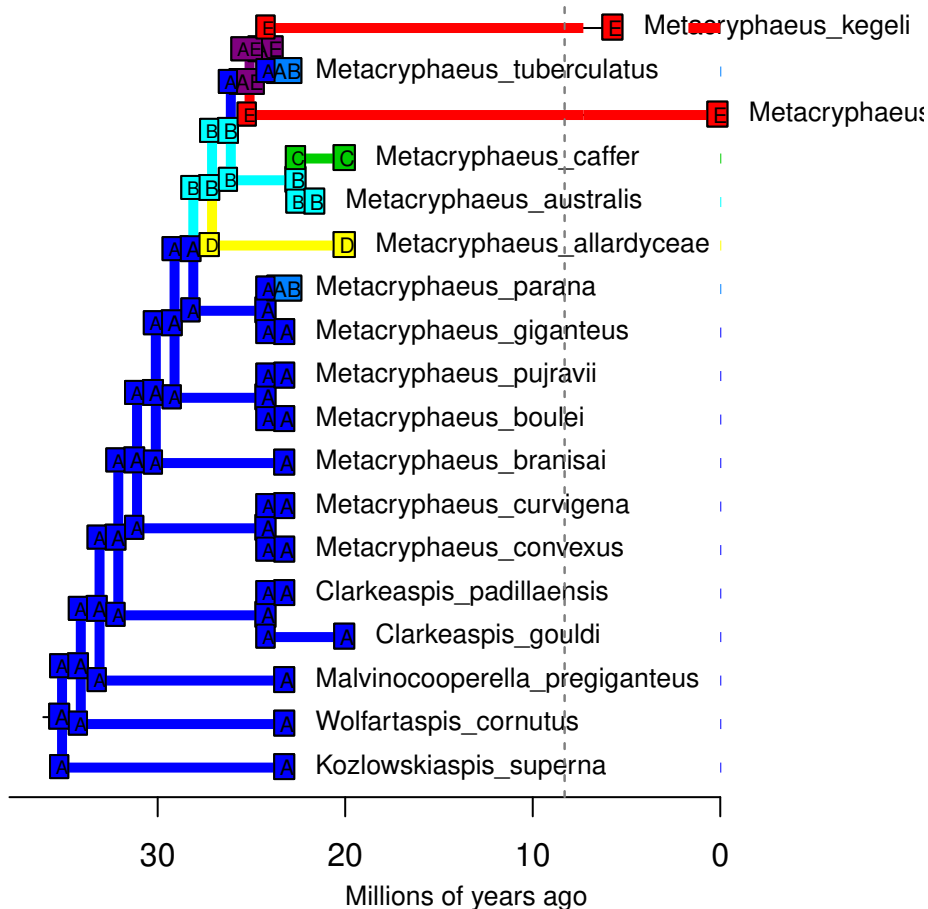
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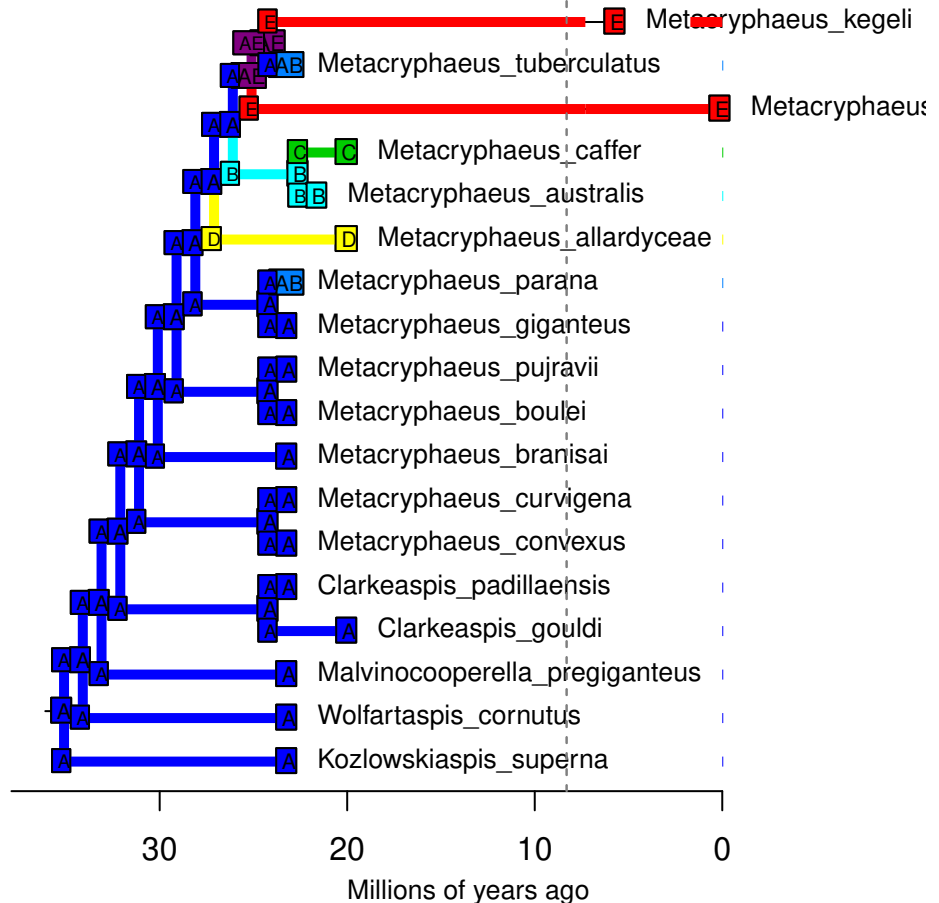
# DECwj – Stochastic Map #28/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



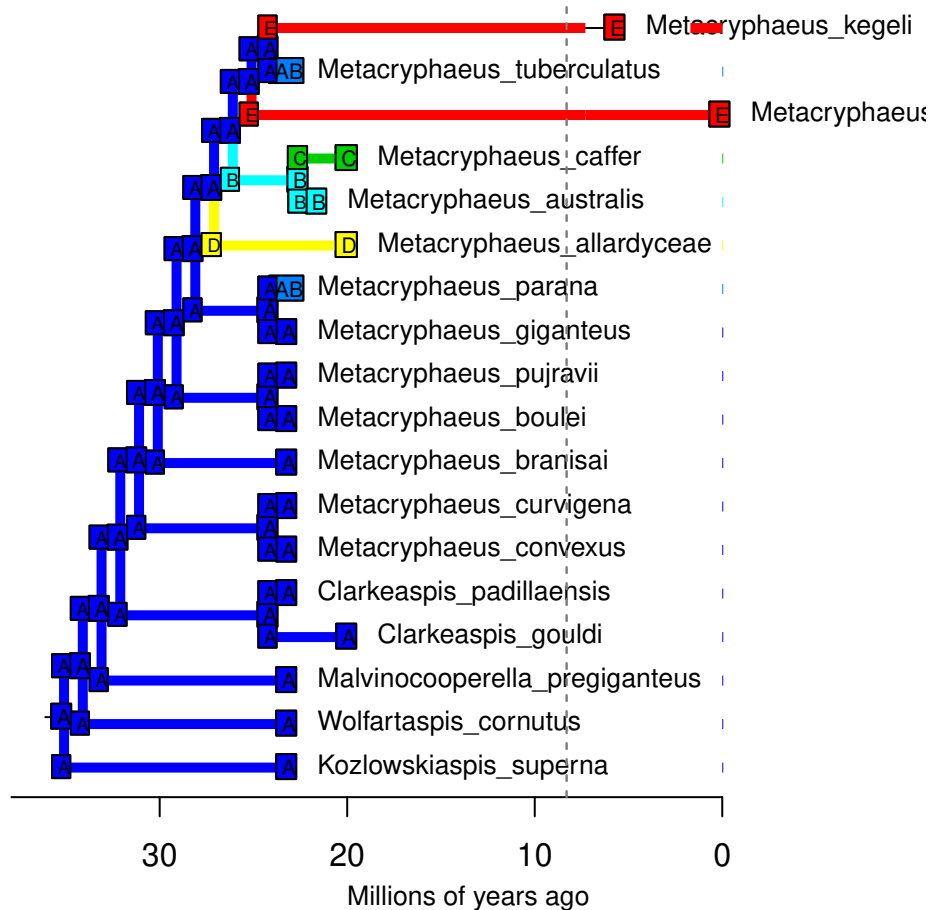
# DECwj – Stochastic Map #29/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



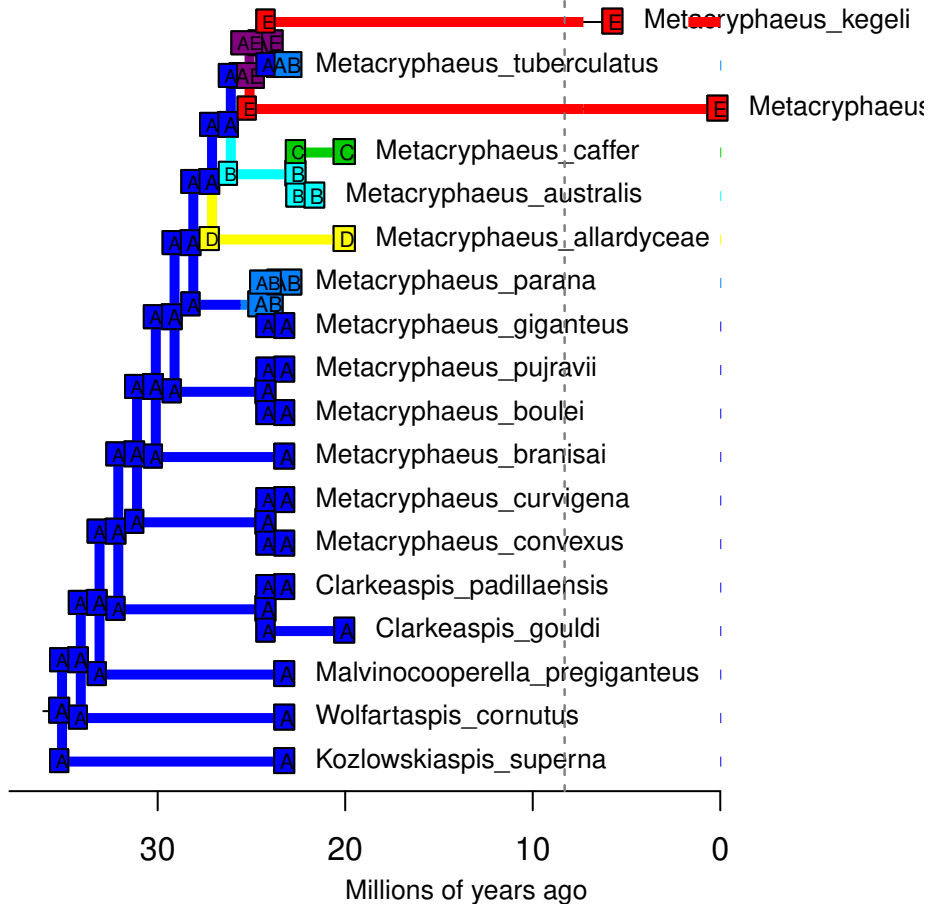
# DECwj – Stochastic Map #30/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #31/100

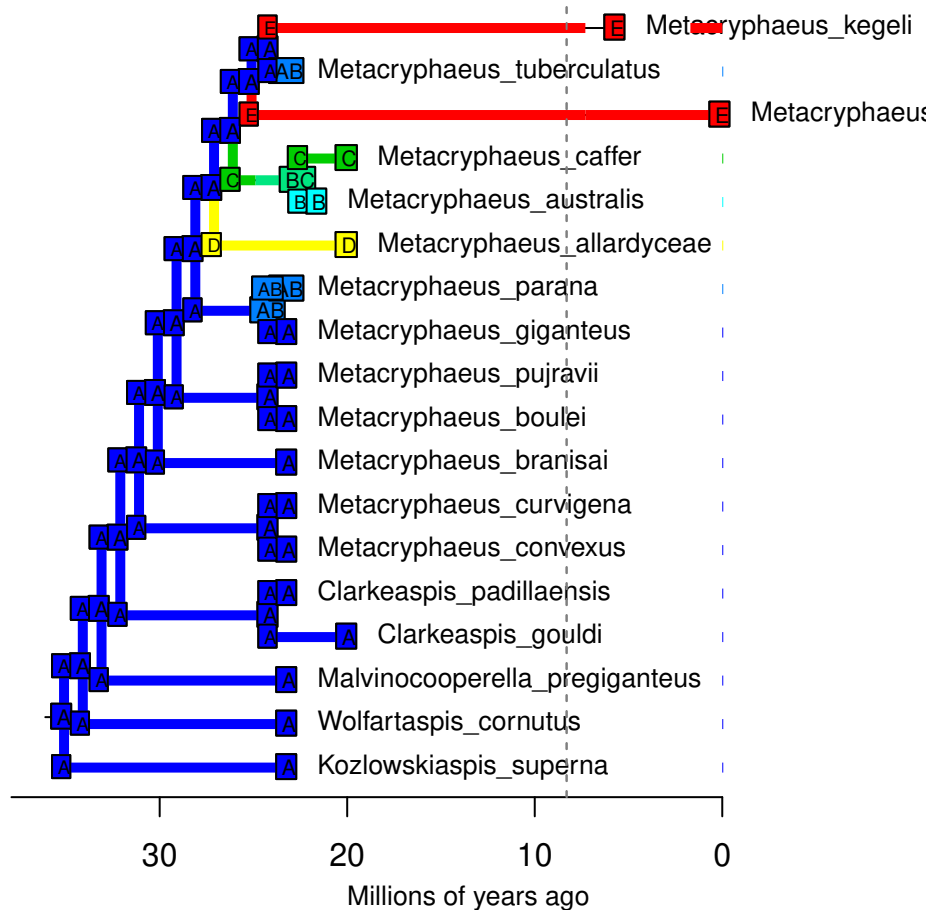
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87





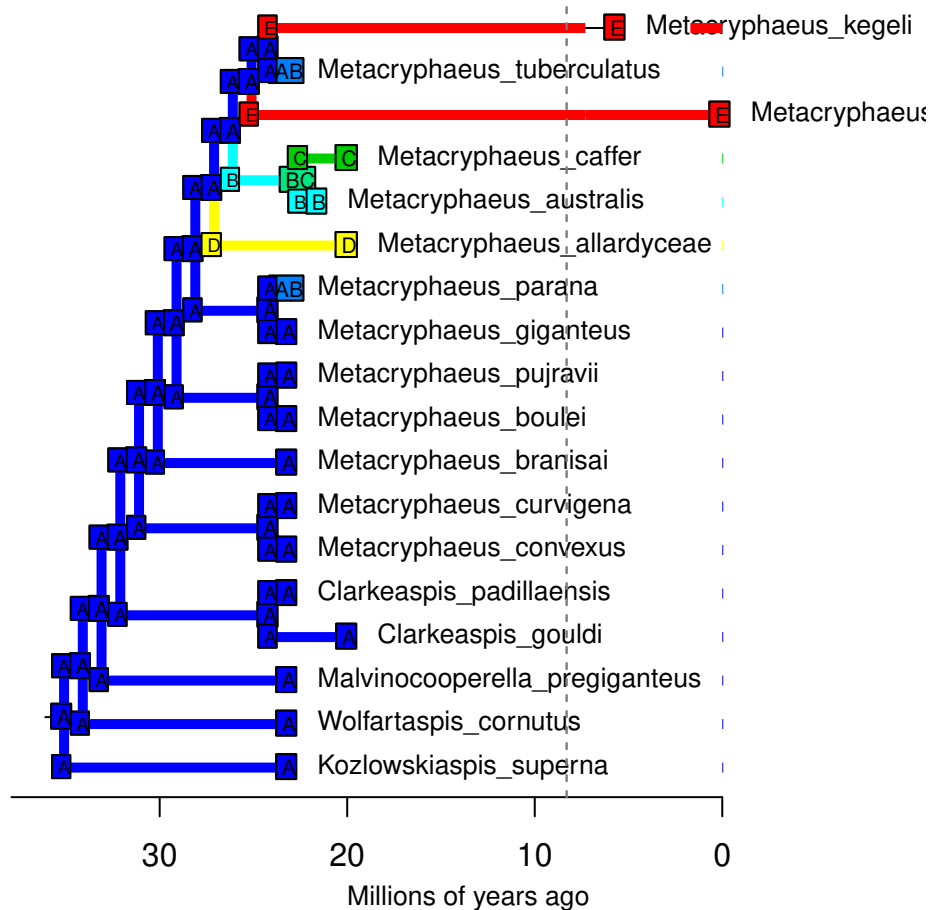
# DECwj – Stochastic Map #32/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



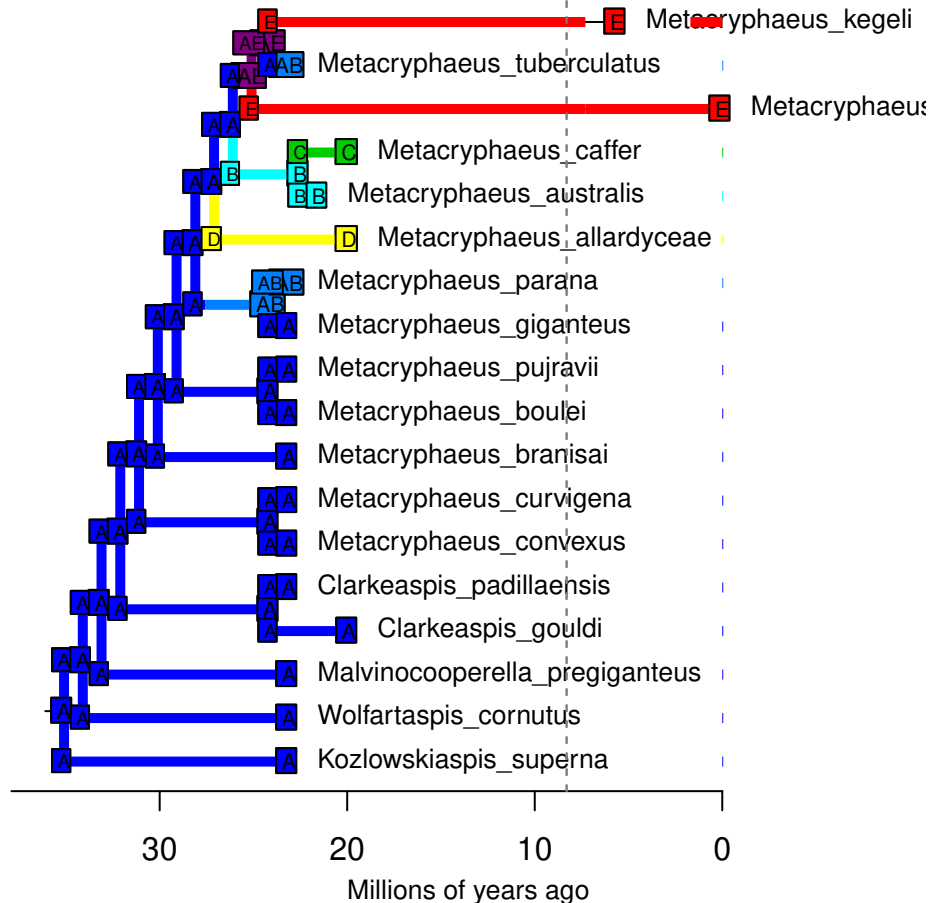
# DECwj – Stochastic Map #33/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



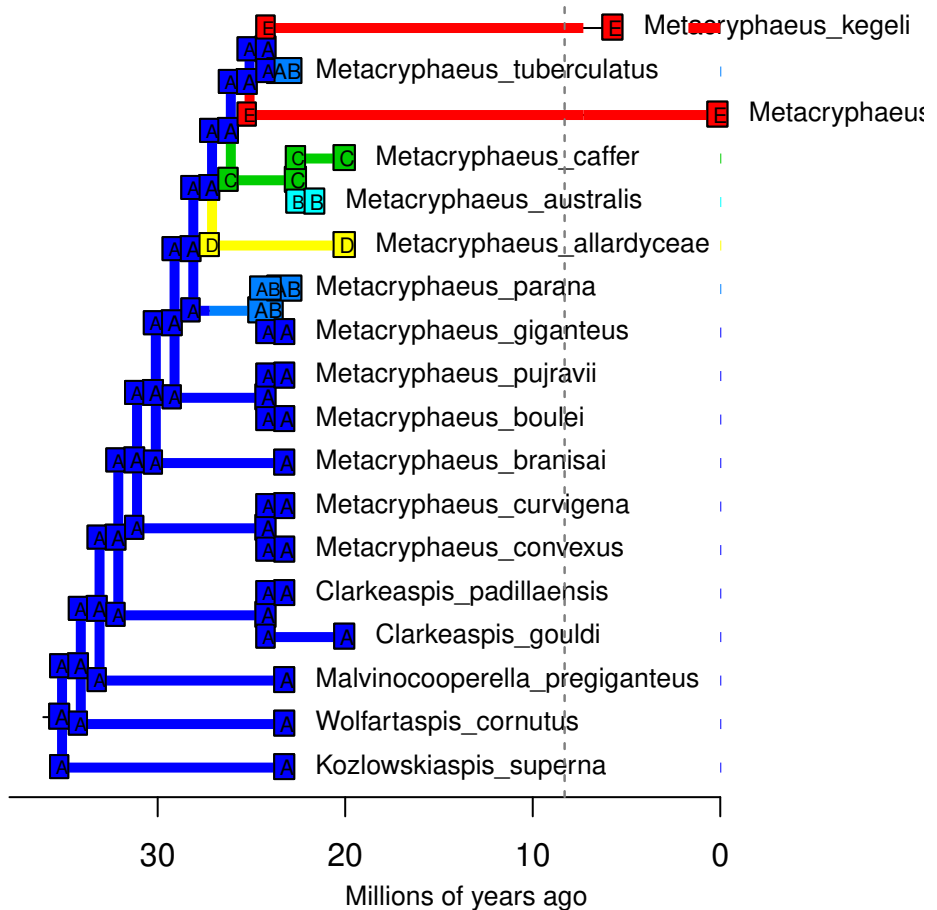
# DECwj – Stochastic Map #34/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



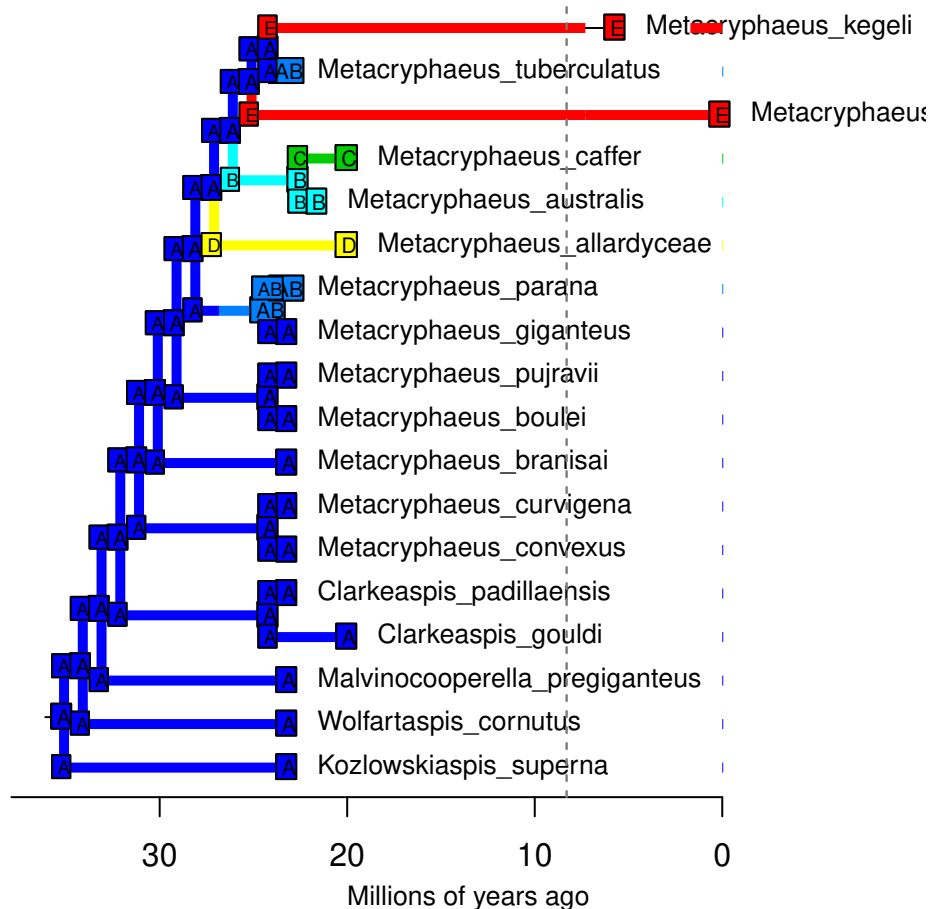
# DECwj – Stochastic Map #35/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



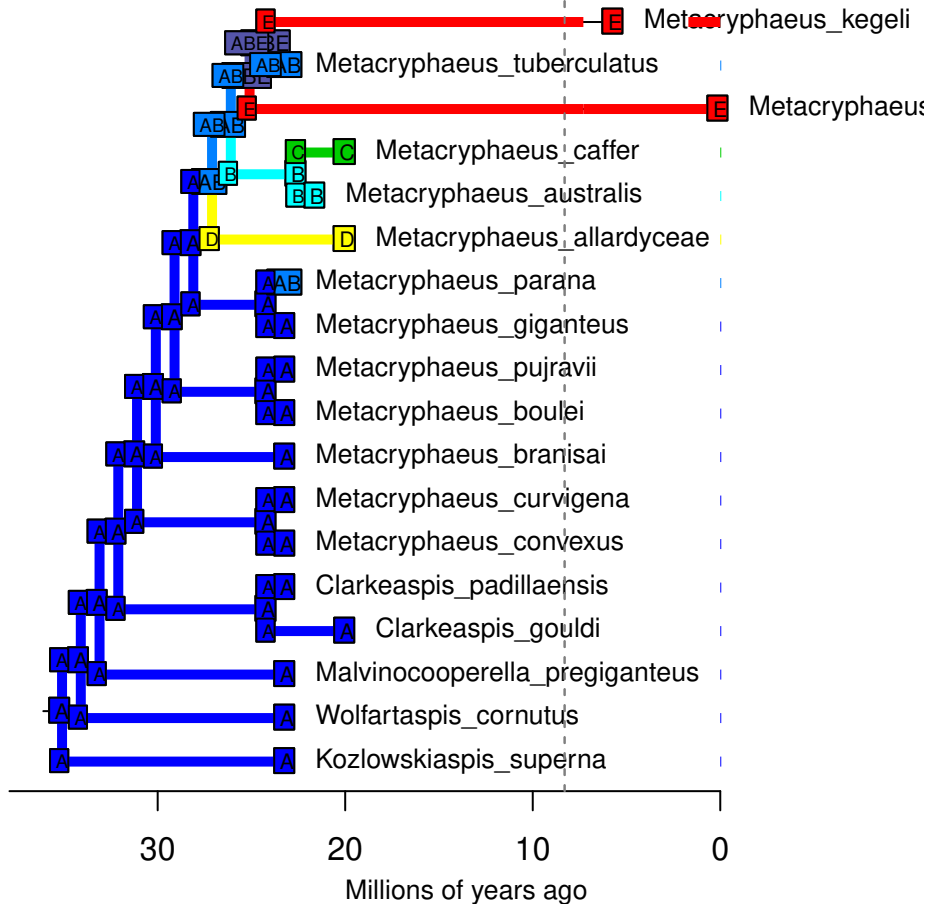
# DECwj – Stochastic Map #36/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



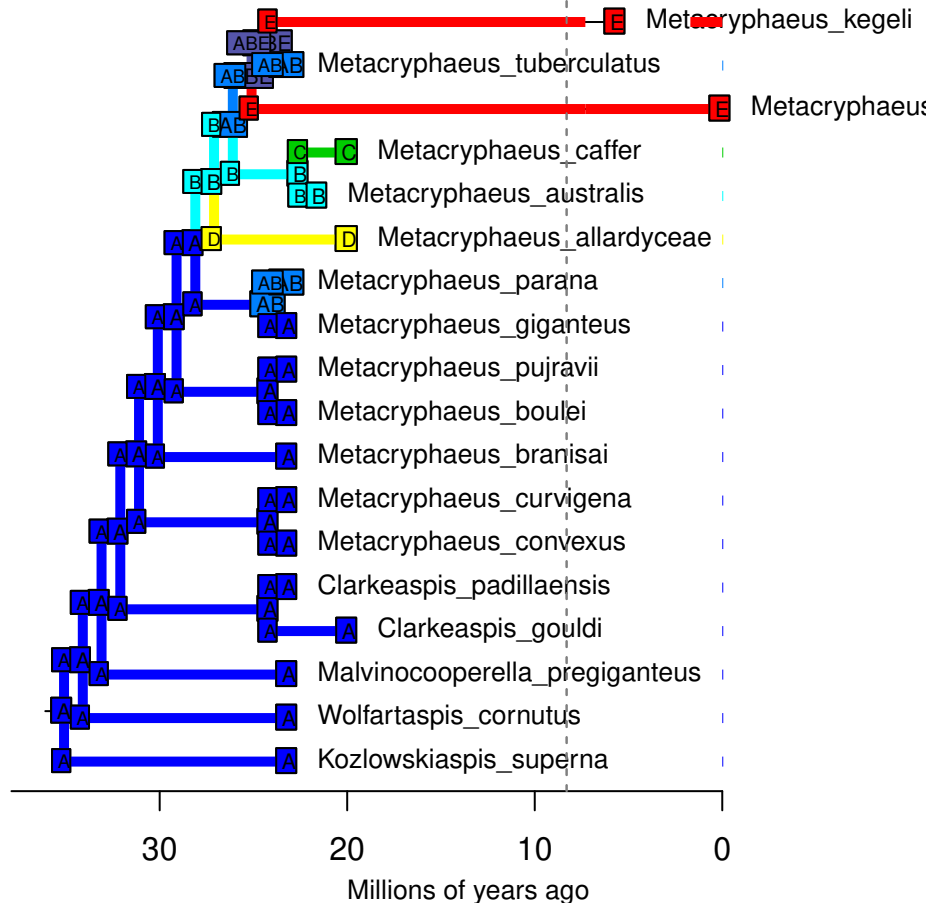
# DECwj – Stochastic Map #37/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



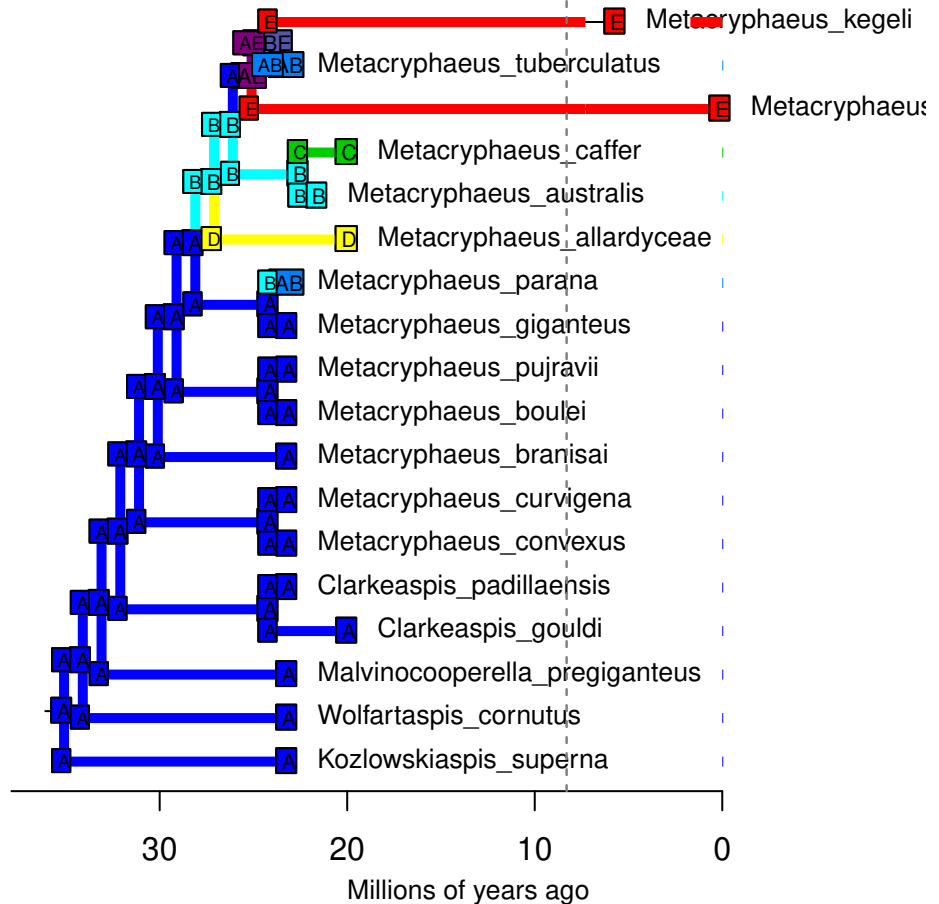
# DECwj – Stochastic Map #38/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #39/100

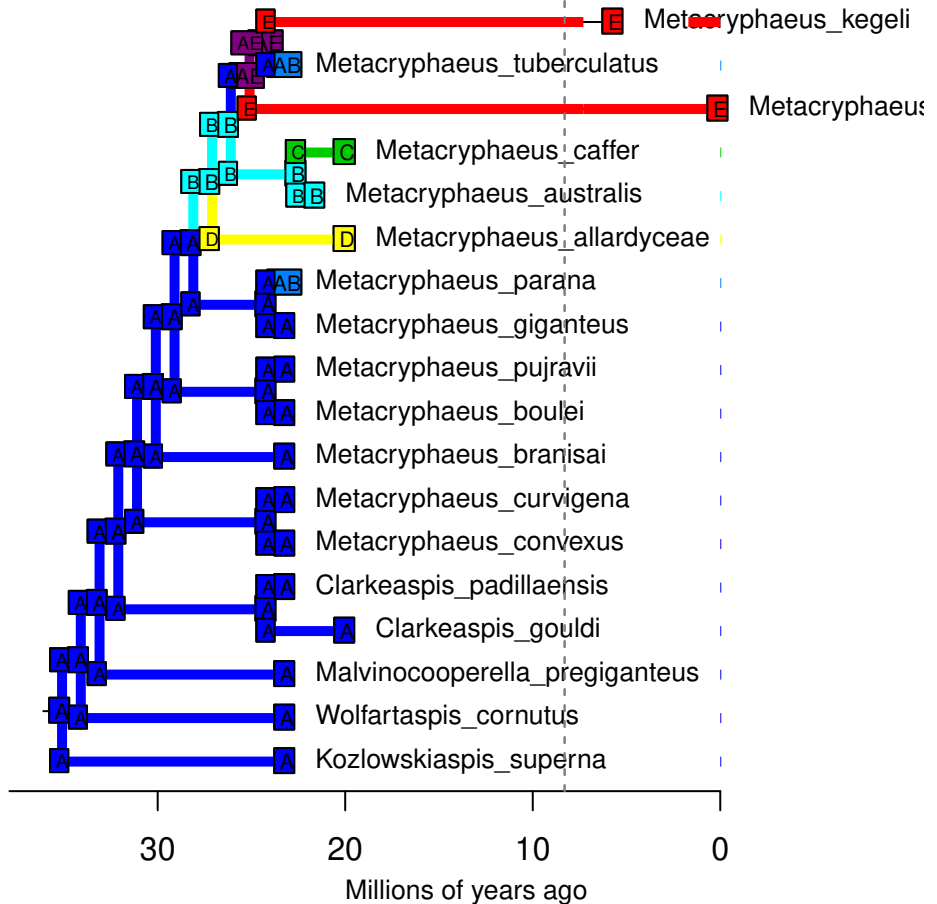
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87





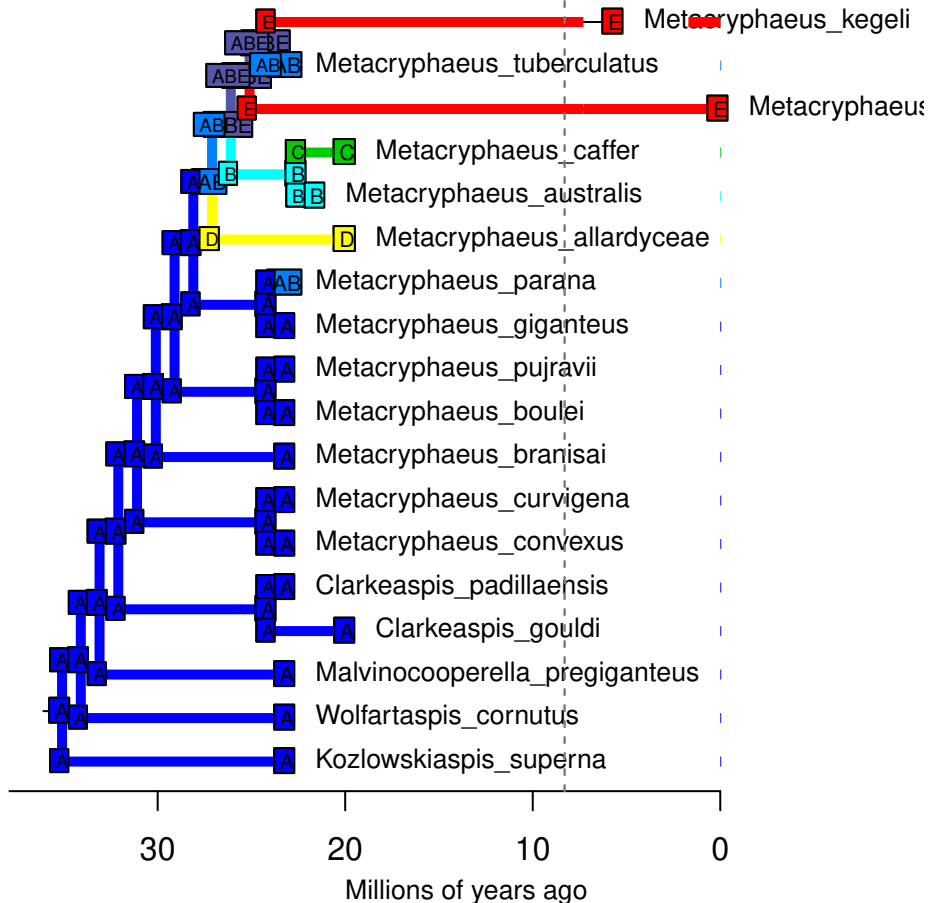
# DECwj – Stochastic Map #40/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



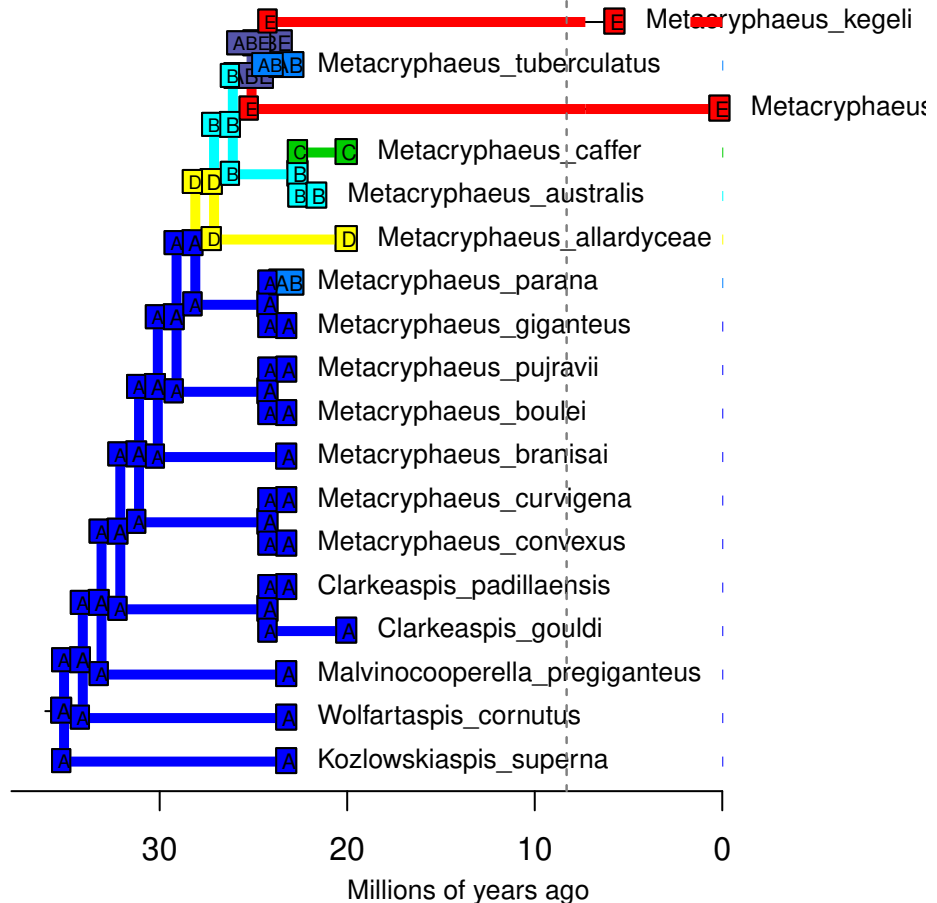
# DECwj – Stochastic Map #41/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



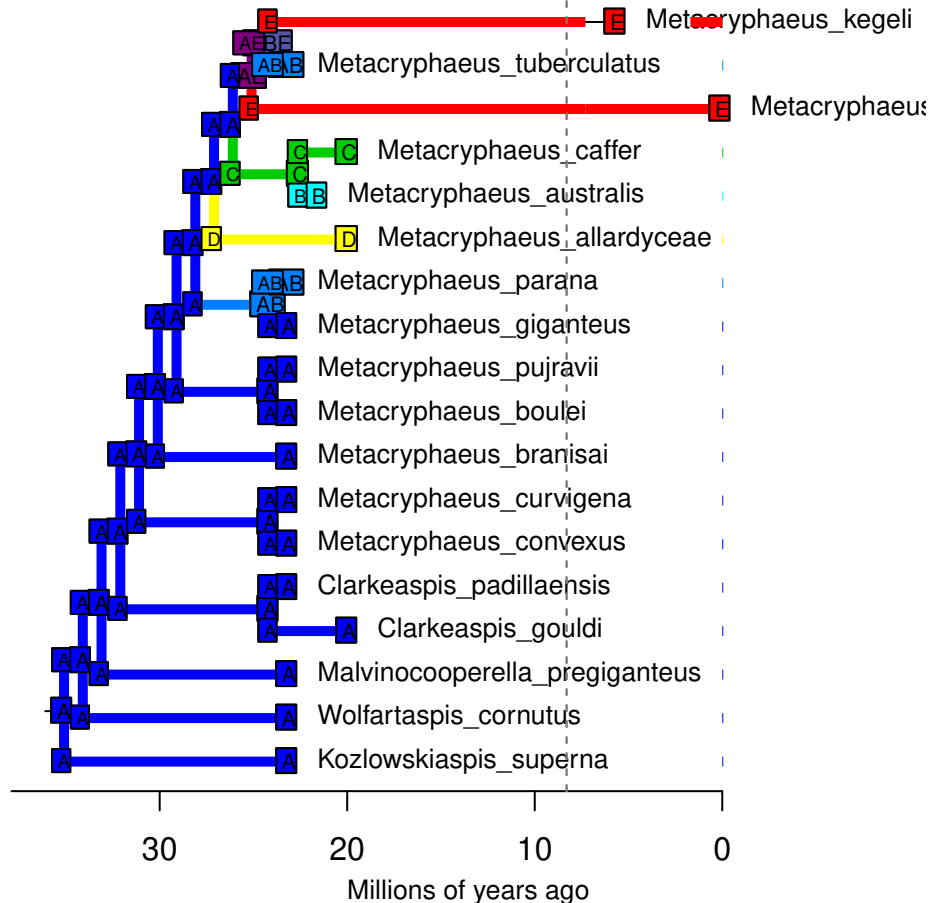
# DECwj – Stochastic Map #42/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



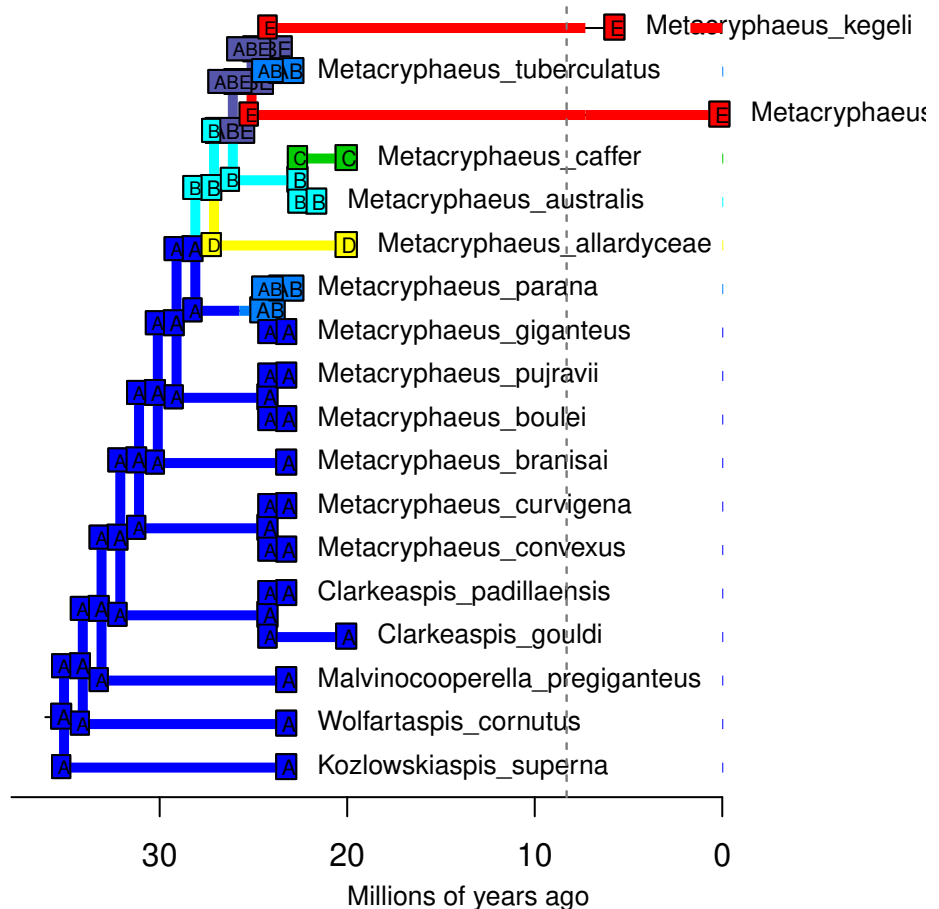
# DECwj – Stochastic Map #43/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



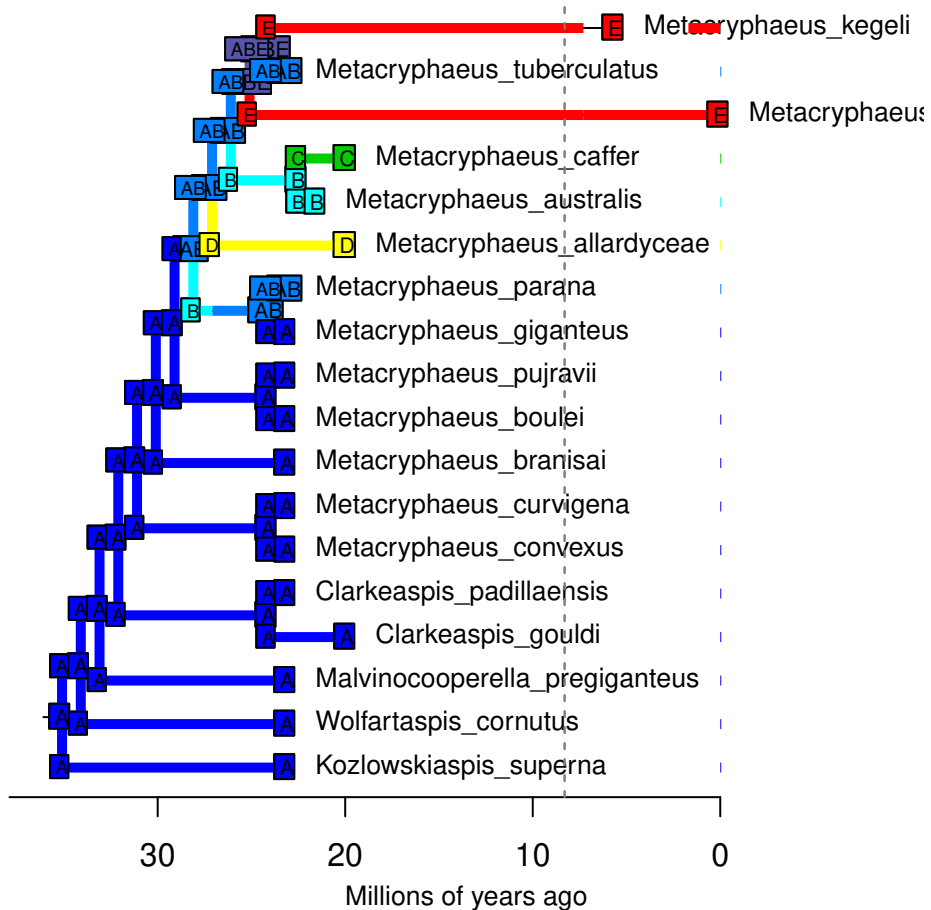
# DECwj – Stochastic Map #44/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



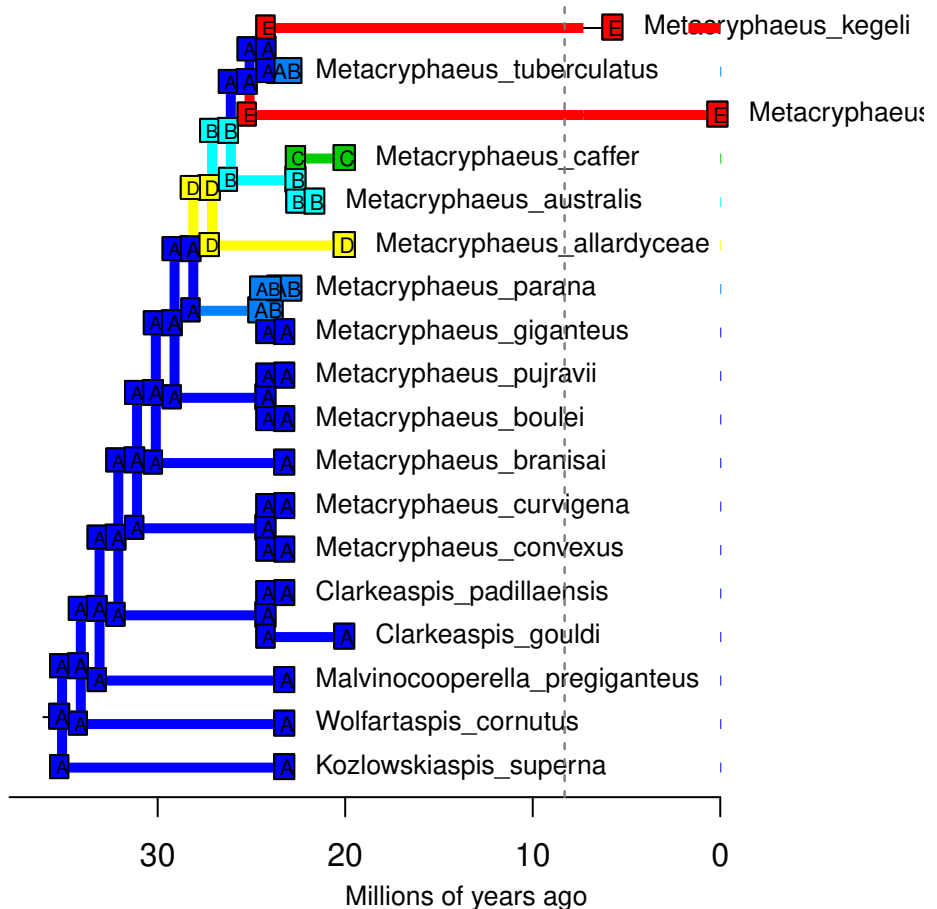
# DECwj – Stochastic Map #45/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



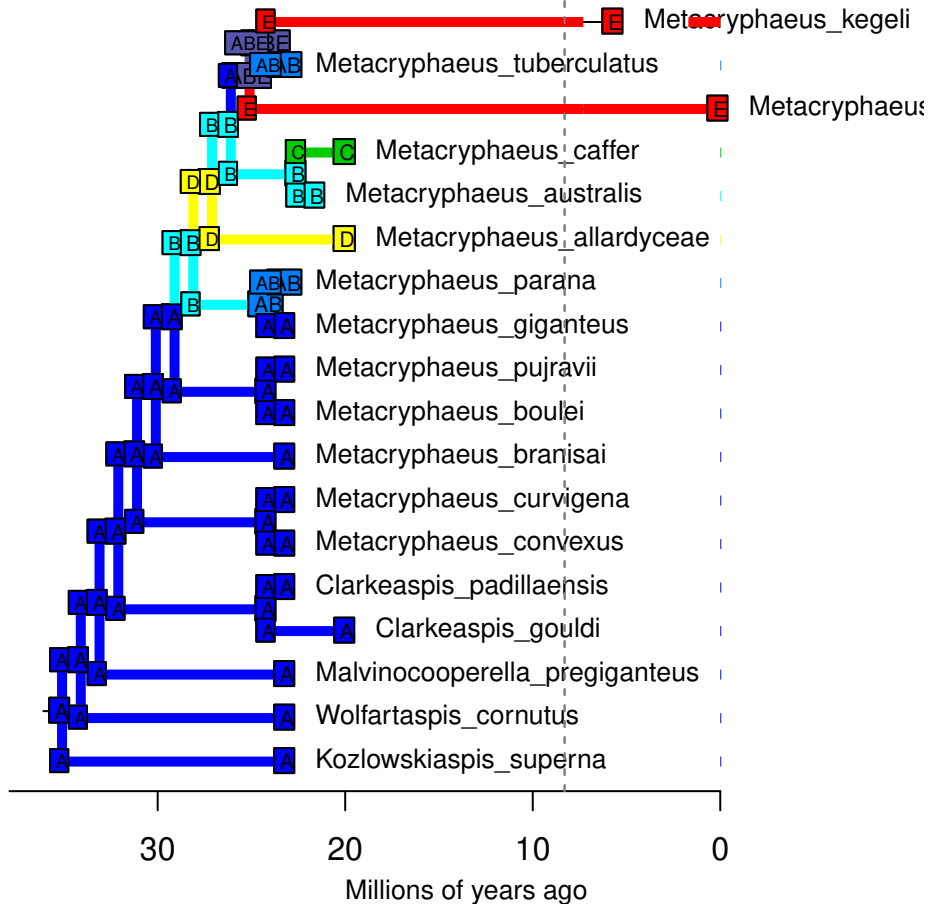
# DECwj – Stochastic Map #46/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #47/100

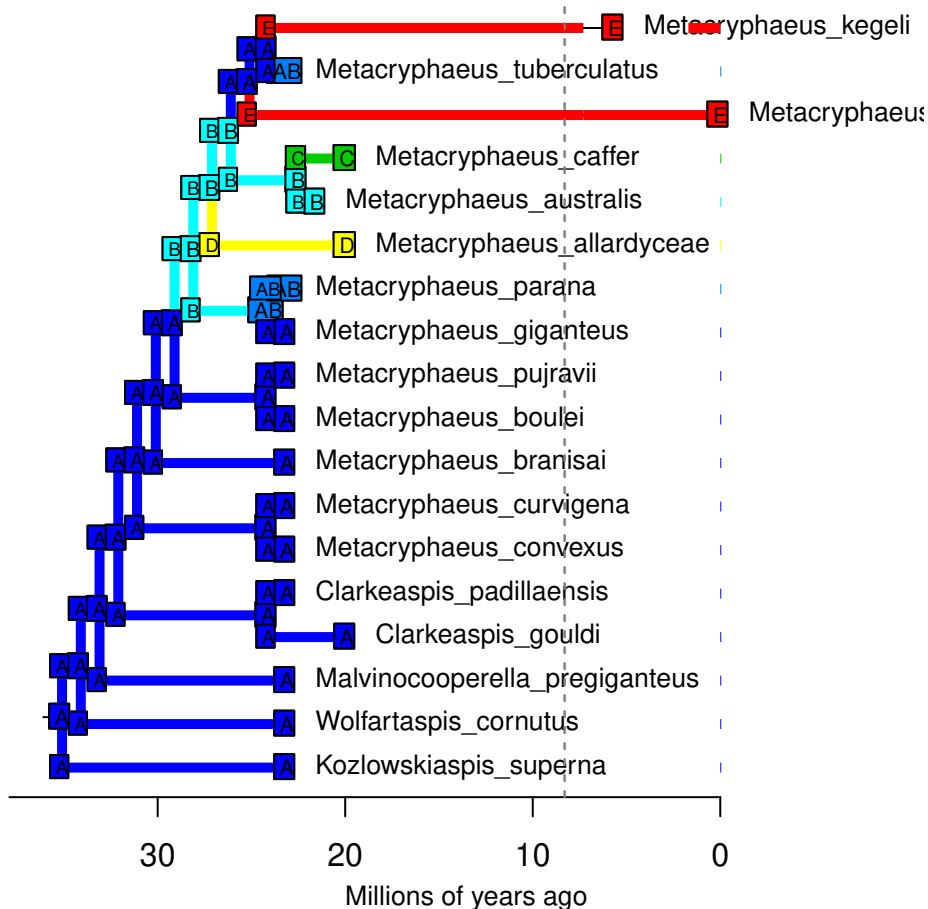
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87





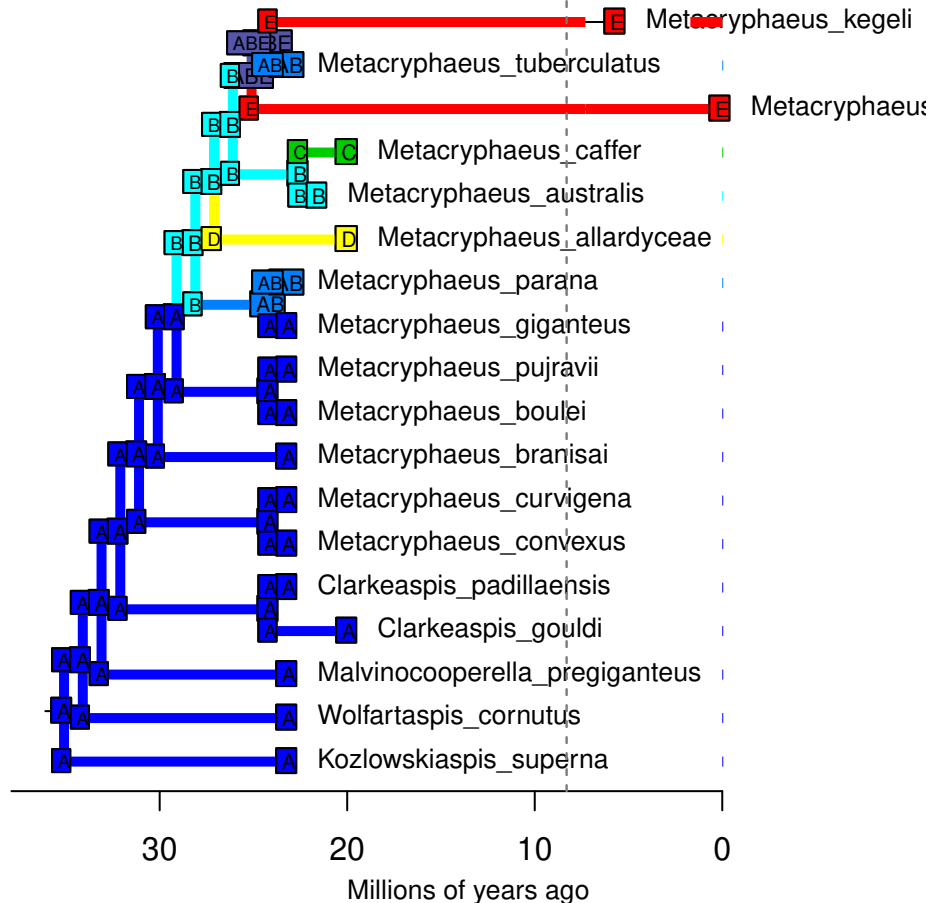
# DECwj – Stochastic Map #48/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



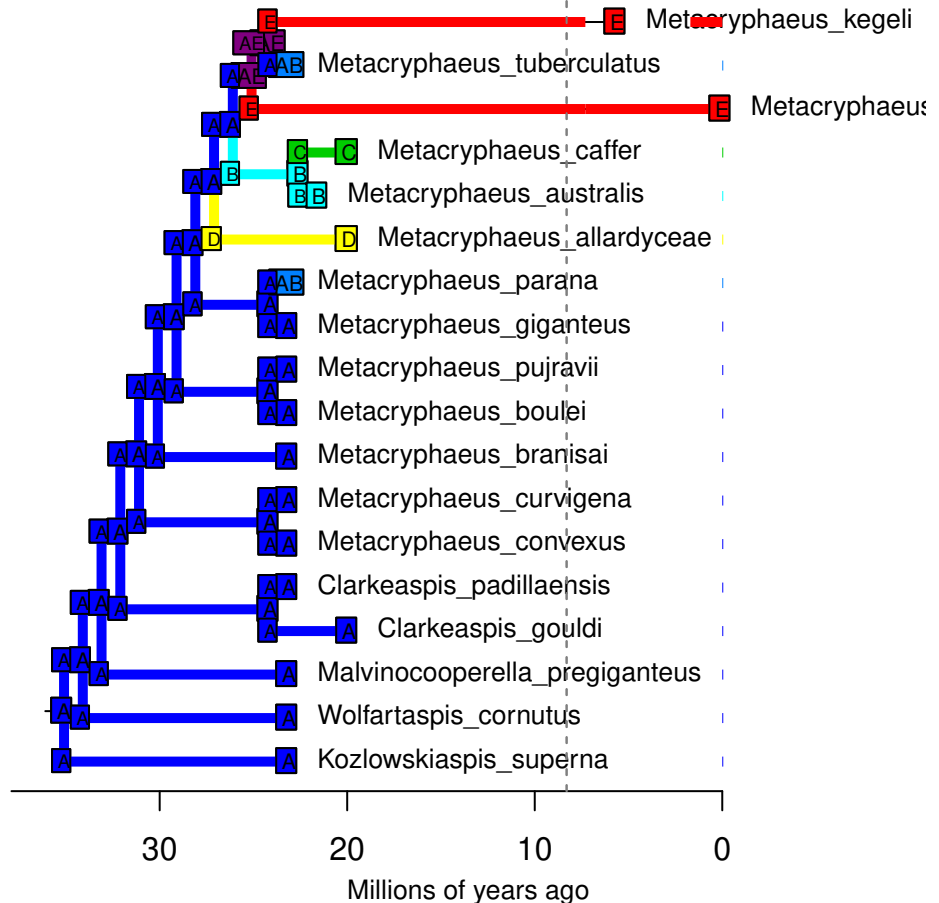
# DECwj – Stochastic Map #49/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



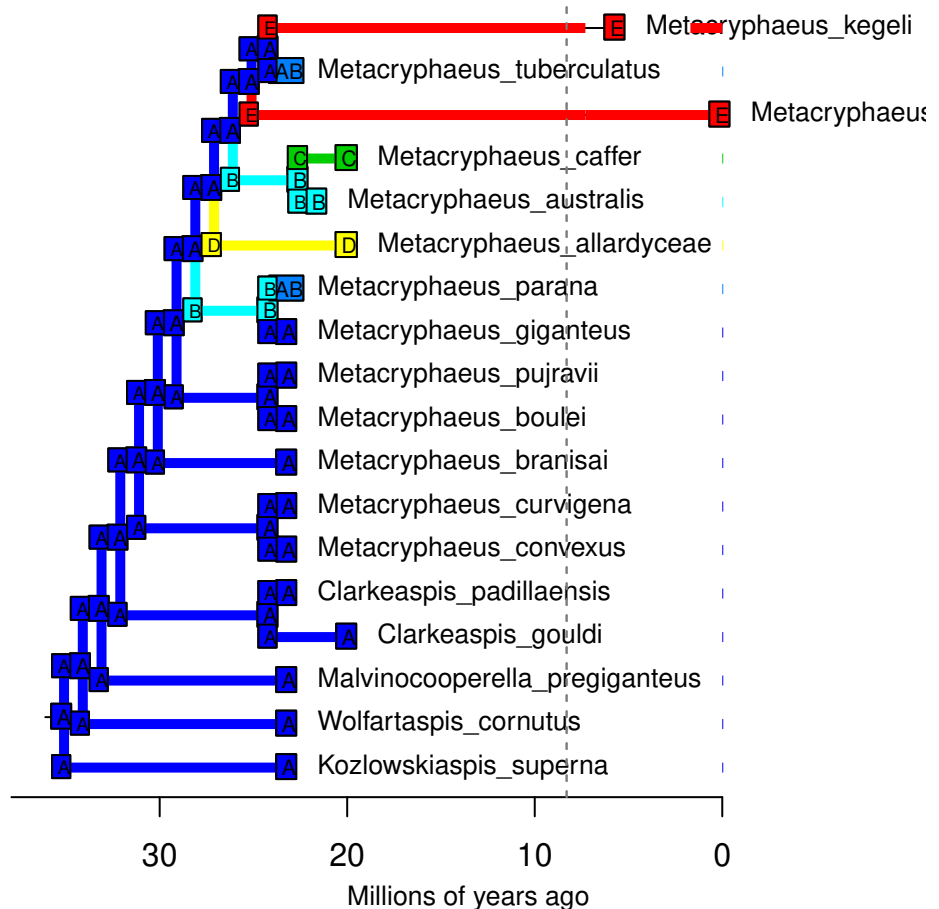
# DECwj – Stochastic Map #50/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



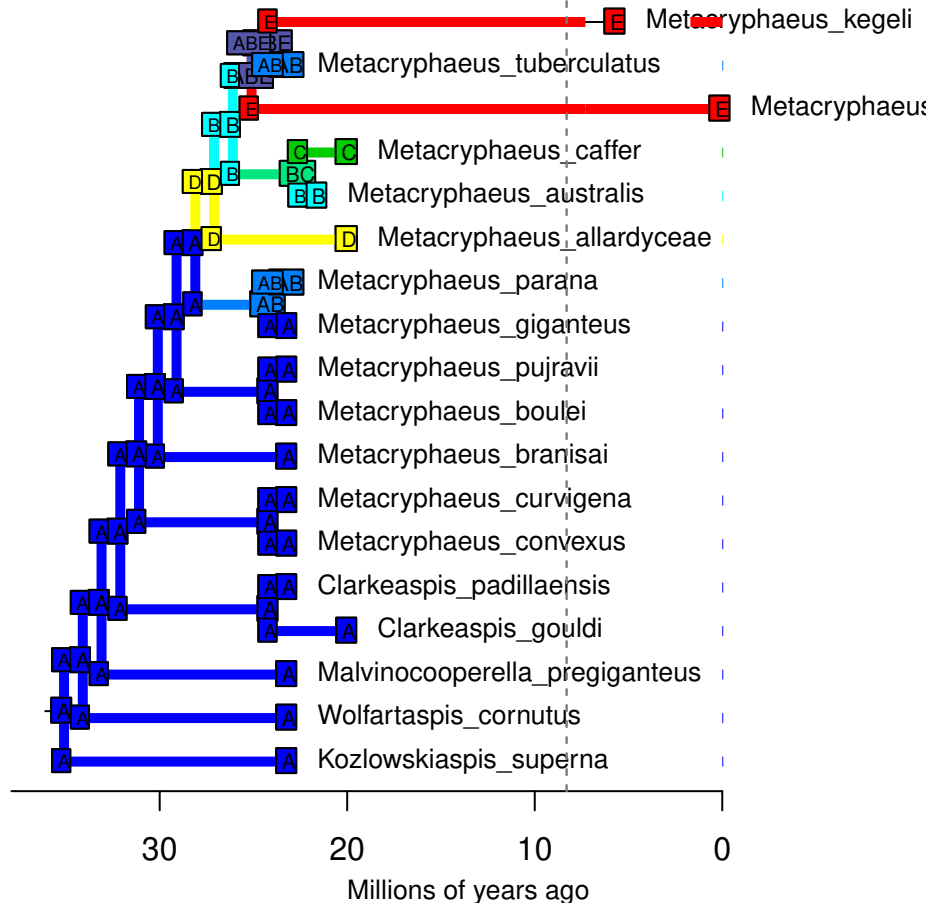
# DECwj – Stochastic Map #51/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



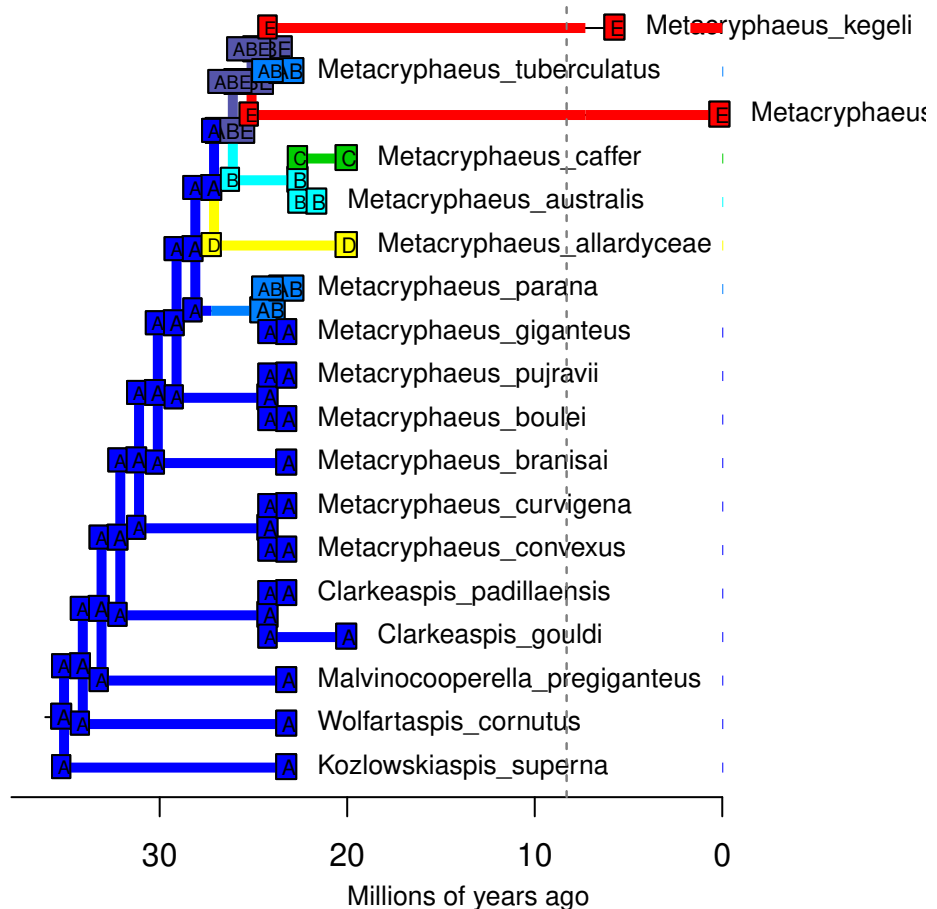
# DECwj – Stochastic Map #52/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



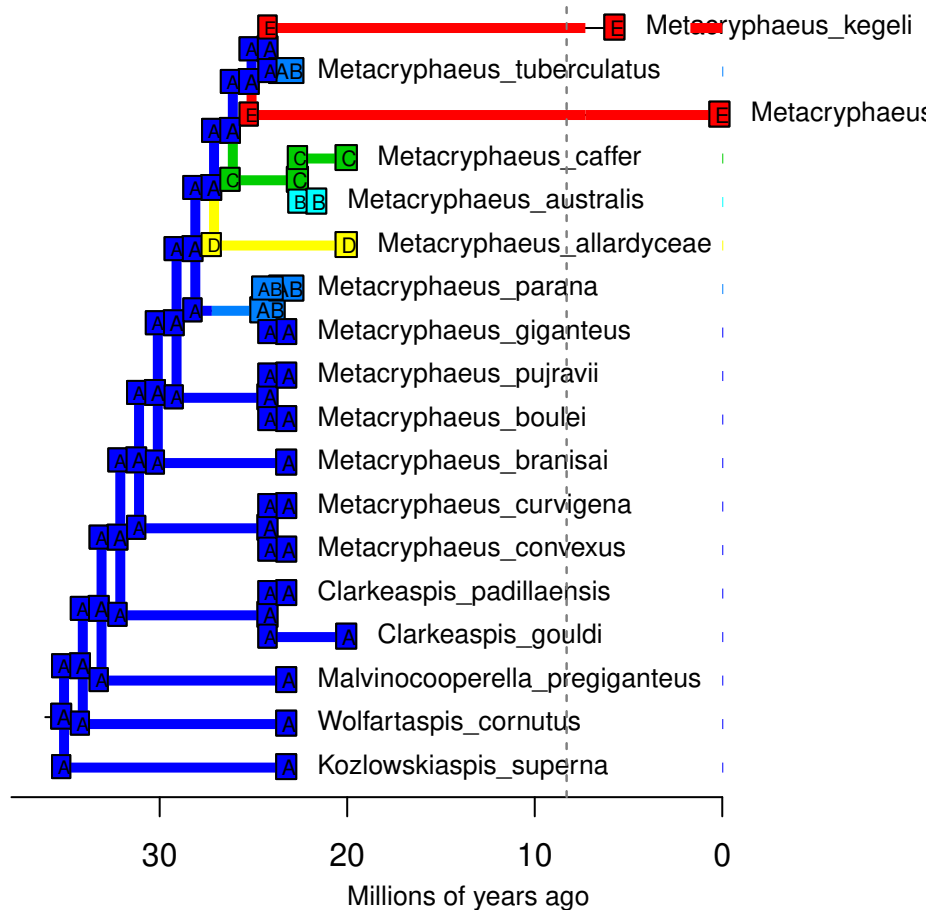
# DECwj – Stochastic Map #53/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



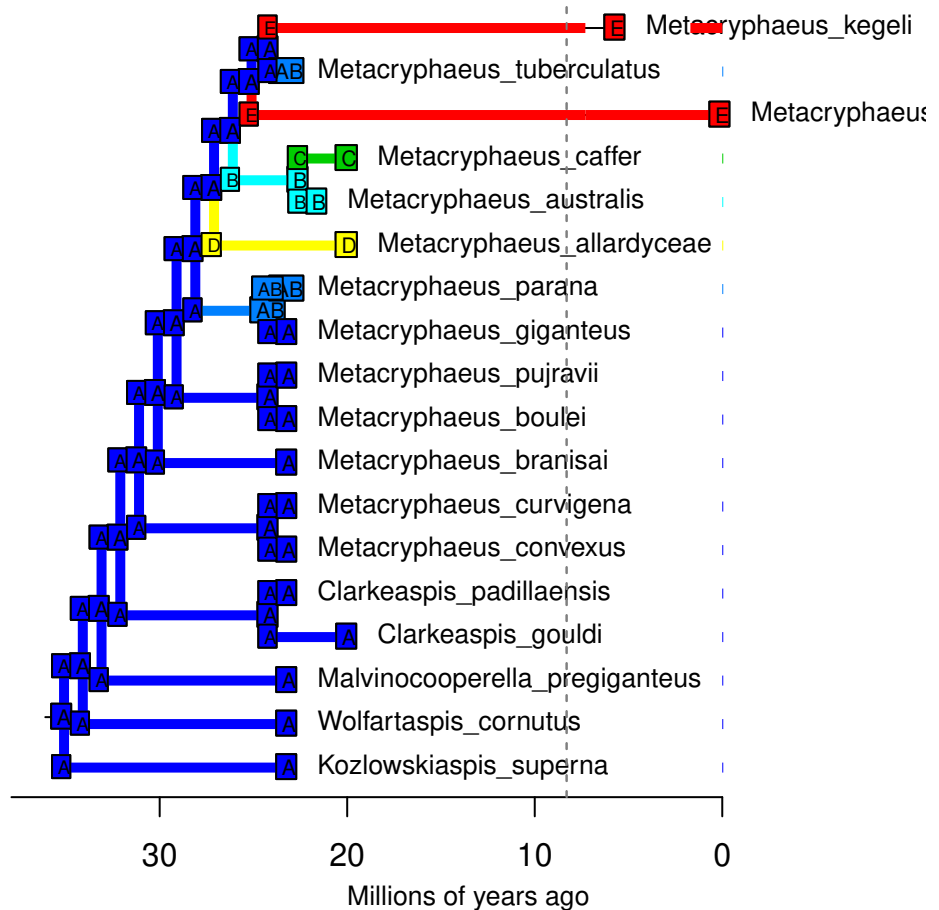
# DECwj – Stochastic Map #54/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #55/100

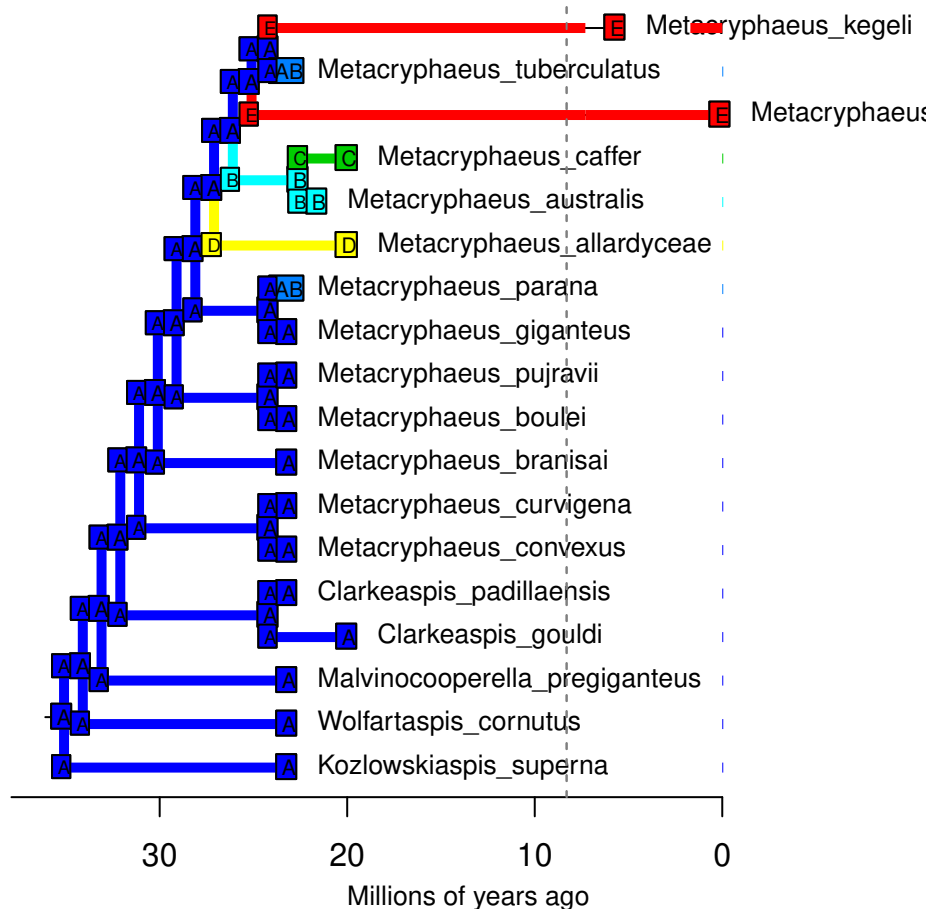
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87





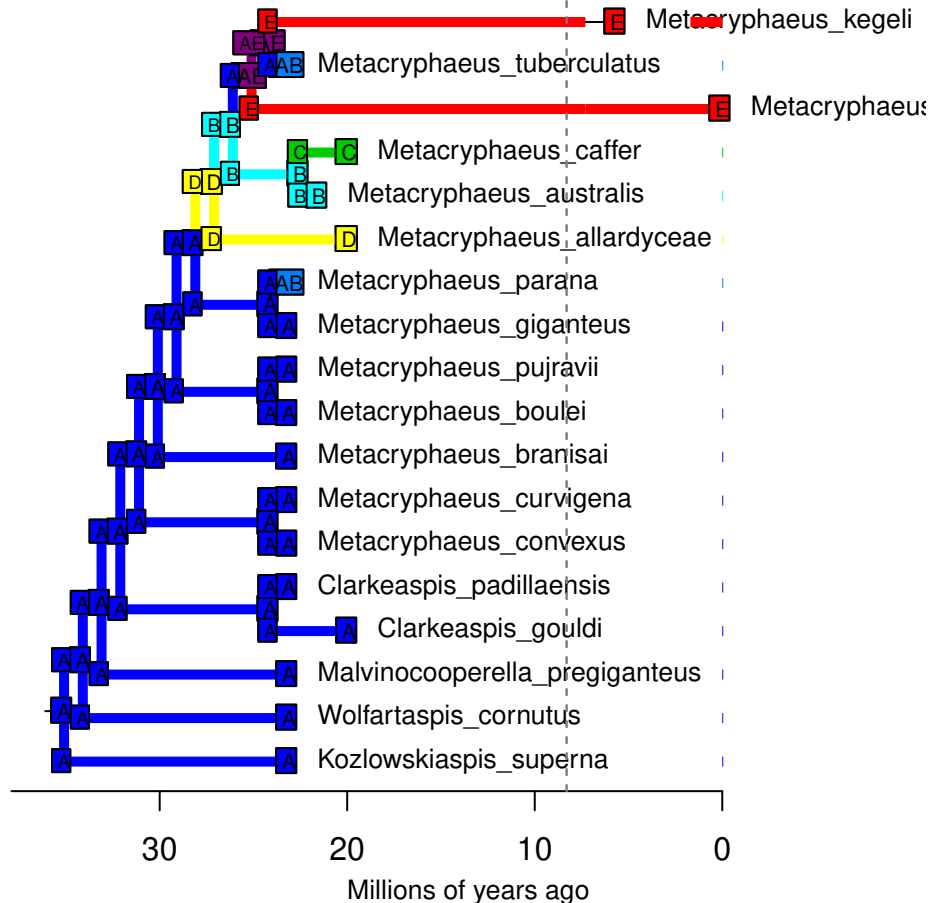
# DECwj – Stochastic Map #56/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



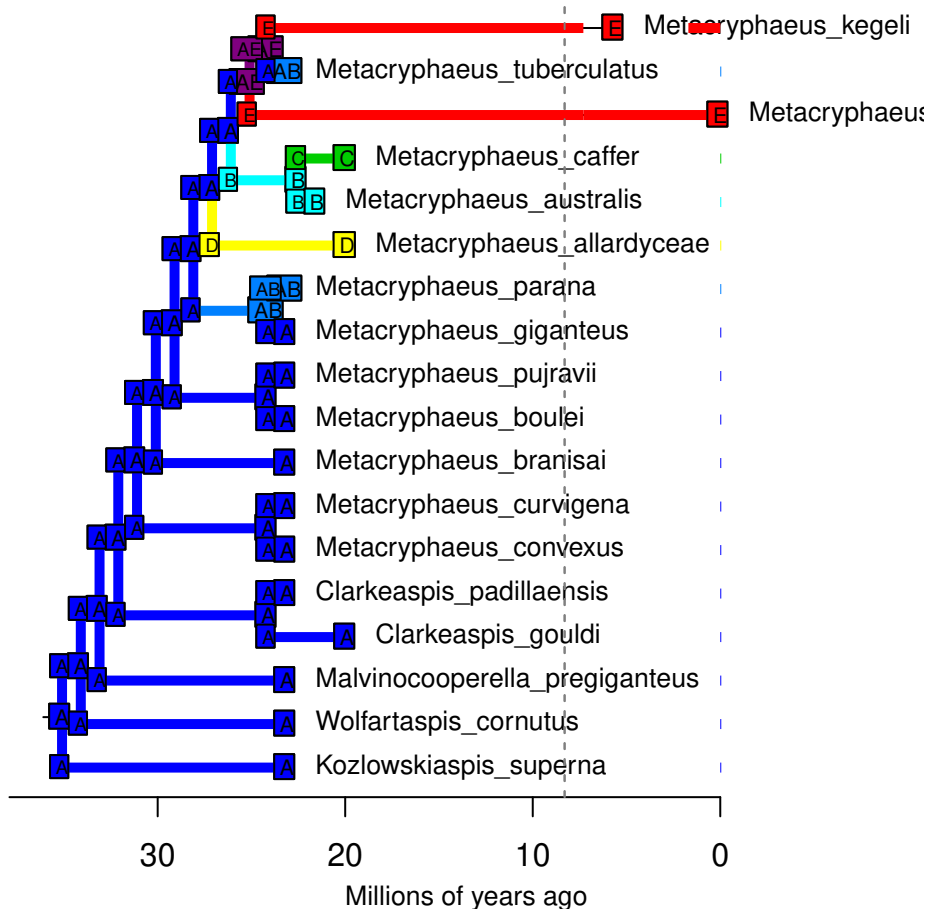
# DECwj – Stochastic Map #57/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



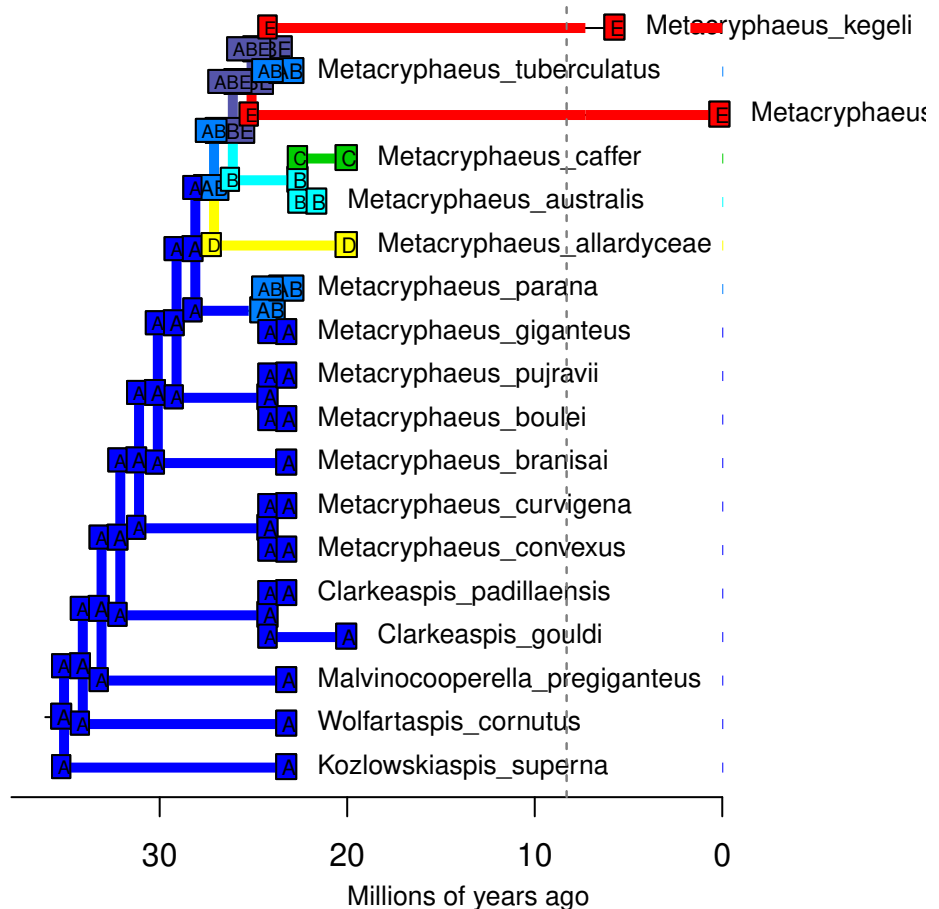
# DECwj – Stochastic Map #58/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



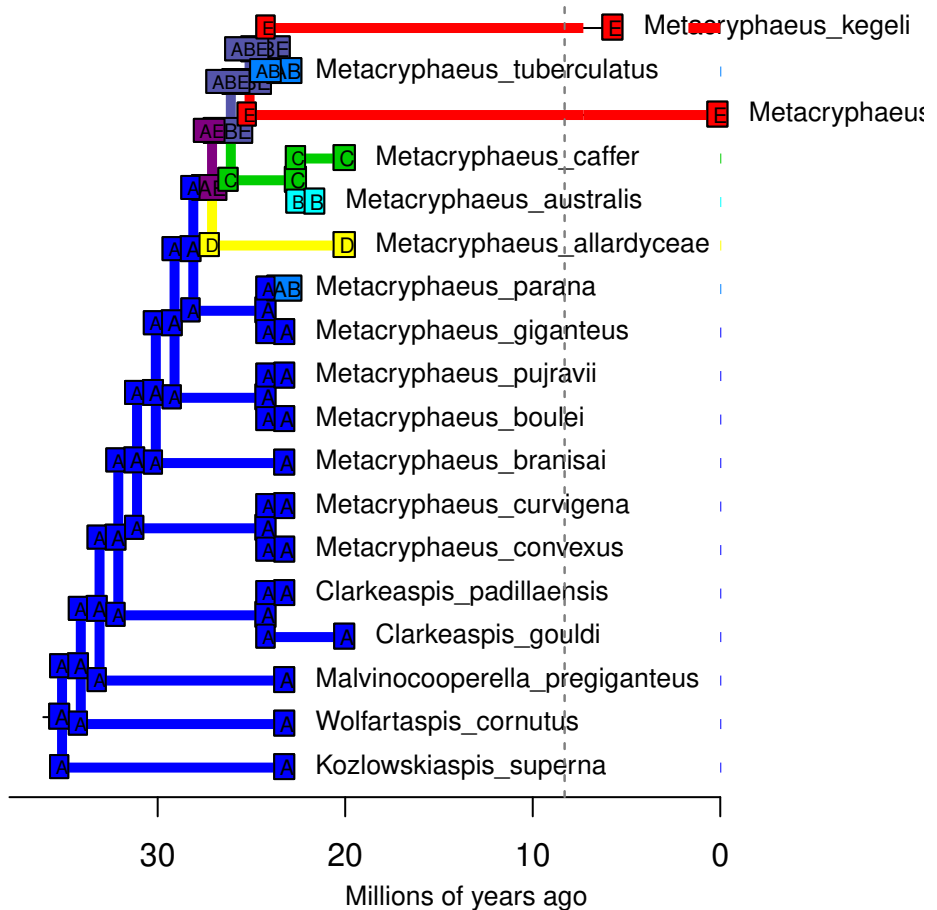
# DECwj – Stochastic Map #59/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



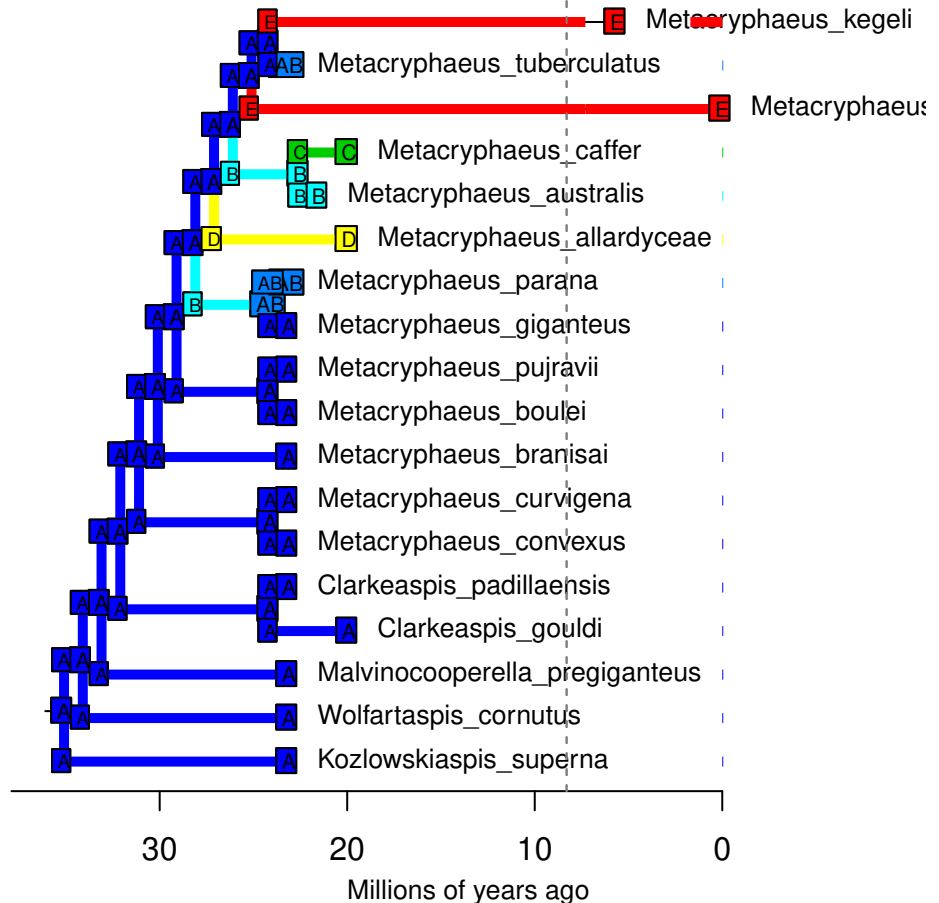
# DECwj – Stochastic Map #60/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



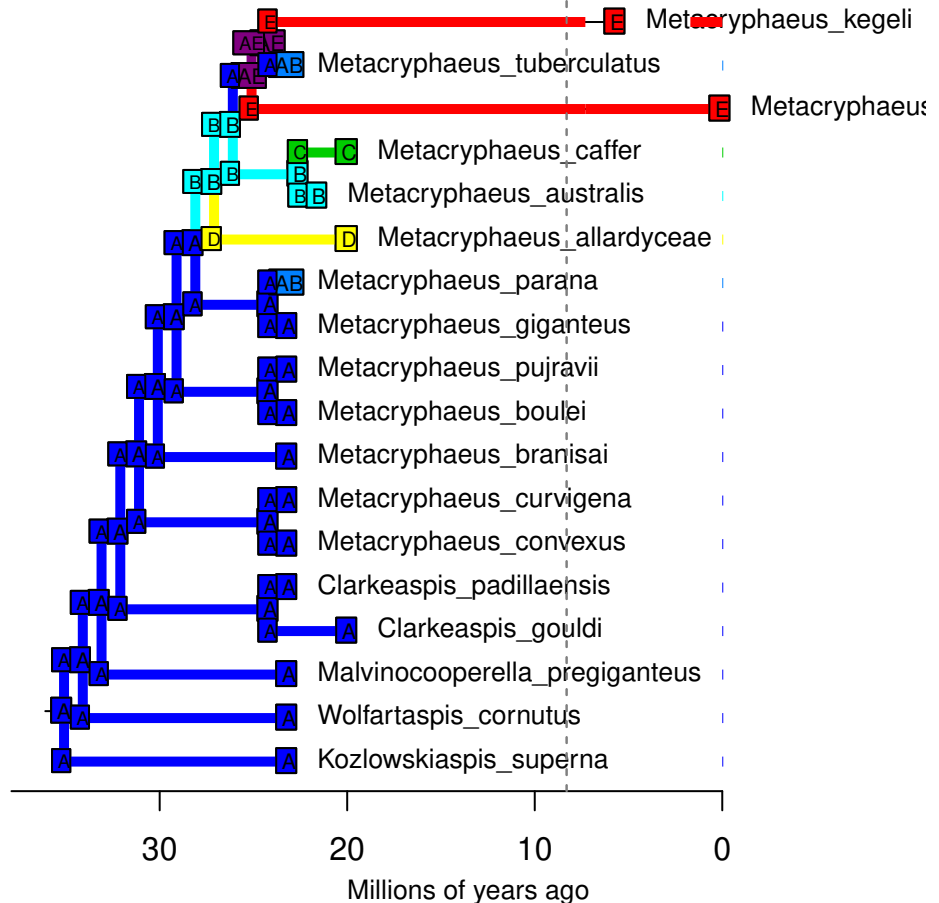
# DECwj – Stochastic Map #61/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



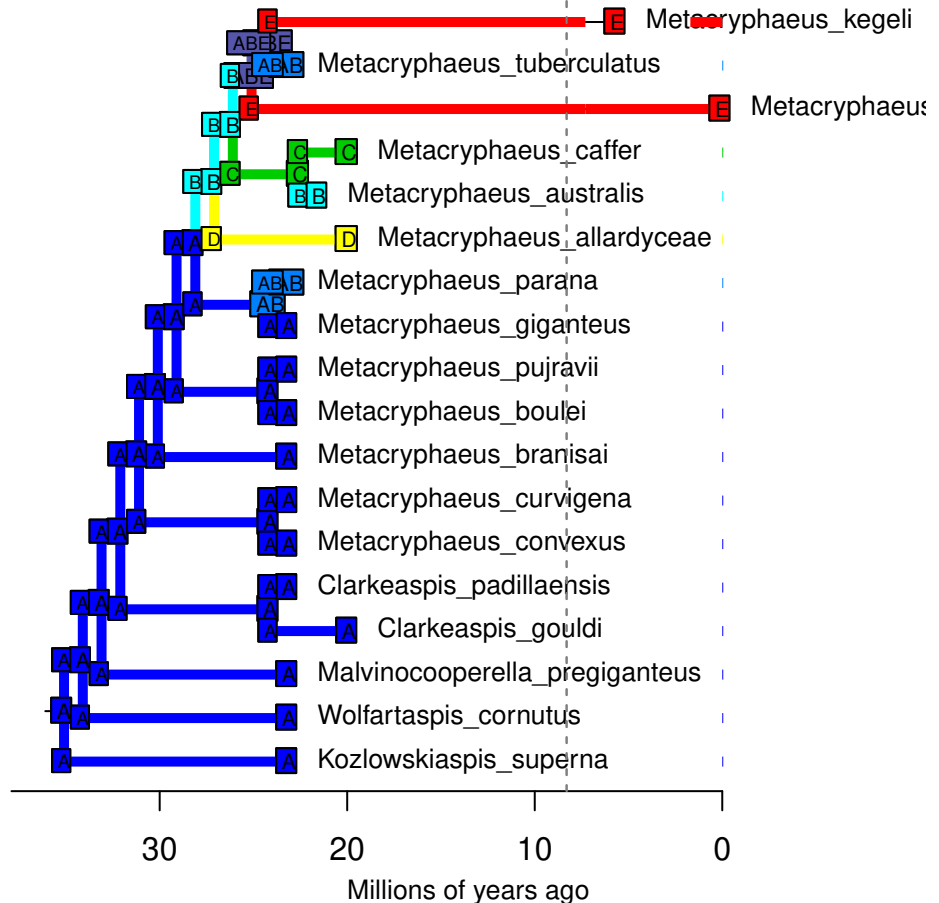
# DECwj – Stochastic Map #62/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #63/100

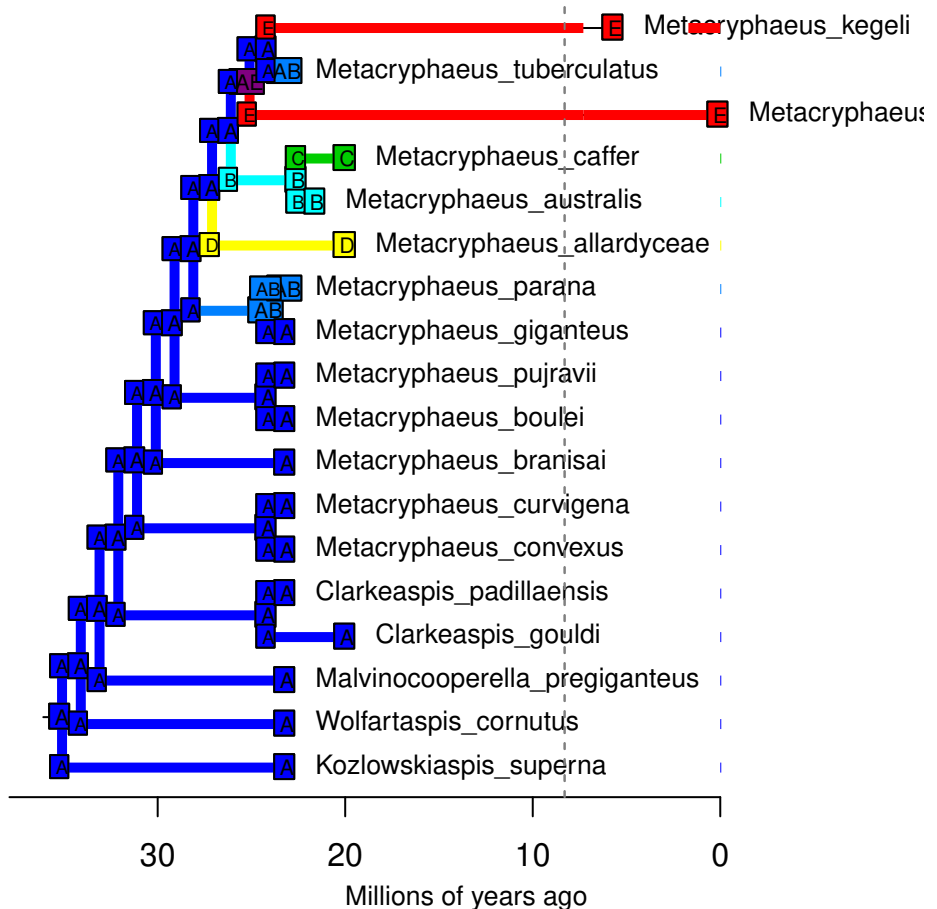
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87





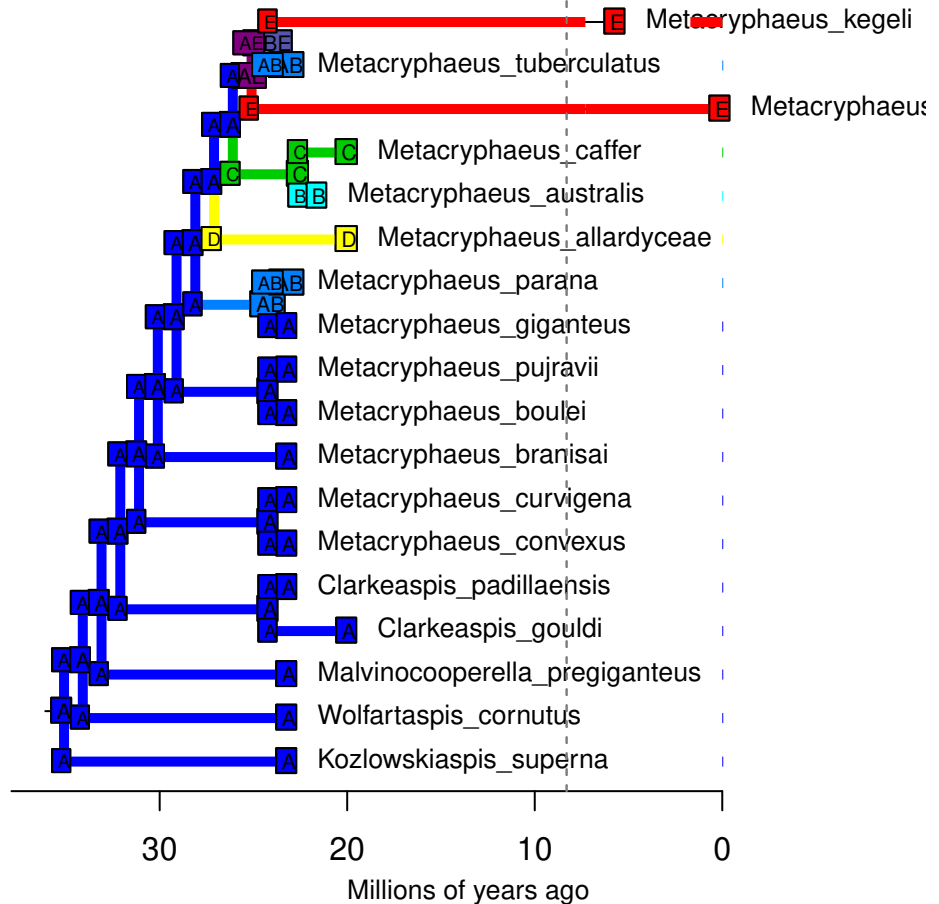
# DECwj – Stochastic Map #64/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



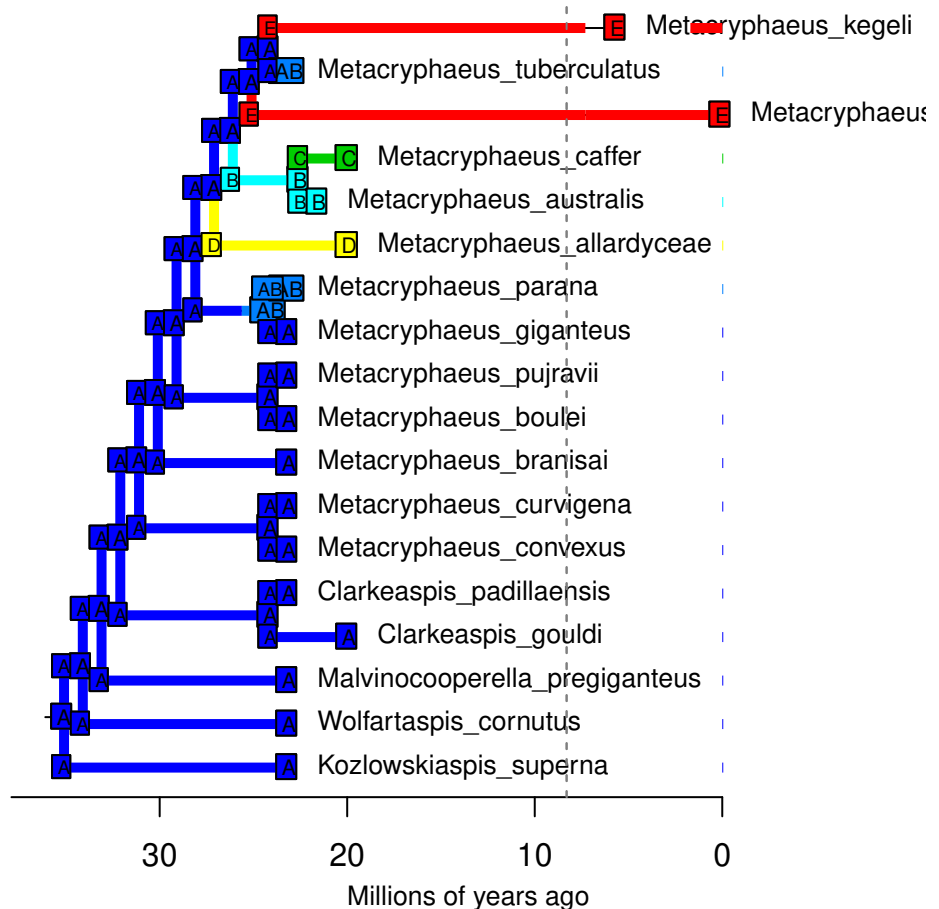
# DECwj – Stochastic Map #65/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



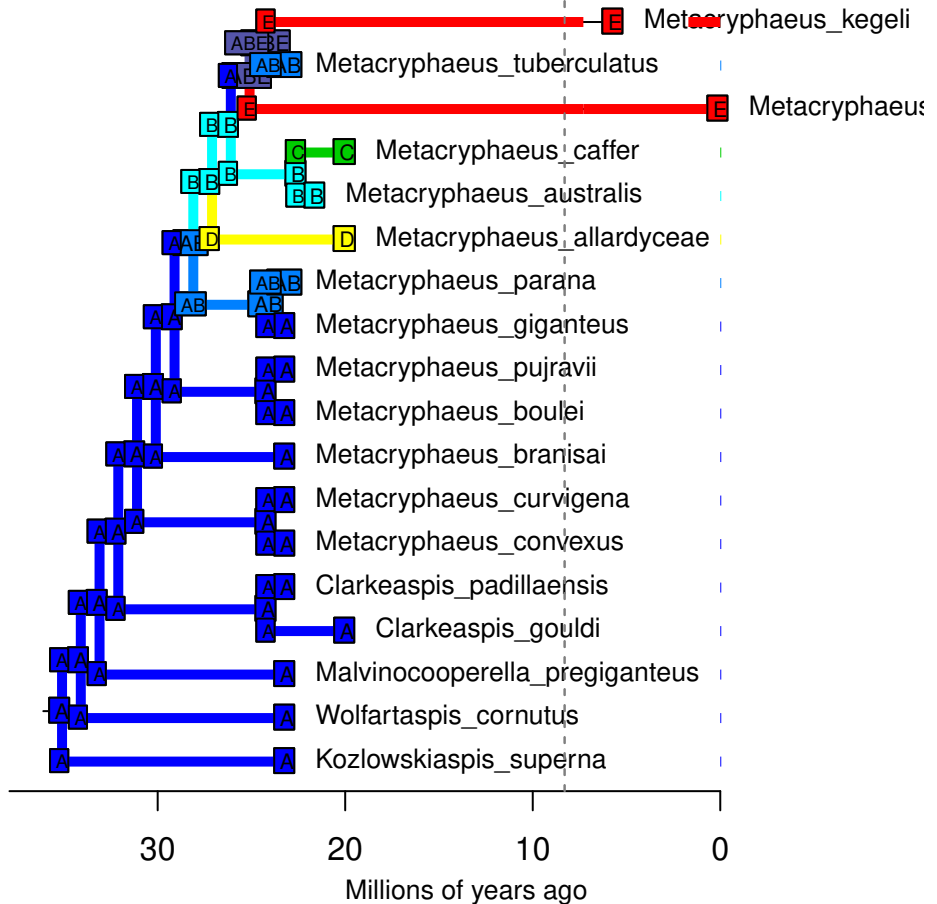
# DECwj – Stochastic Map #66/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



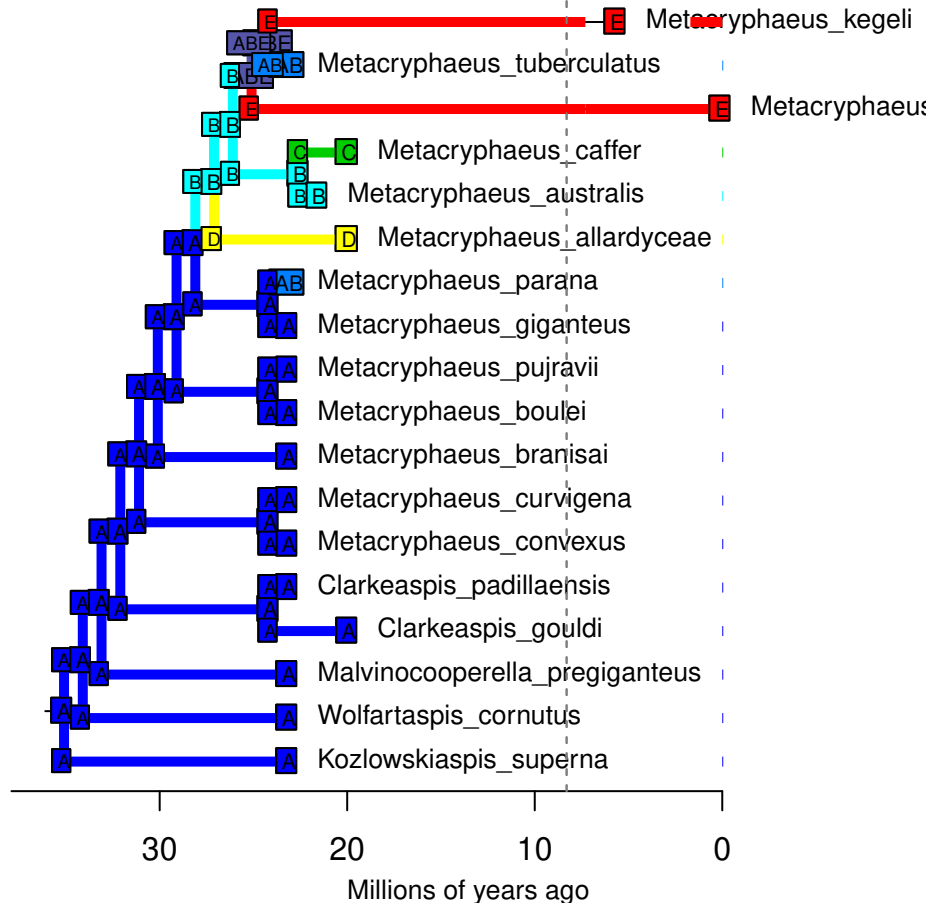
# DECwj – Stochastic Map #67/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



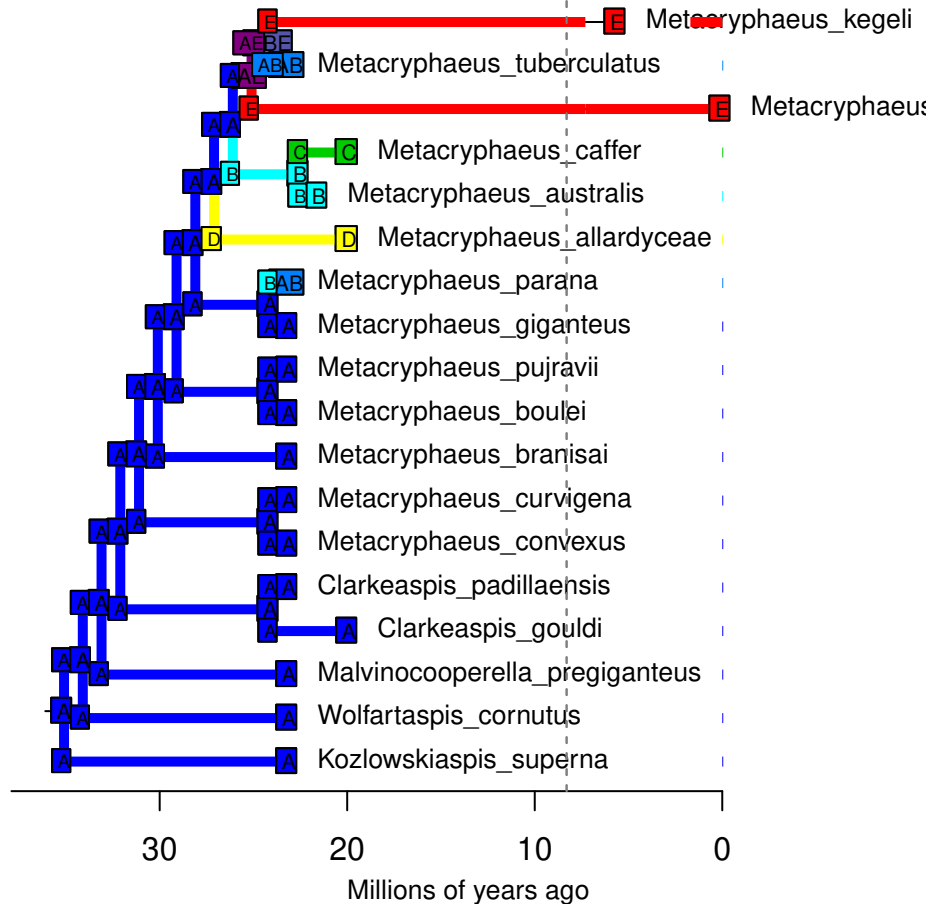
# DECwj – Stochastic Map #68/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



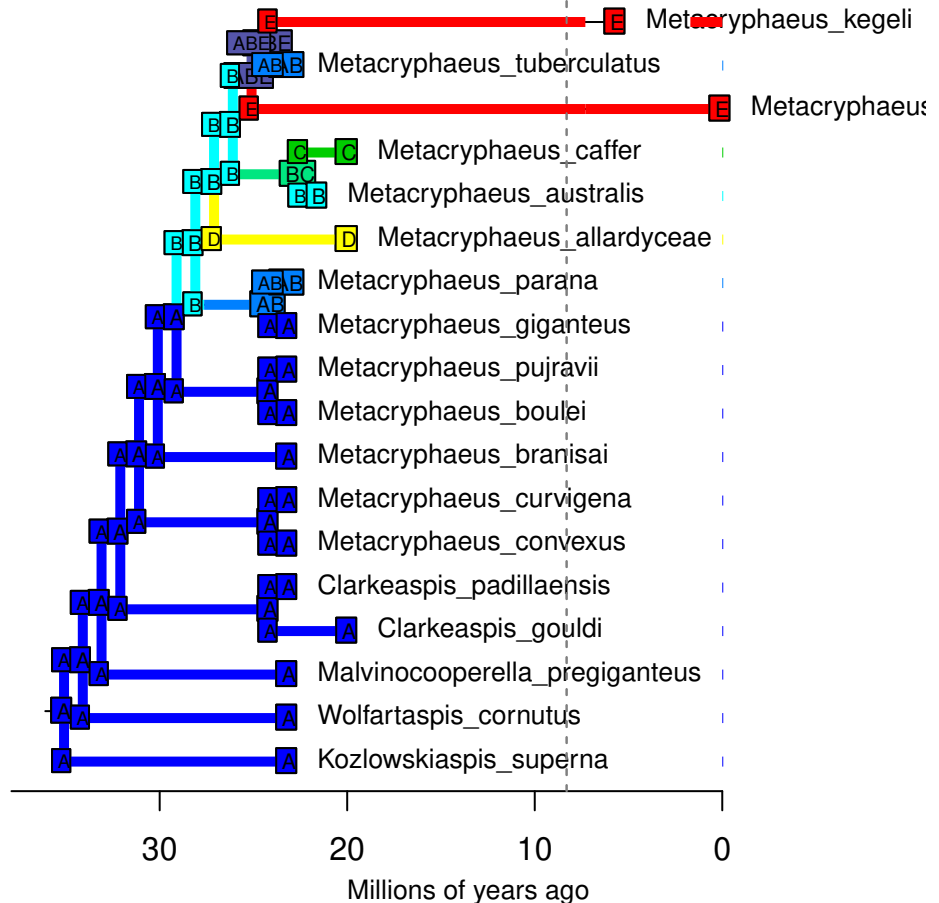
# DECwj – Stochastic Map #69/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



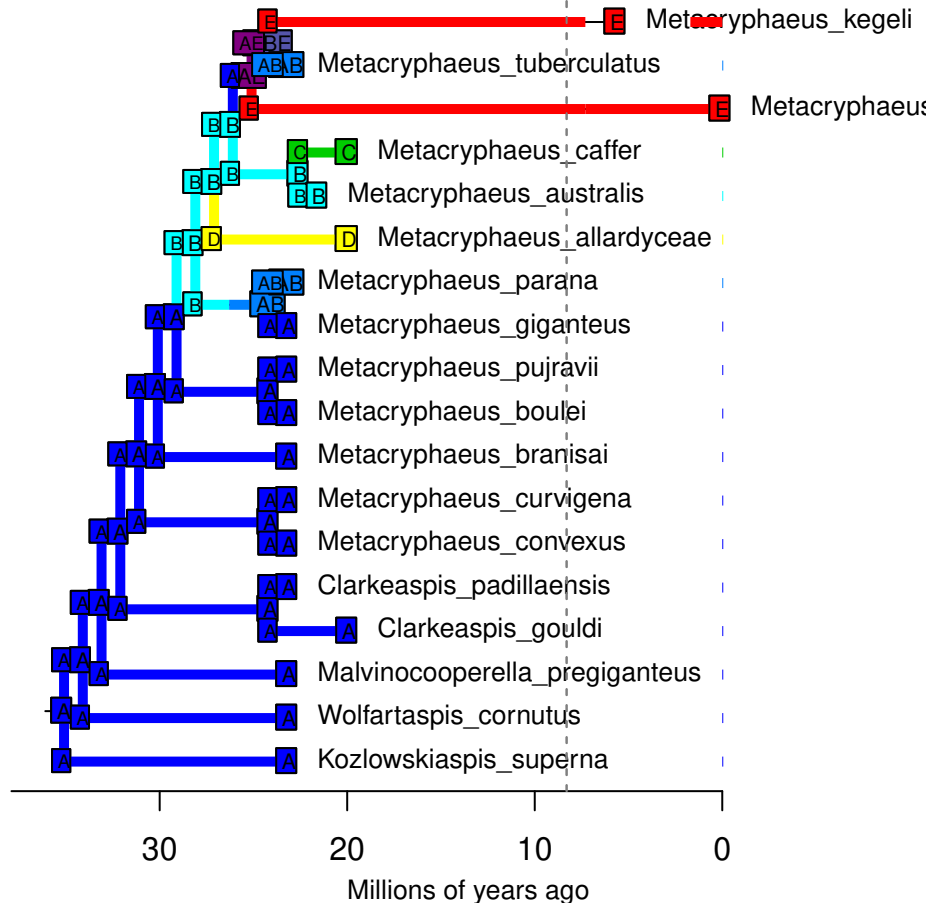
# DECwj – Stochastic Map #70/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #71/100

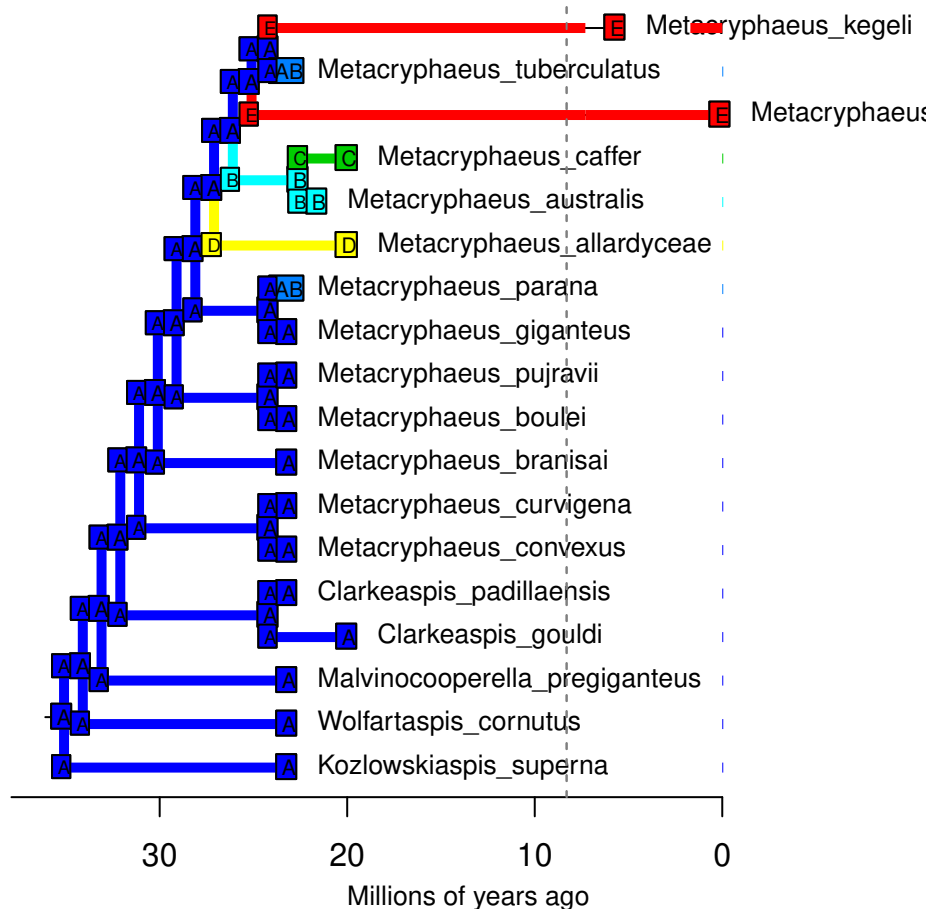
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87





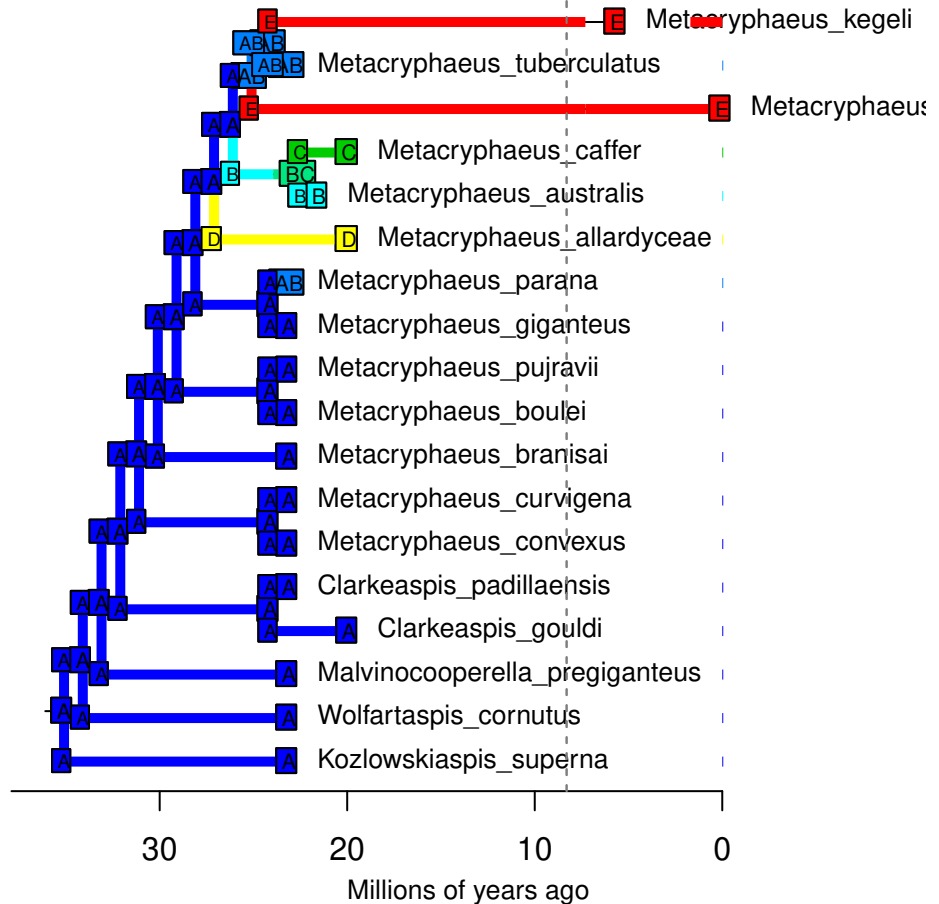
# DECwj – Stochastic Map #72/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



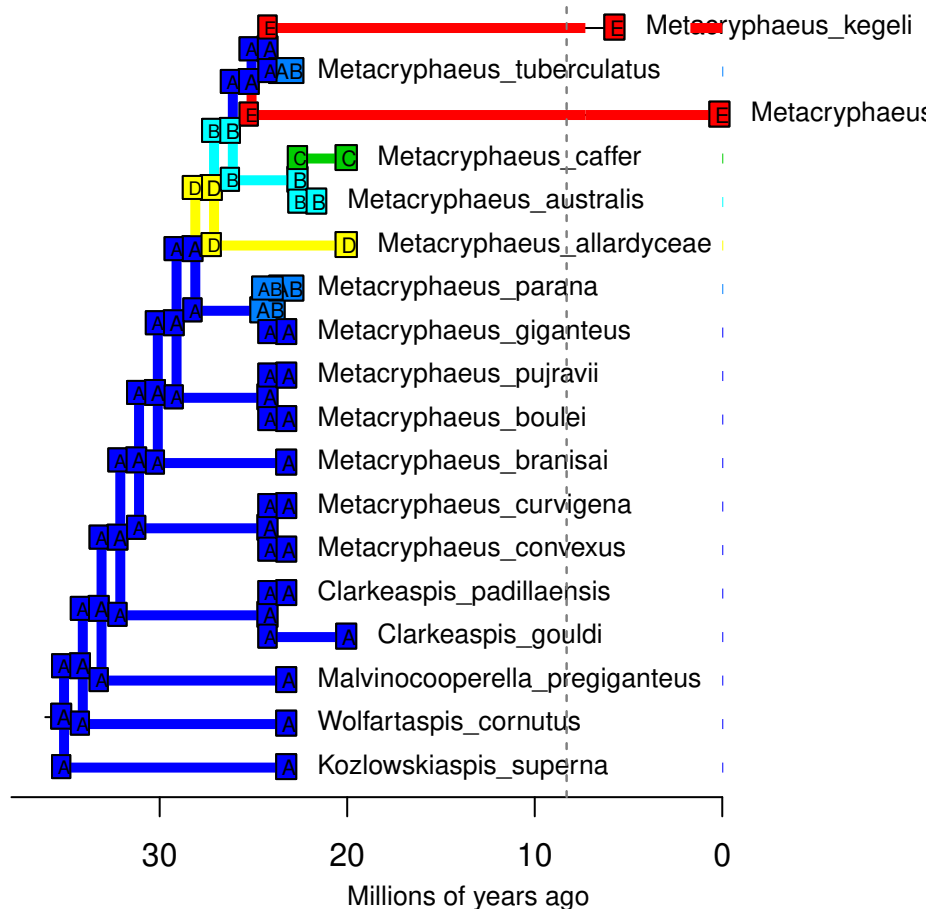
# DECwj – Stochastic Map #73/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



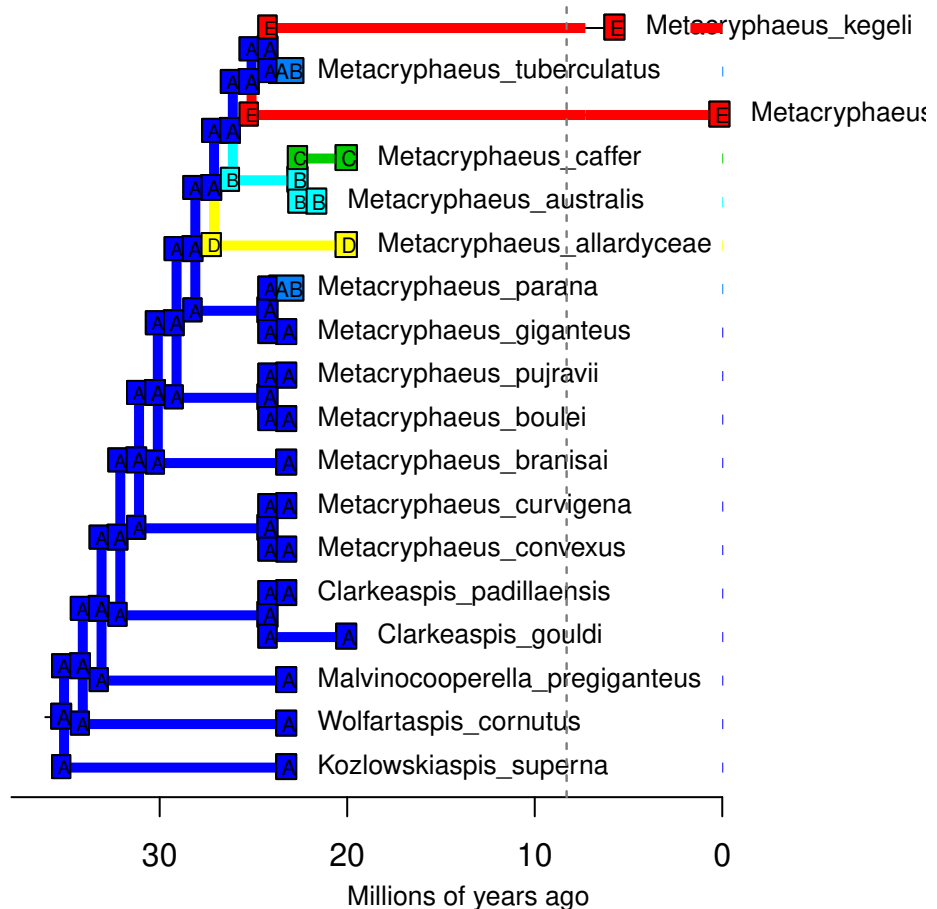
# DECwj – Stochastic Map #74/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



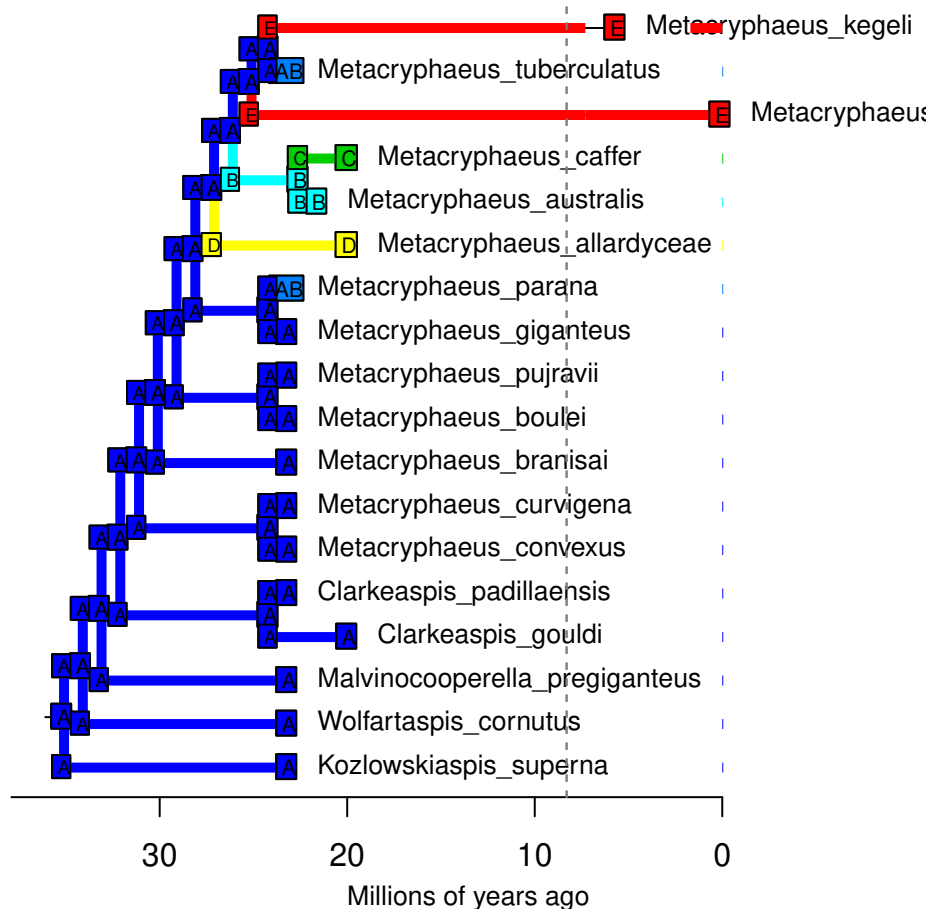
# DECwj – Stochastic Map #75/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



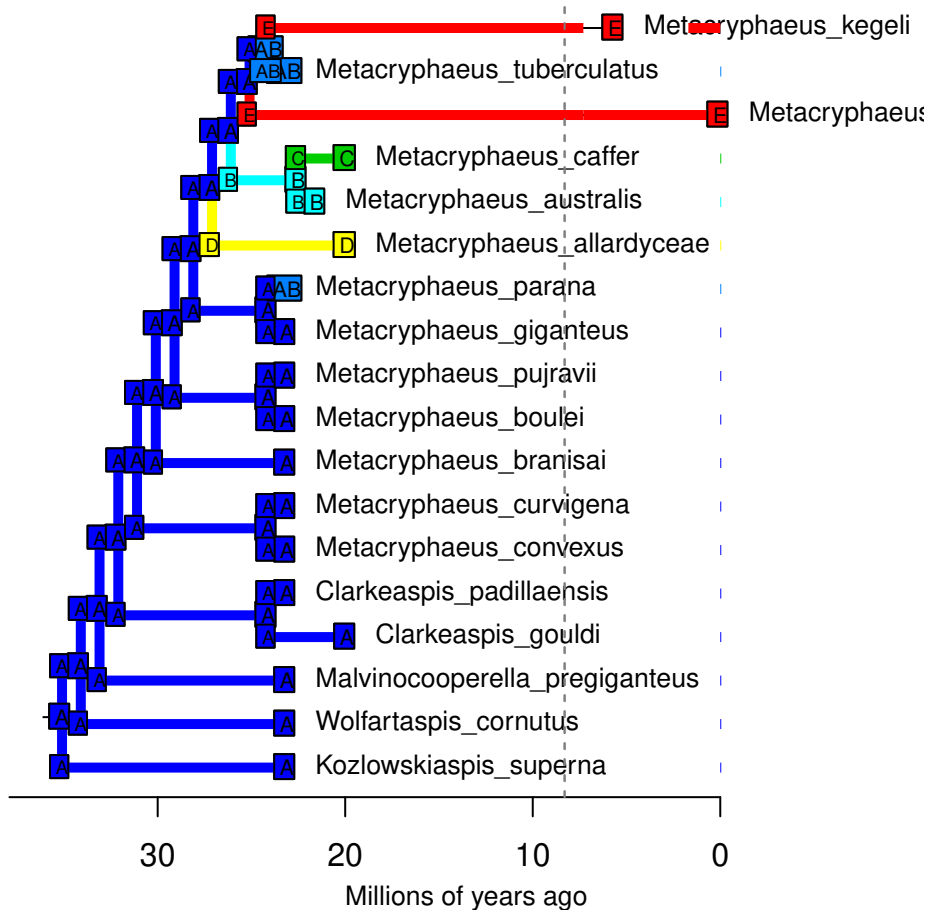
# DECwj – Stochastic Map #76/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



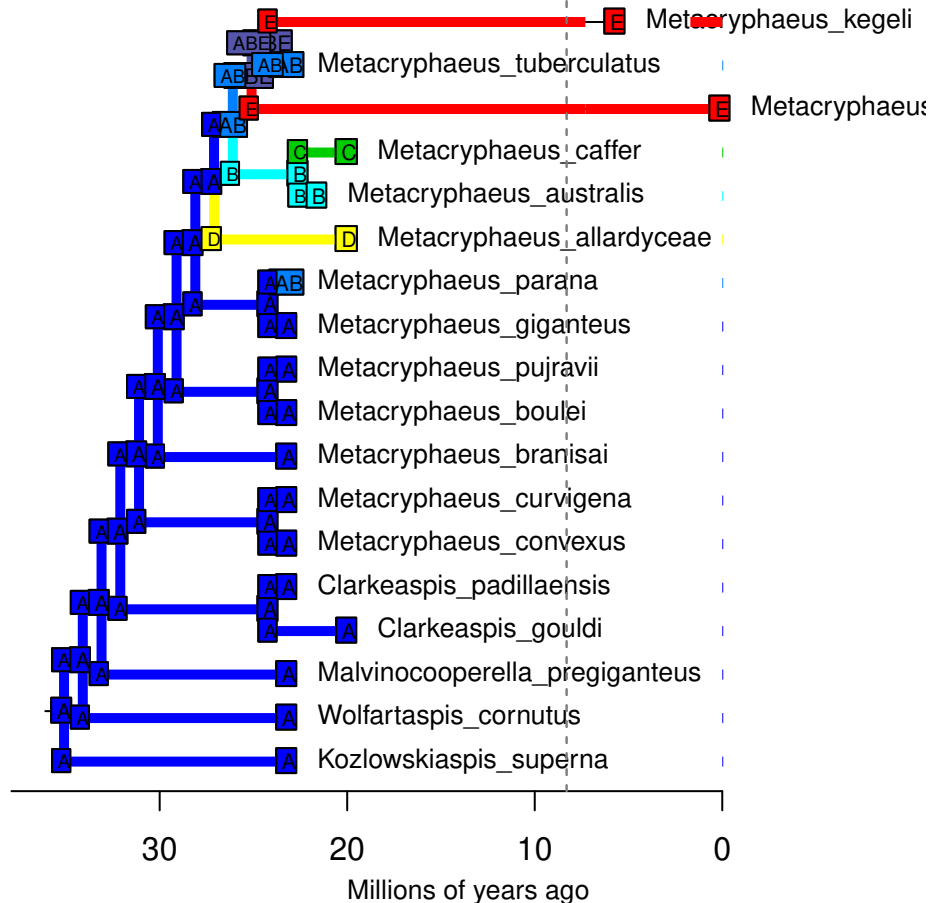
# DECwj – Stochastic Map #77/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



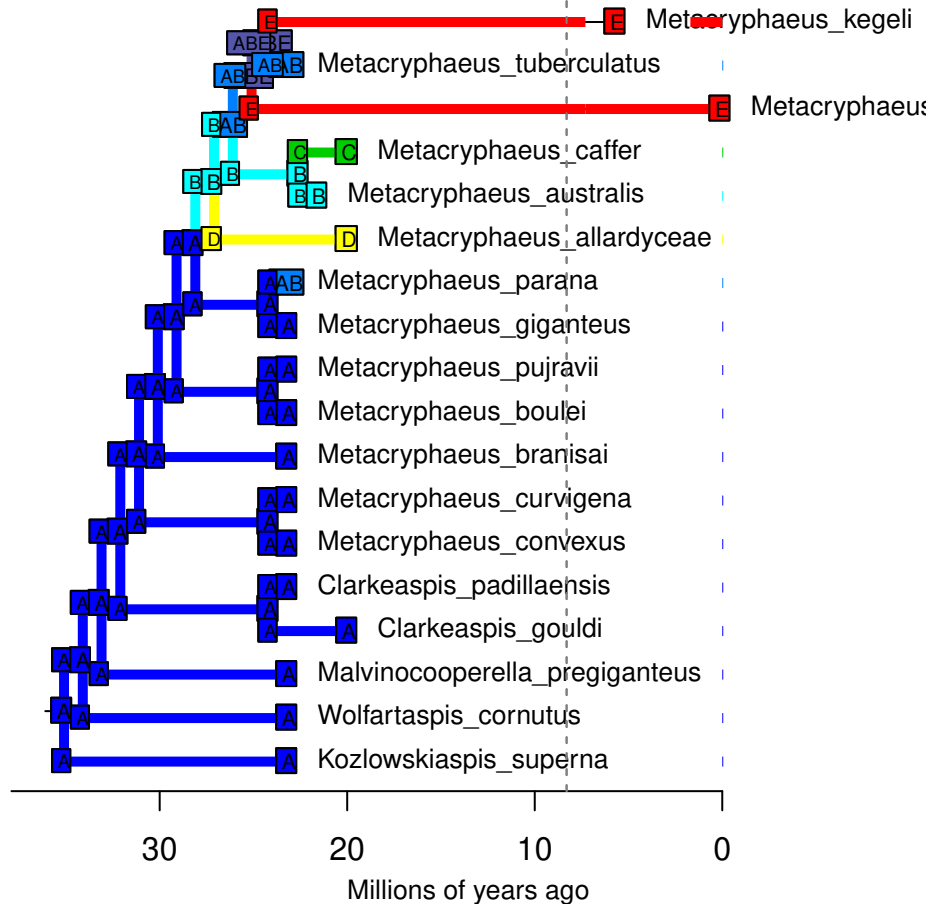
# DECwj – Stochastic Map #78/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #79/100

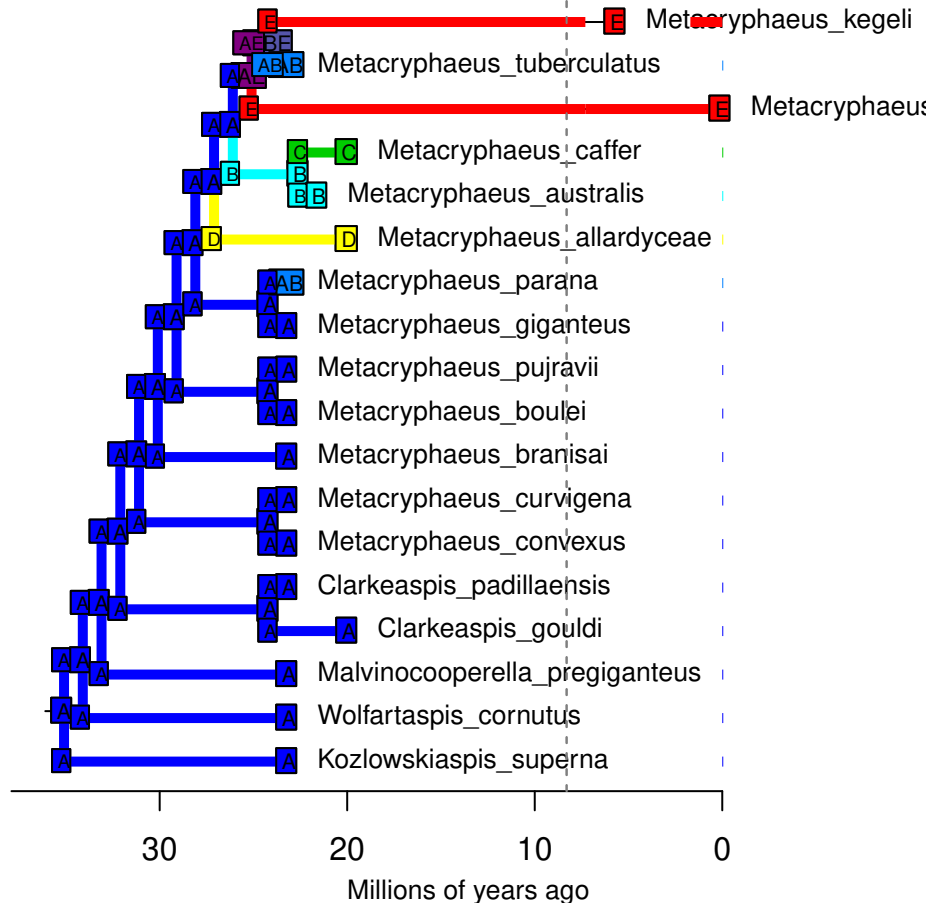
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87





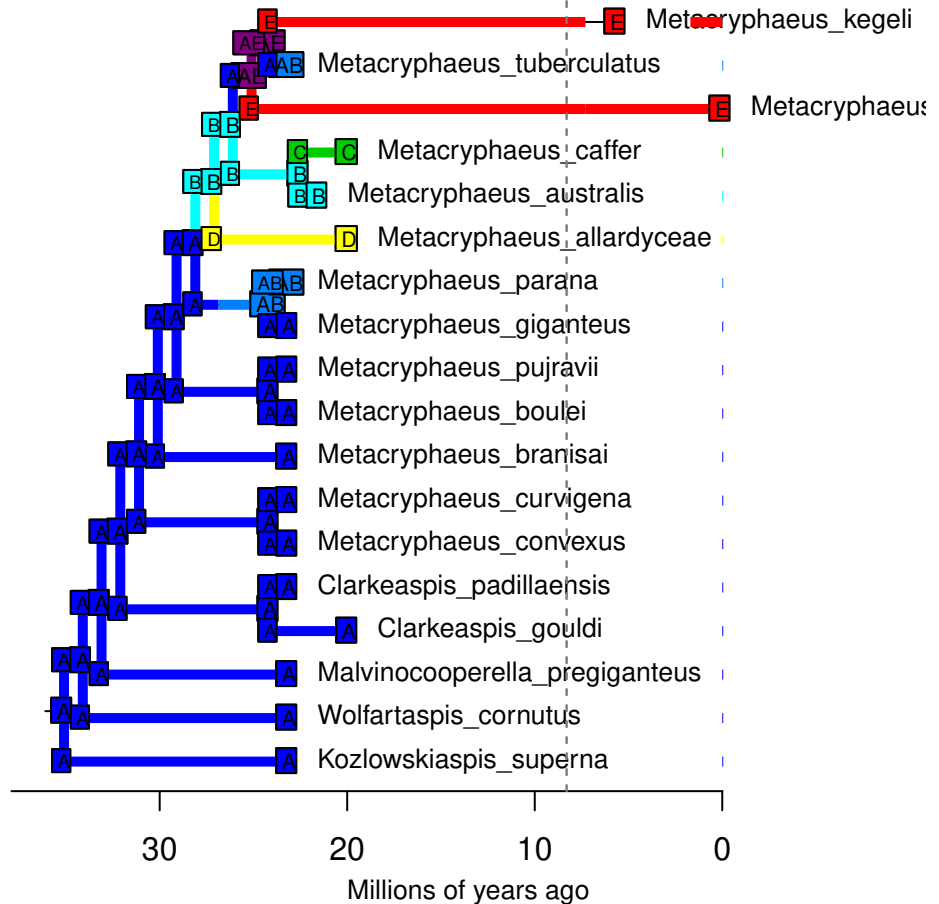
# DECwj – Stochastic Map #80/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



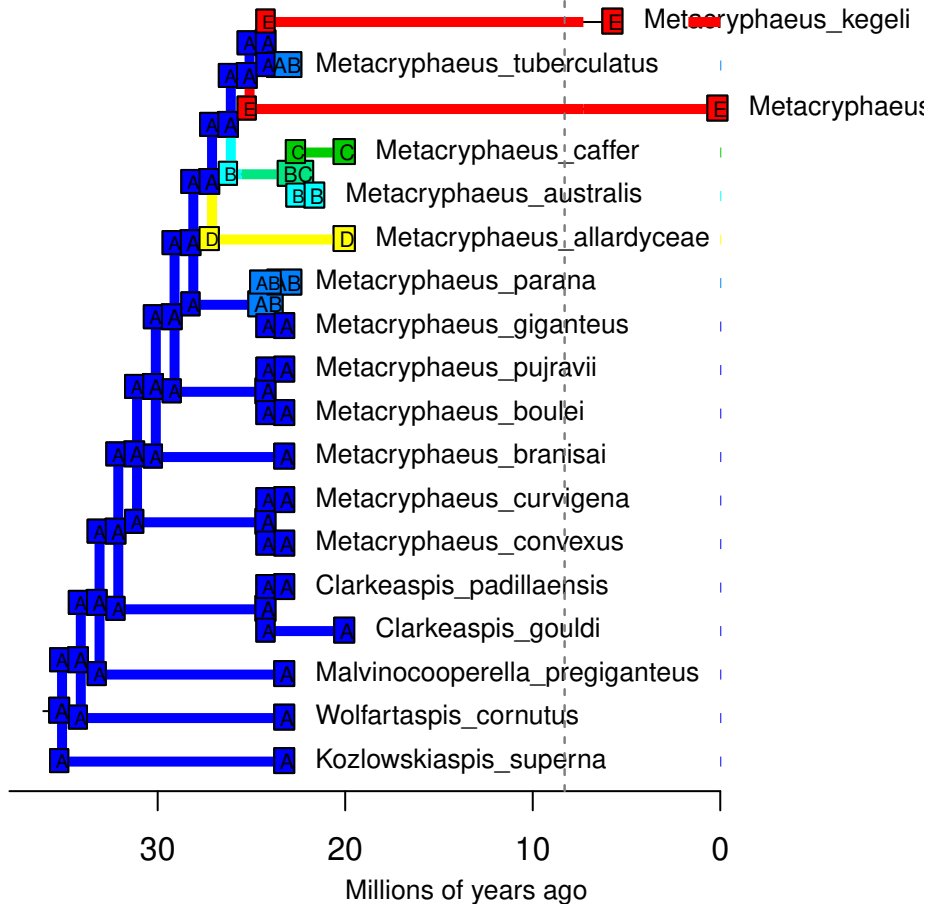
# DECwj – Stochastic Map #81/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



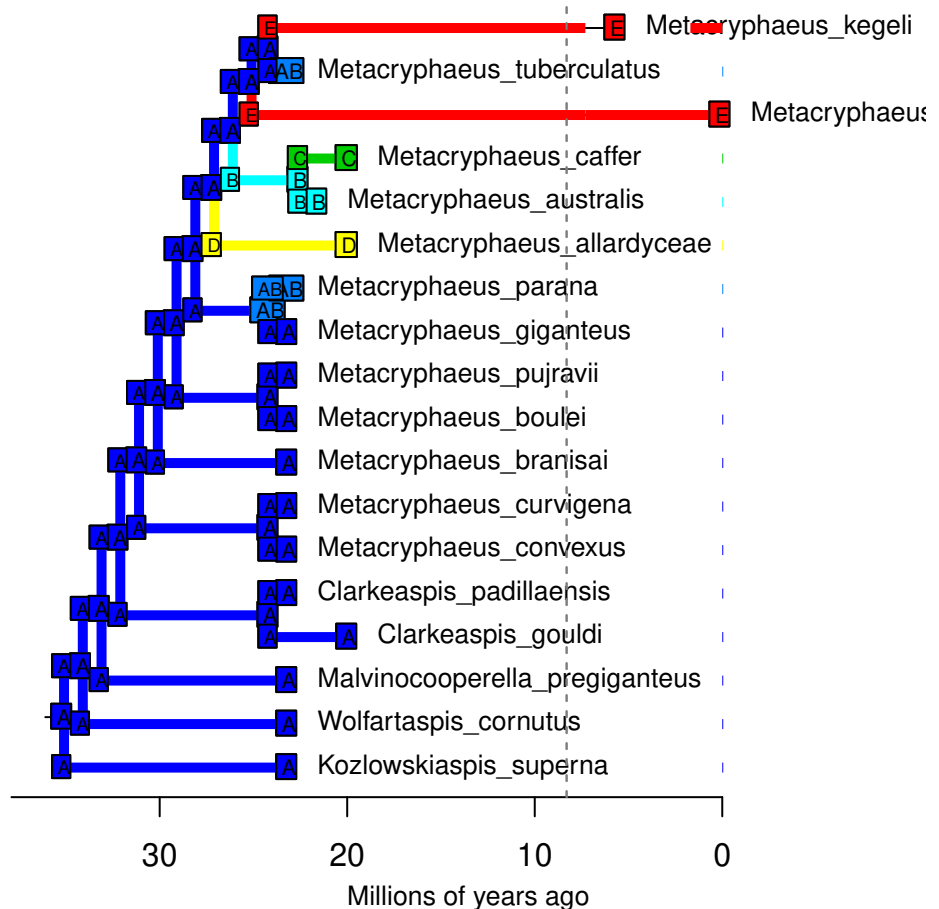
# DECwj – Stochastic Map #82/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



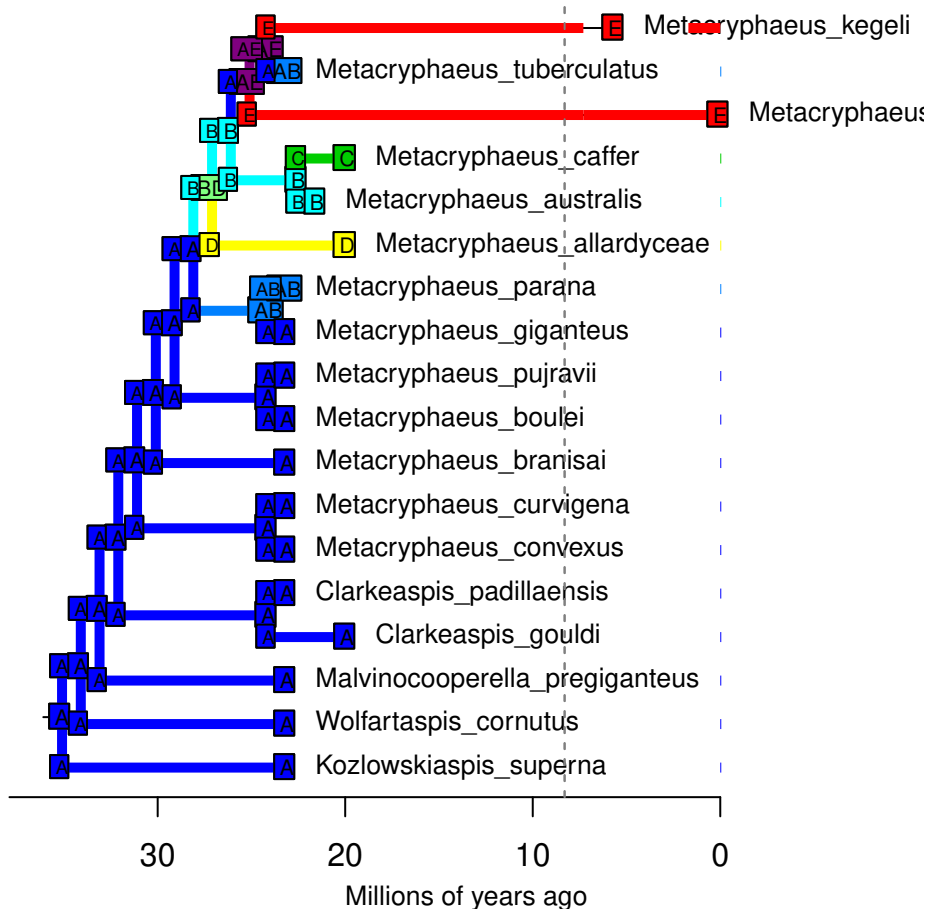
# DECwj – Stochastic Map #83/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



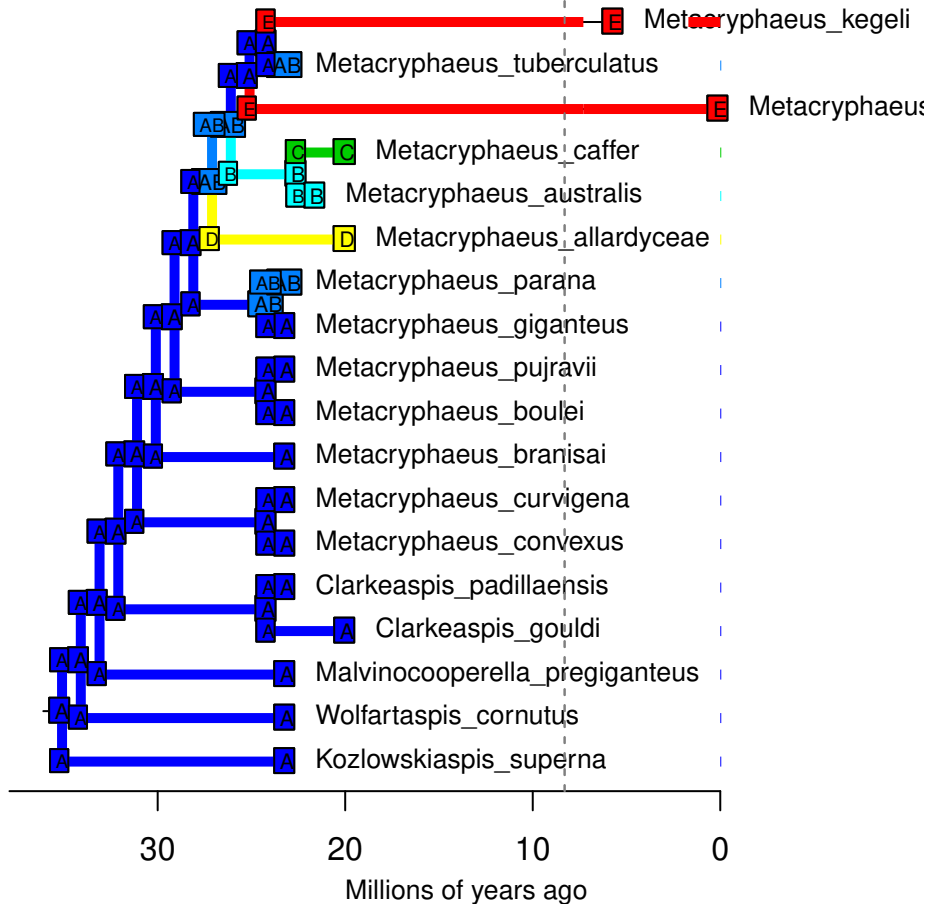
# DECwj – Stochastic Map #84/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



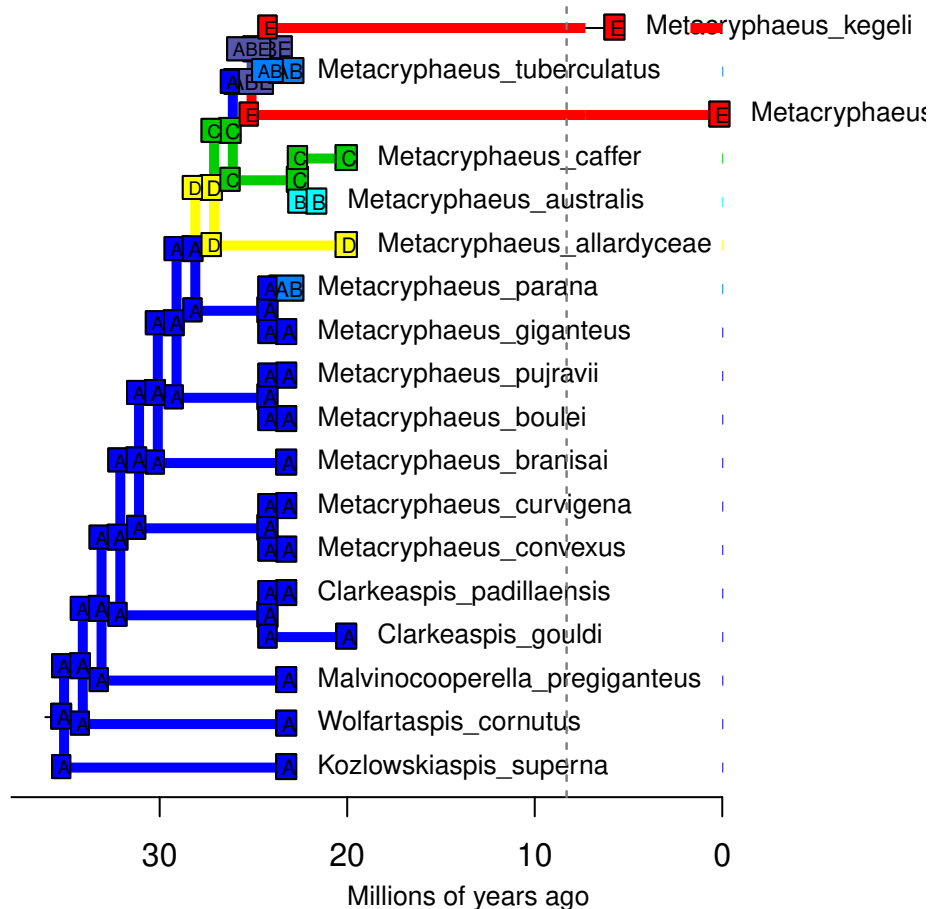
# DECwj – Stochastic Map #85/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



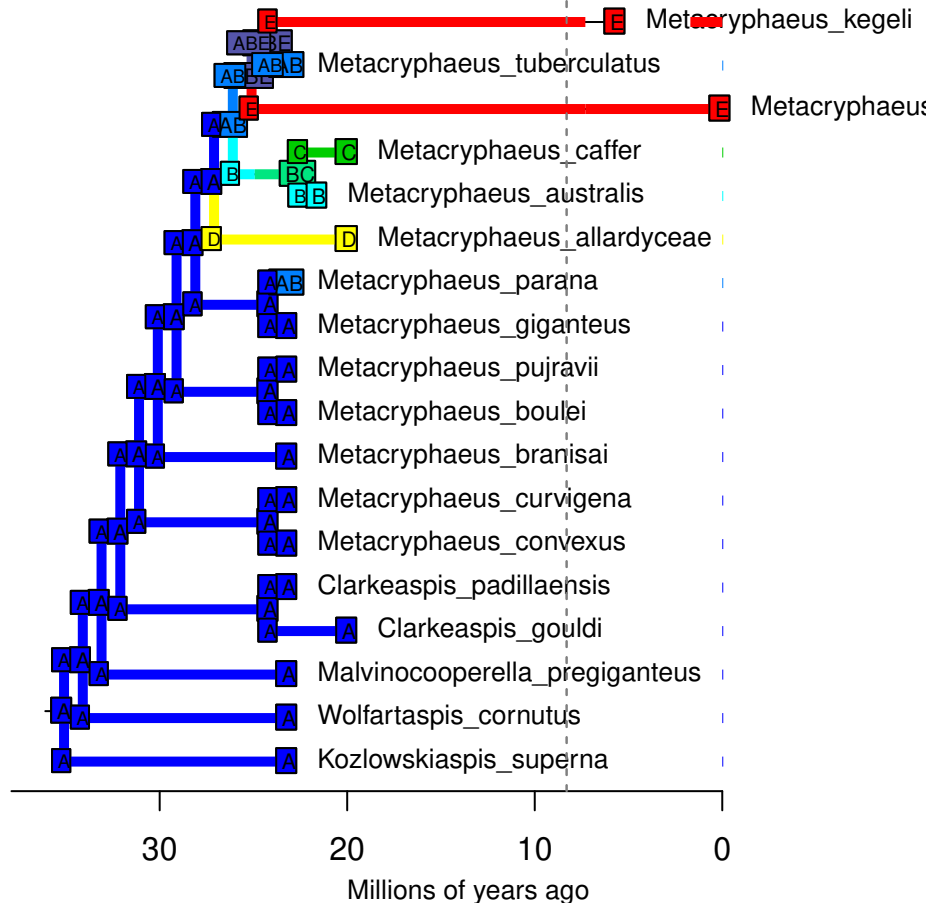
# DECwj – Stochastic Map #86/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #87/100

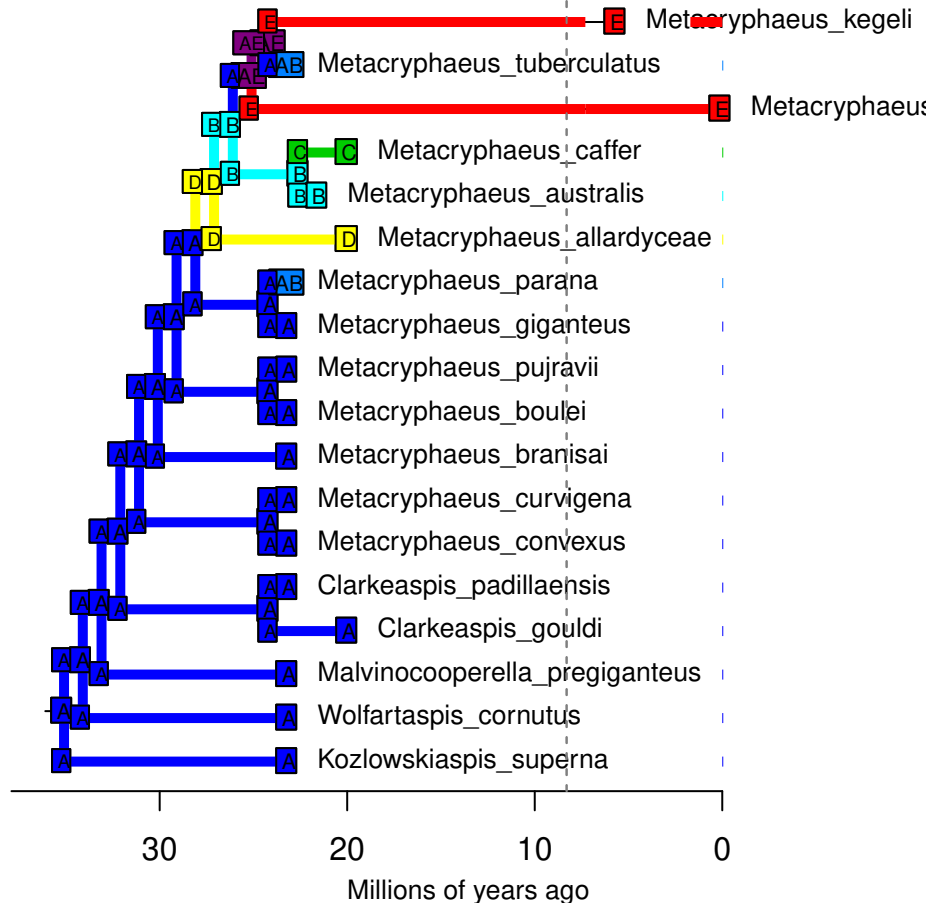
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87





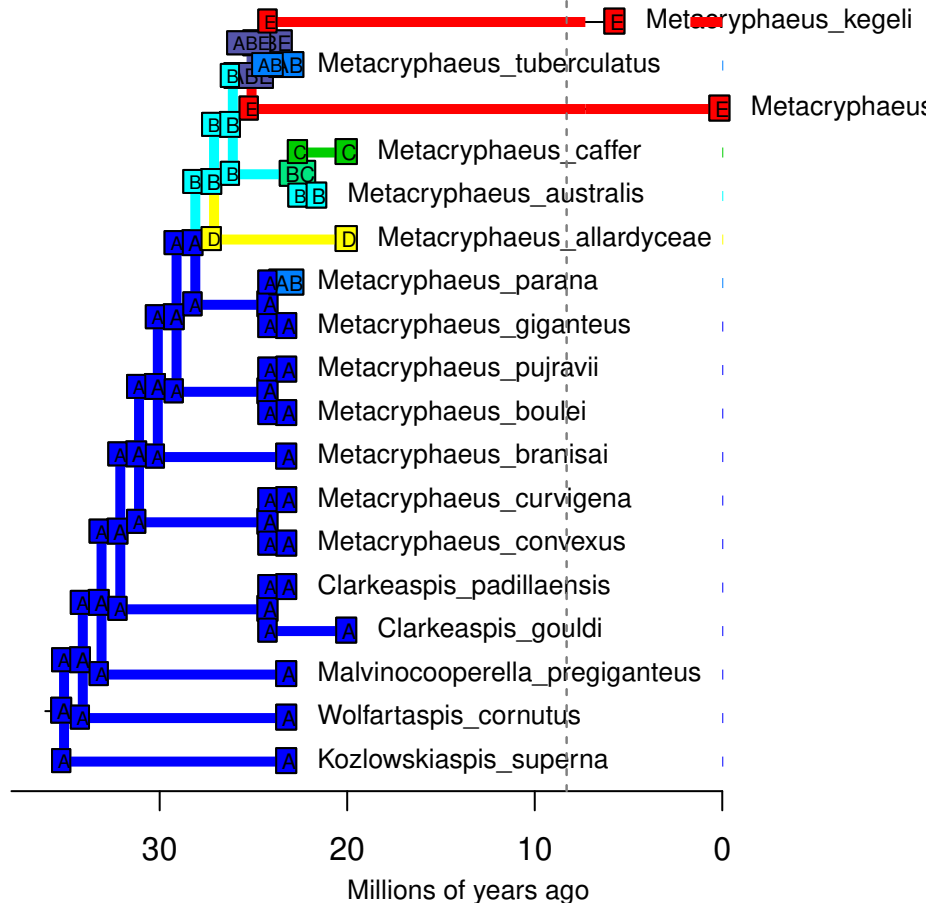
# DECwj – Stochastic Map #88/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



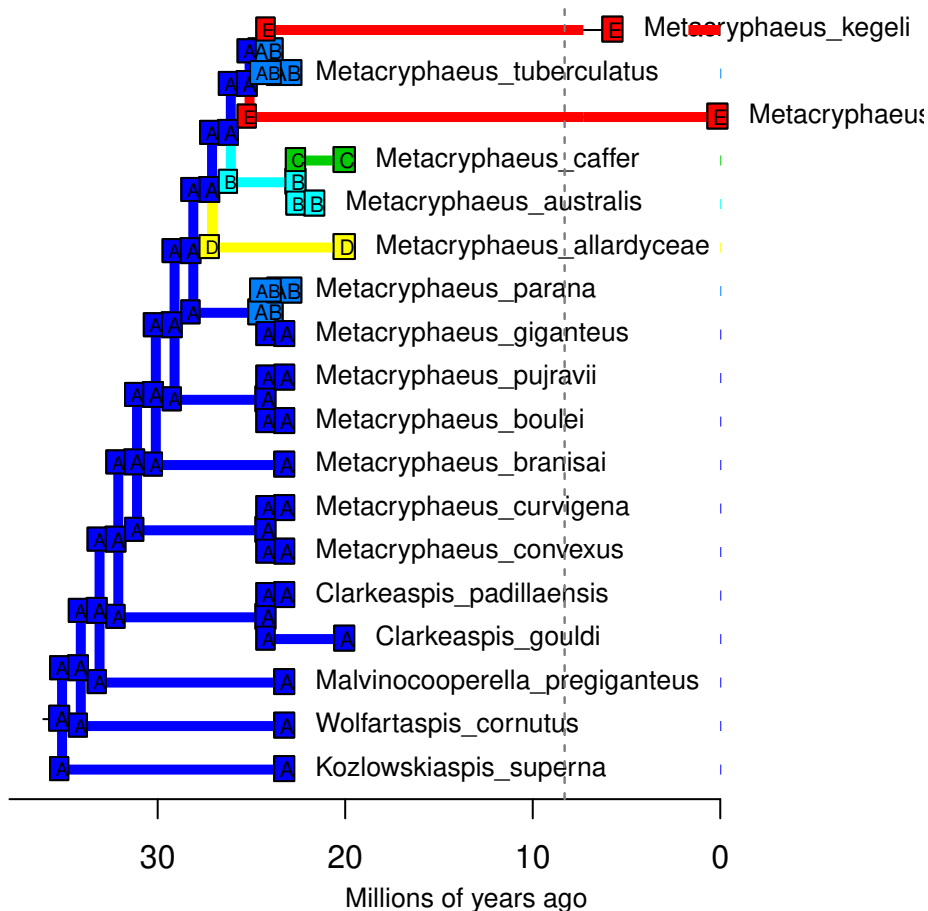
# DECwj – Stochastic Map #89/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



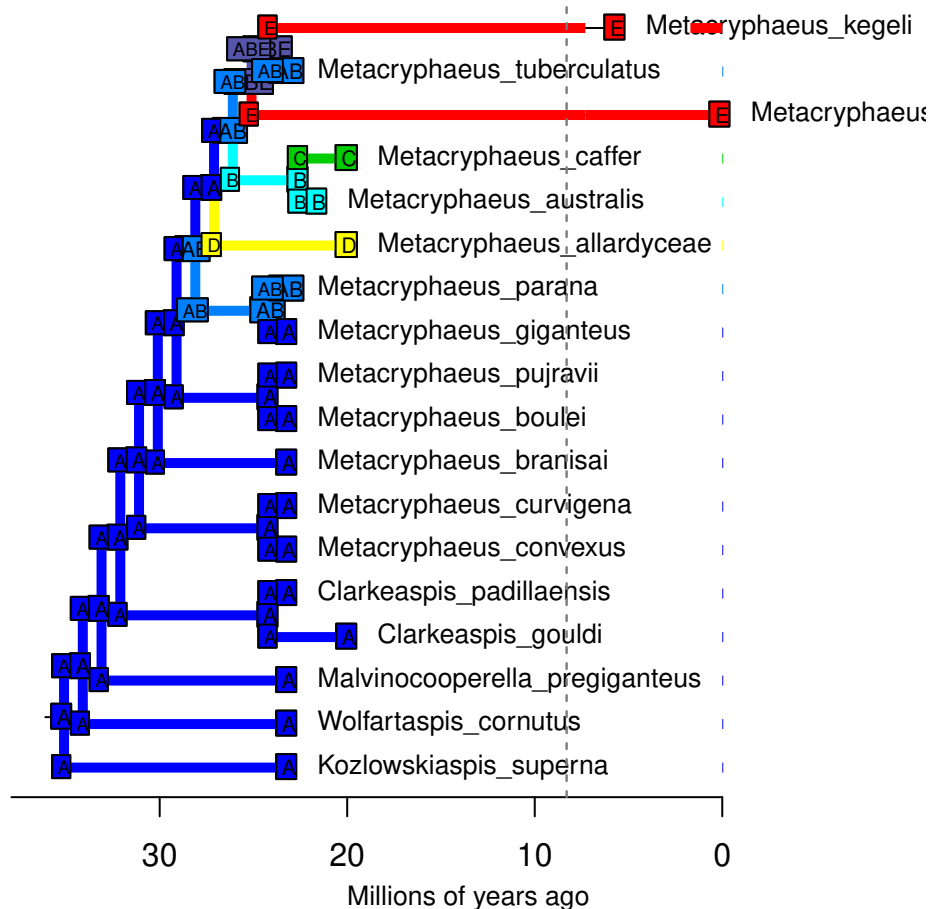
# DECwj – Stochastic Map #90/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



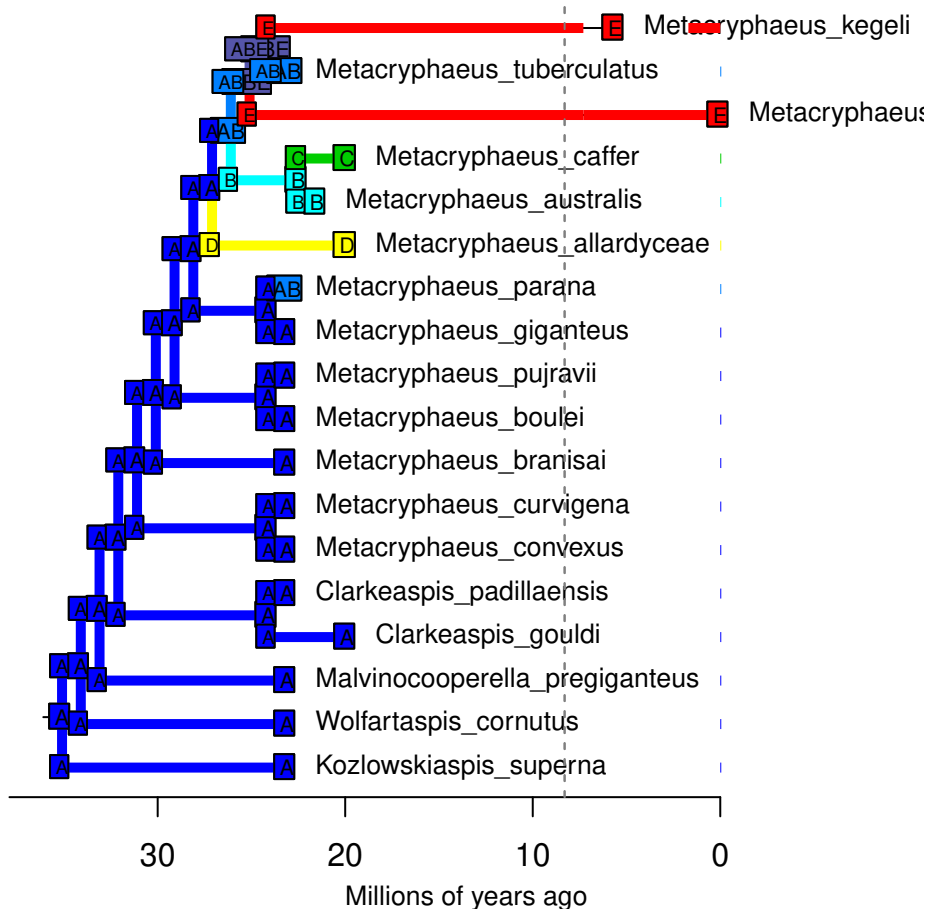
# DECwj – Stochastic Map #91/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



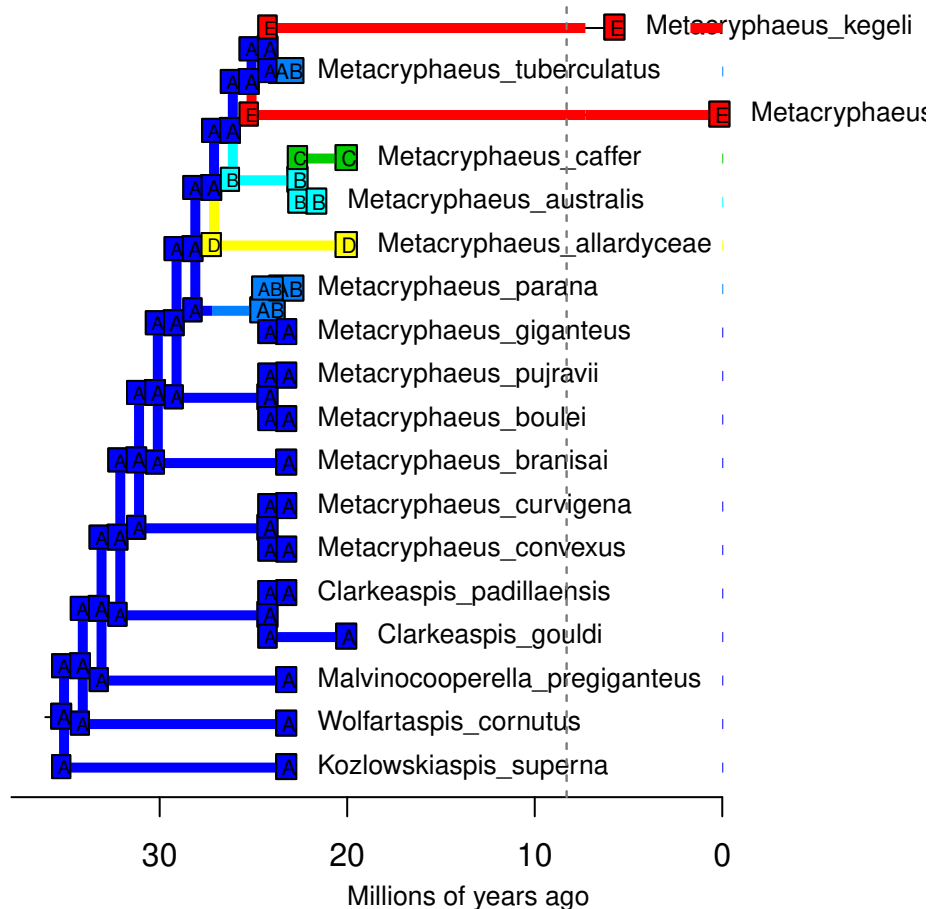
# DECwj – Stochastic Map #92/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



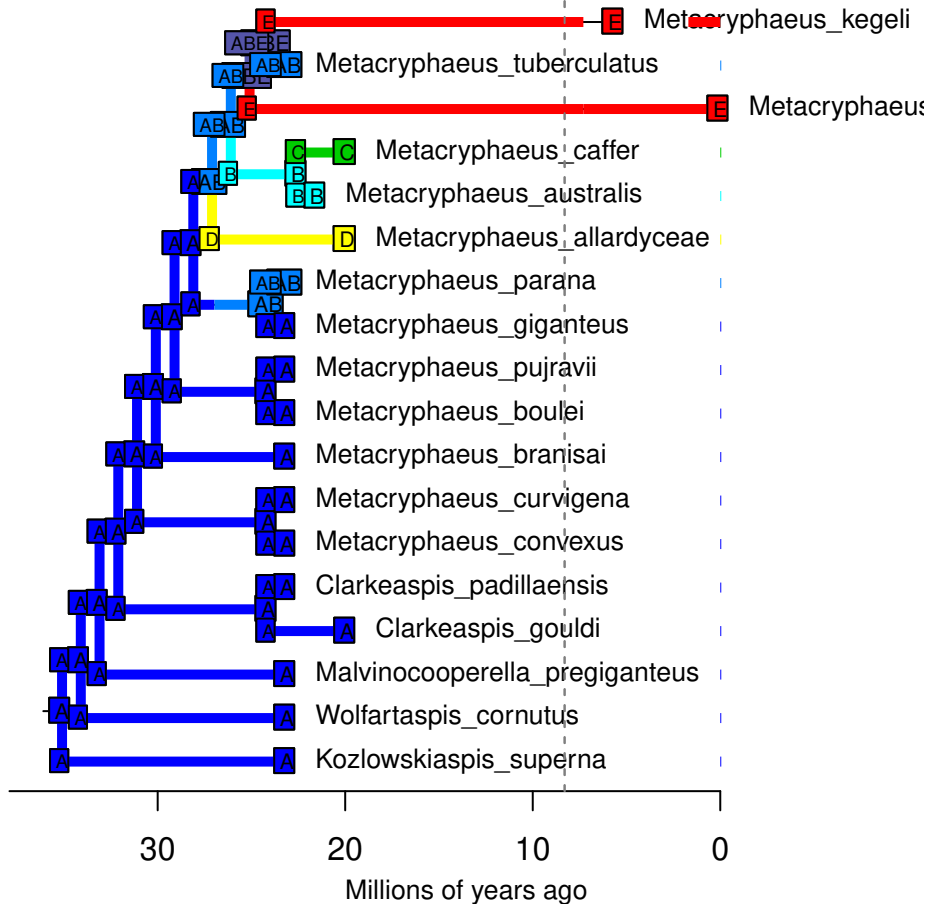
# DECwj – Stochastic Map #93/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



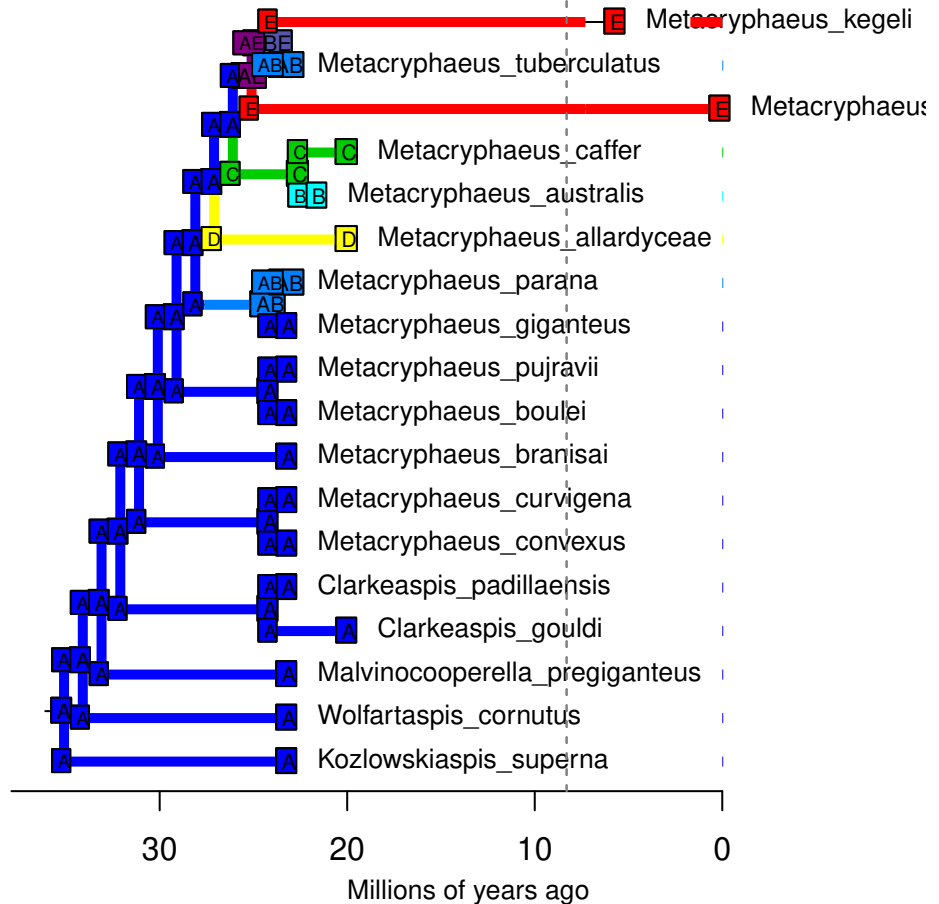
# DECwj – Stochastic Map #94/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #95/100

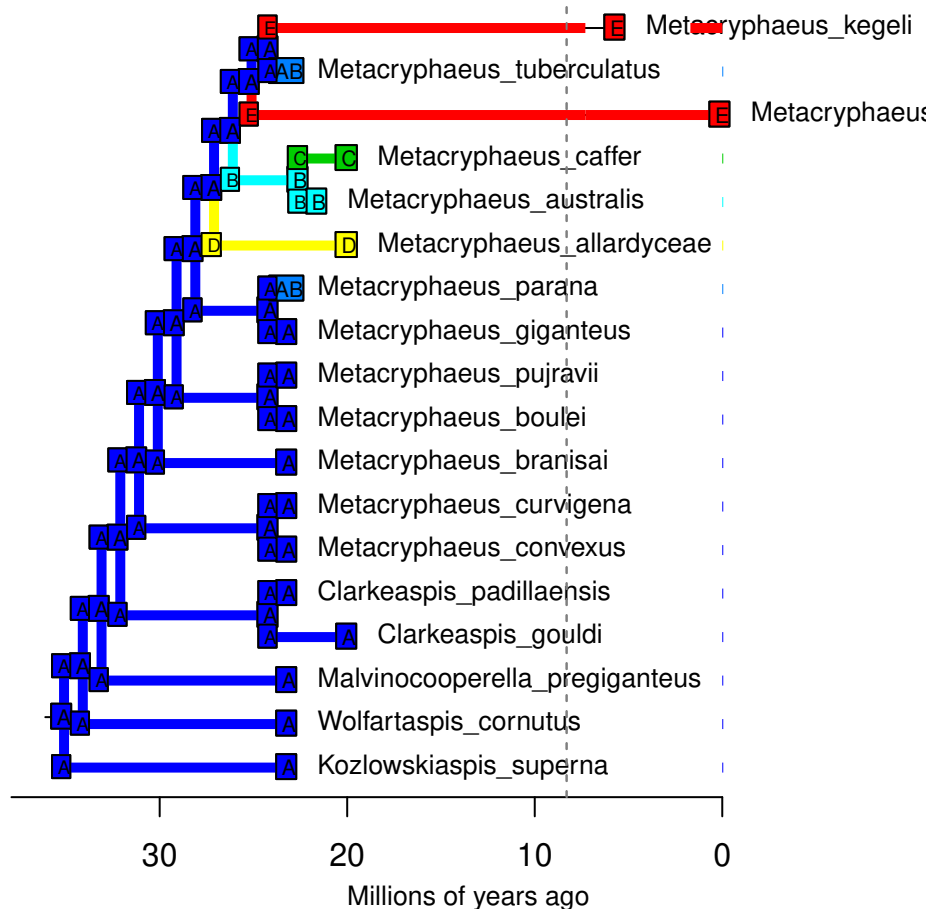
ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87





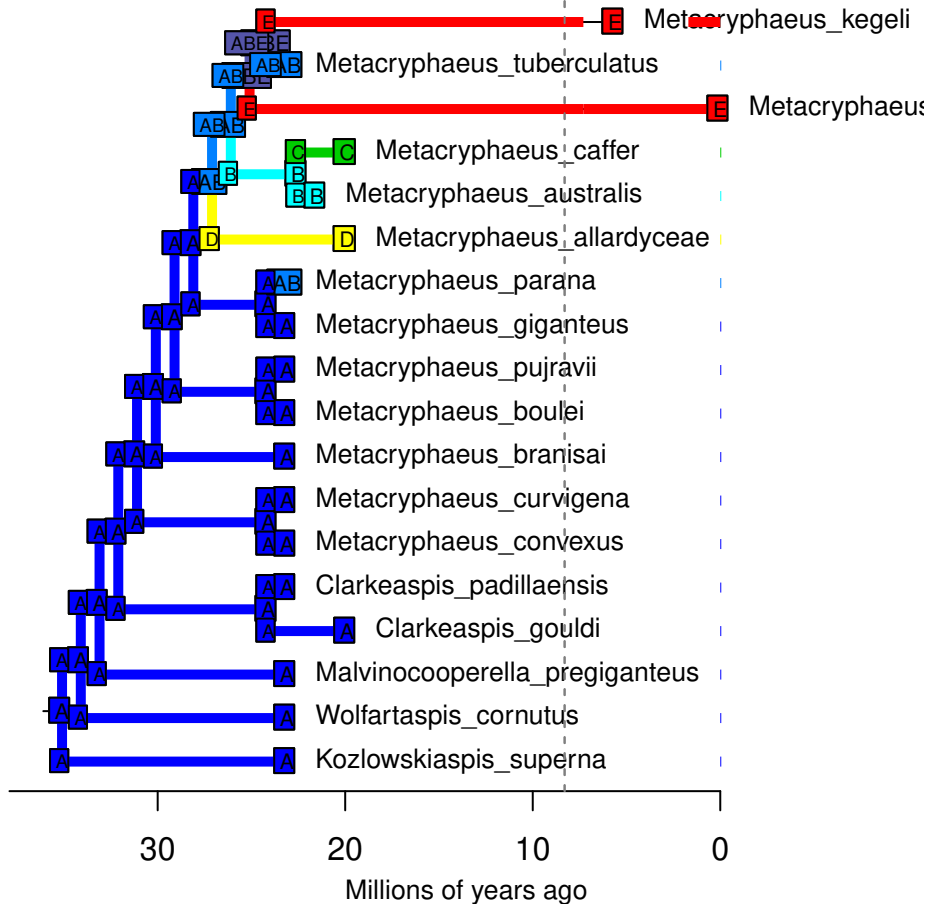
# DECwj – Stochastic Map #96/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



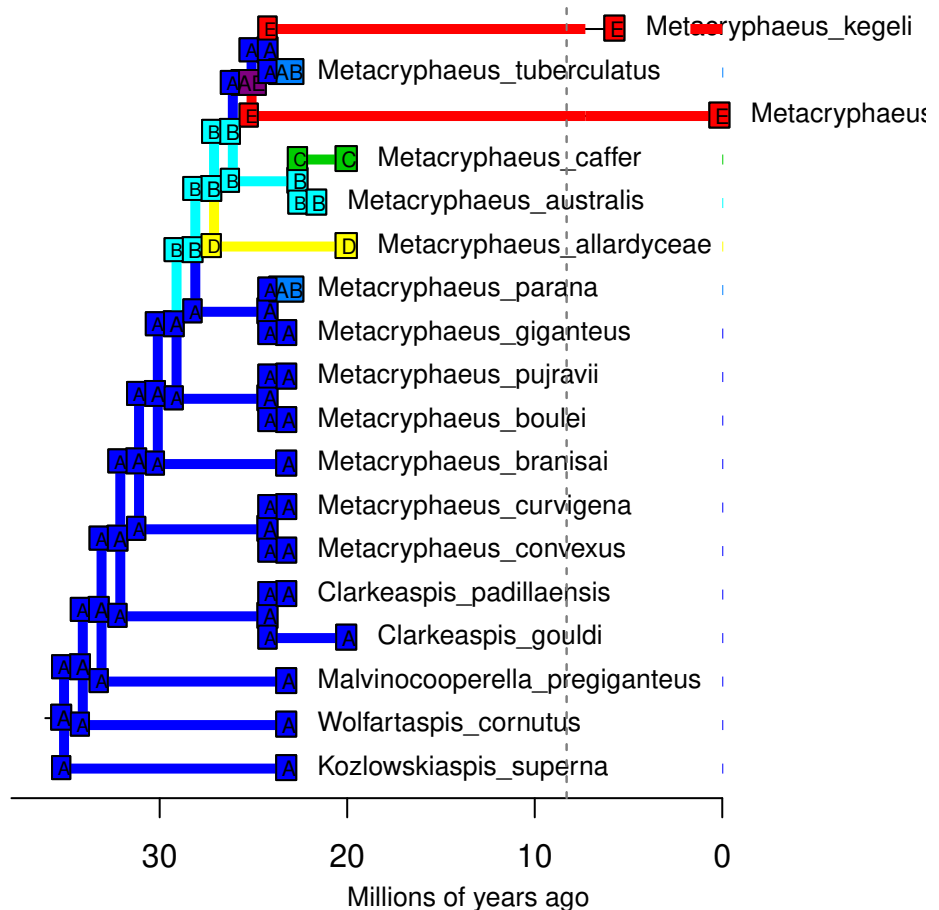
# DECwj – Stochastic Map #97/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



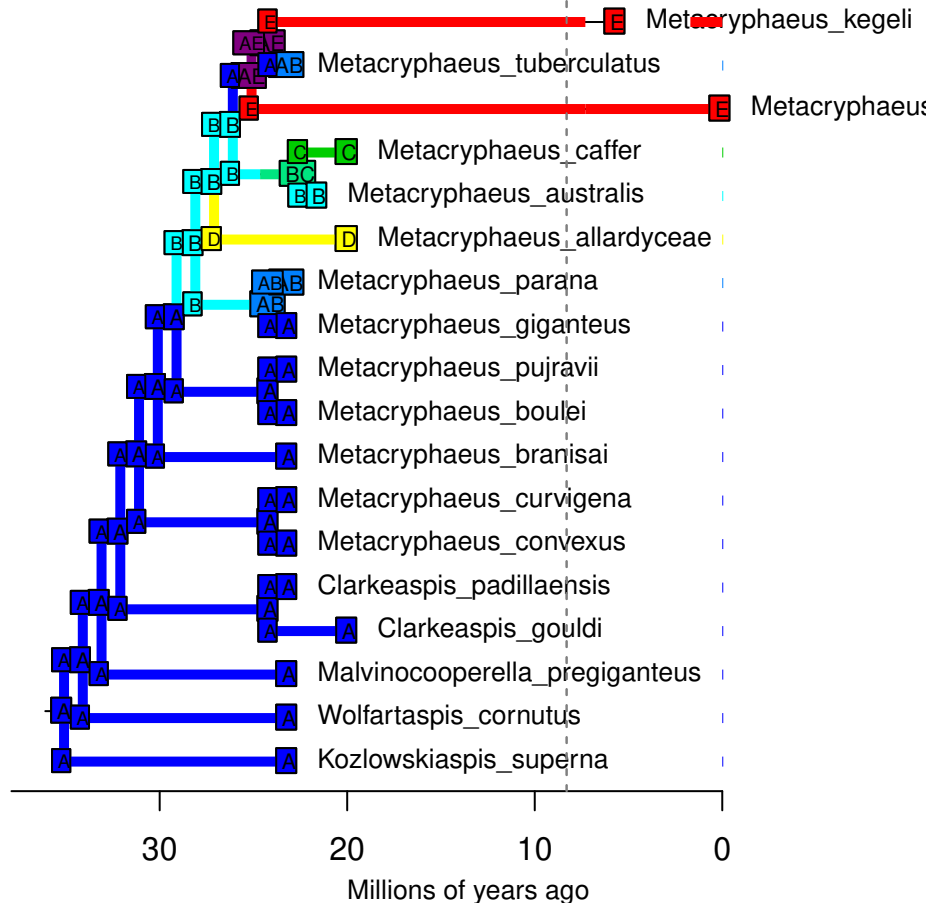
# DECwj – Stochastic Map #98/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



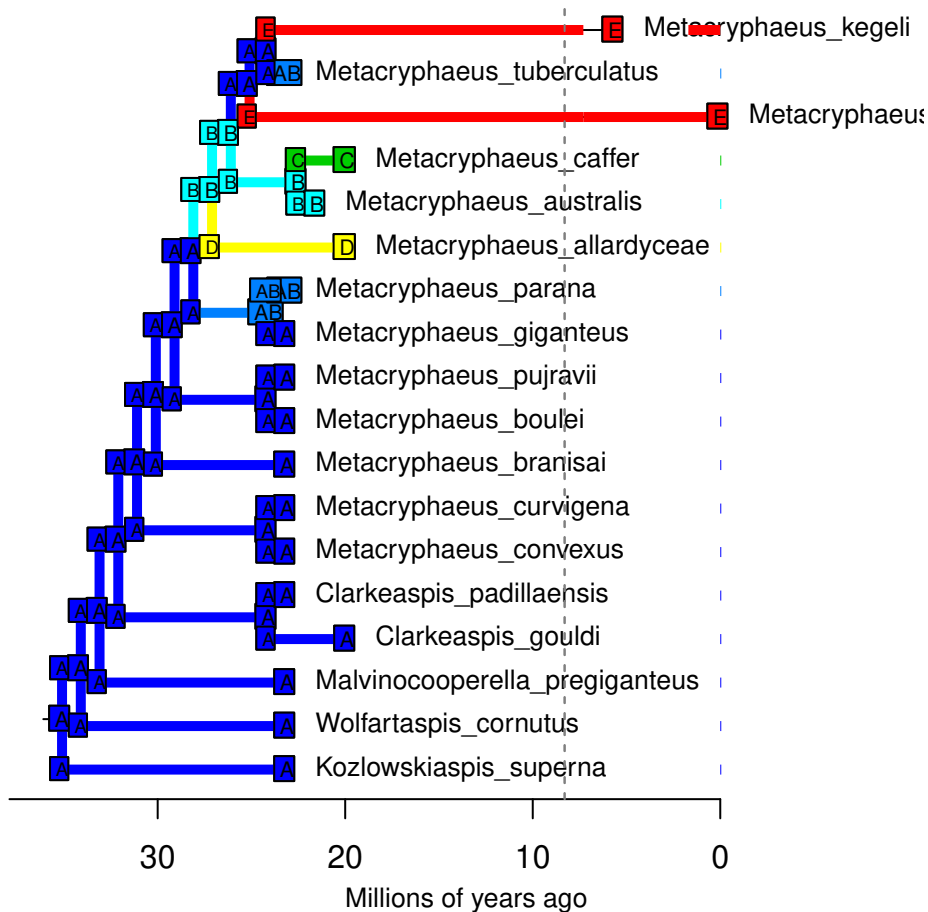
# DECwj – Stochastic Map #99/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87



# DECwj – Stochastic Map #100/100

ancstates: global optim, 3 areas max. d=0.0142; e=0; w=2.3553; j=0.0983; LnL=-29.87

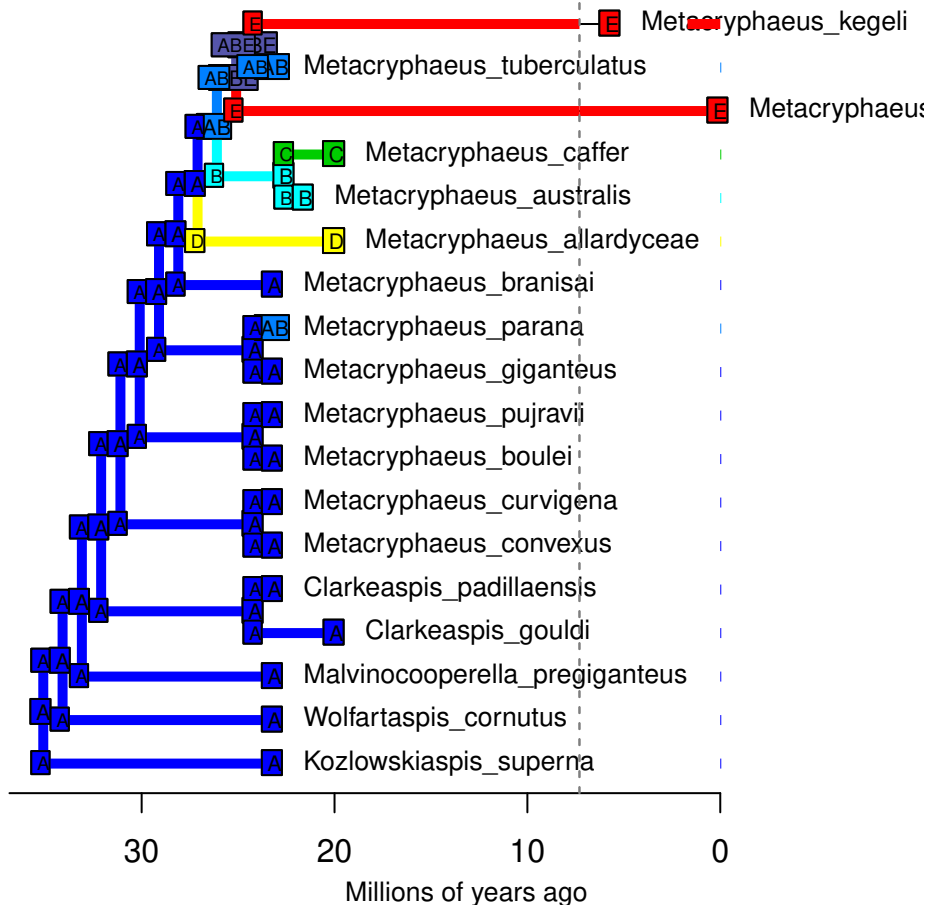


**Carbonaro et al. 2018.** *Inferring ancestral range reconstruction on trilobite records: a study-case based on Metacryphaeus (Phacopida, Calmoniidae)*

**Appendix 2.** Plots of 100 BSMs on tree 2.

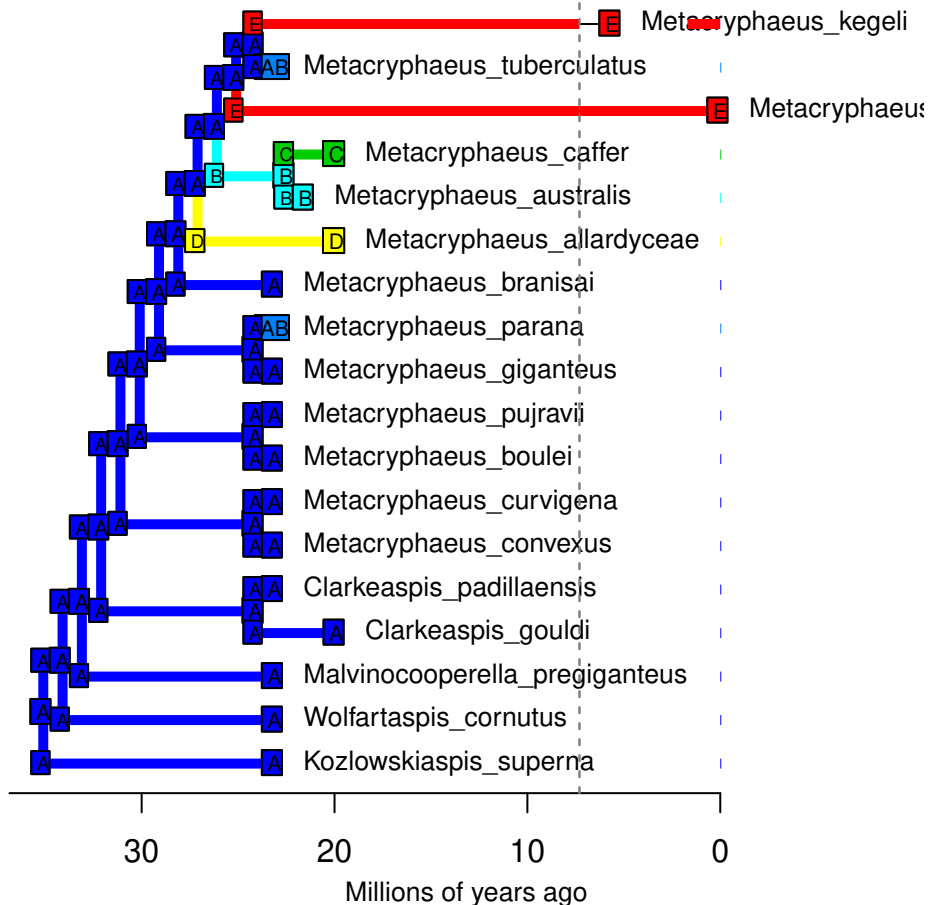
# DECwj – Stochastic Map #1/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #2/100

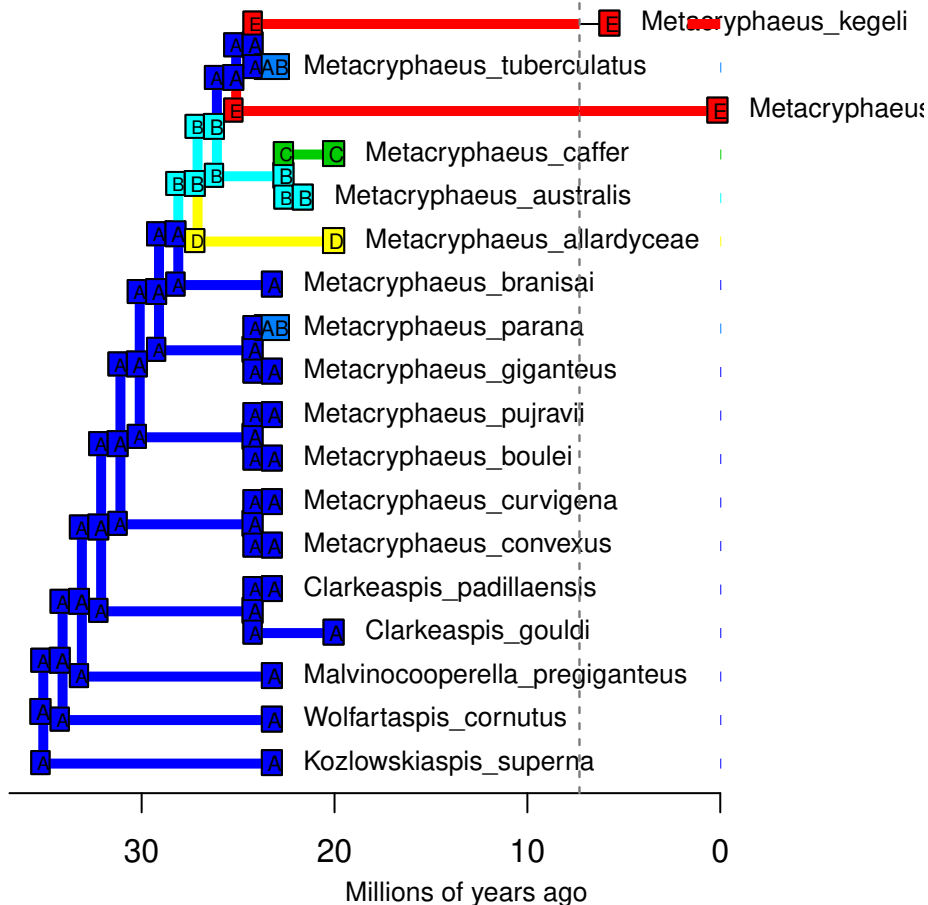
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





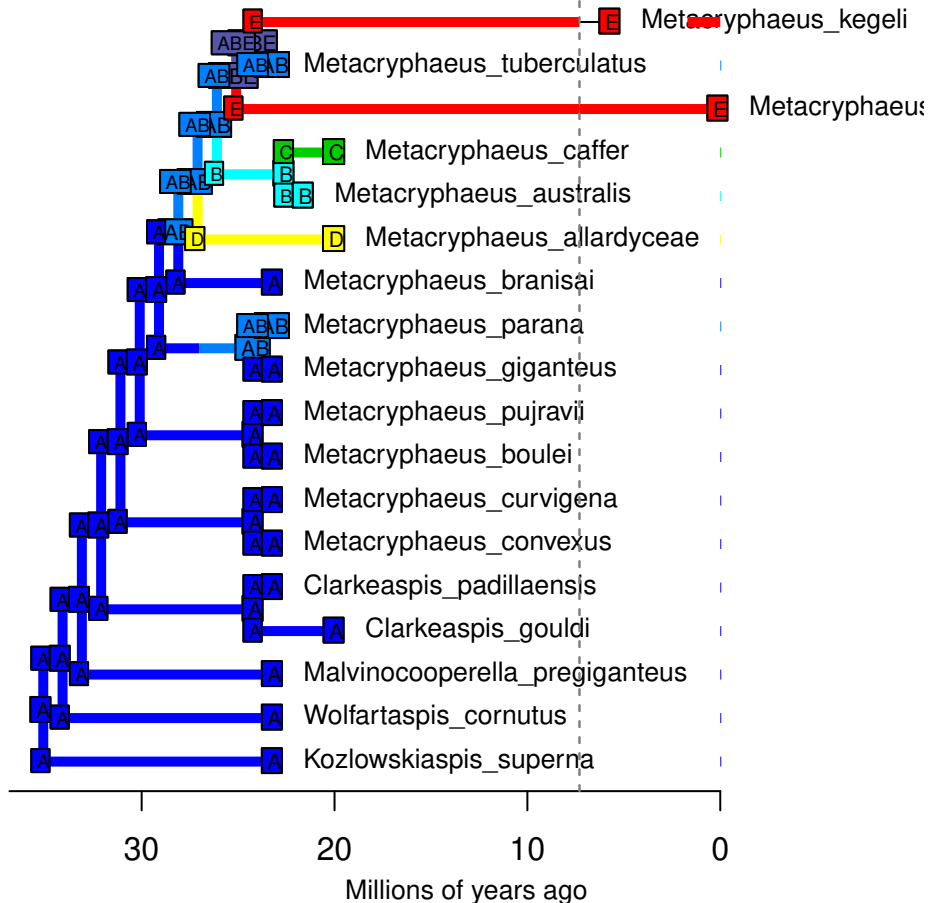
# DECwj – Stochastic Map #3/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



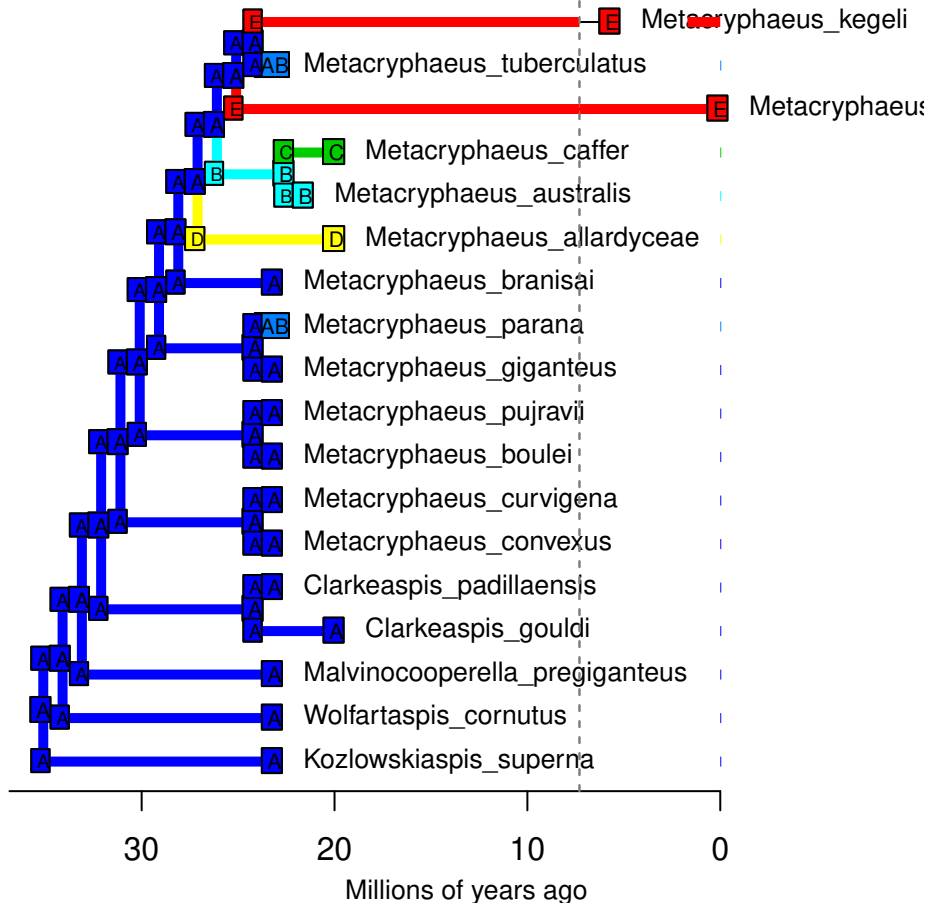
# DECwj – Stochastic Map #4/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



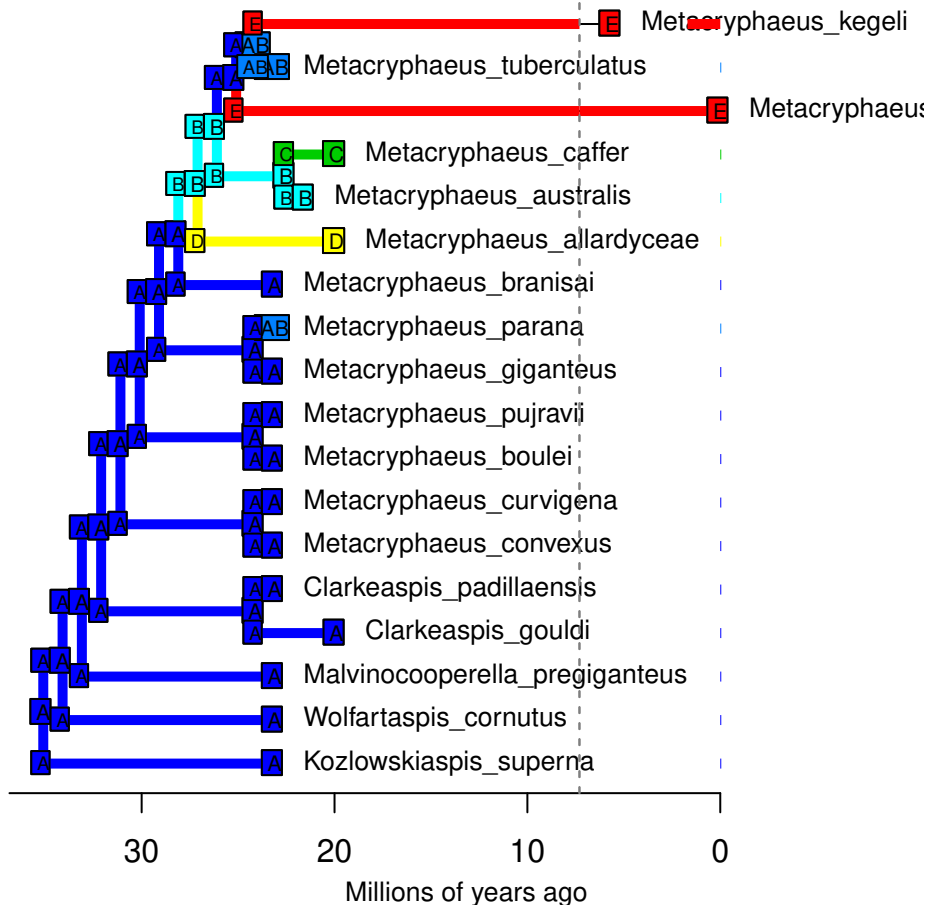
# DECwj – Stochastic Map #5/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



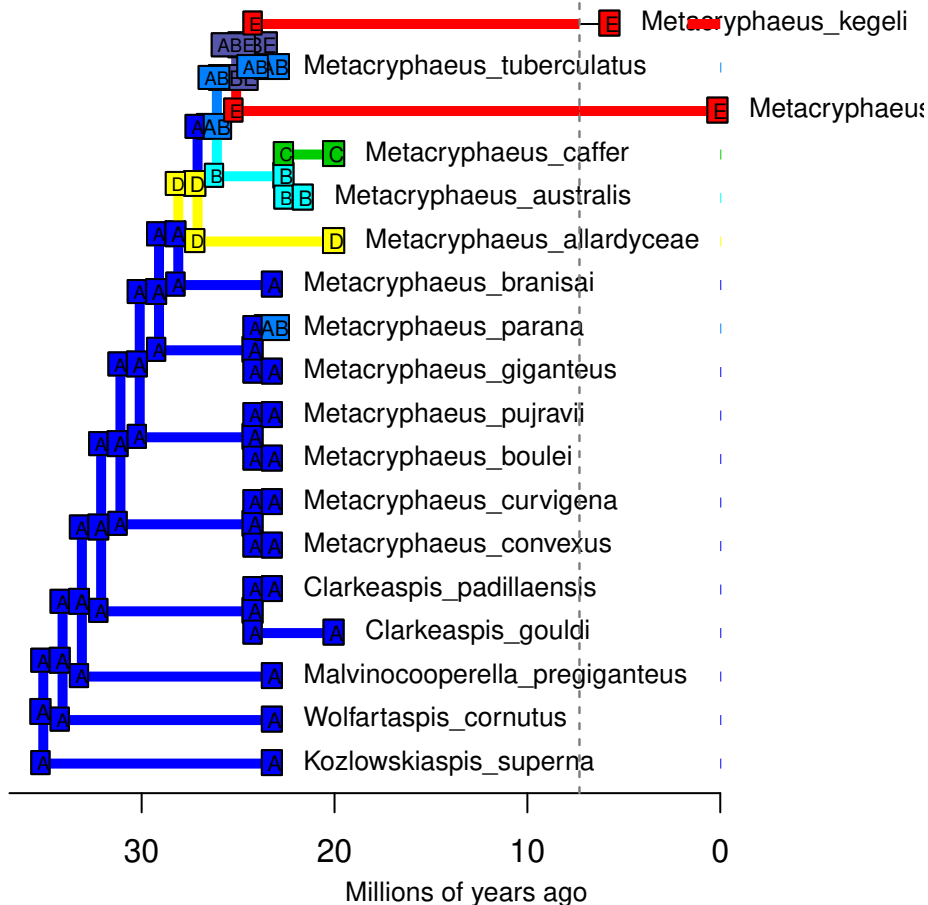
# DECwj – Stochastic Map #6/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



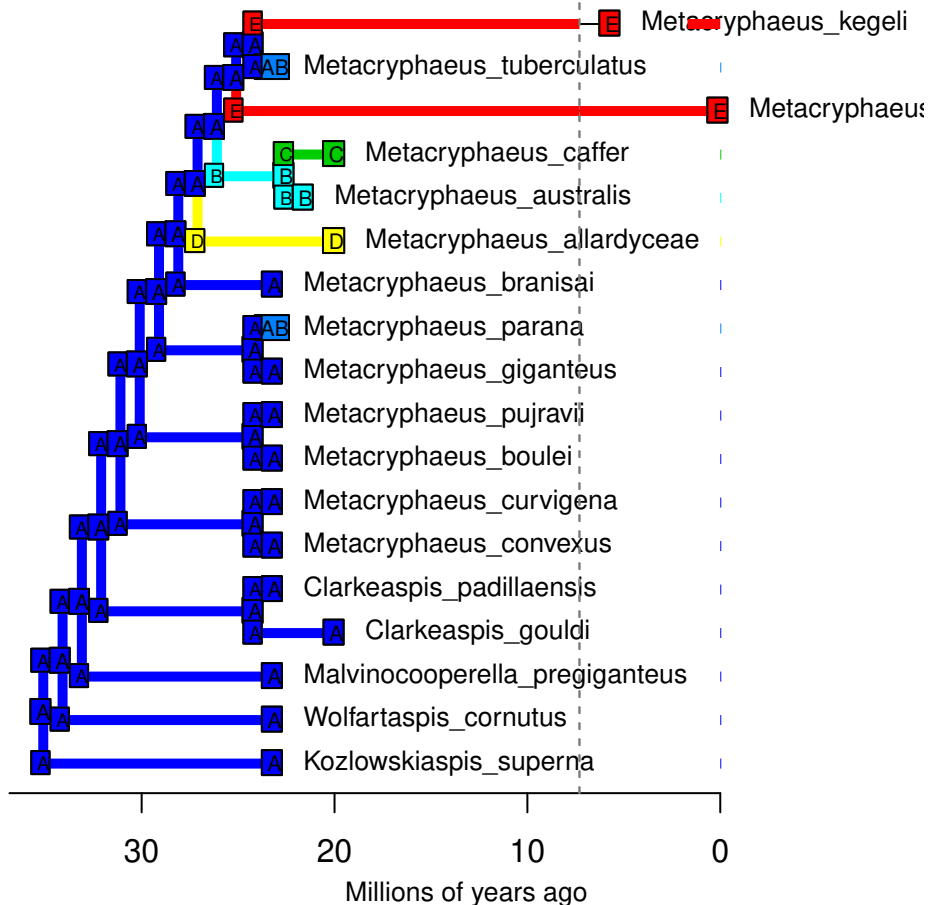
# DECwj – Stochastic Map #7/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



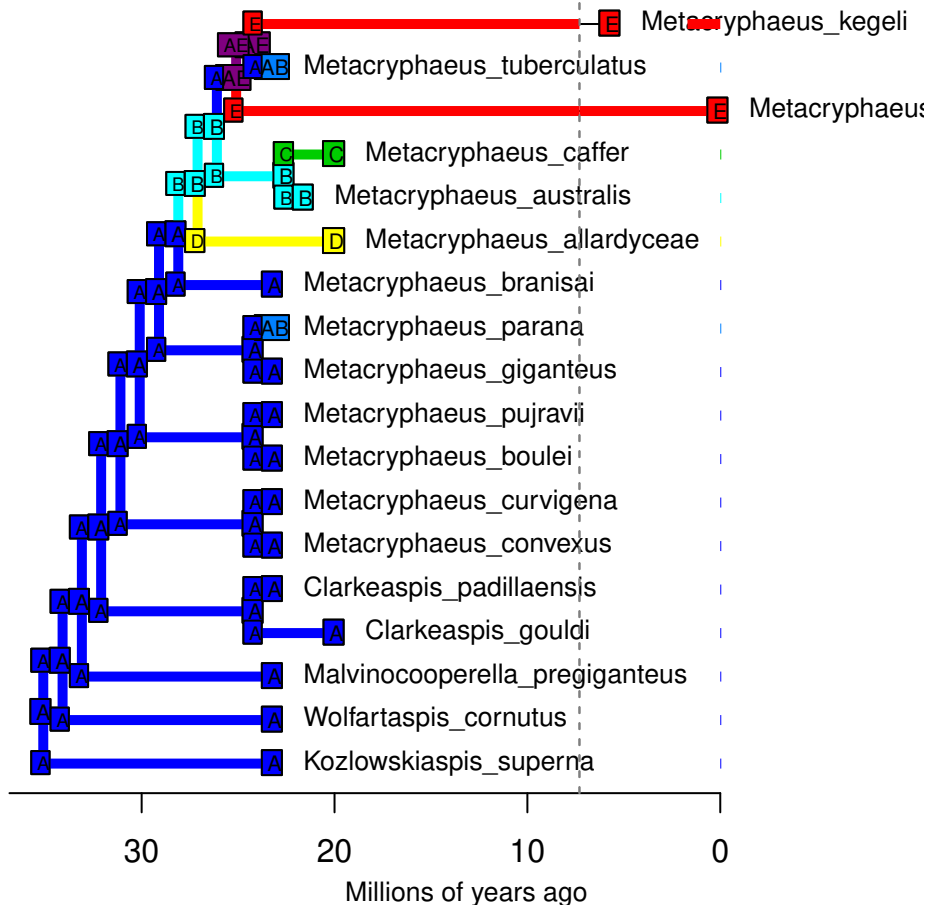
# DECwj – Stochastic Map #8/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



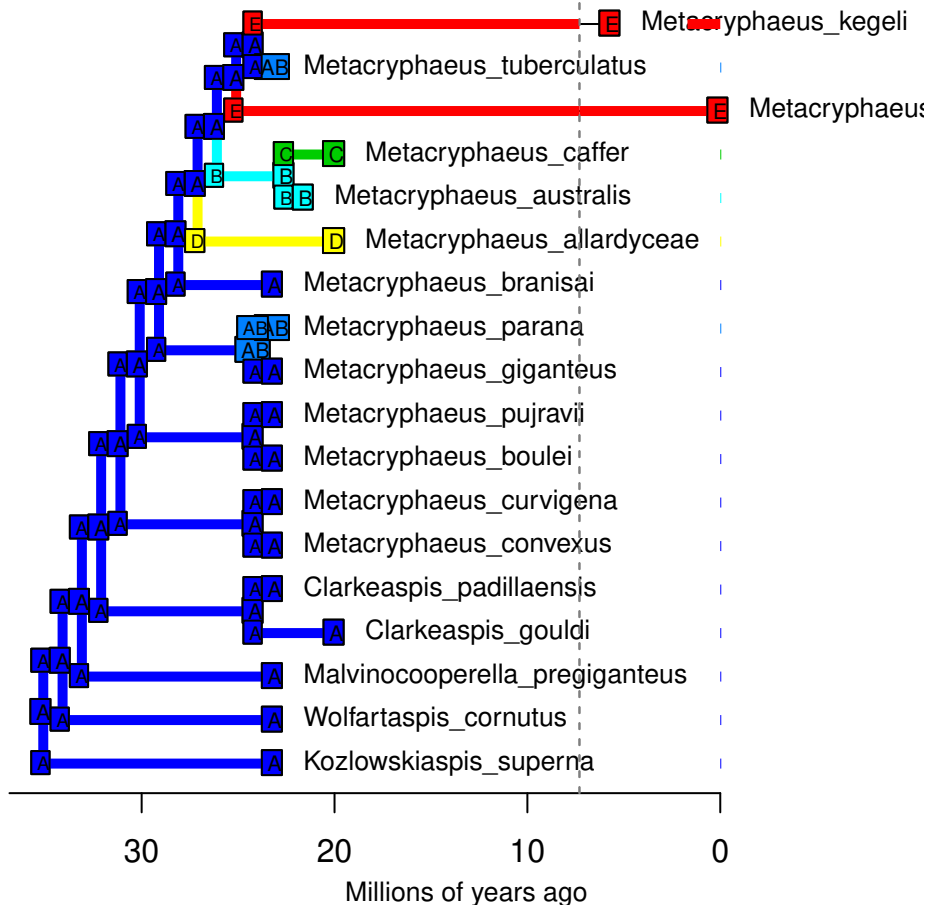
# DECwj – Stochastic Map #9/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #10/100

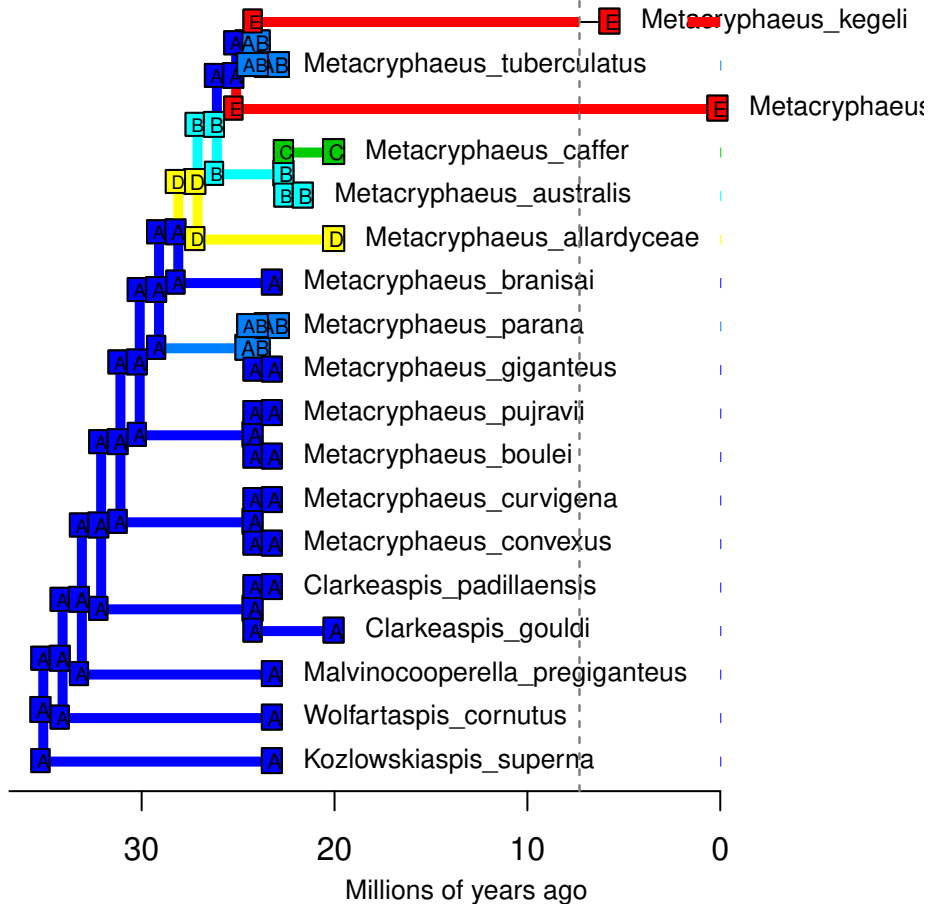
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





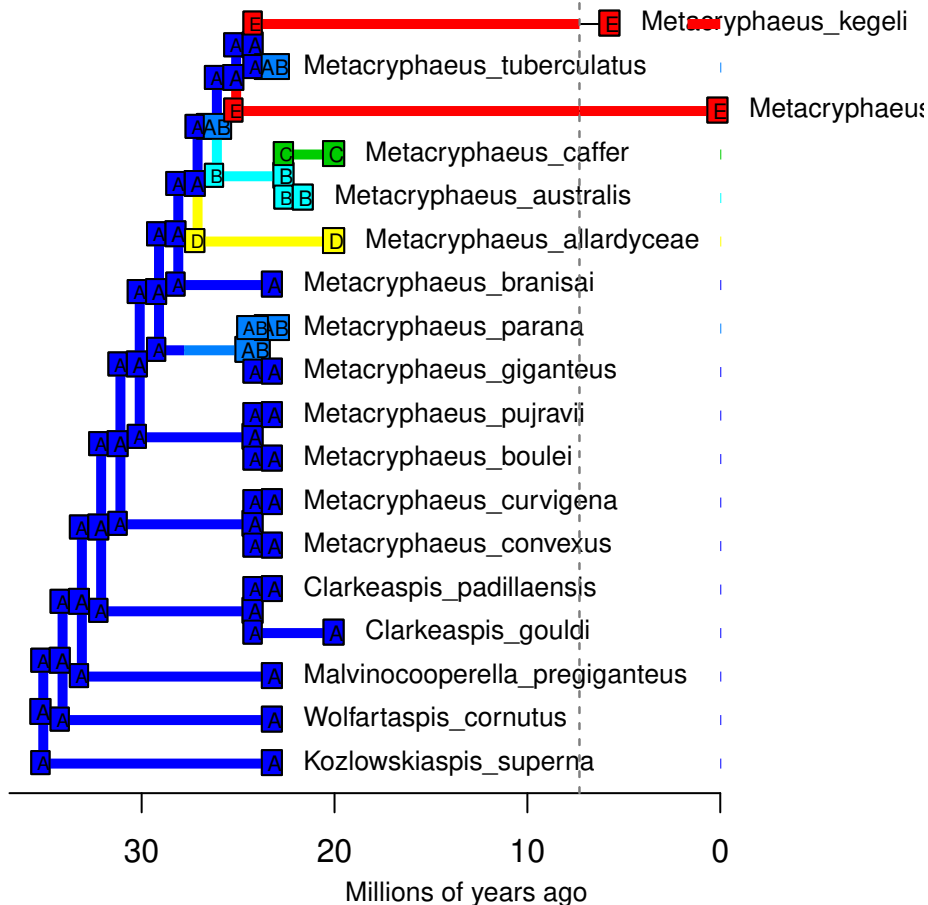
# DECwj – Stochastic Map #11/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



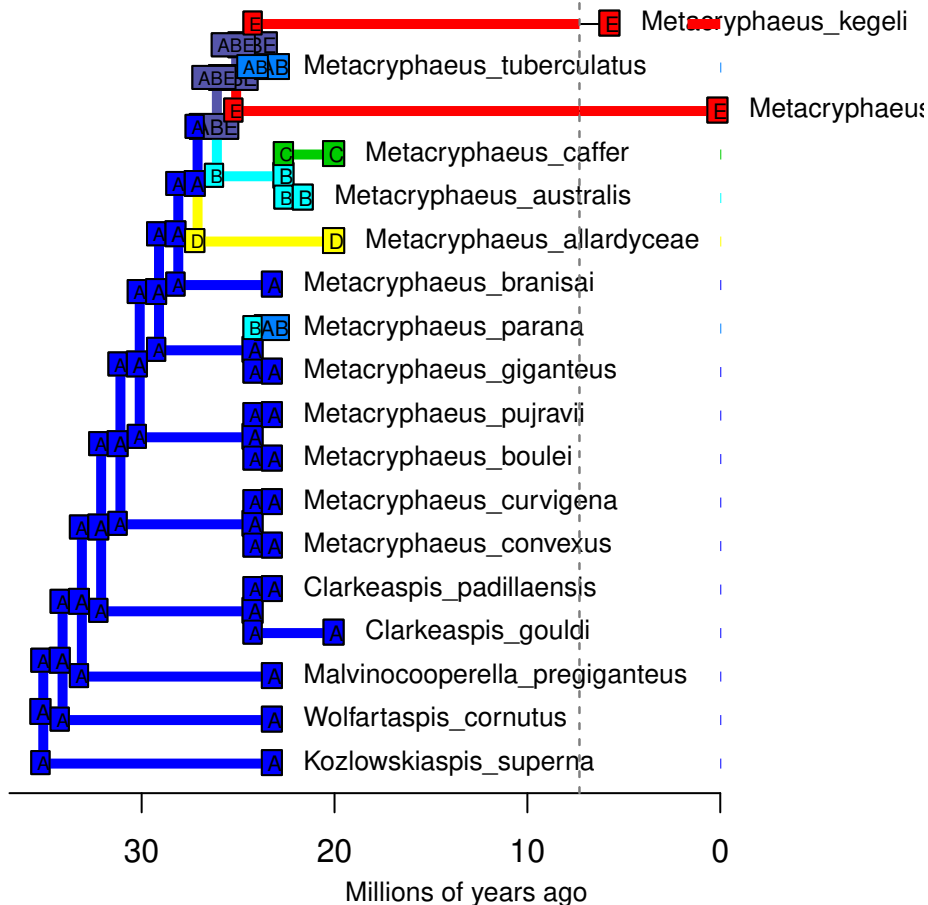
# DECwj – Stochastic Map #12/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



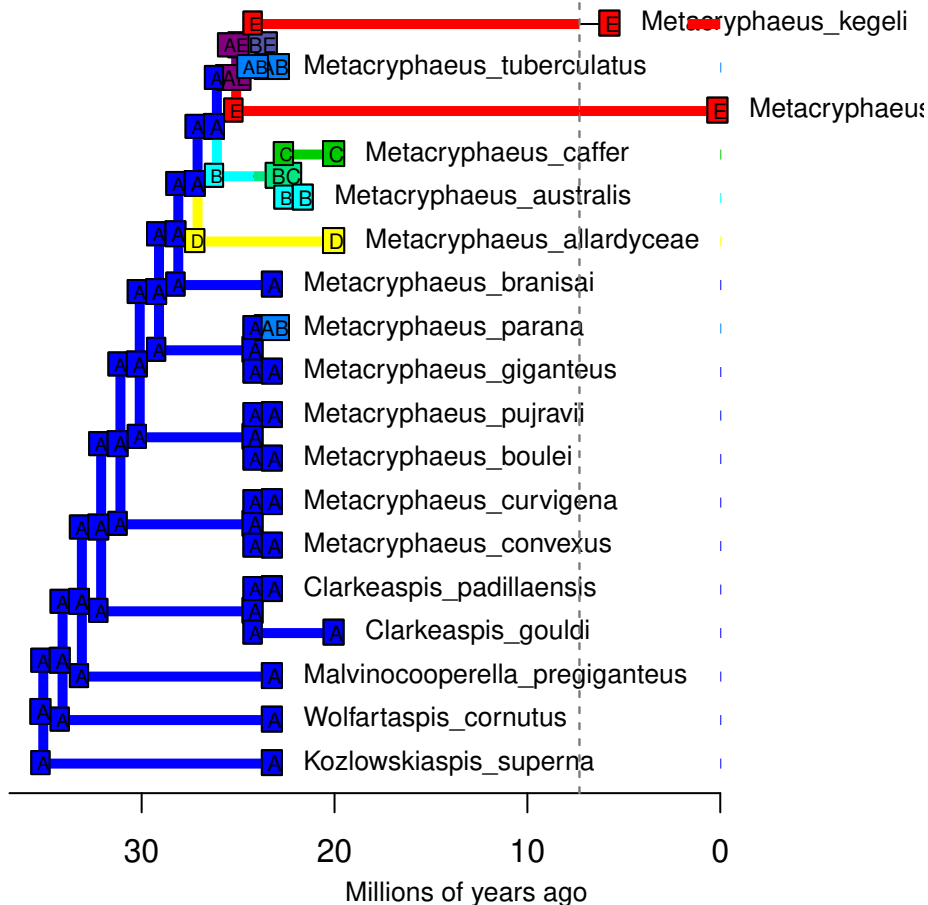
# DECwj – Stochastic Map #13/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



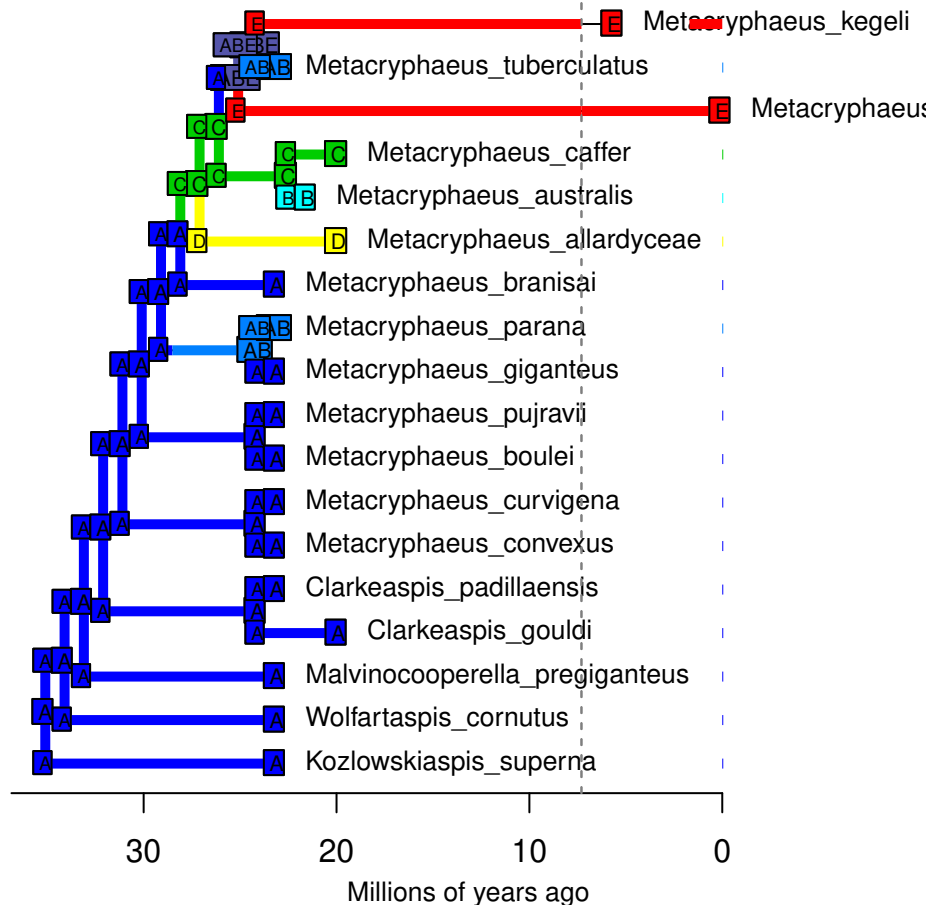
# DECwj – Stochastic Map #14/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



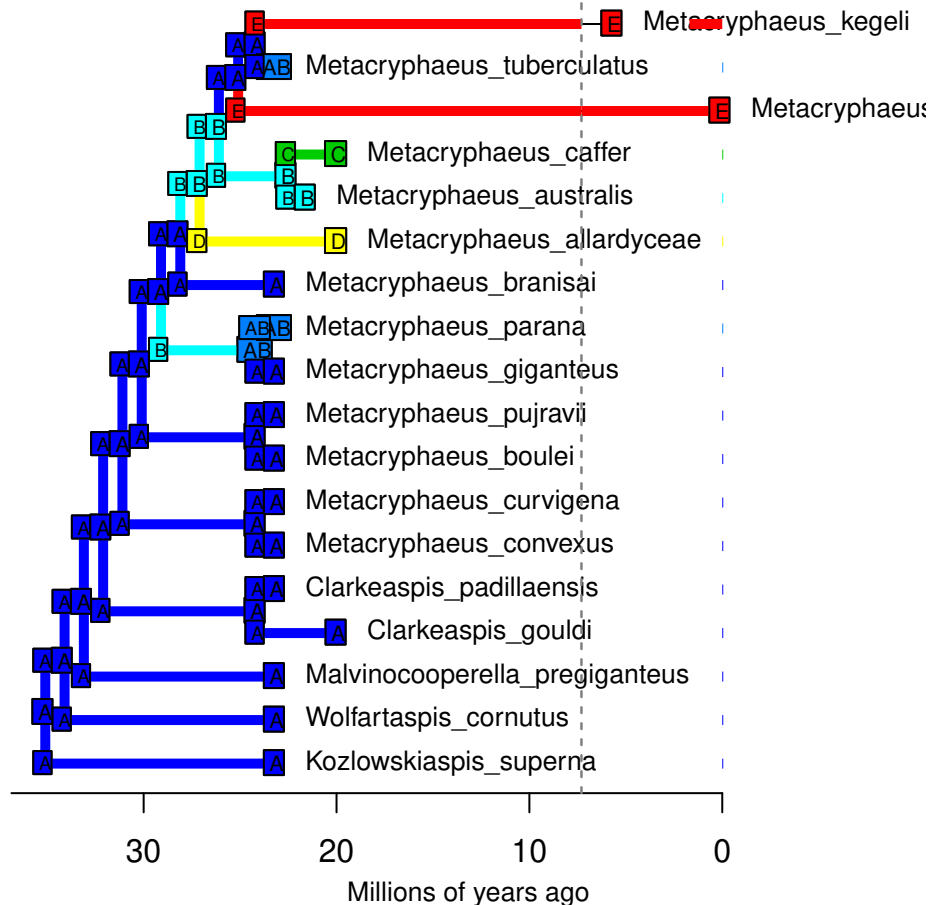
# DECwj – Stochastic Map #15/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



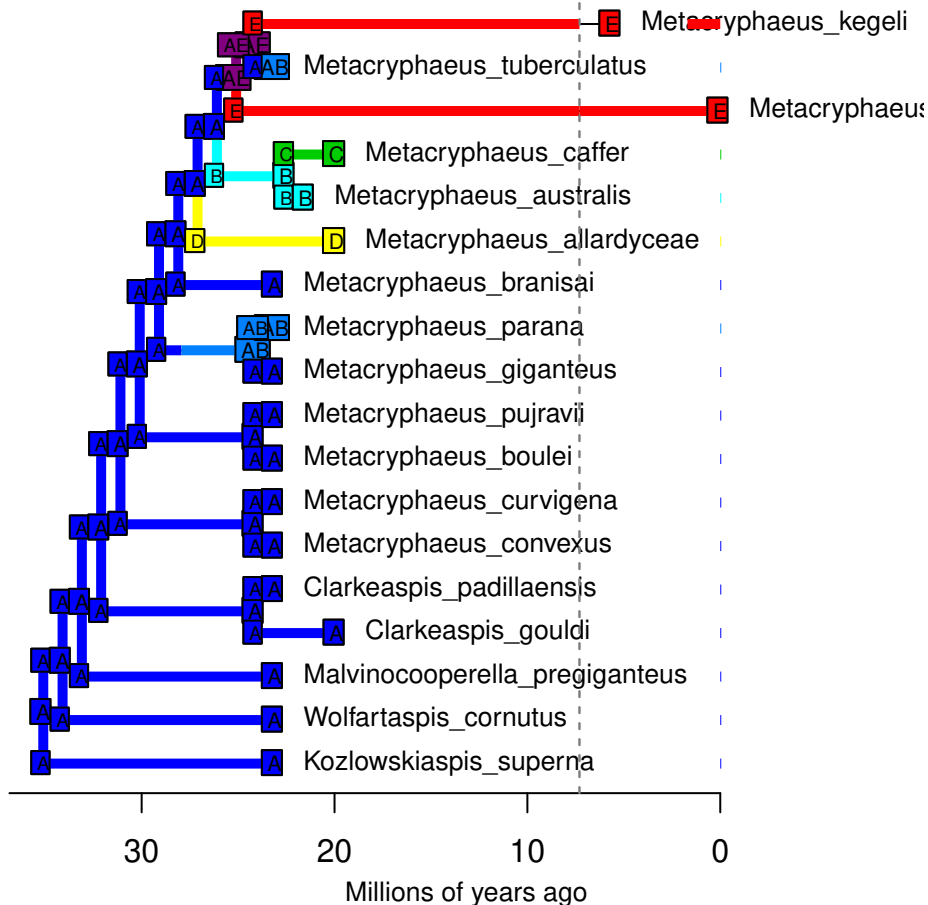
# DECwj – Stochastic Map #16/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



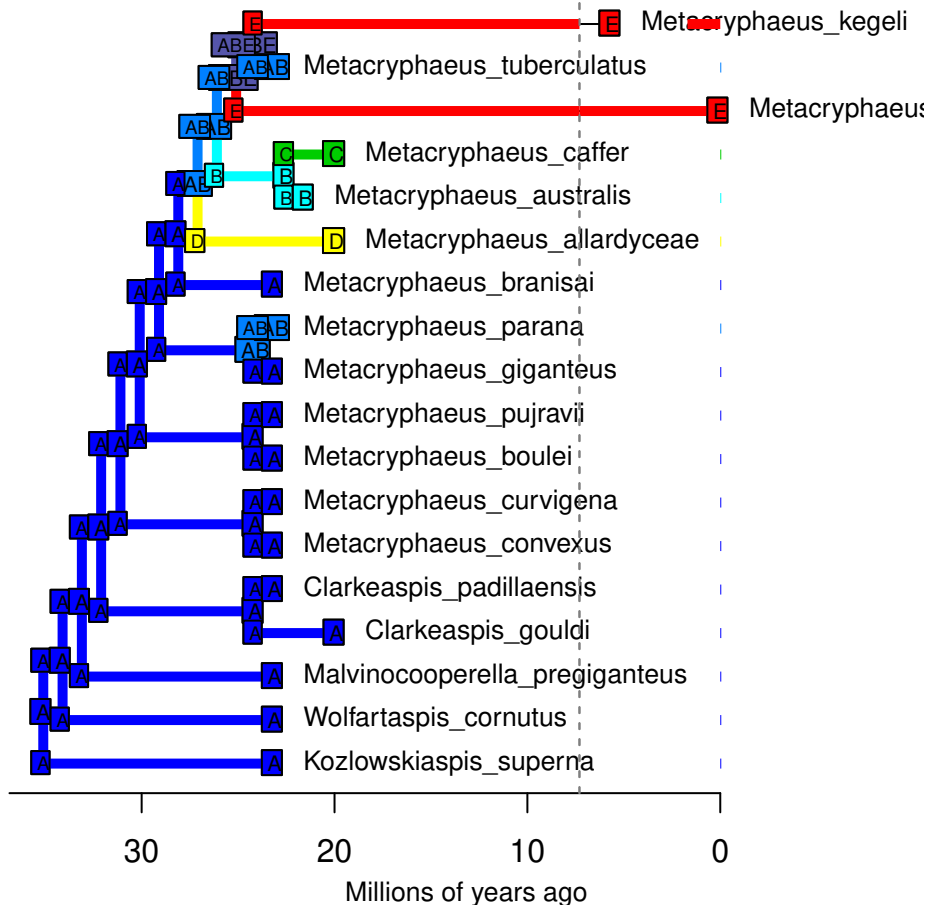
# DECwj – Stochastic Map #17/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #18/100

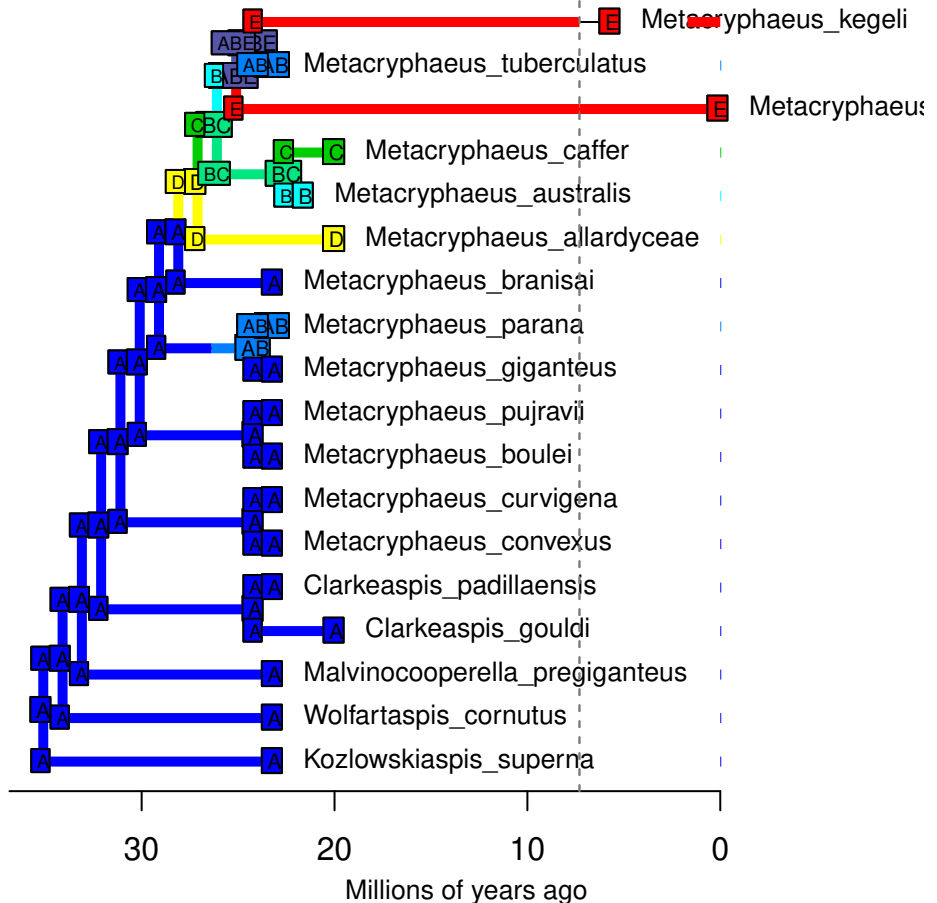
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





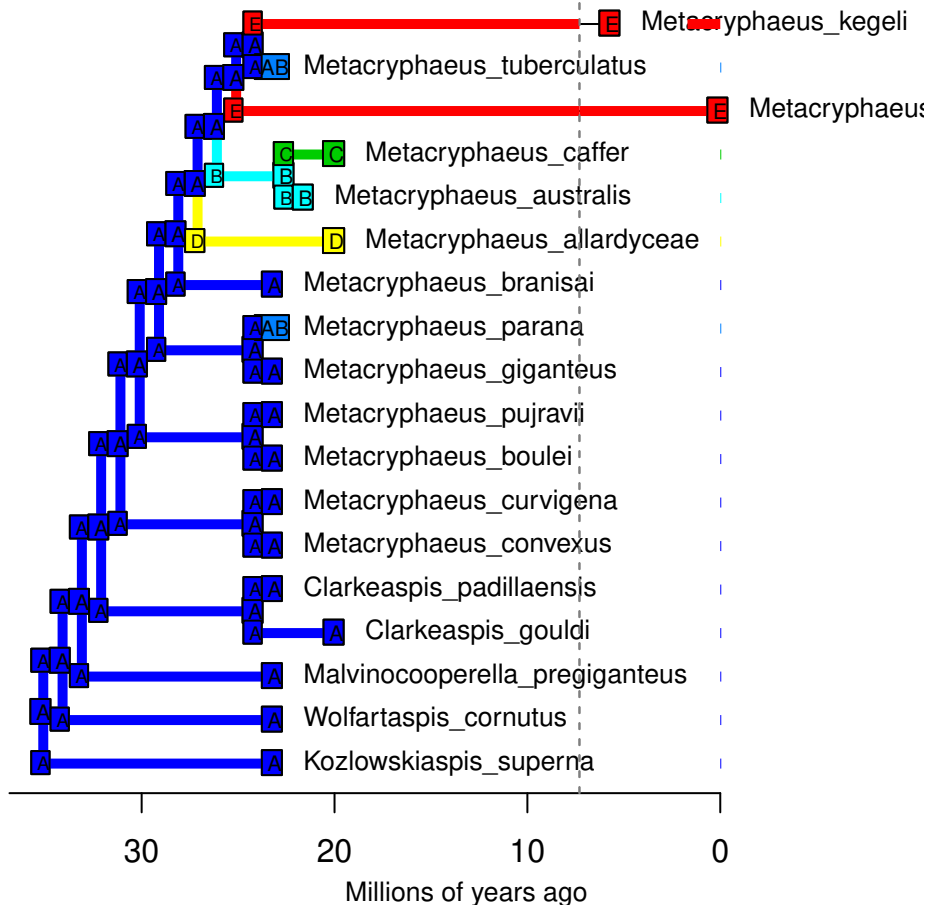
# DECwj – Stochastic Map #19/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



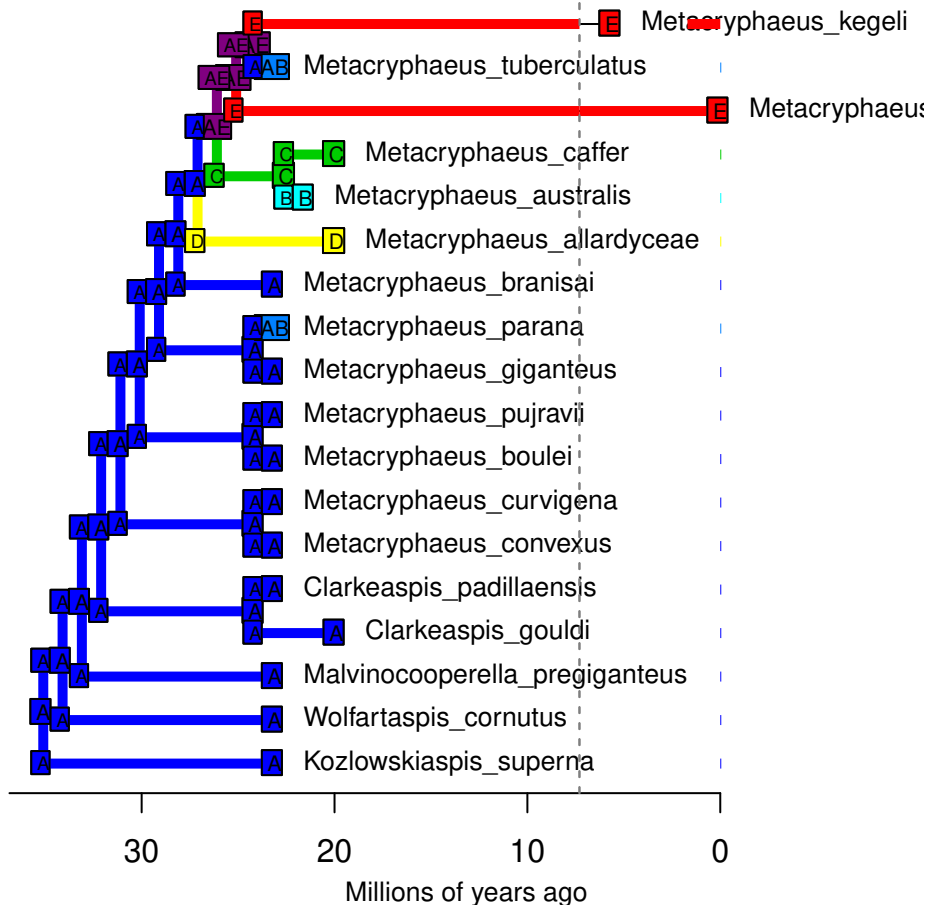
# DECwj – Stochastic Map #20/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



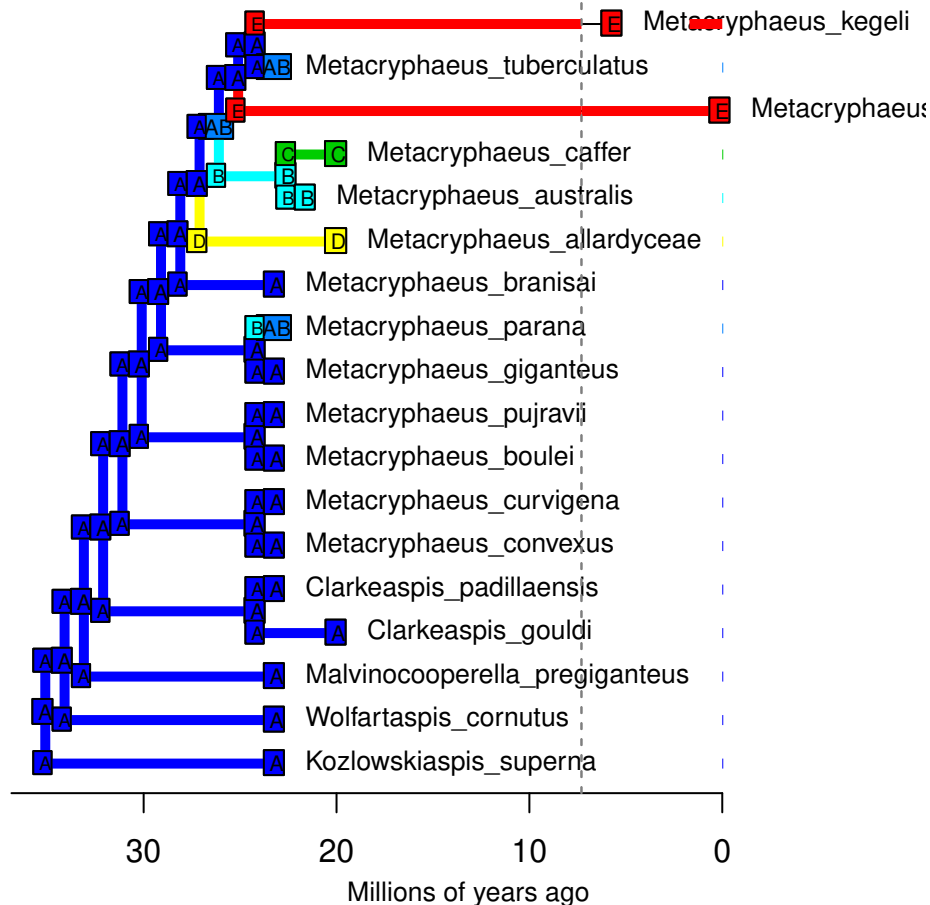
# DECwj – Stochastic Map #21/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



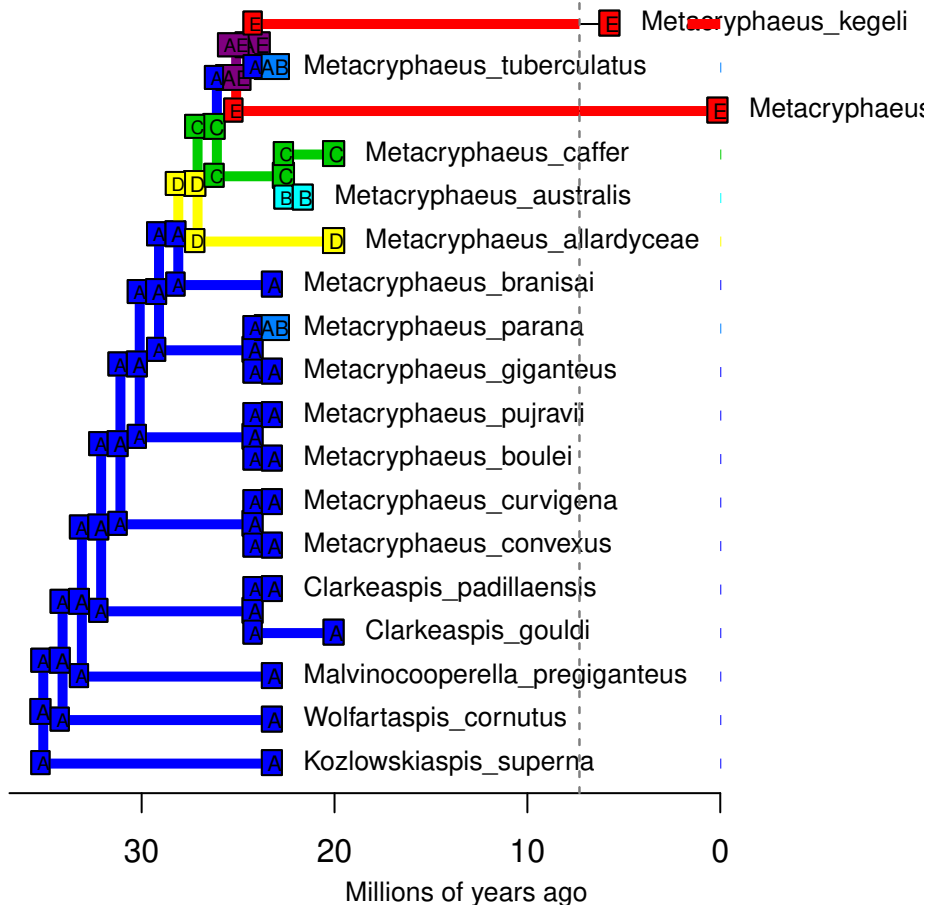
# DECwj – Stochastic Map #22/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



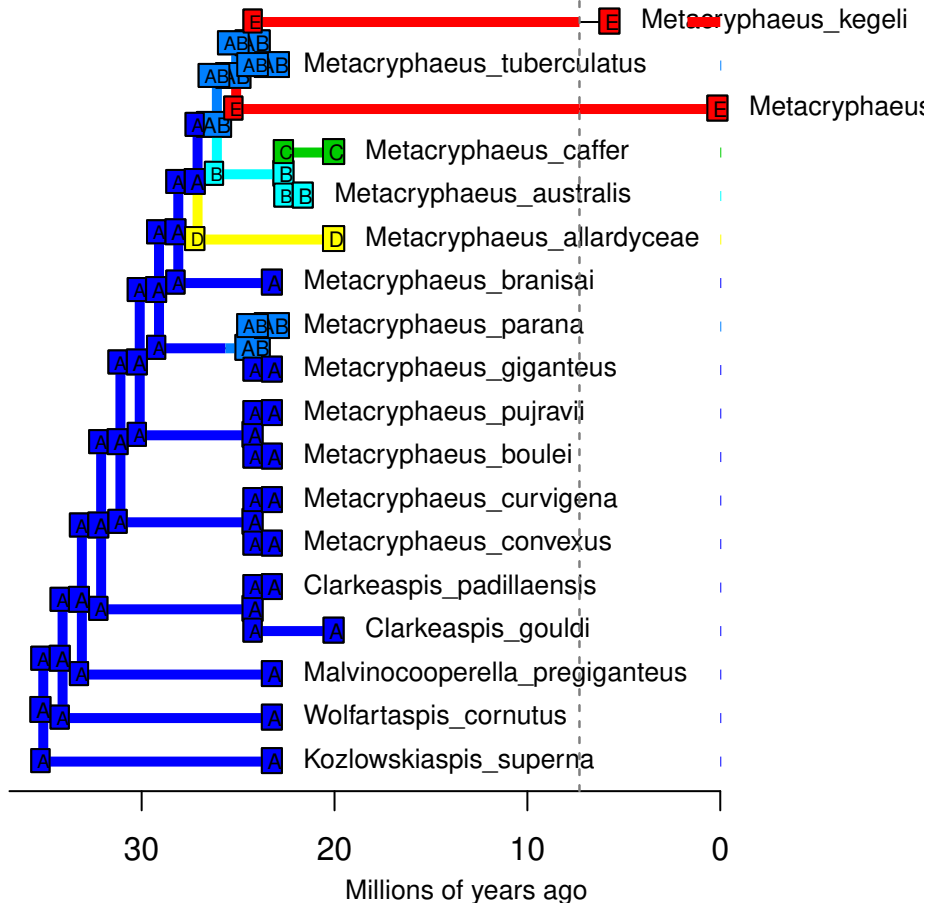
# DECwj – Stochastic Map #23/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



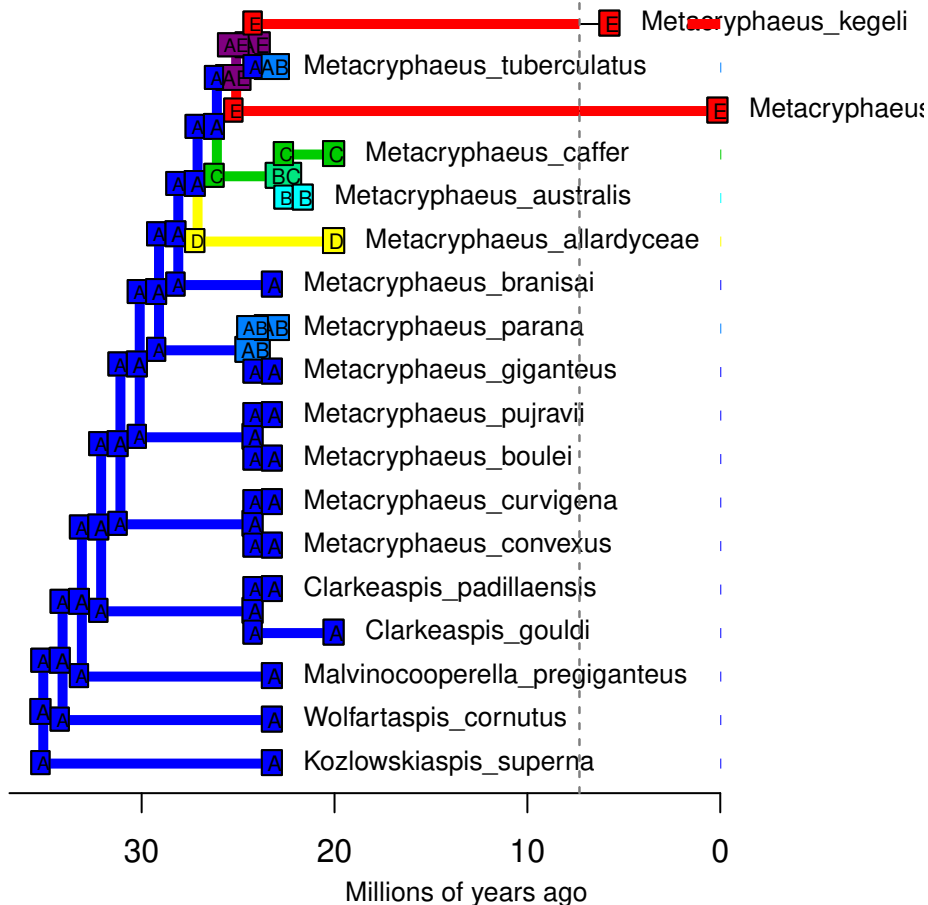
# DECwj – Stochastic Map #24/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



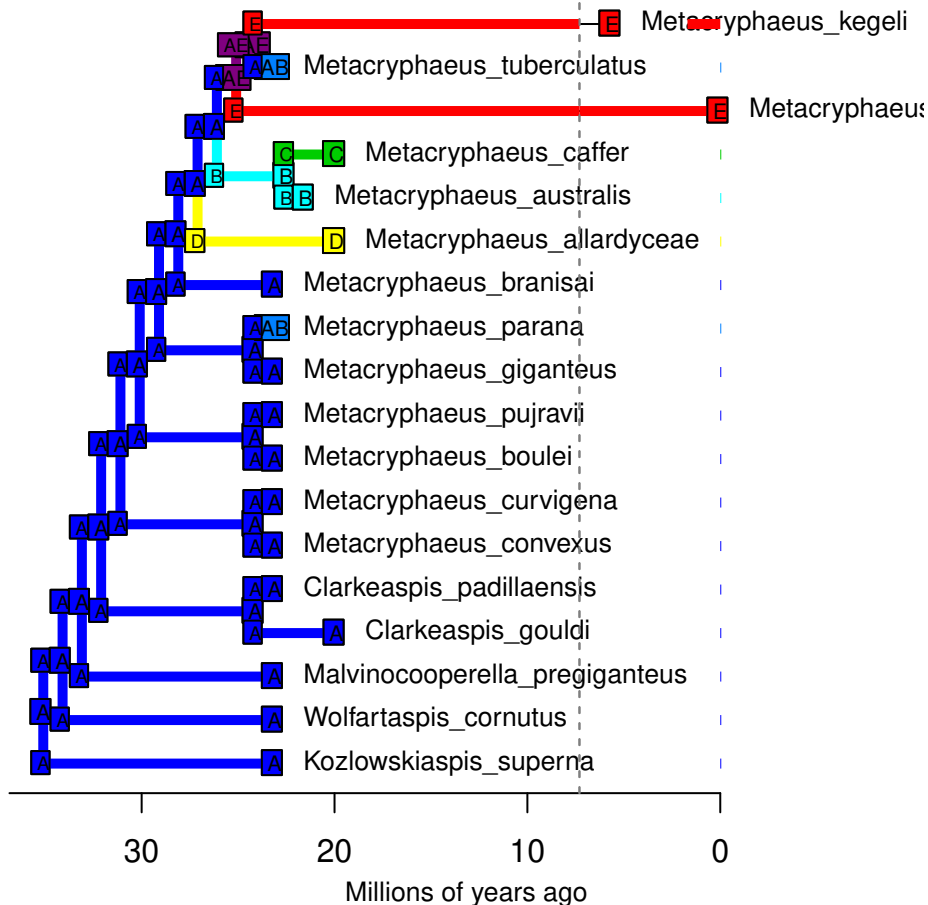
# DECwj – Stochastic Map #25/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #26/100

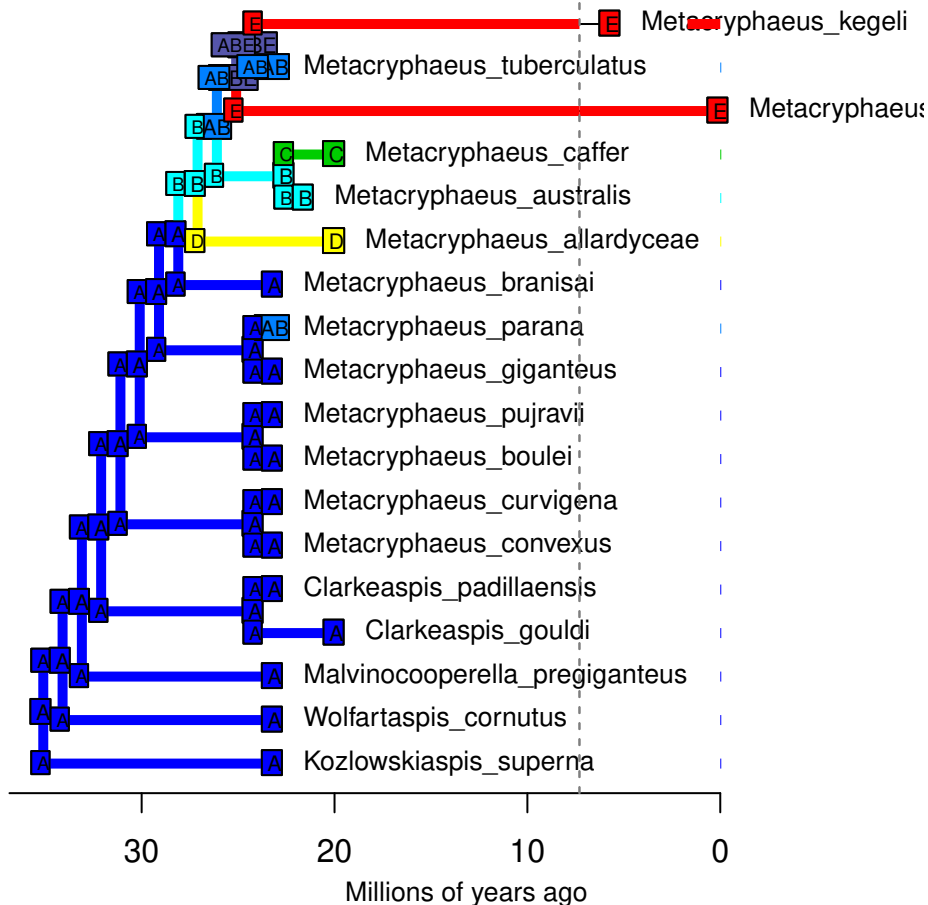
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





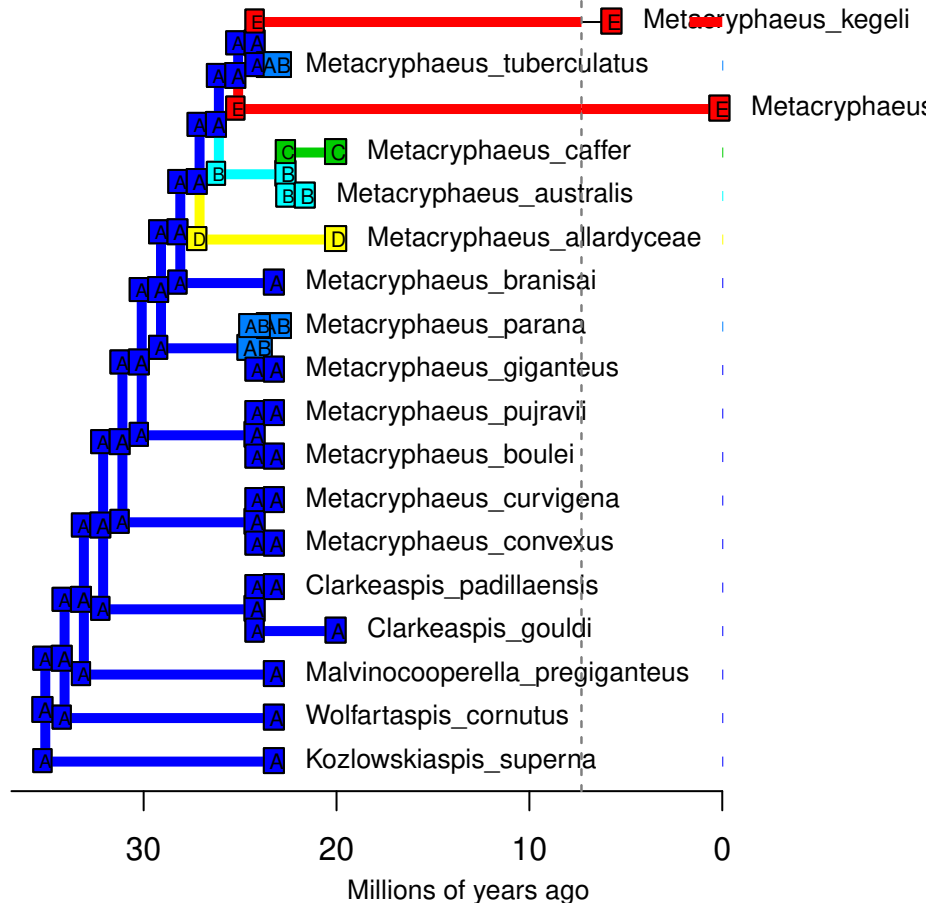
# DECwj – Stochastic Map #27/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



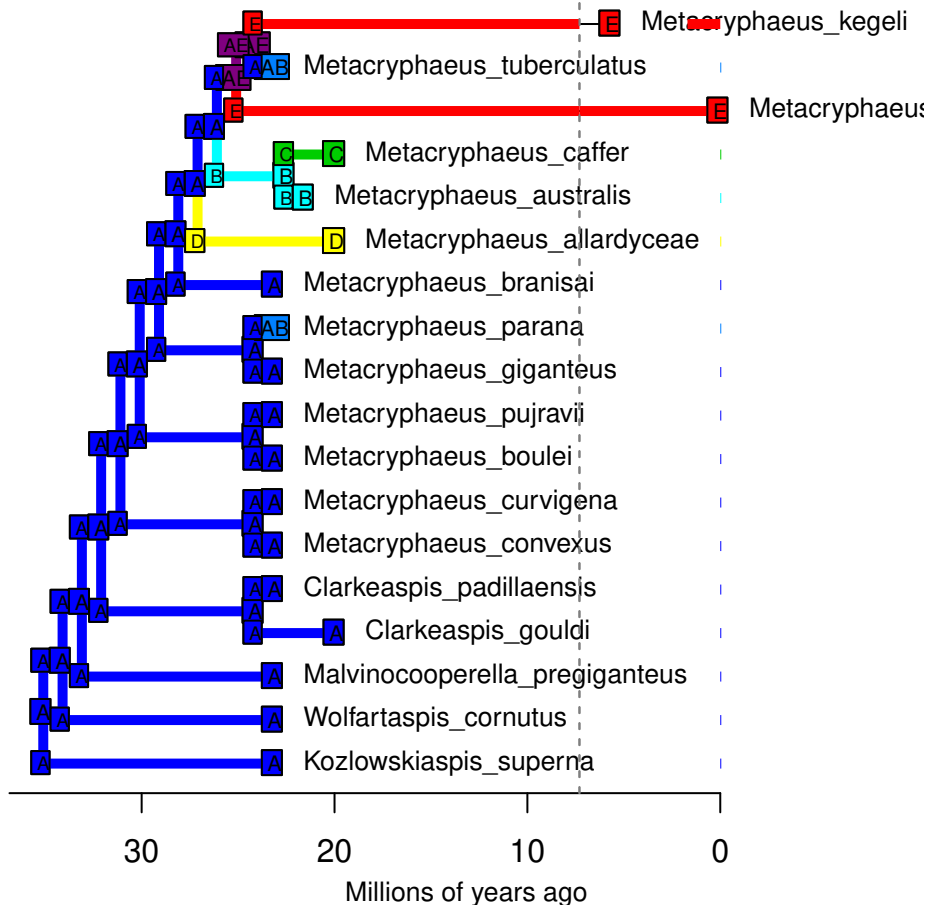
# DECwj – Stochastic Map #28/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



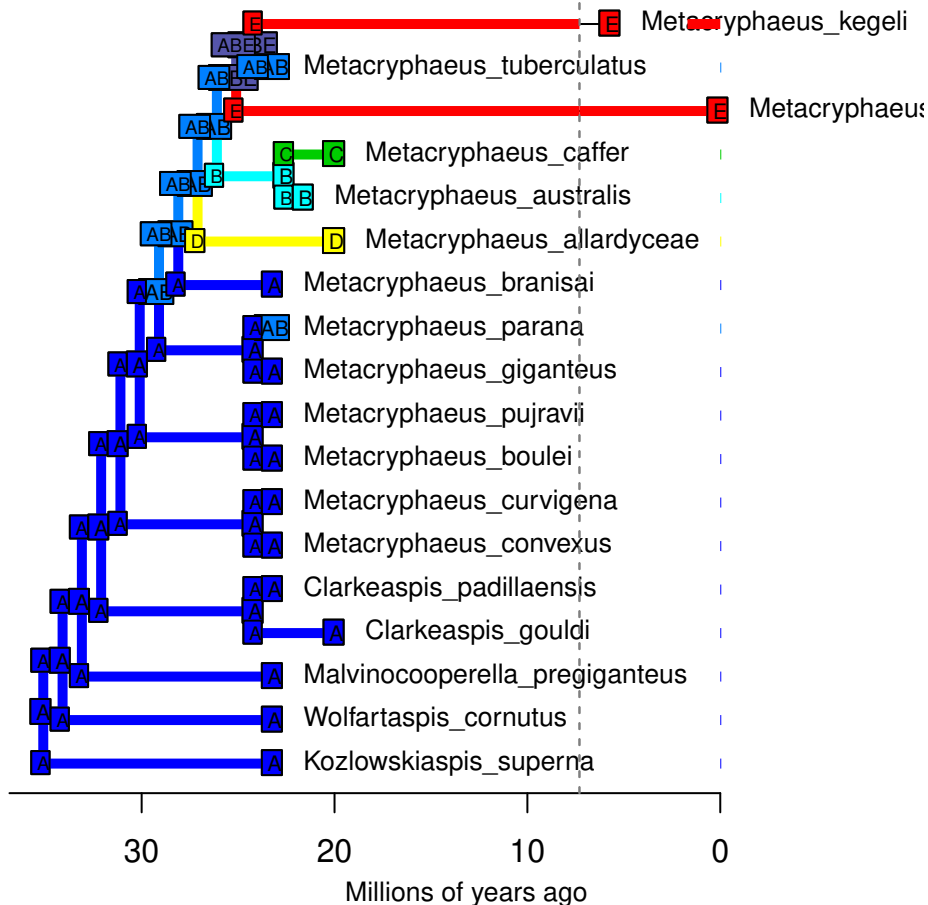
# DECwj – Stochastic Map #29/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



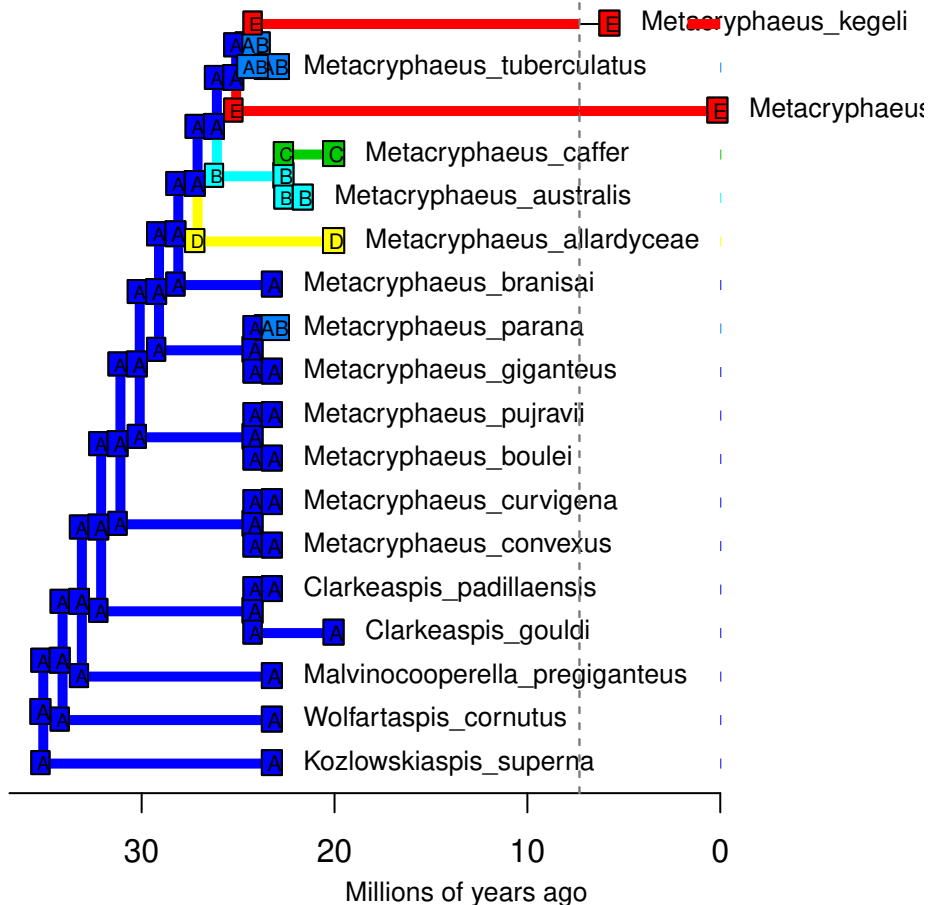
# DECwj – Stochastic Map #30/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



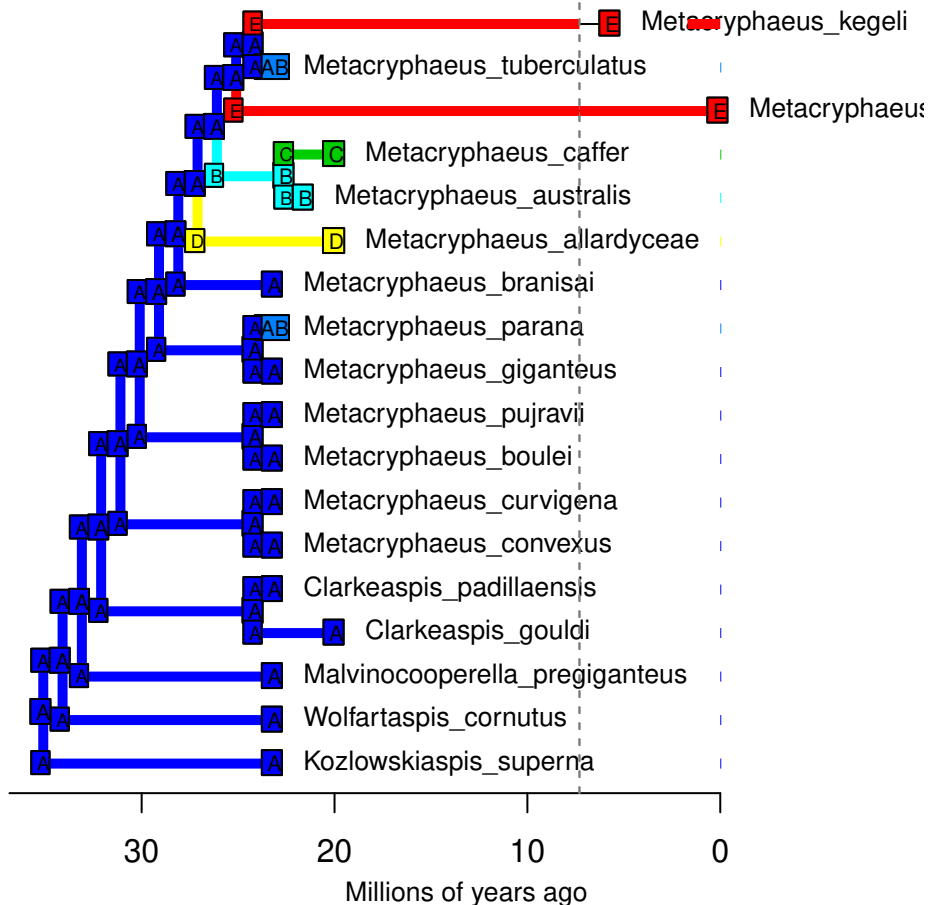
# DECwj – Stochastic Map #31/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



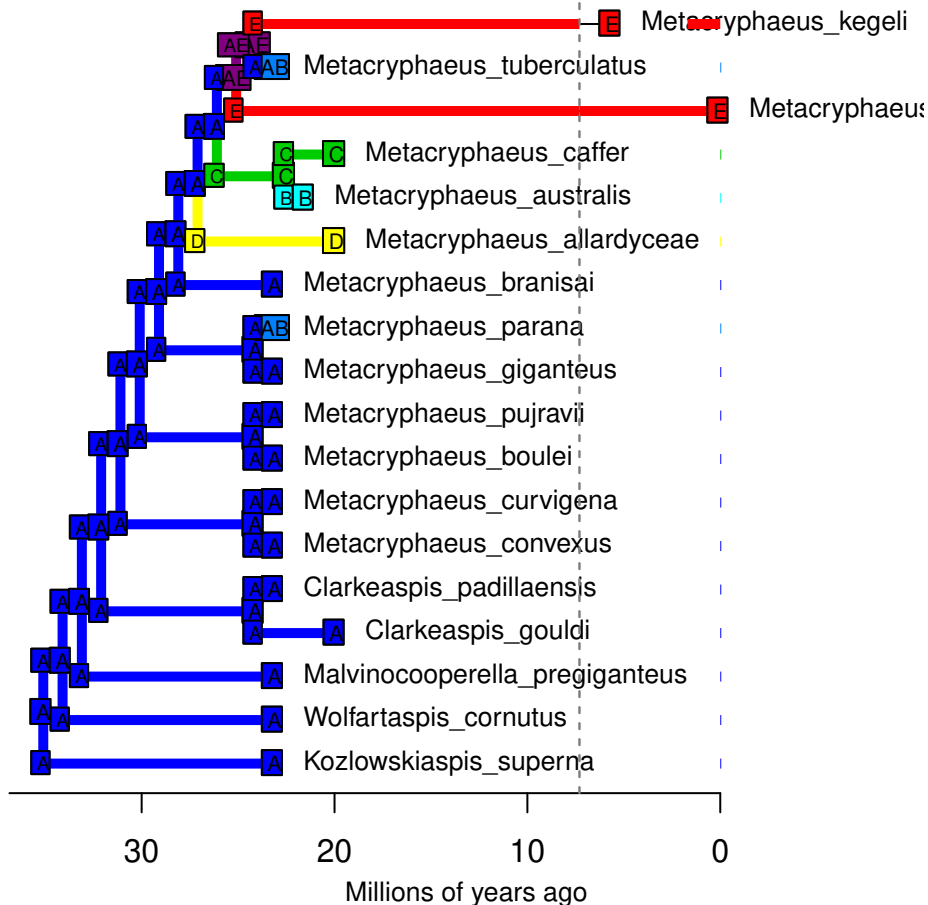
# DECwj – Stochastic Map #32/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



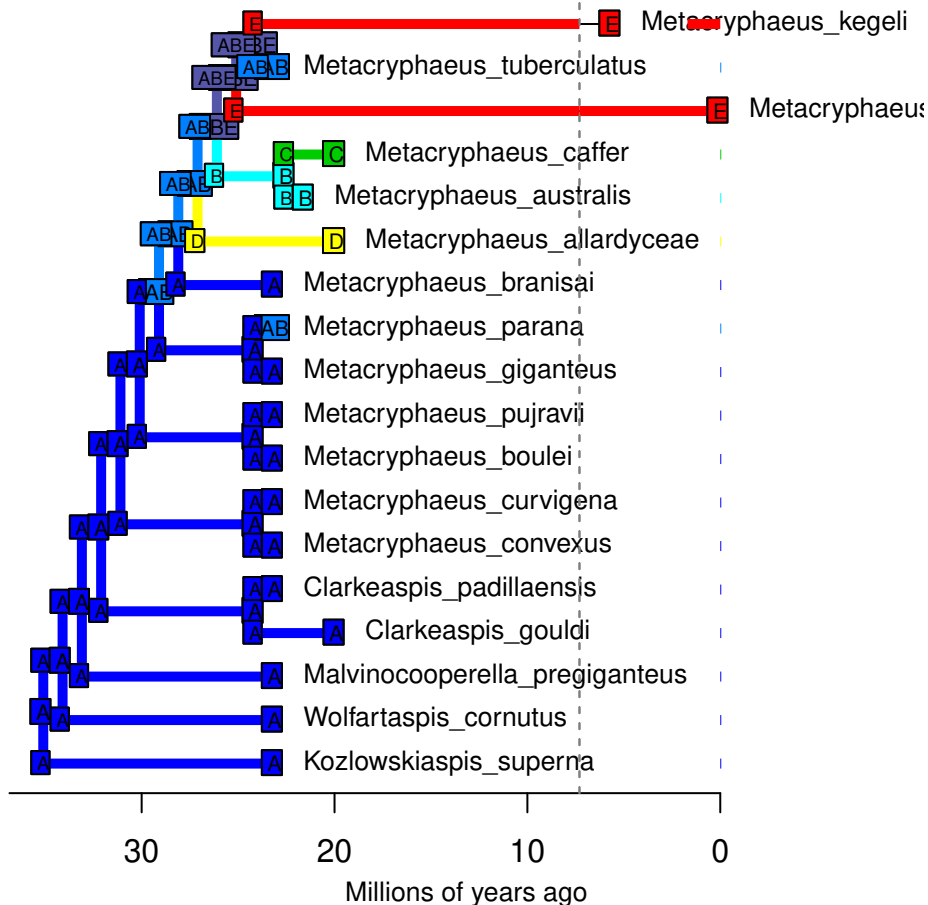
# DECwj – Stochastic Map #33/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #34/100

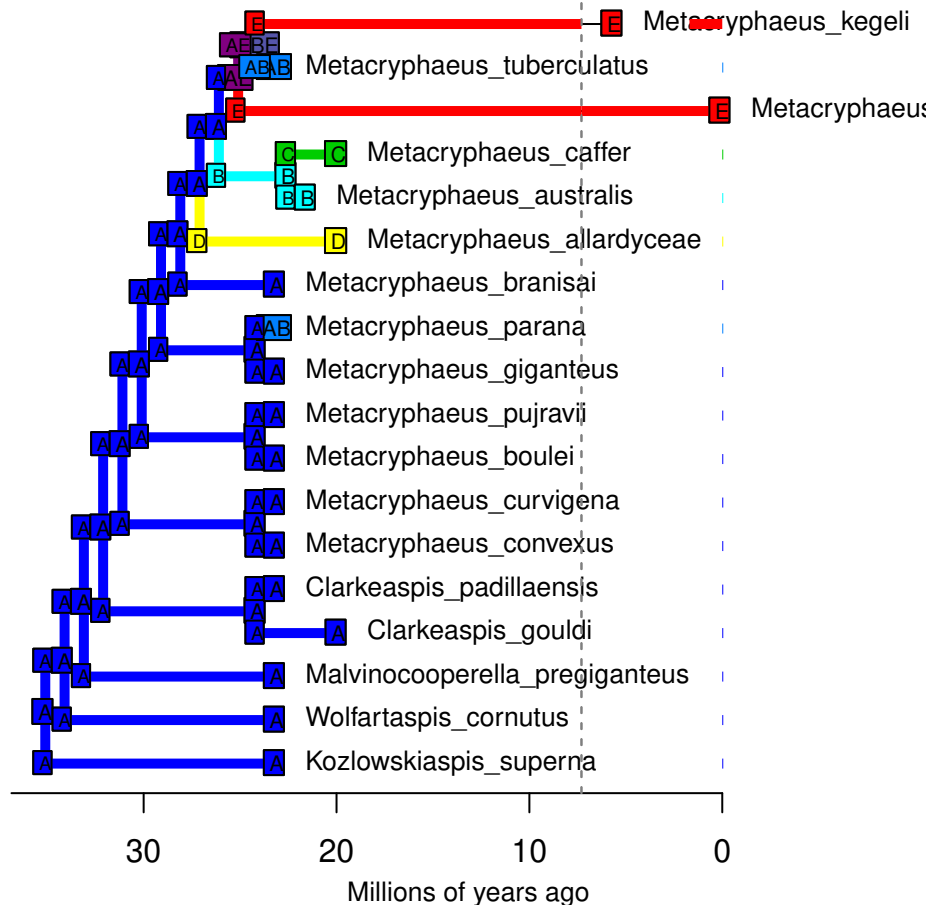
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





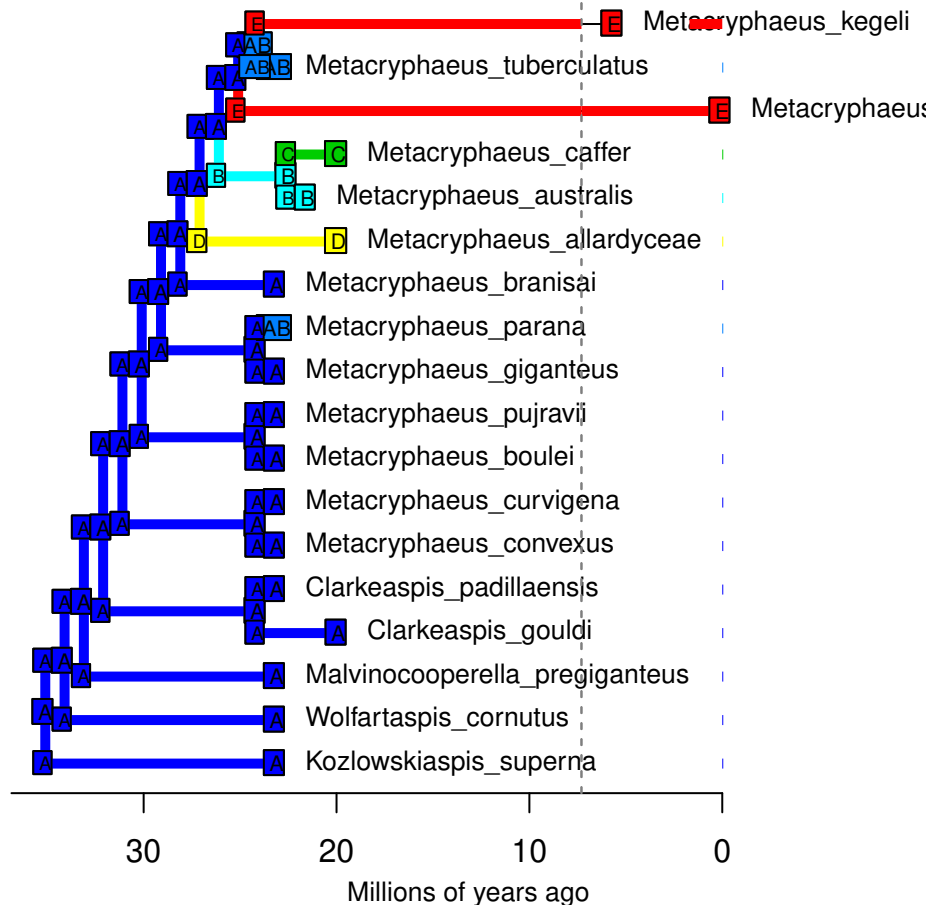
# DECwj – Stochastic Map #35/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



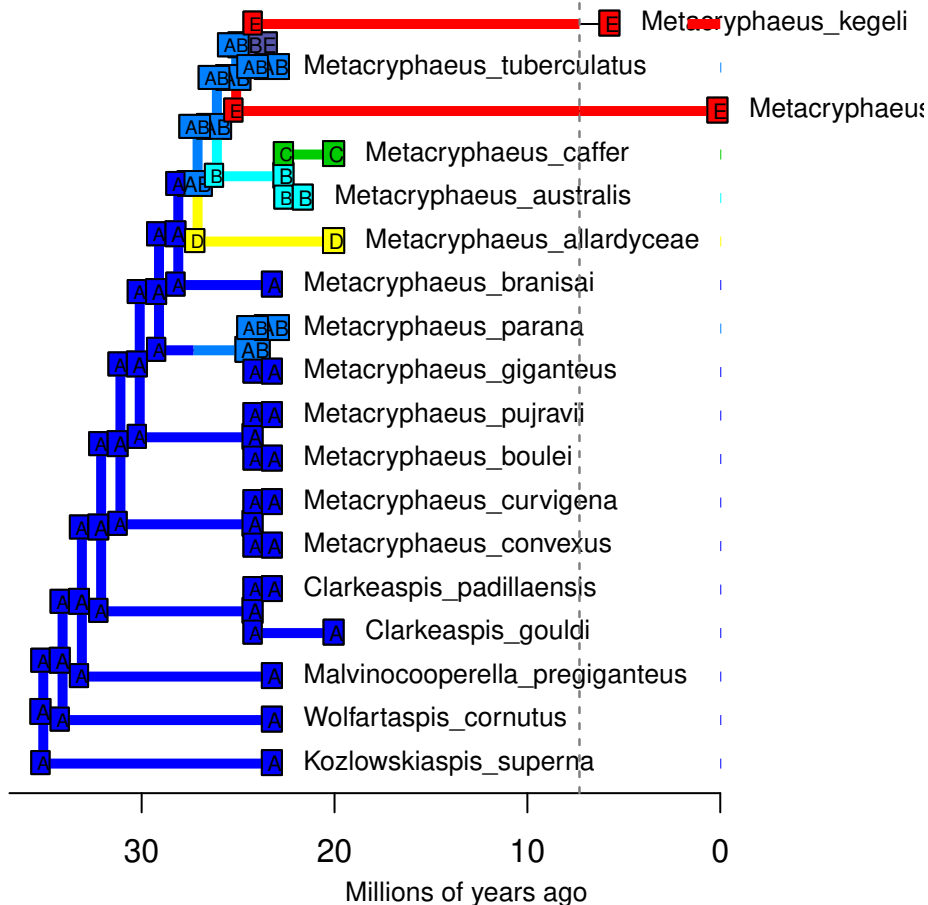
# DECwj – Stochastic Map #36/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



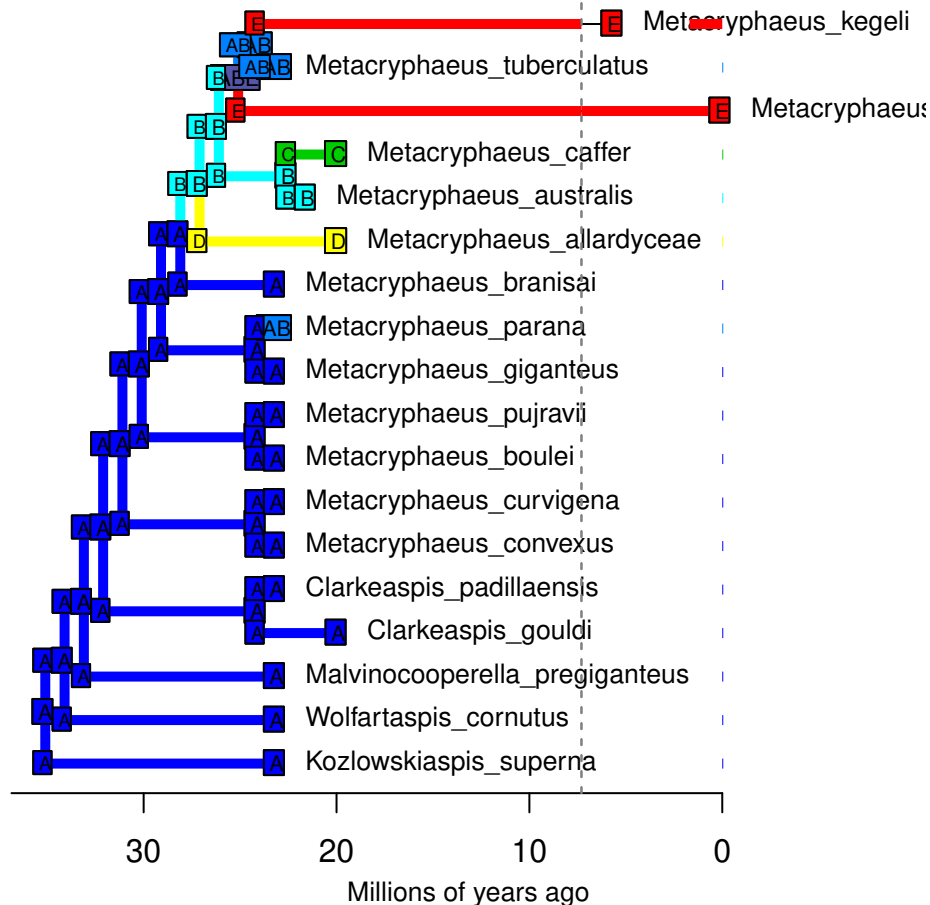
# DECwj – Stochastic Map #37/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



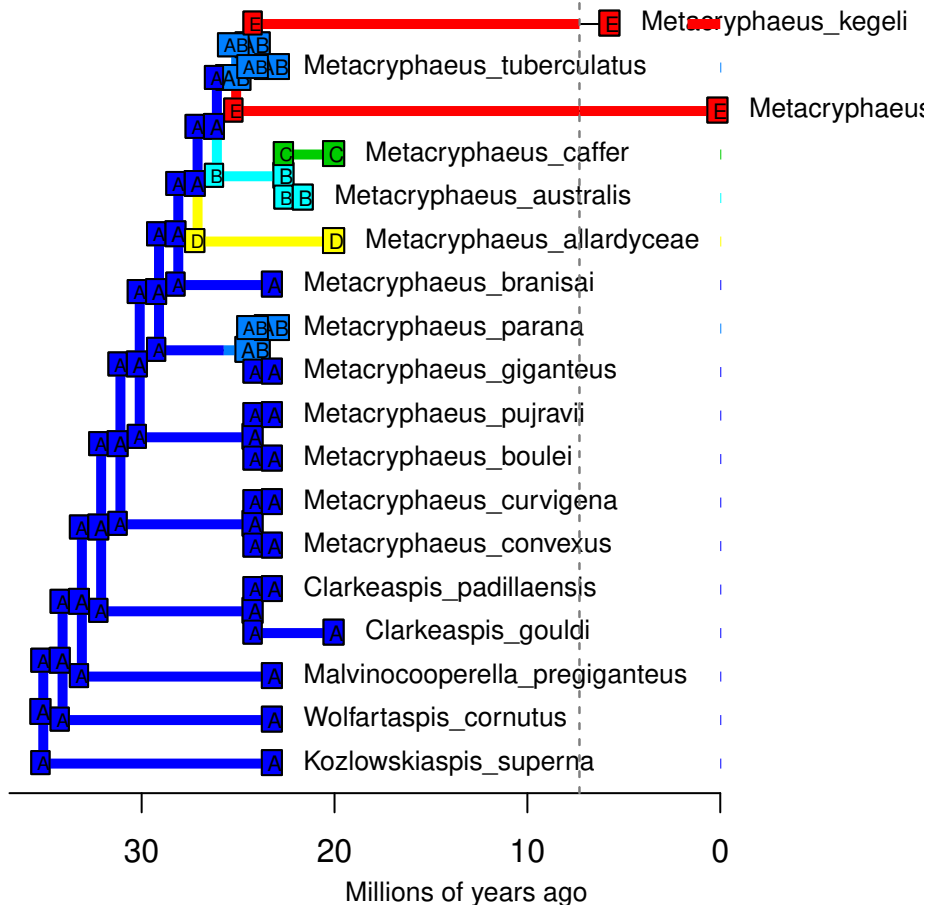
# DECwj – Stochastic Map #38/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



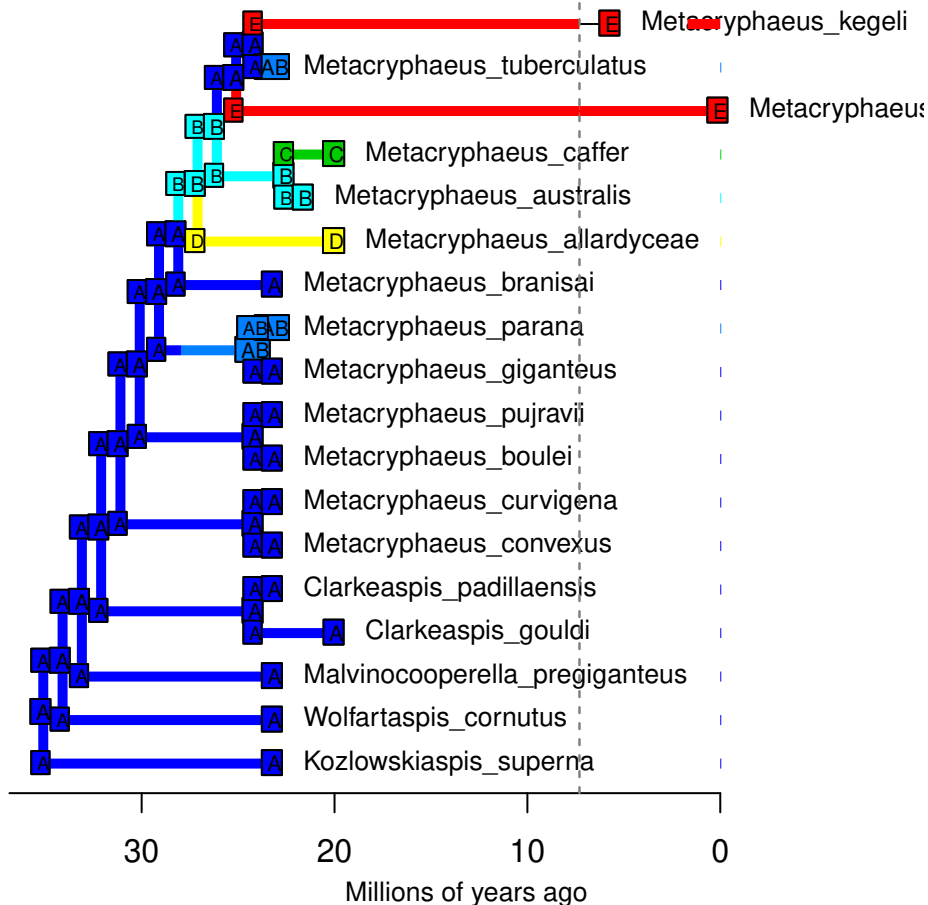
# DECwj – Stochastic Map #39/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



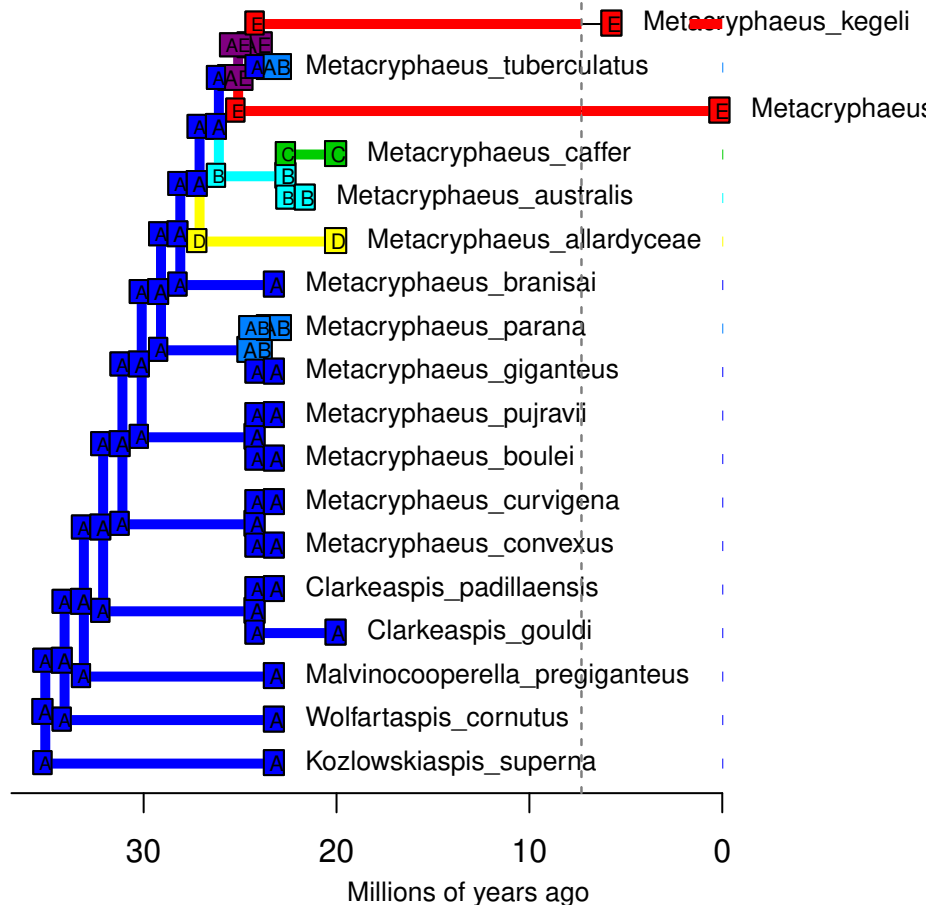
# DECwj – Stochastic Map #40/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



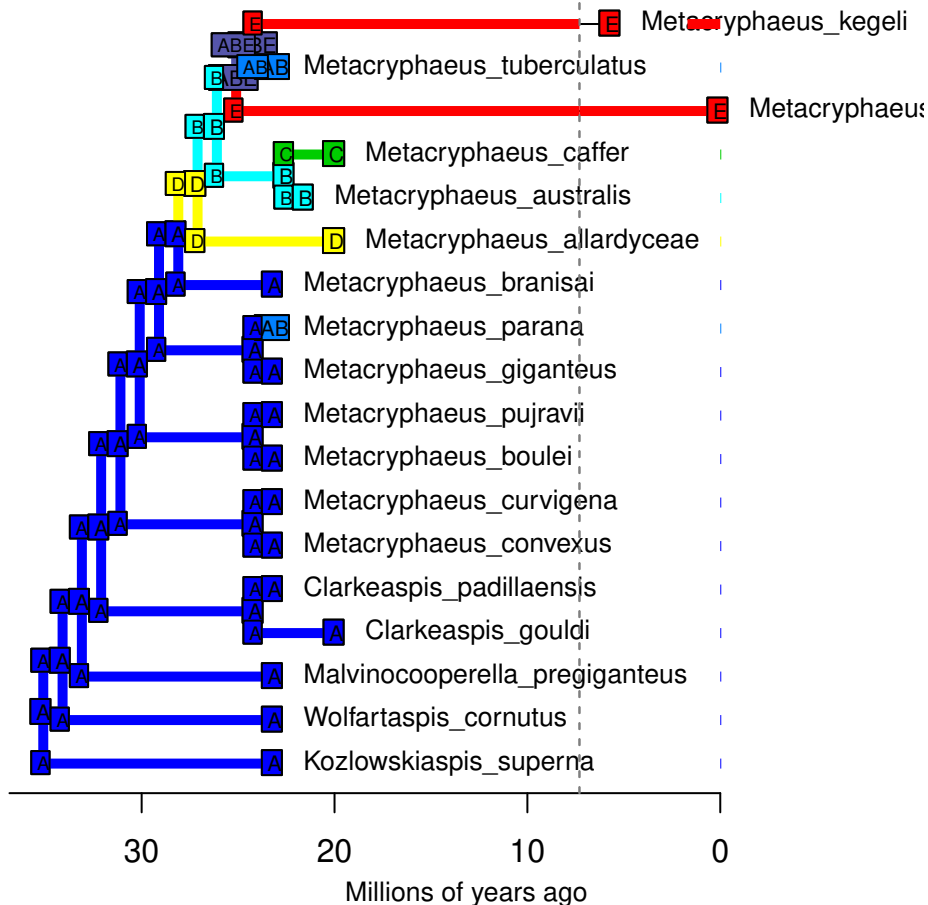
# DECwj – Stochastic Map #41/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #42/100

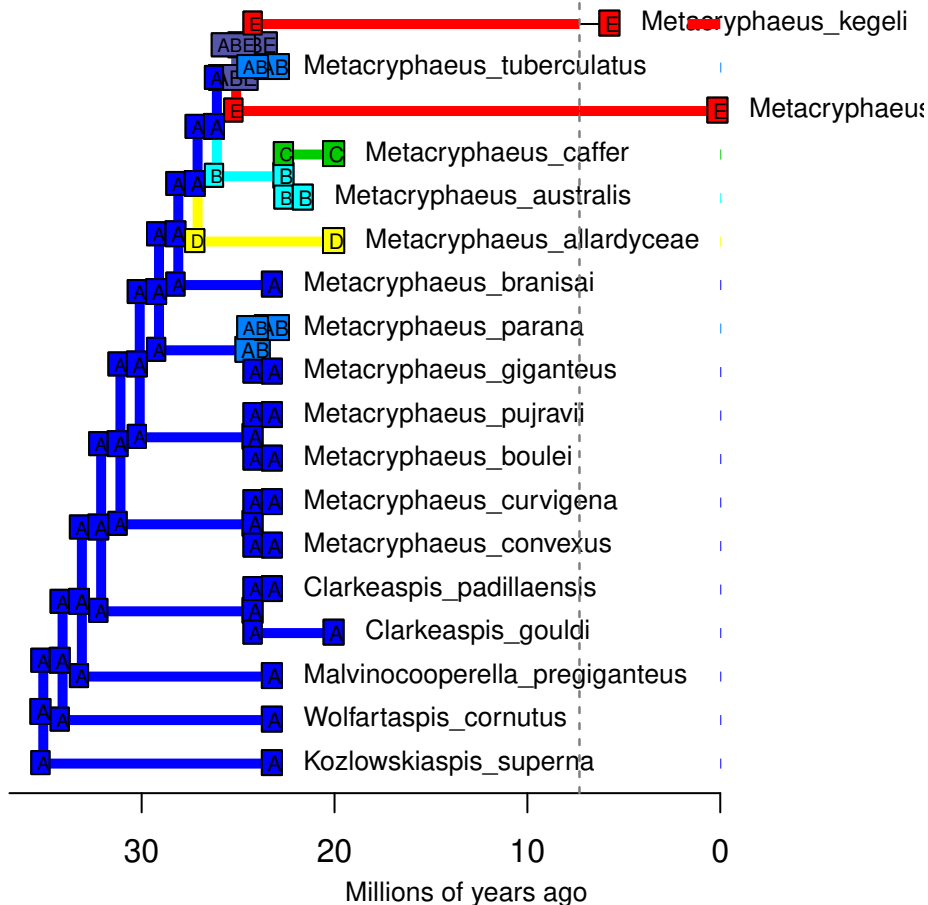
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





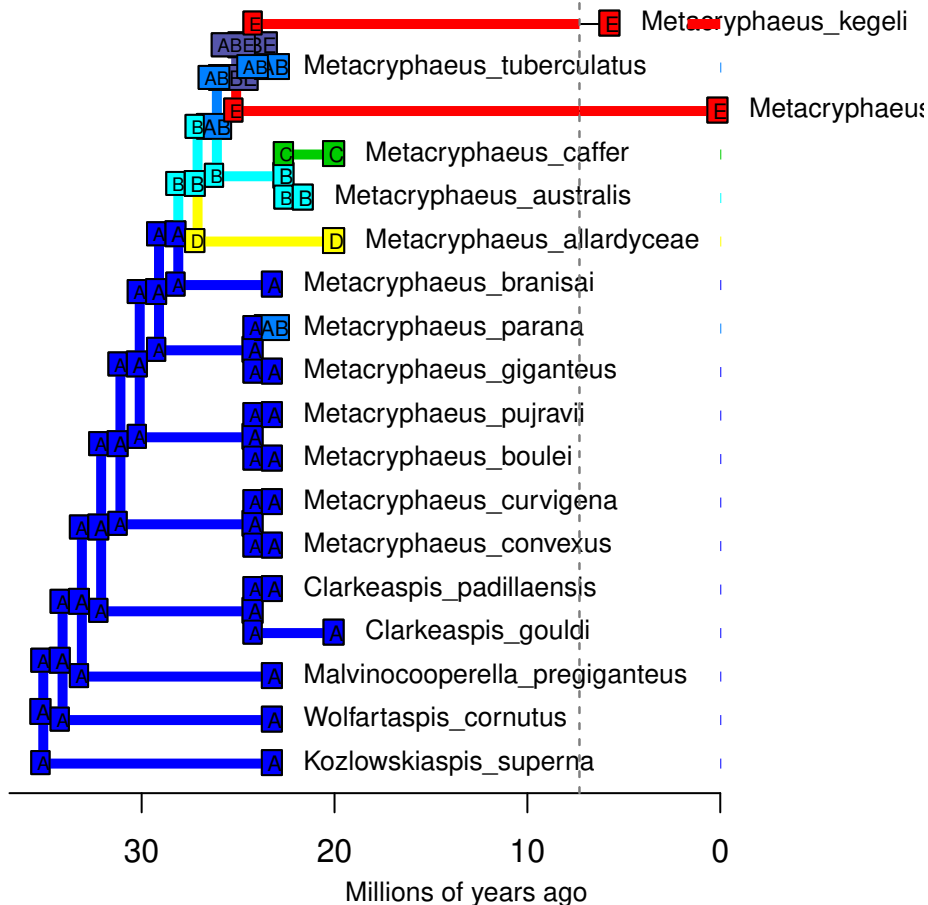
# DECwj – Stochastic Map #43/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



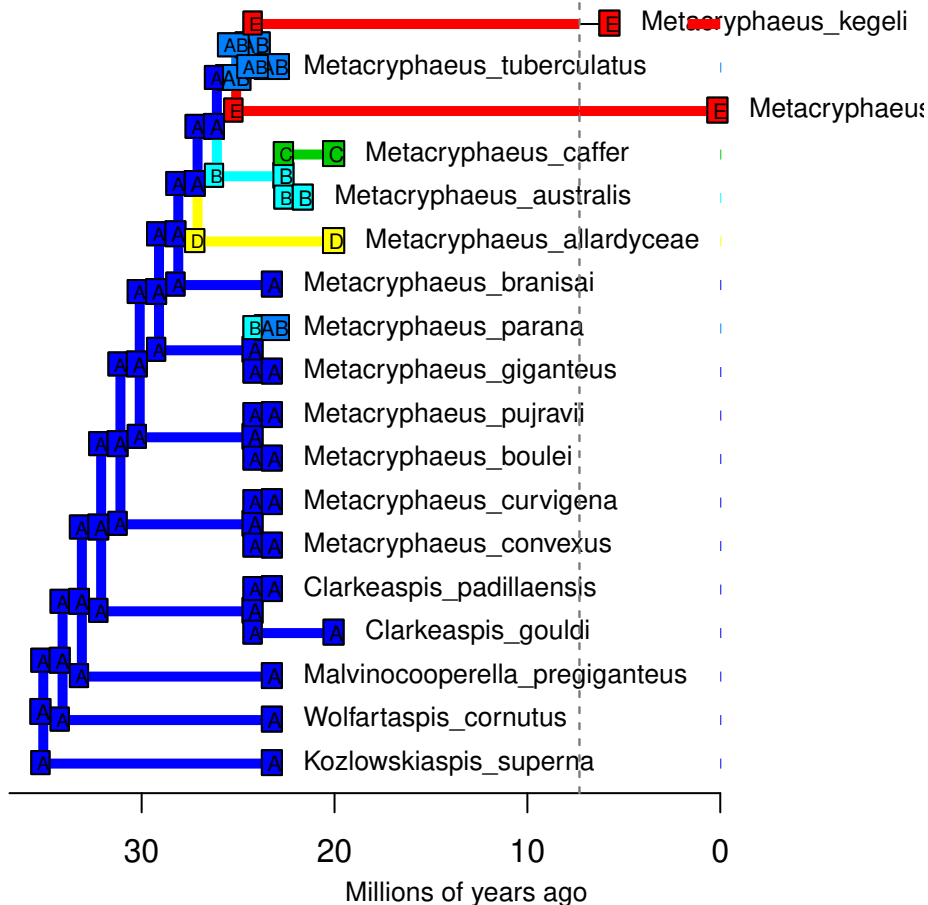
# DECwj – Stochastic Map #44/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



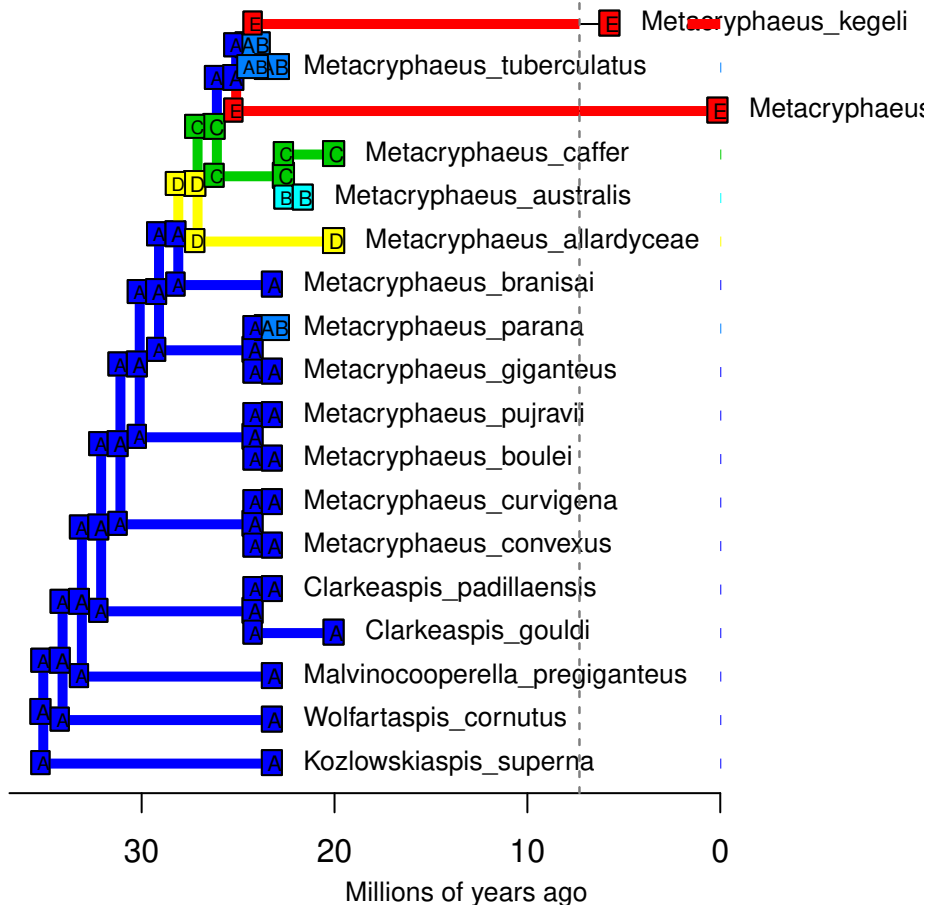
# DECwj – Stochastic Map #45/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



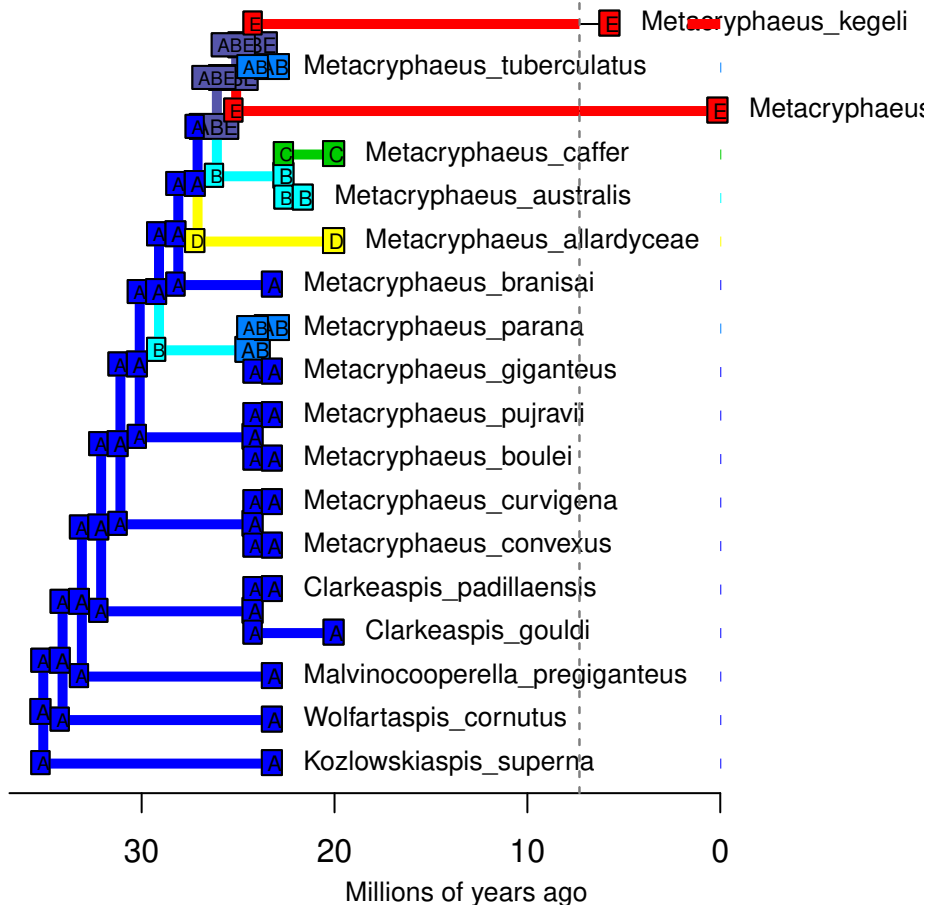
# DECwj – Stochastic Map #46/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



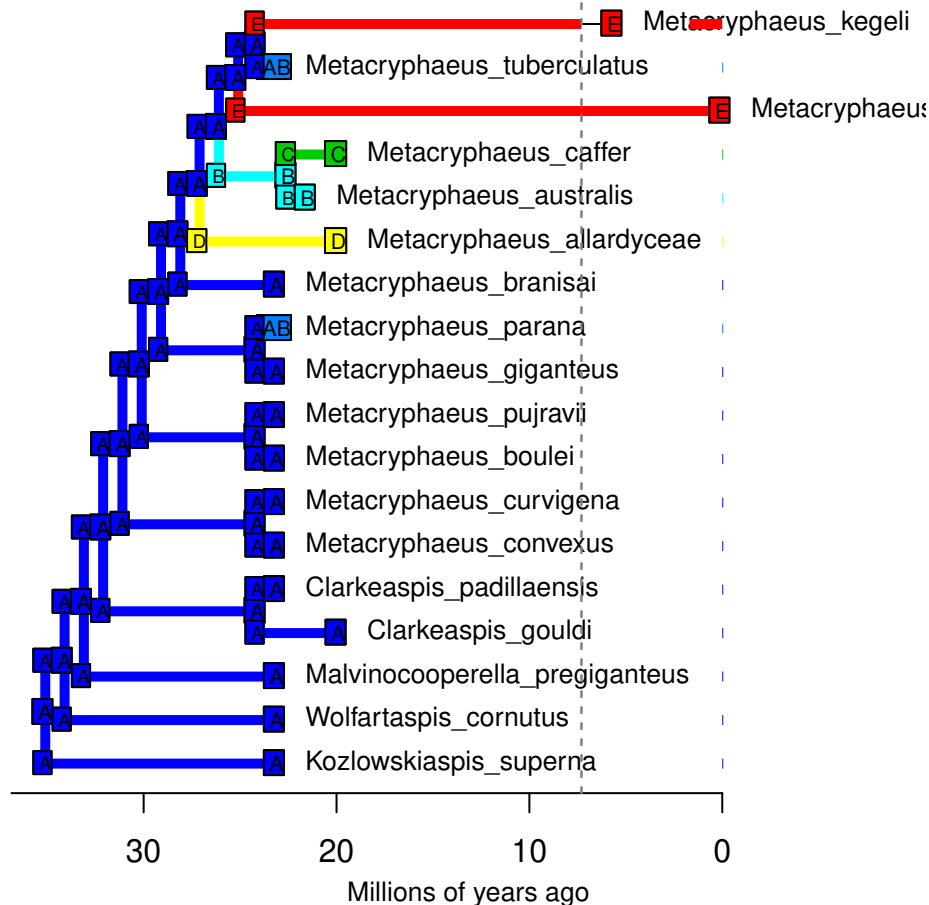
# DECwj – Stochastic Map #47/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



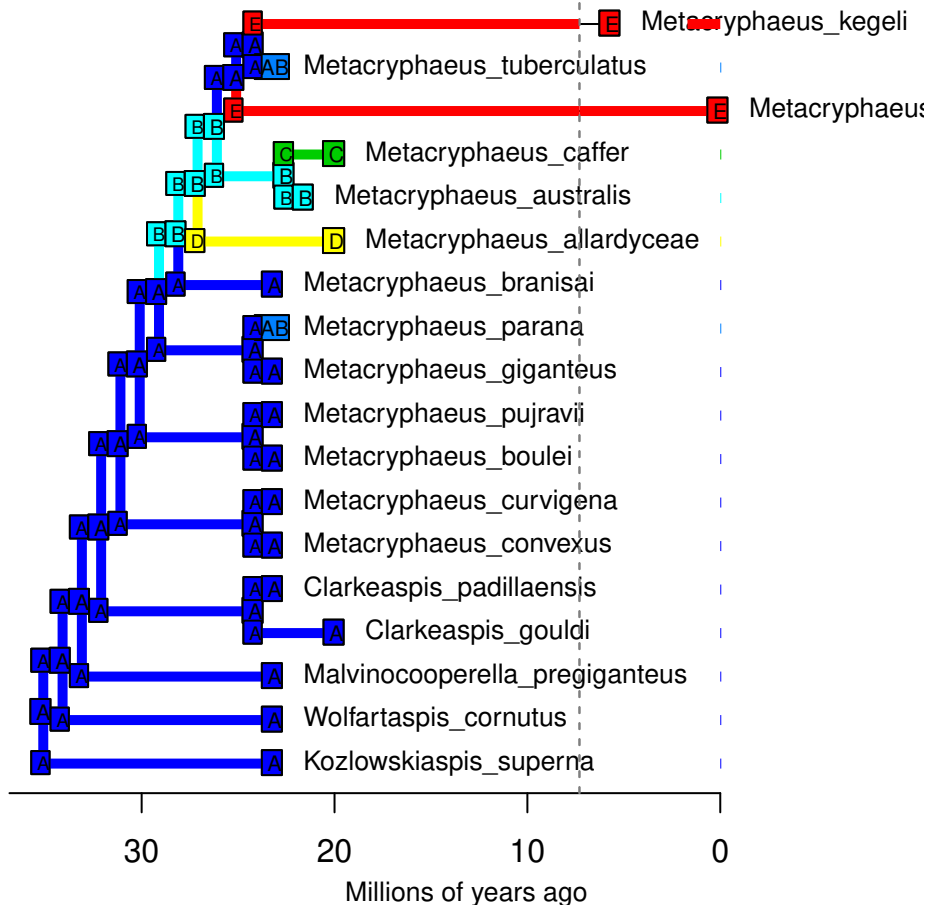
# DECwj – Stochastic Map #48/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



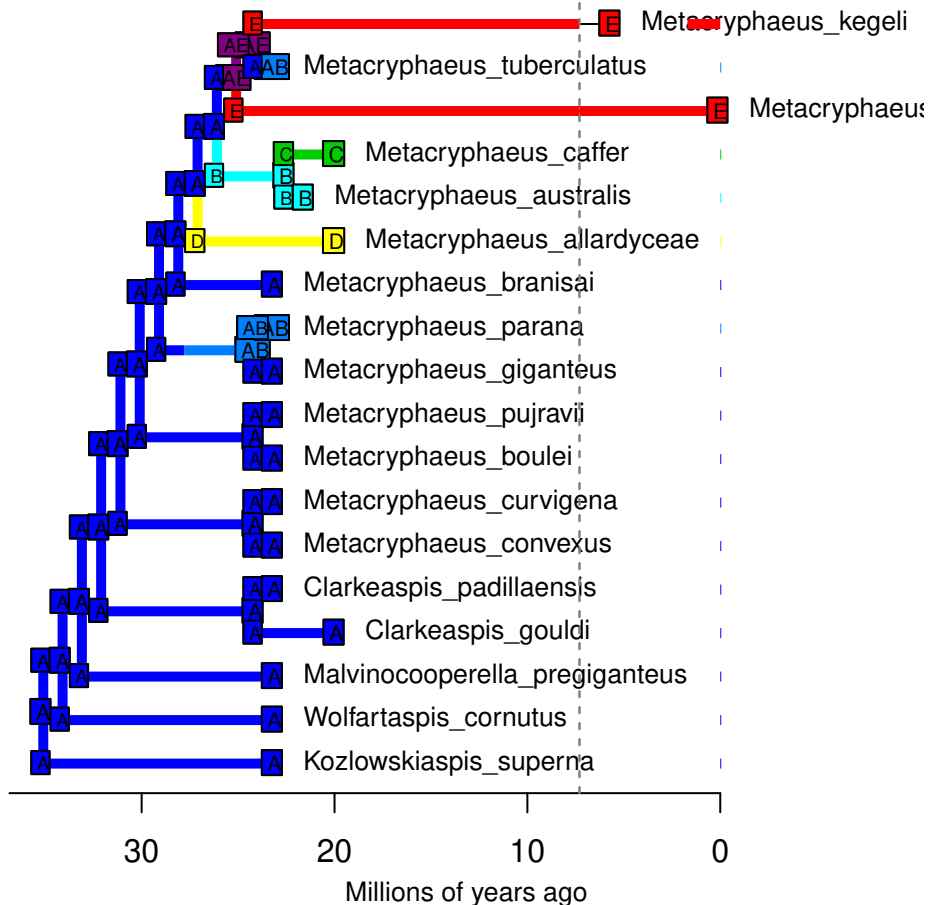
# DECwj – Stochastic Map #49/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #50/100

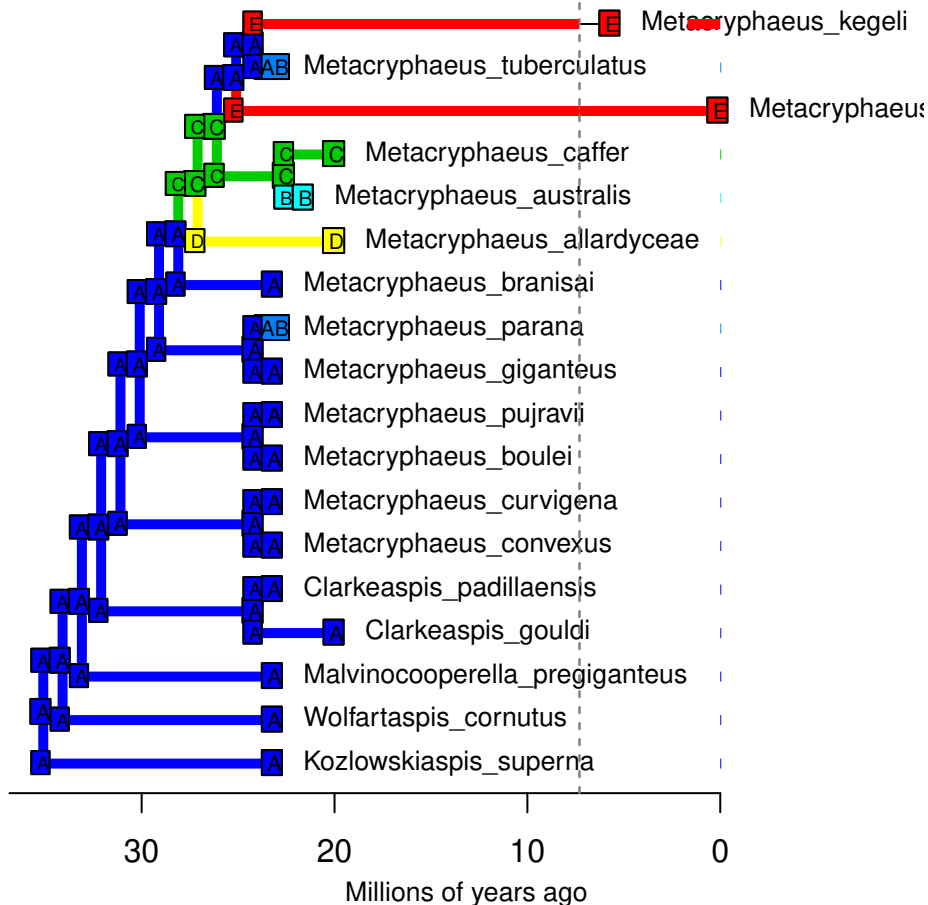
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





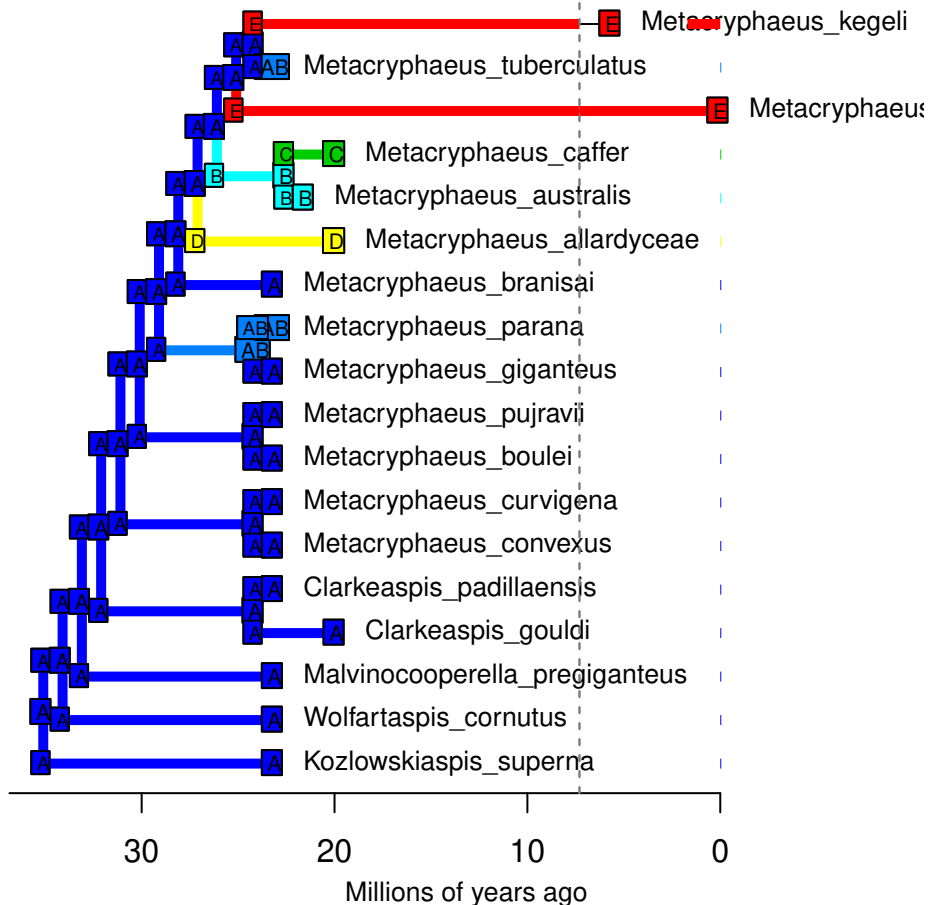
# DECwj – Stochastic Map #51/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



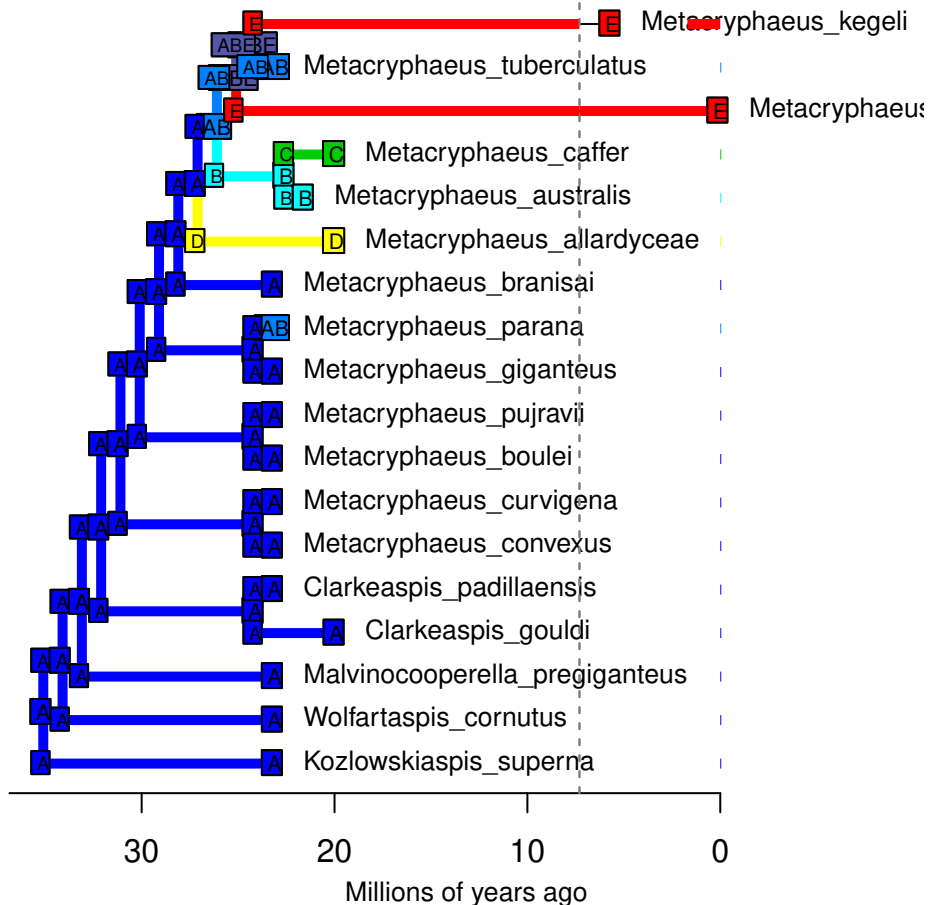
# DECwj – Stochastic Map #52/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



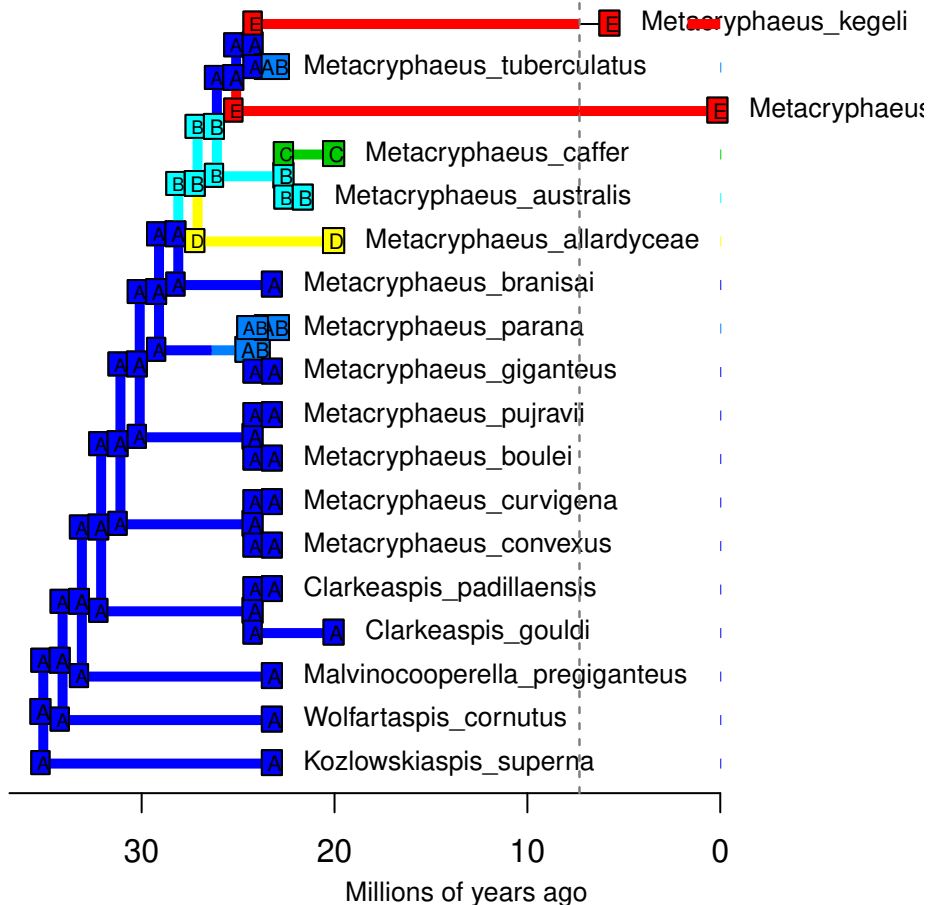
# DECwj – Stochastic Map #53/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



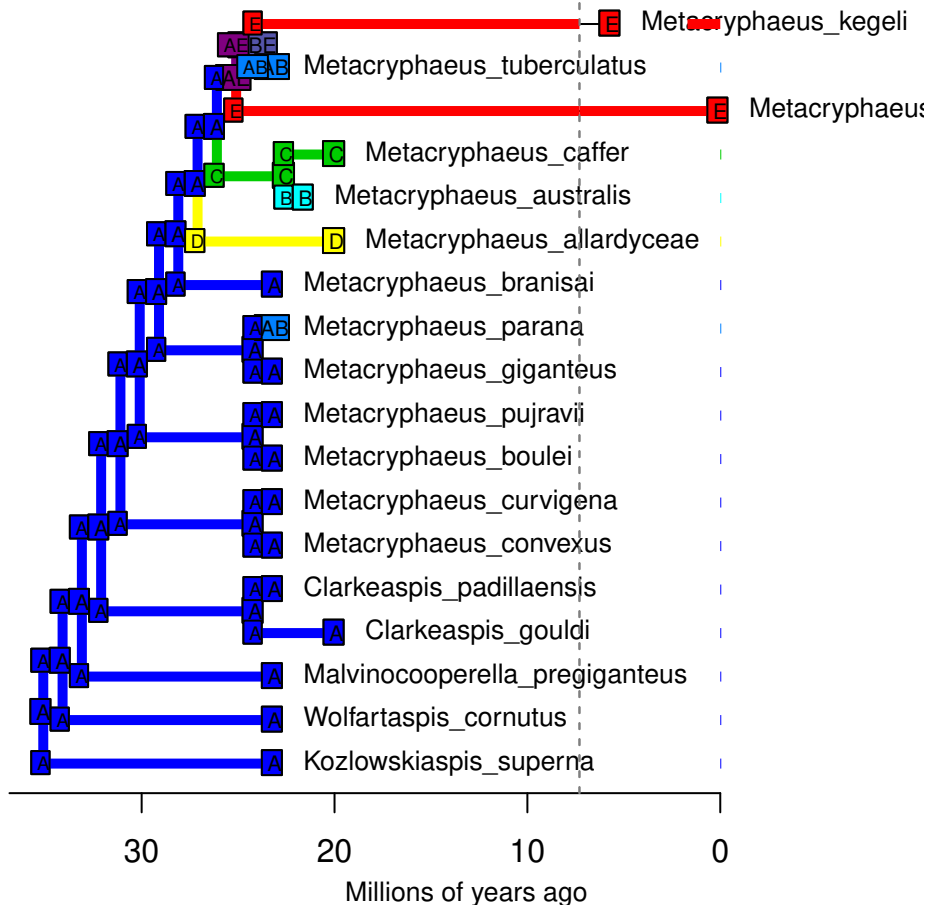
# DECwj – Stochastic Map #54/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



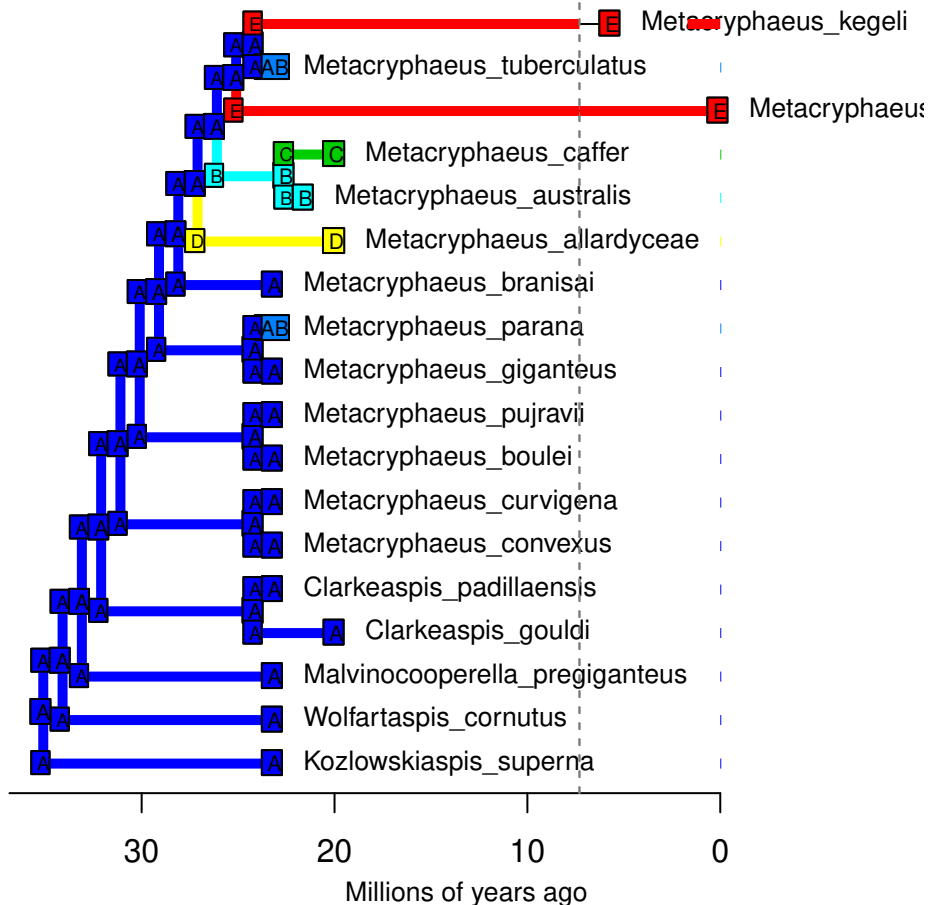
# DECwj – Stochastic Map #55/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



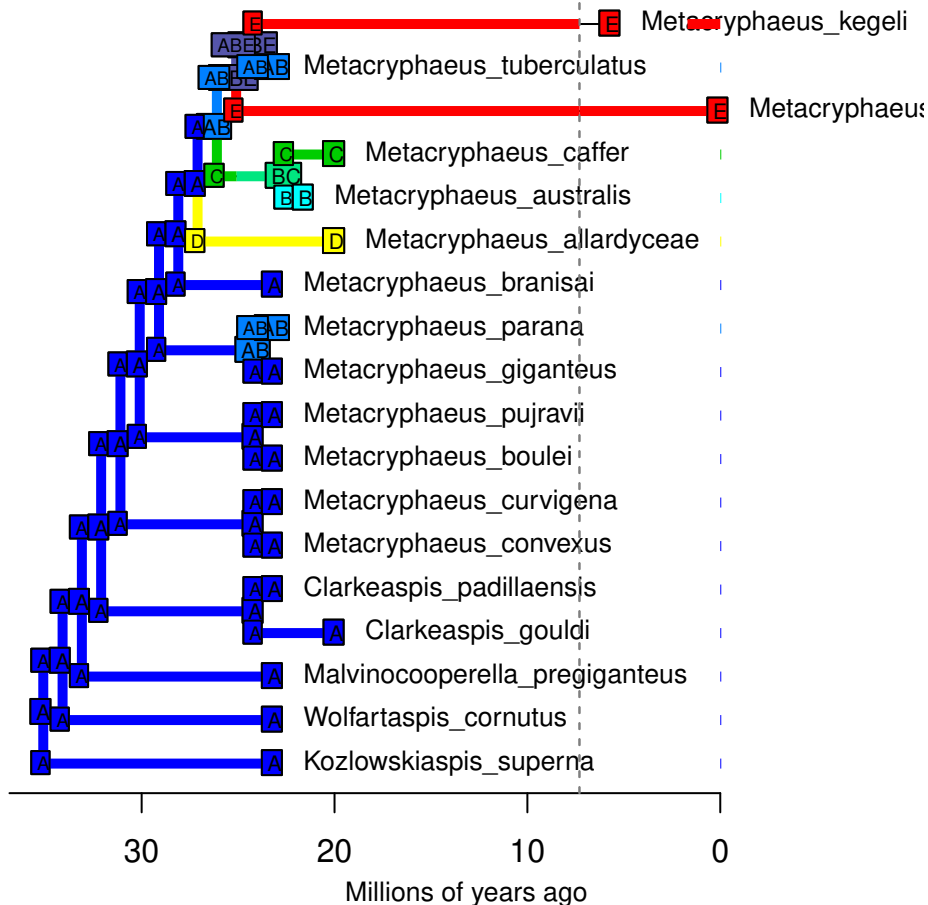
# DECwj – Stochastic Map #56/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



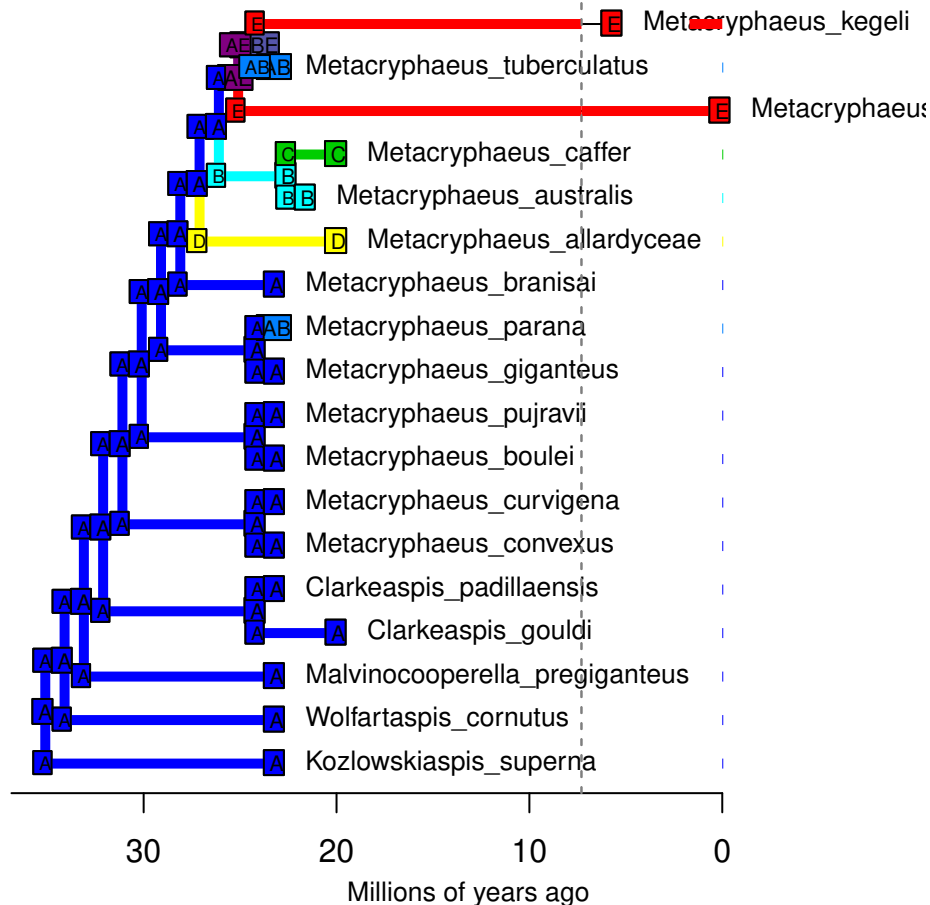
# DECwj – Stochastic Map #57/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #58/100

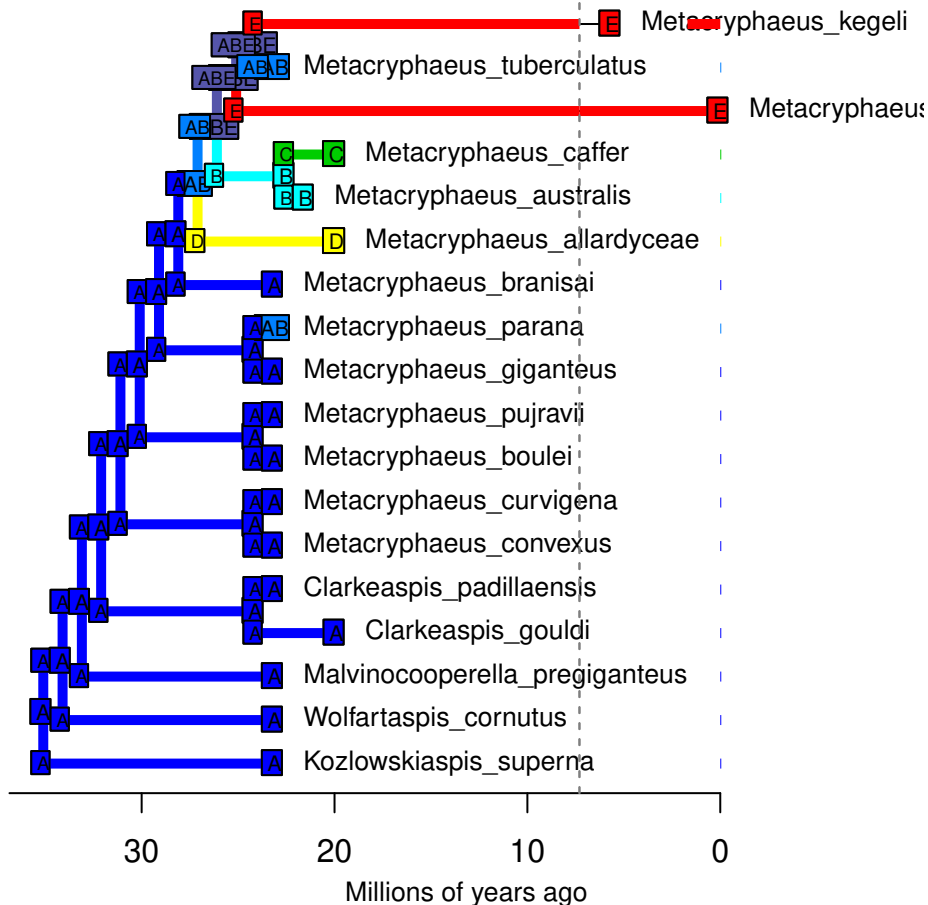
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





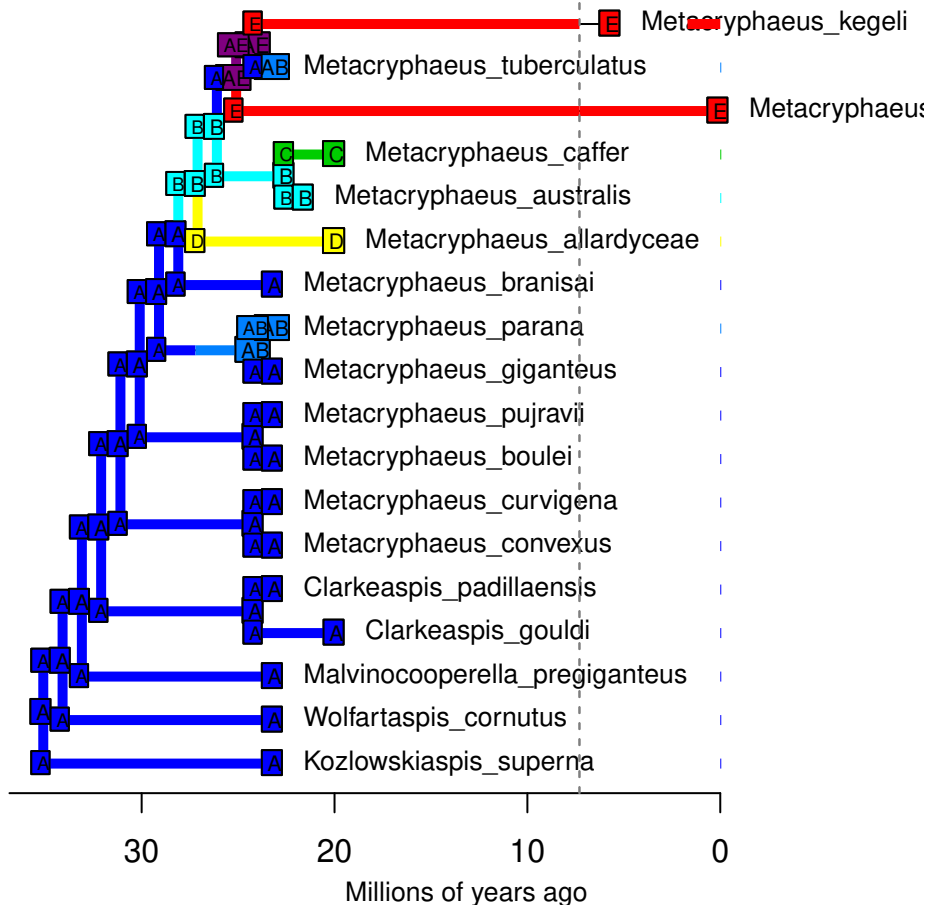
# DECwj – Stochastic Map #59/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



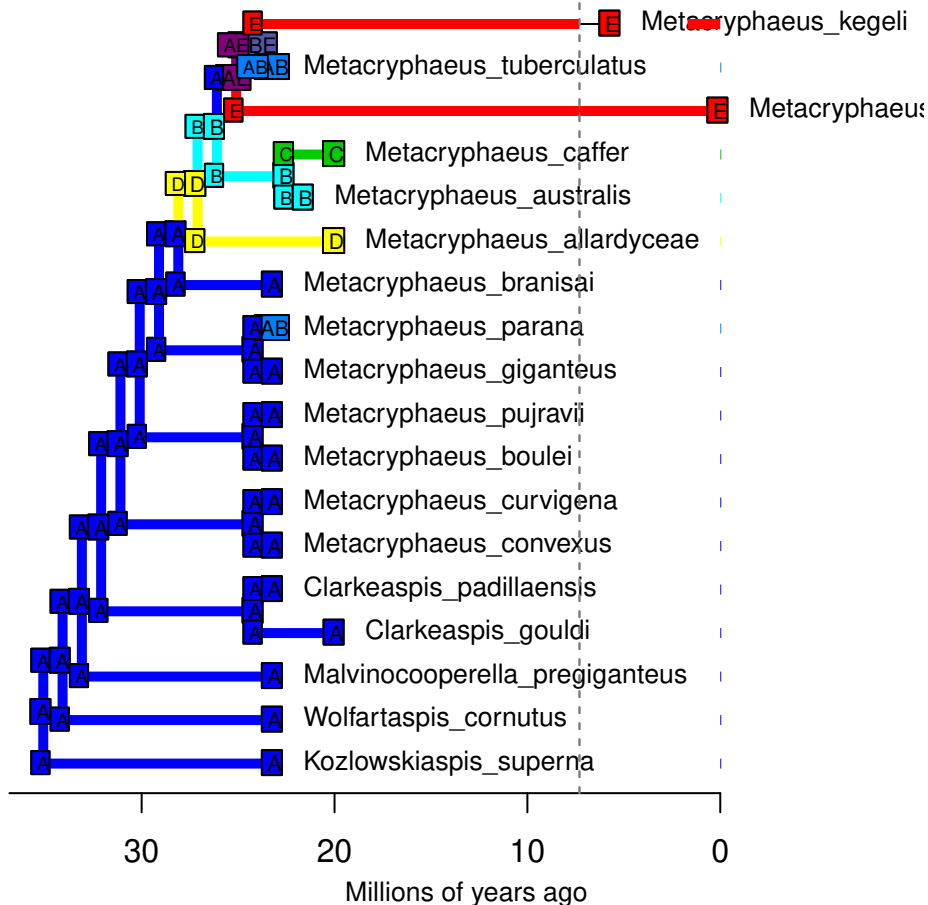
# DECwj – Stochastic Map #60/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



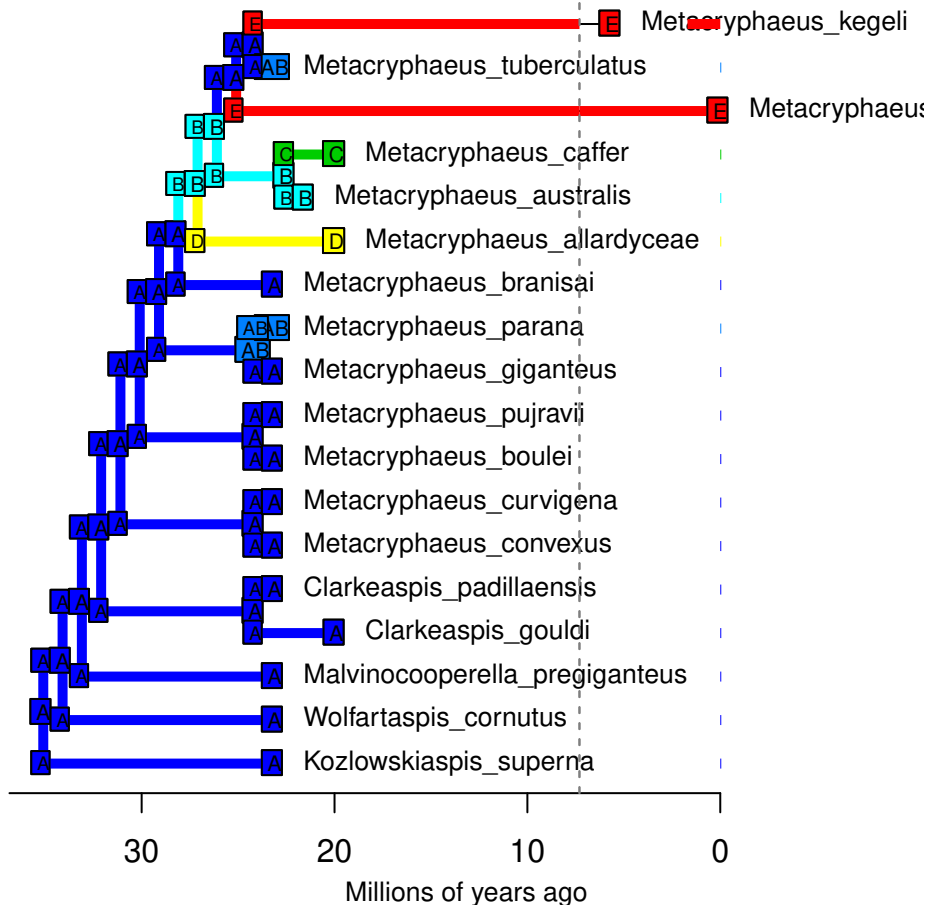
# DECwj – Stochastic Map #61/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



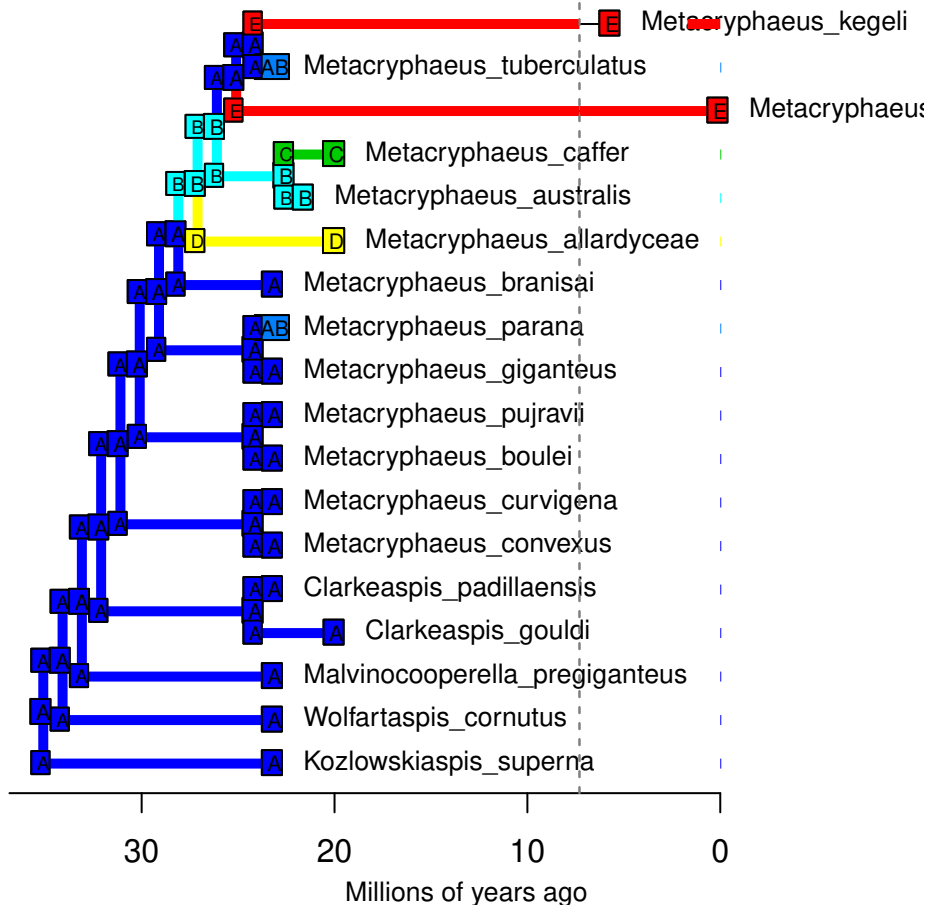
# DECwj – Stochastic Map #62/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



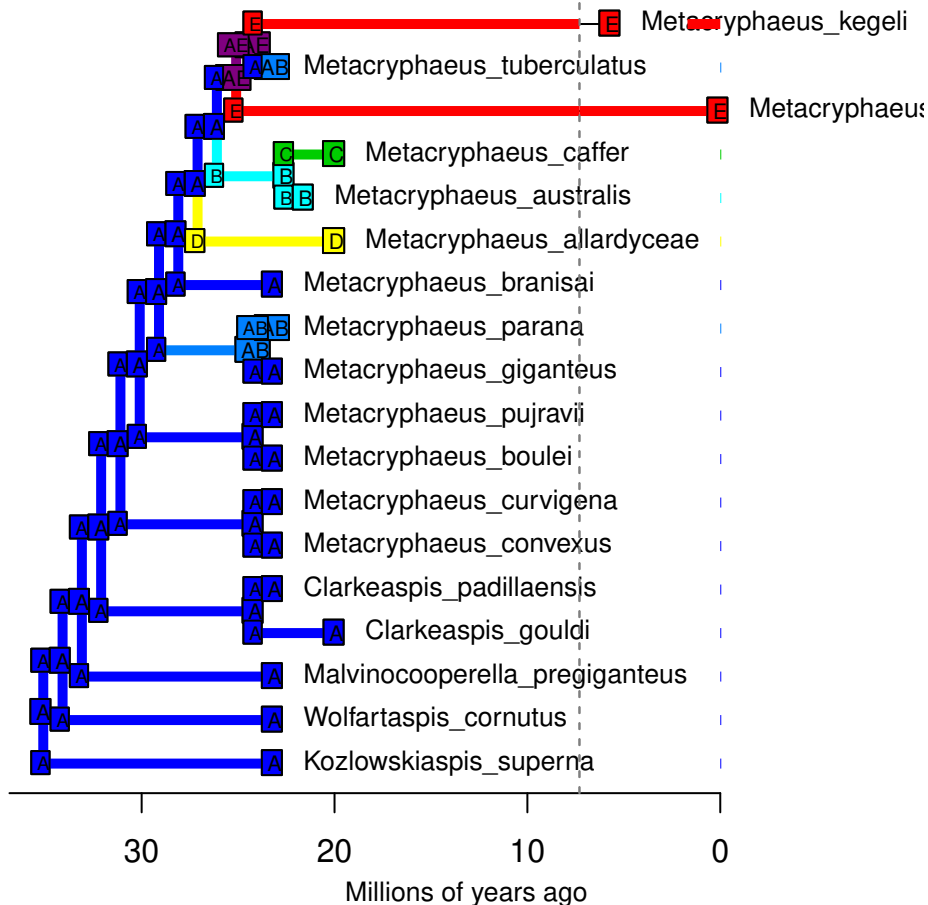
# DECwj – Stochastic Map #63/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



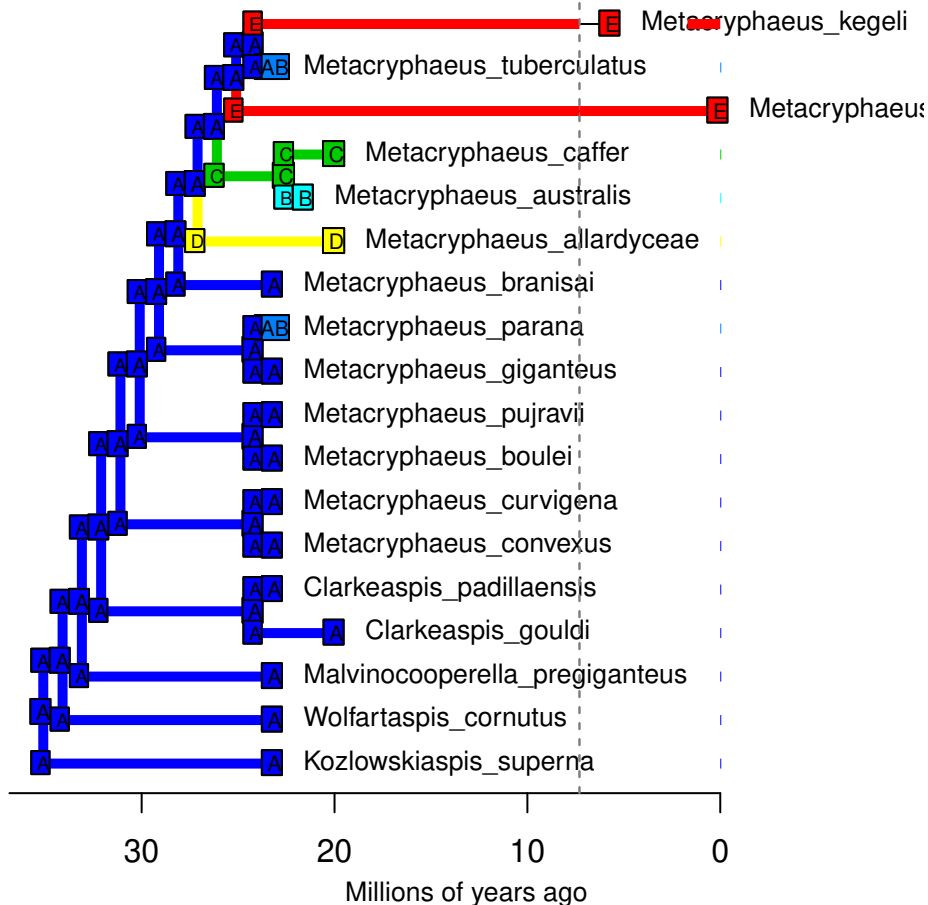
# DECwj – Stochastic Map #64/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



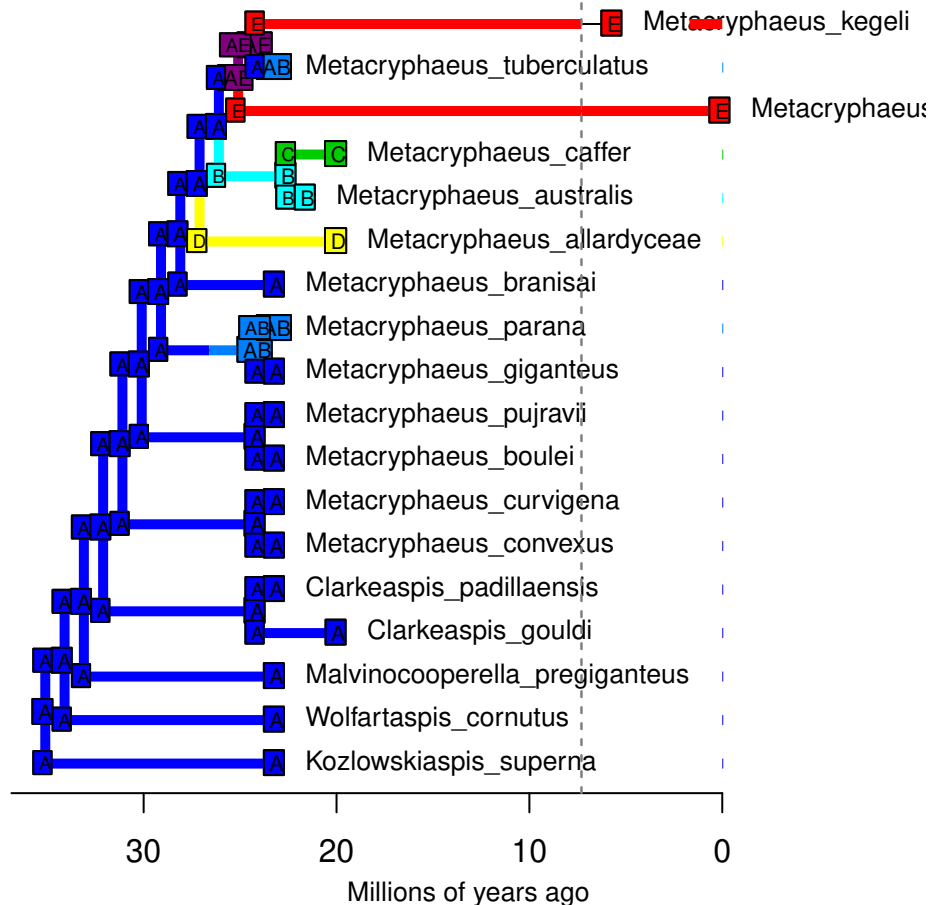
# DECwj – Stochastic Map #65/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #66/100

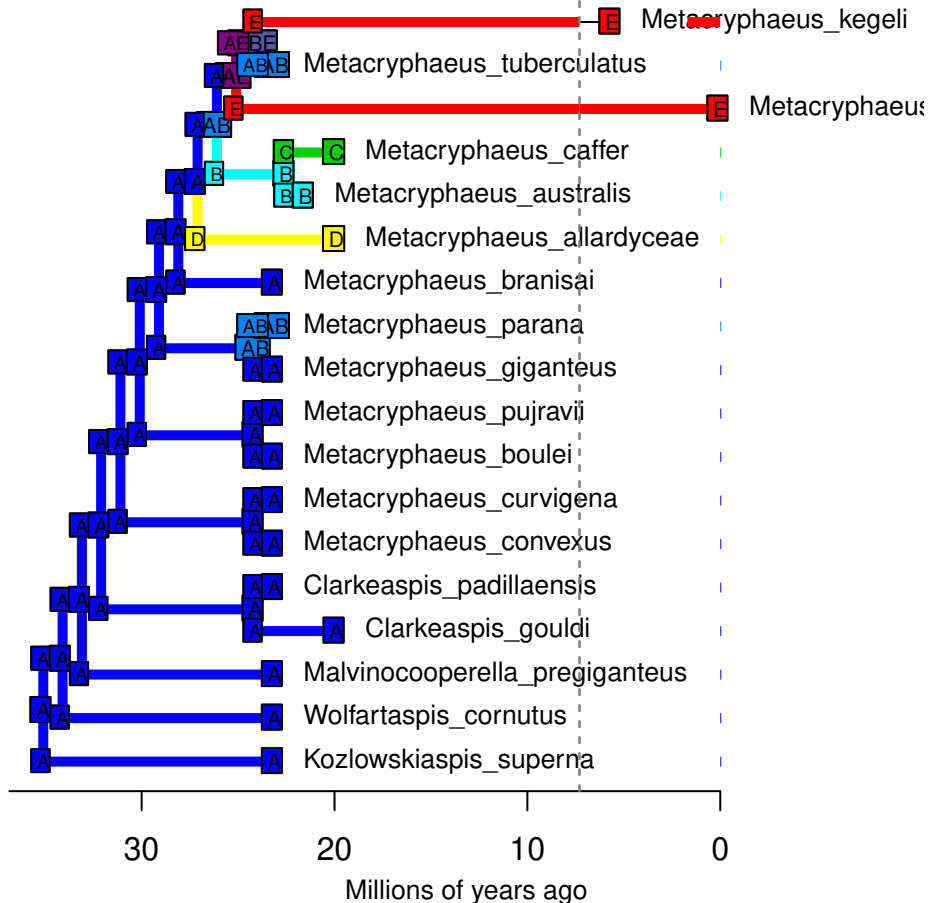
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





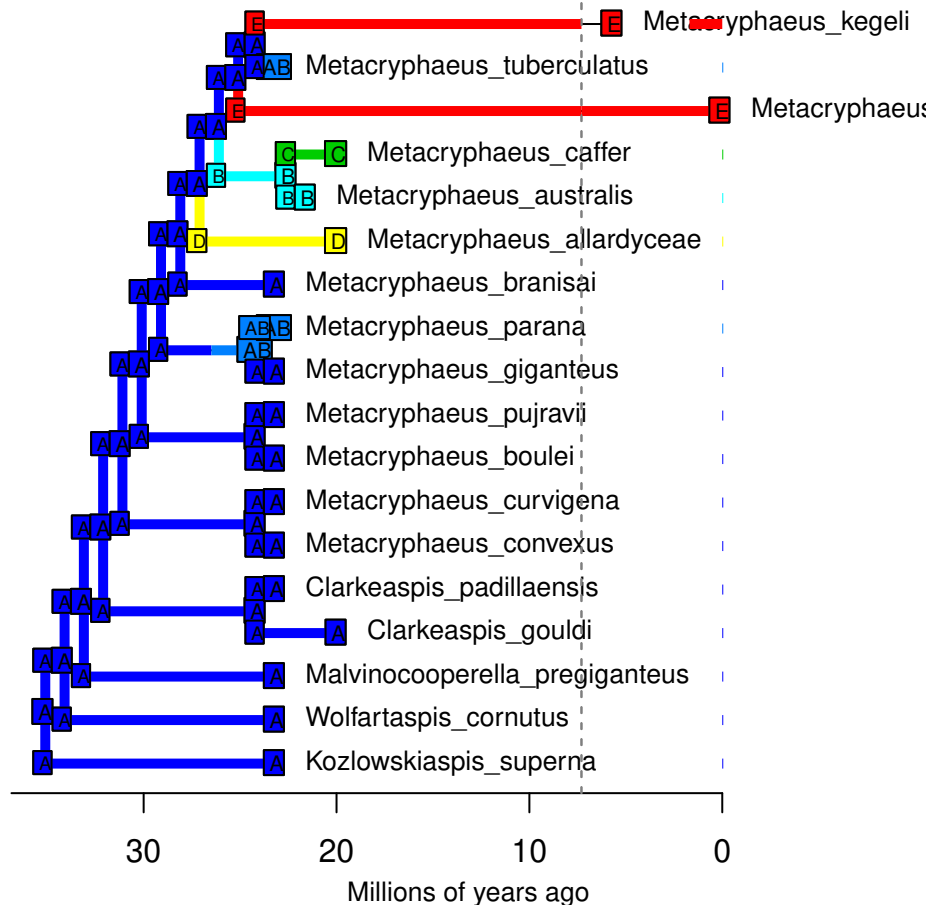
# DECwj – Stochastic Map #67/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



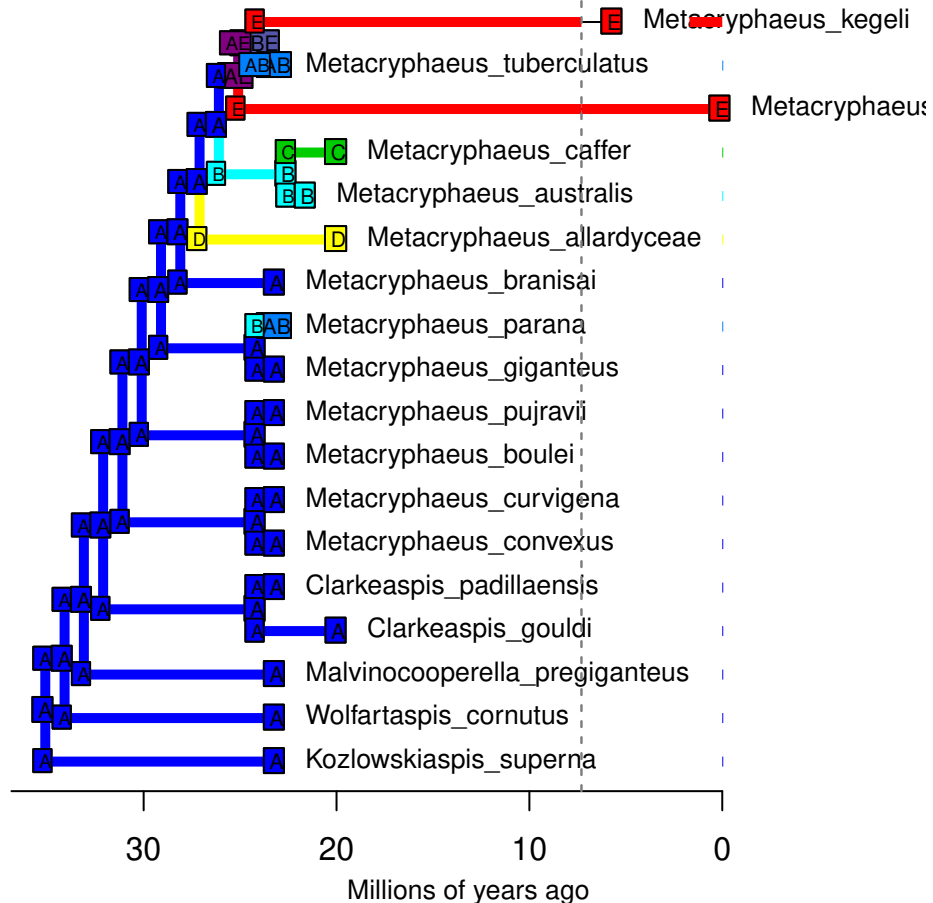
# DECwj – Stochastic Map #68/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



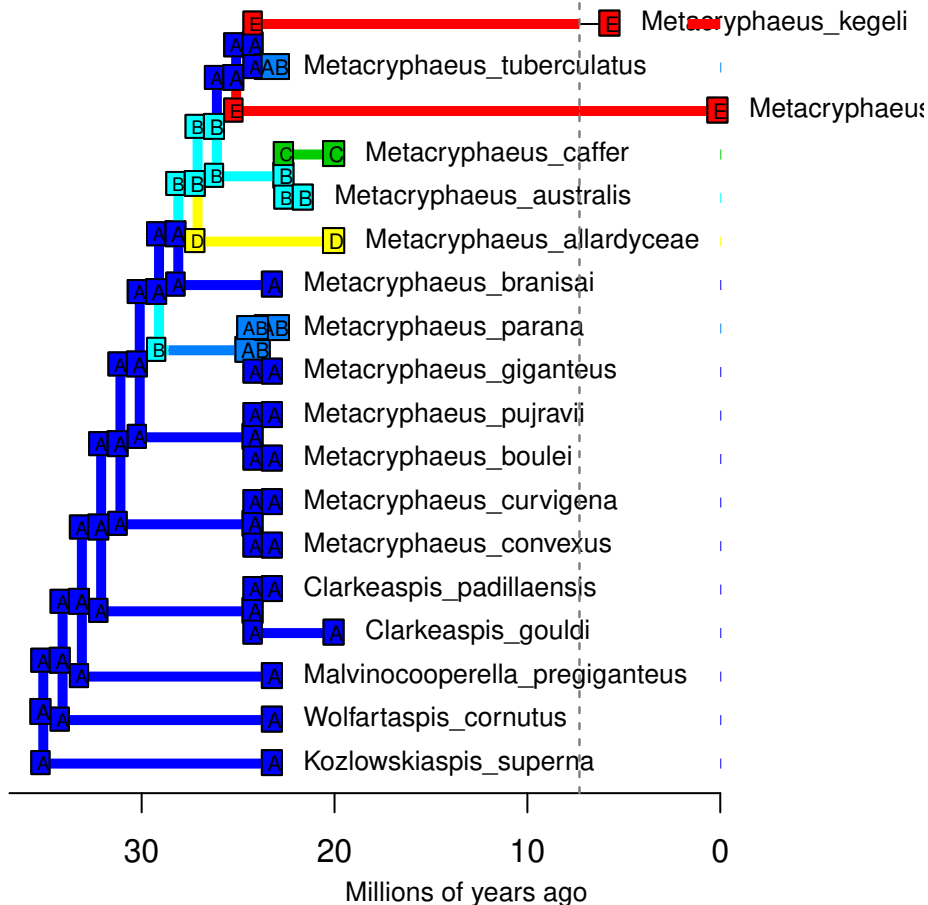
# DECwj – Stochastic Map #69/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



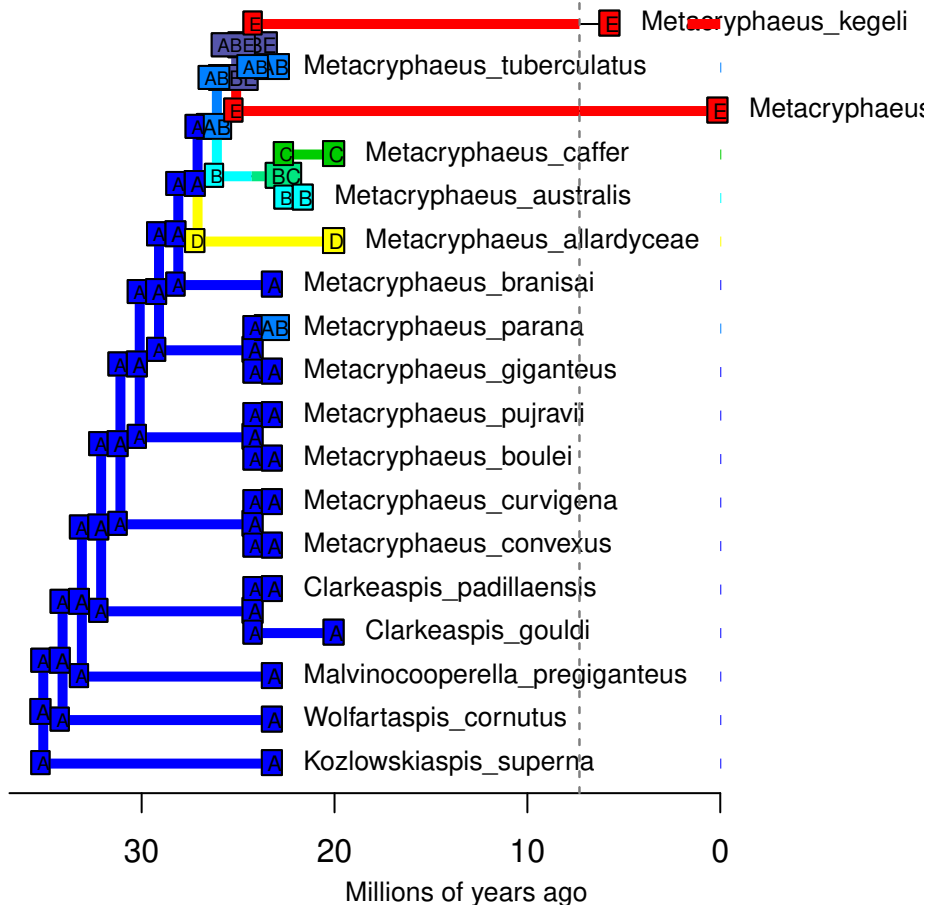
# DECwj – Stochastic Map #70/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



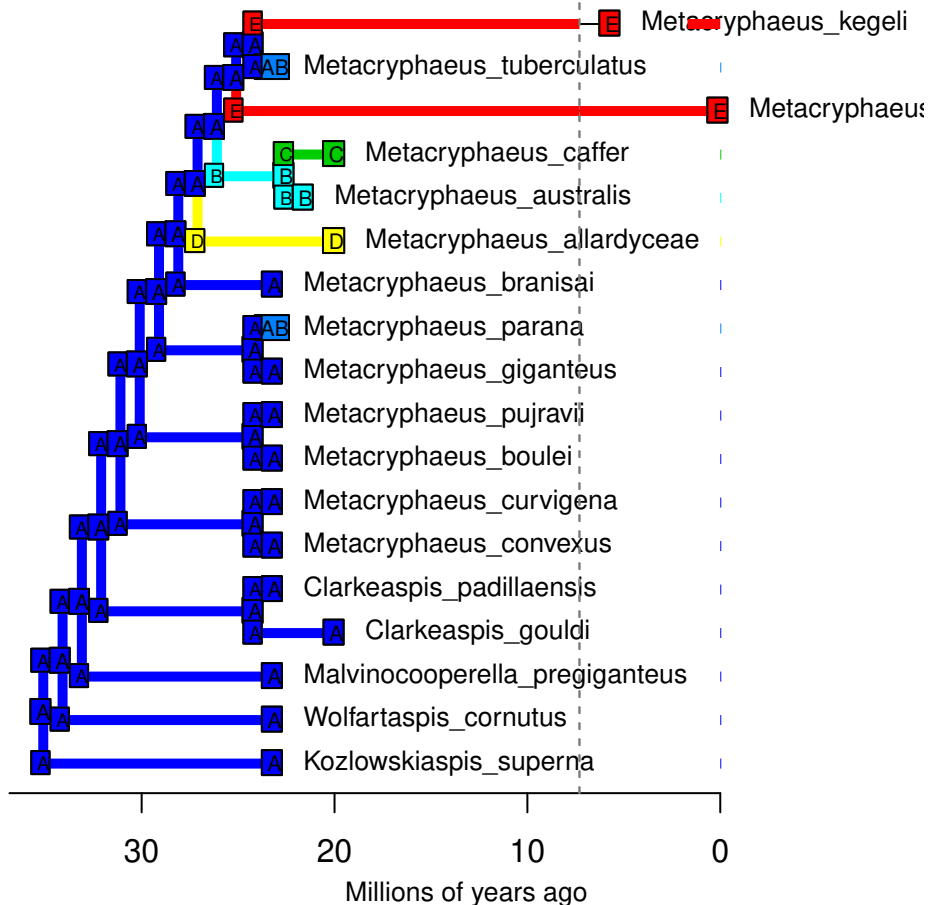
# DECwj – Stochastic Map #71/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



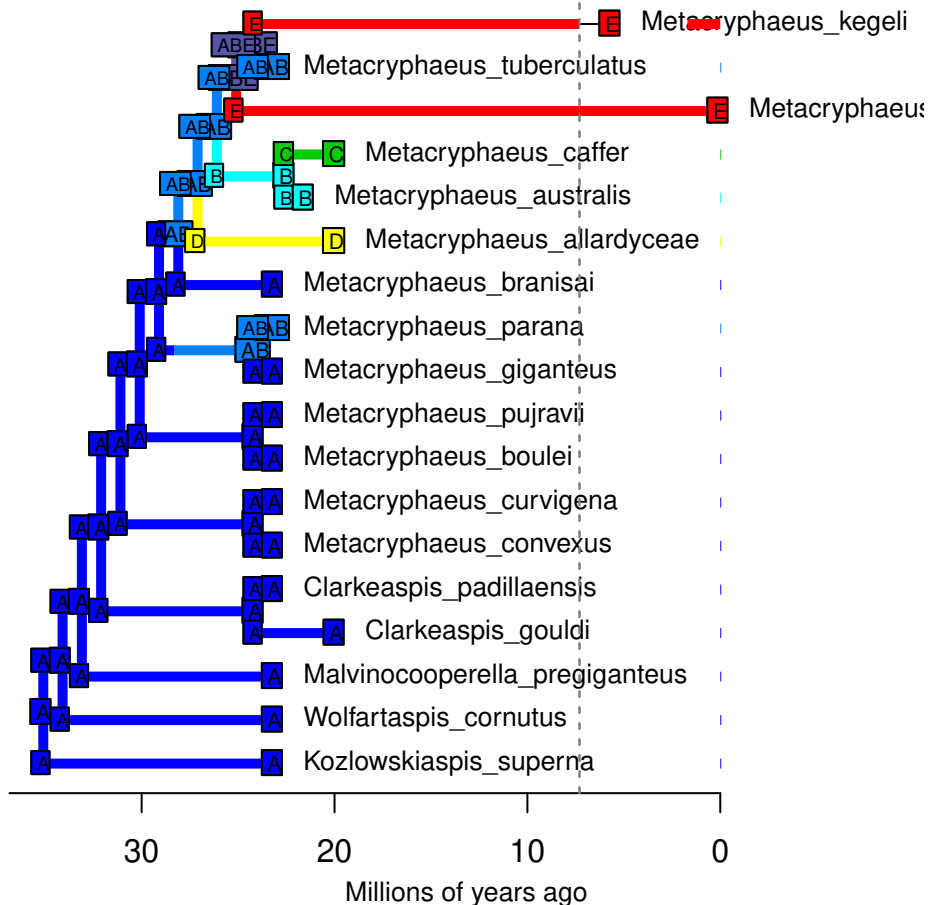
# DECwj – Stochastic Map #72/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



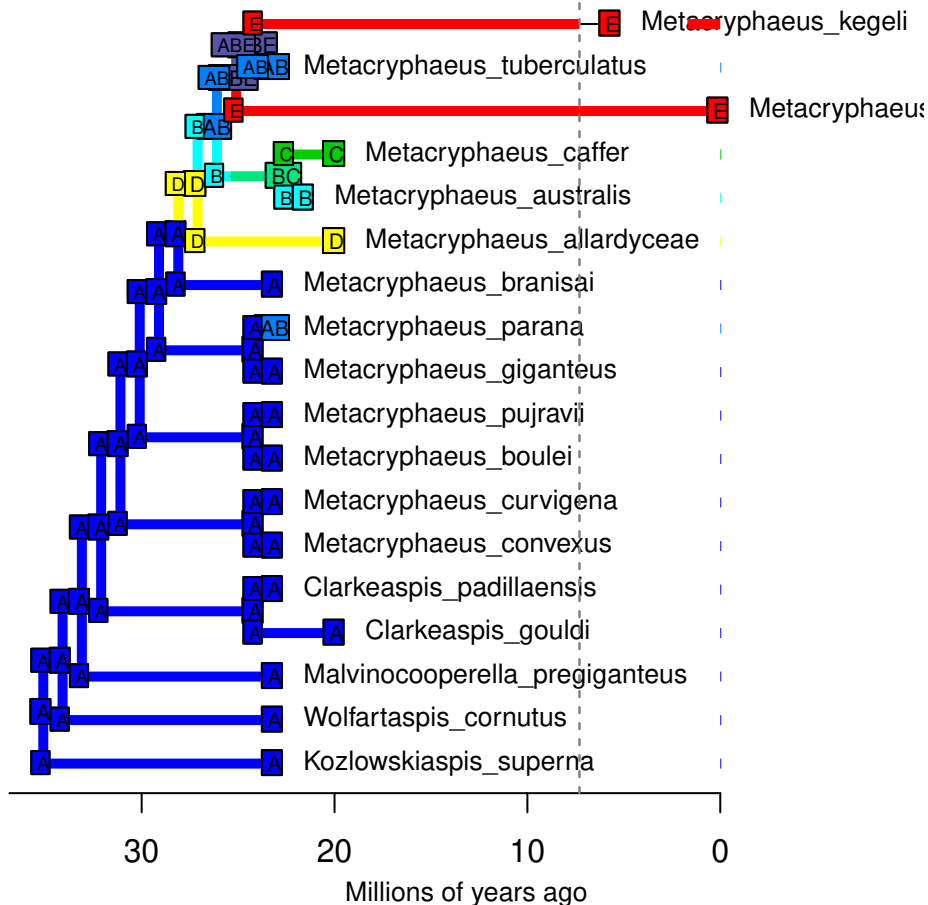
# DECwj – Stochastic Map #73/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #74/100

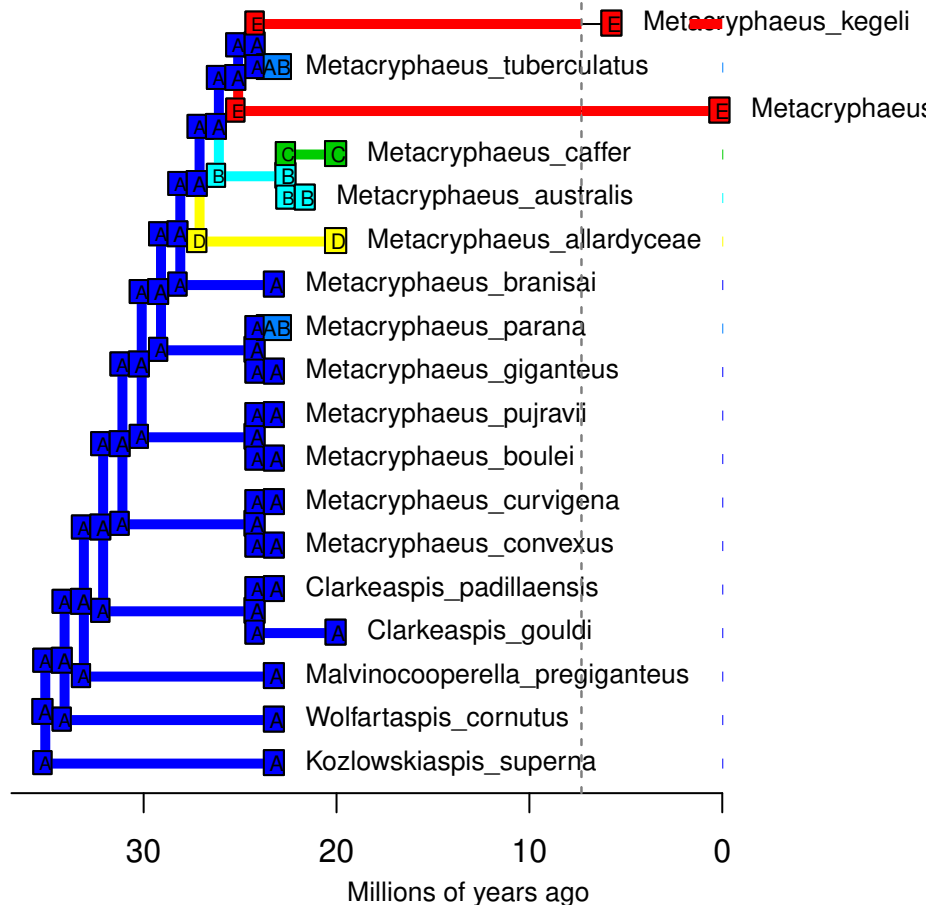
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





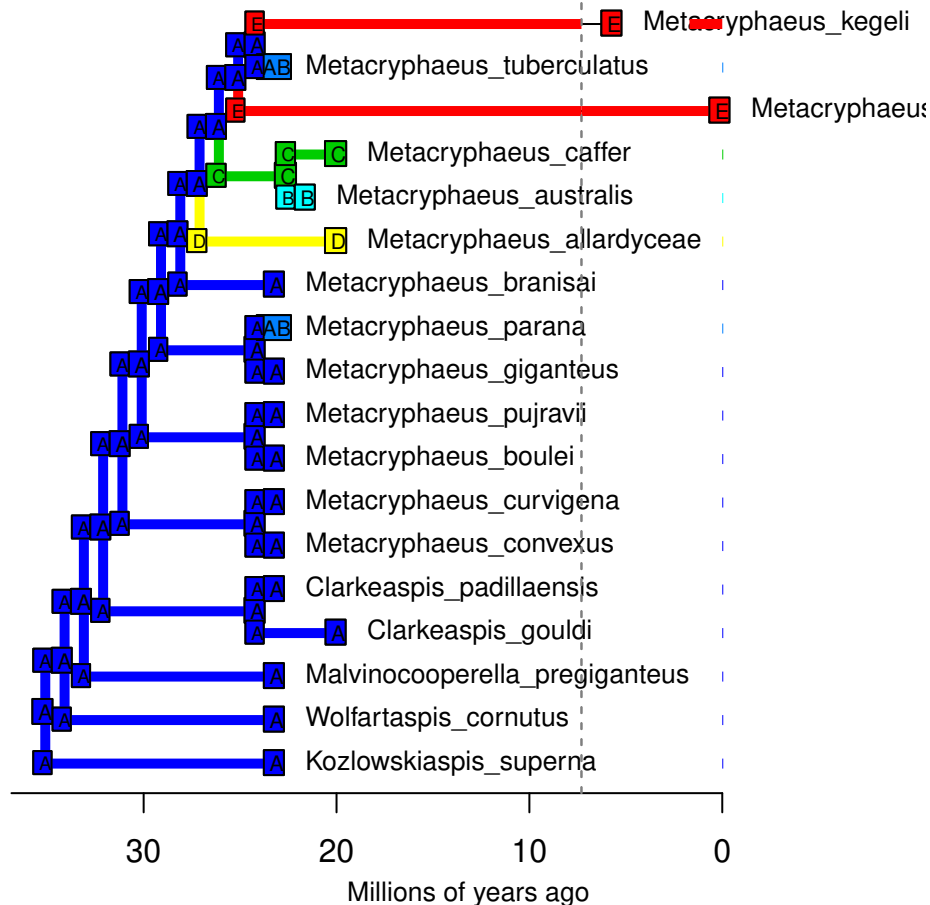
# DECwj – Stochastic Map #75/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



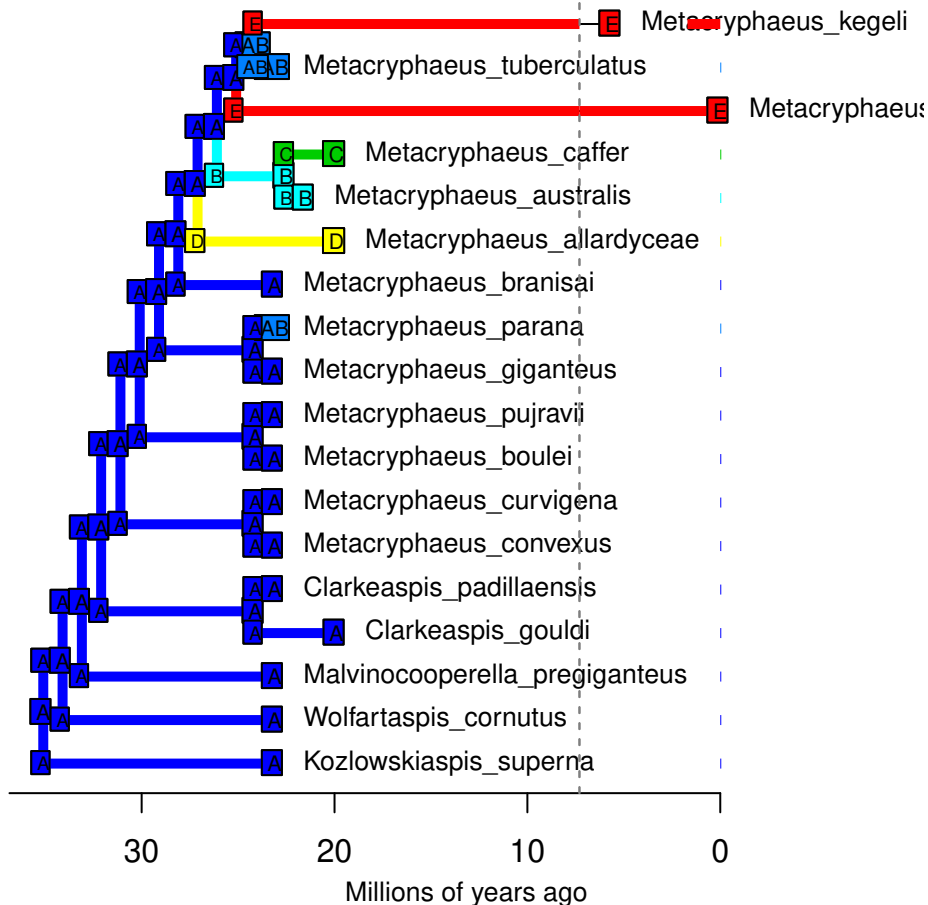
# DECwj – Stochastic Map #76/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



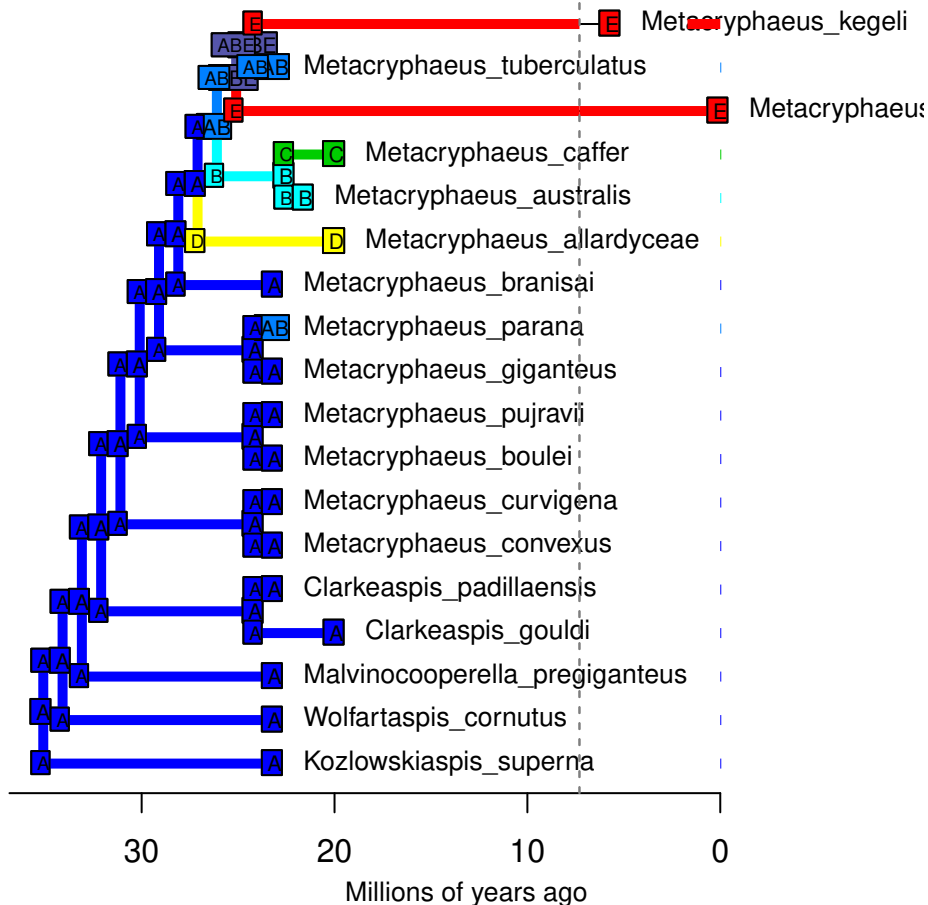
# DECwj – Stochastic Map #77/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



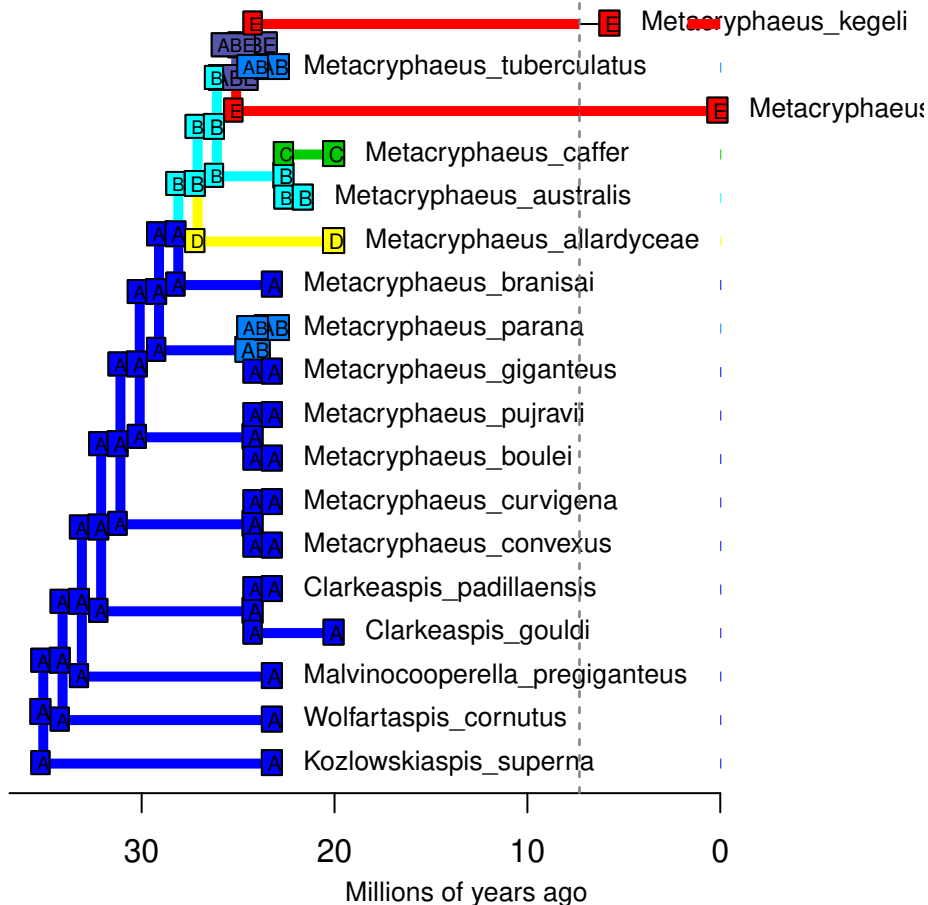
# DECwj – Stochastic Map #78/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



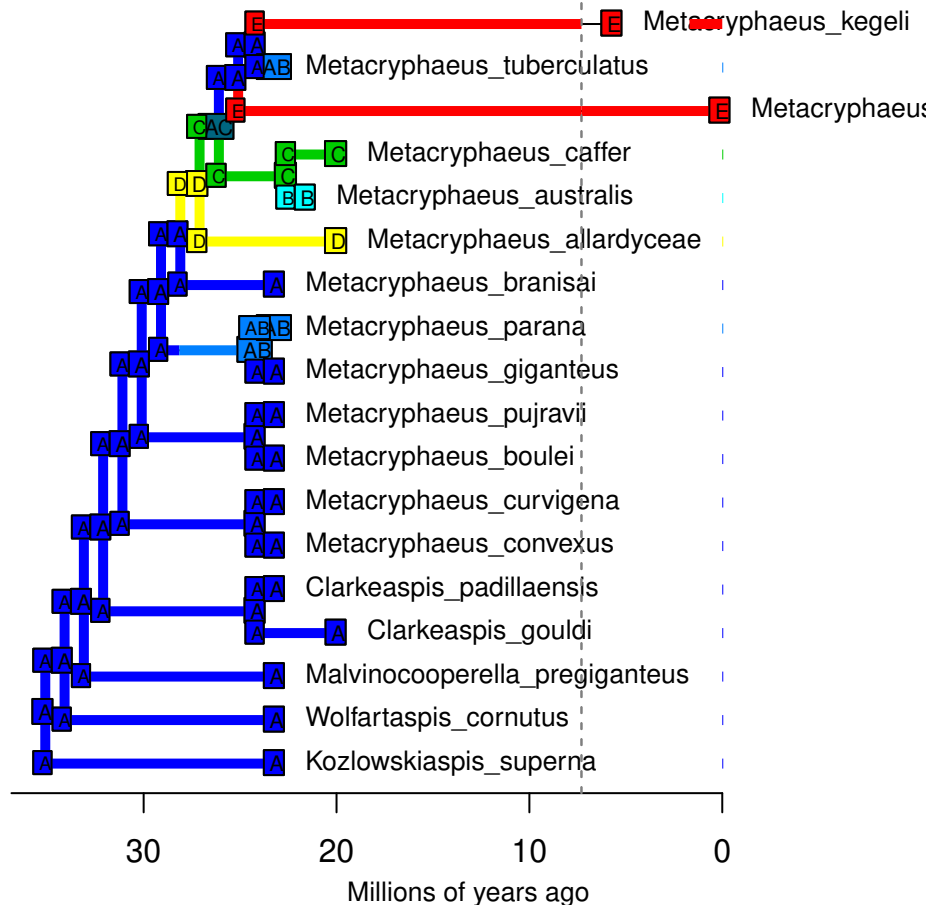
# DECwj – Stochastic Map #79/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



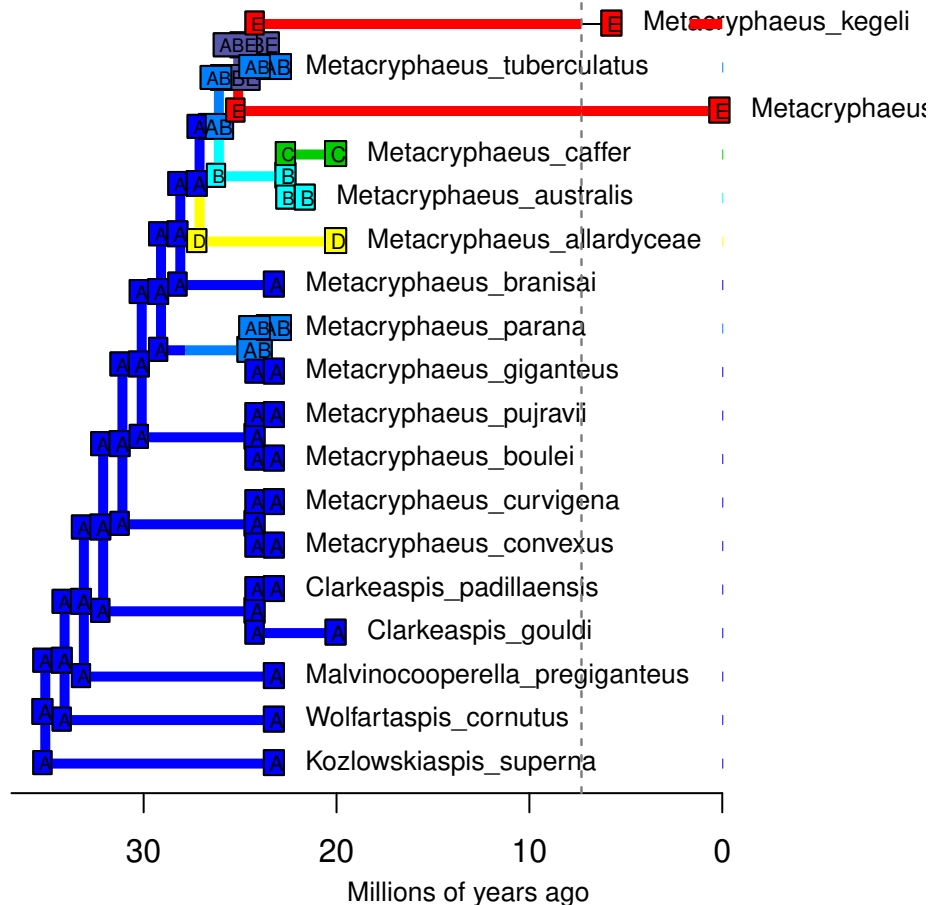
# DECwj – Stochastic Map #80/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



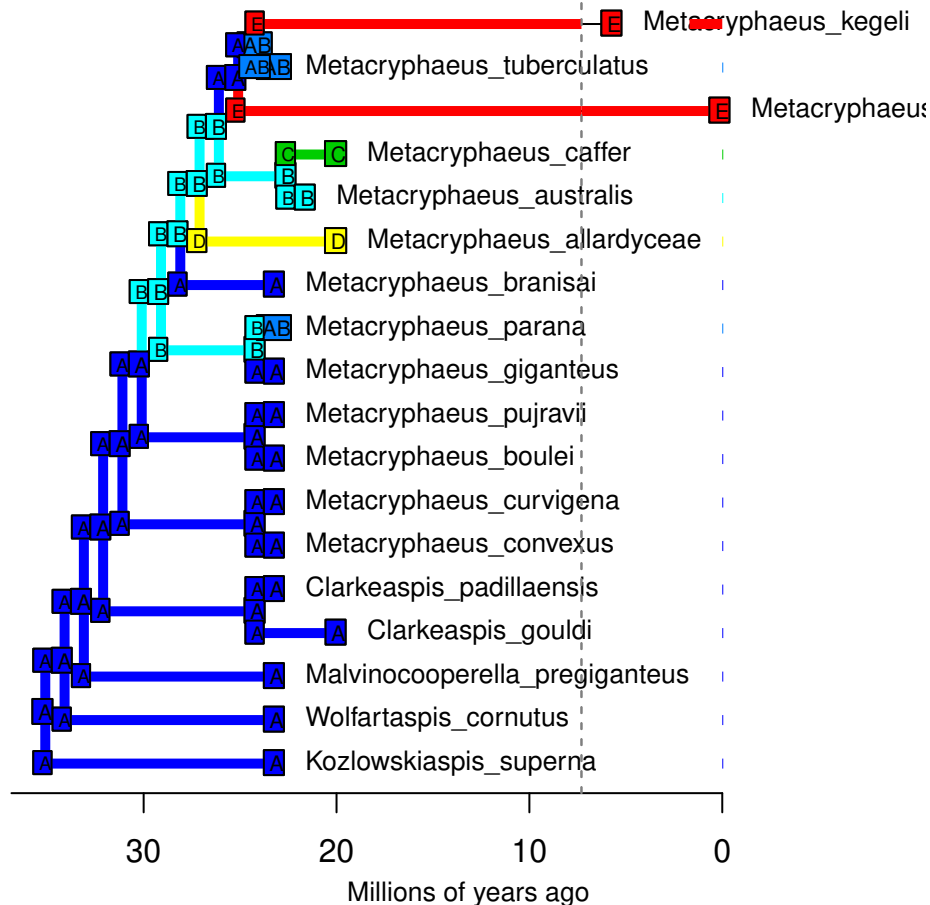
# DECwj – Stochastic Map #81/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #82/100

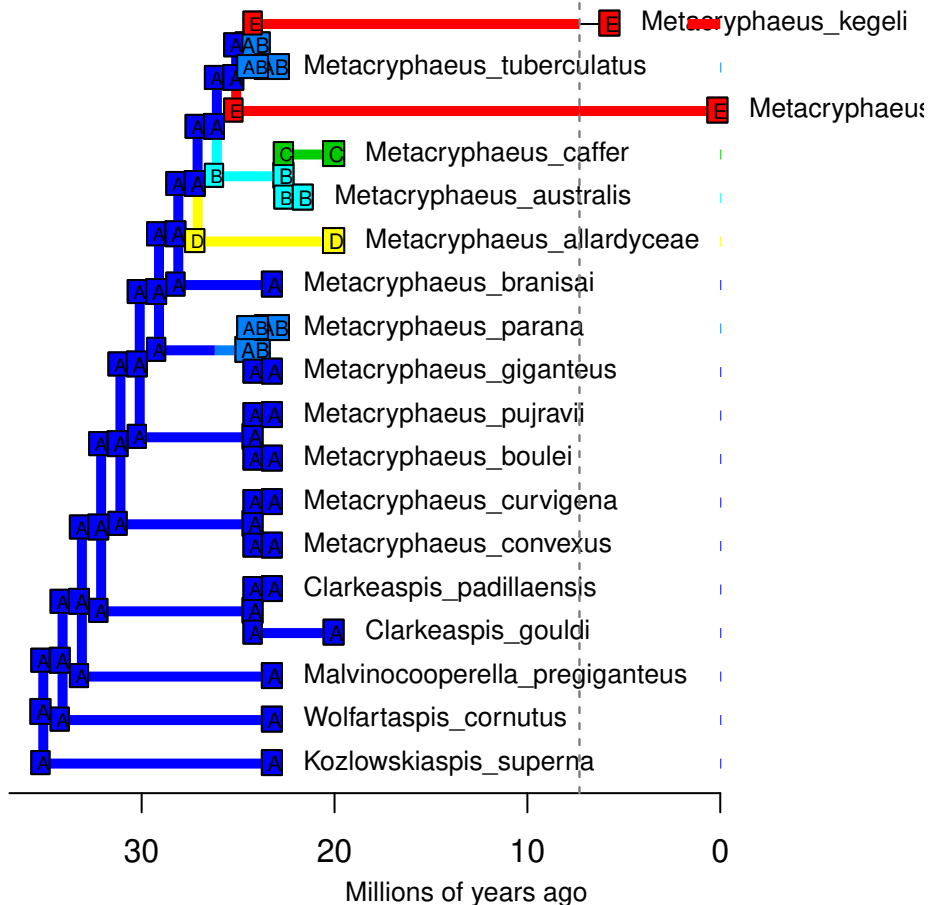
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





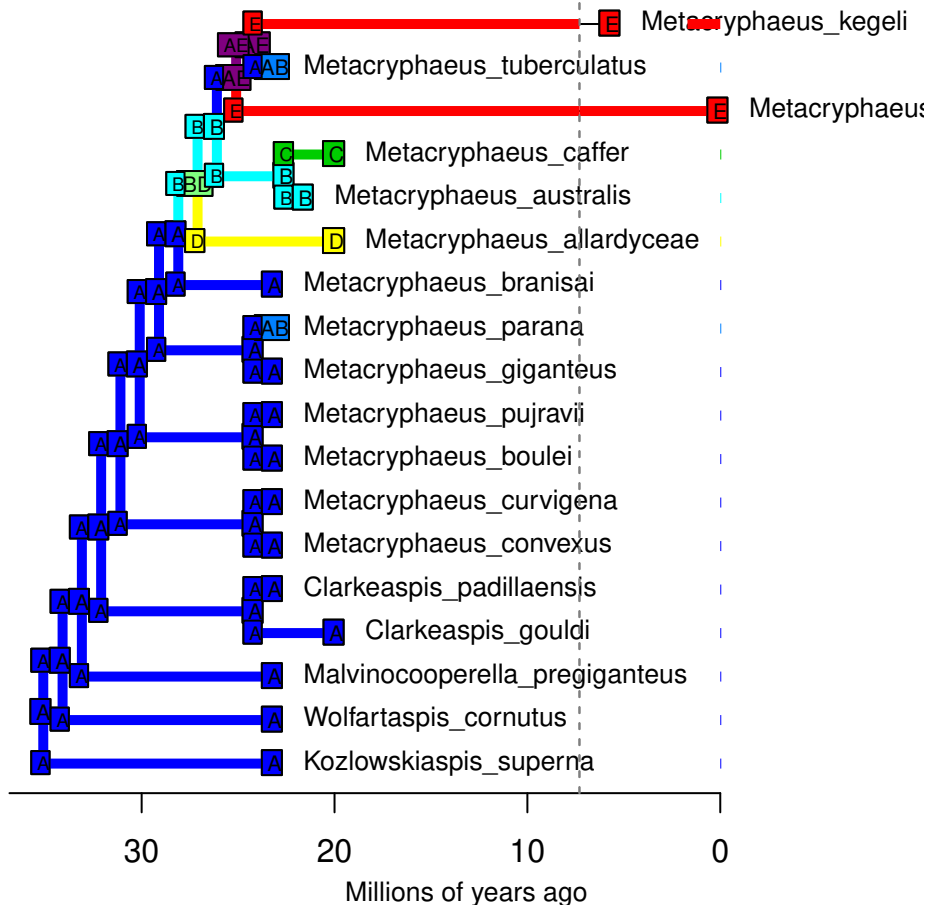
# DECwj – Stochastic Map #83/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



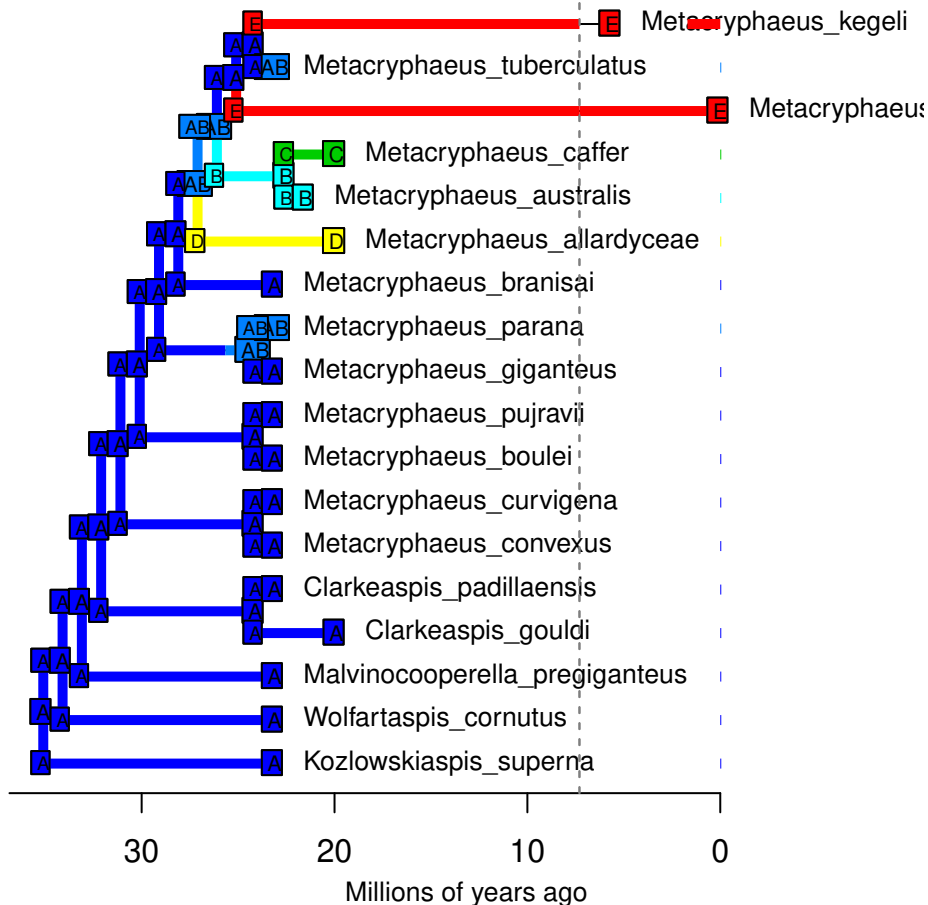
# DECwj – Stochastic Map #84/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



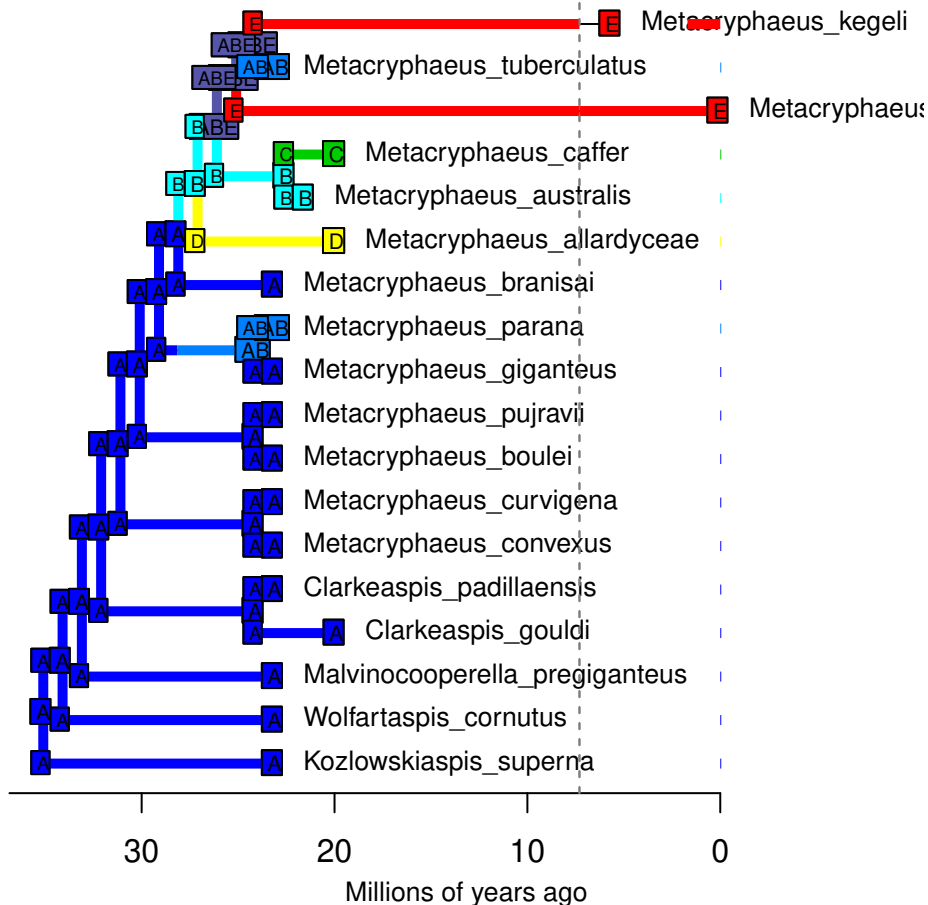
# DECwj – Stochastic Map #85/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



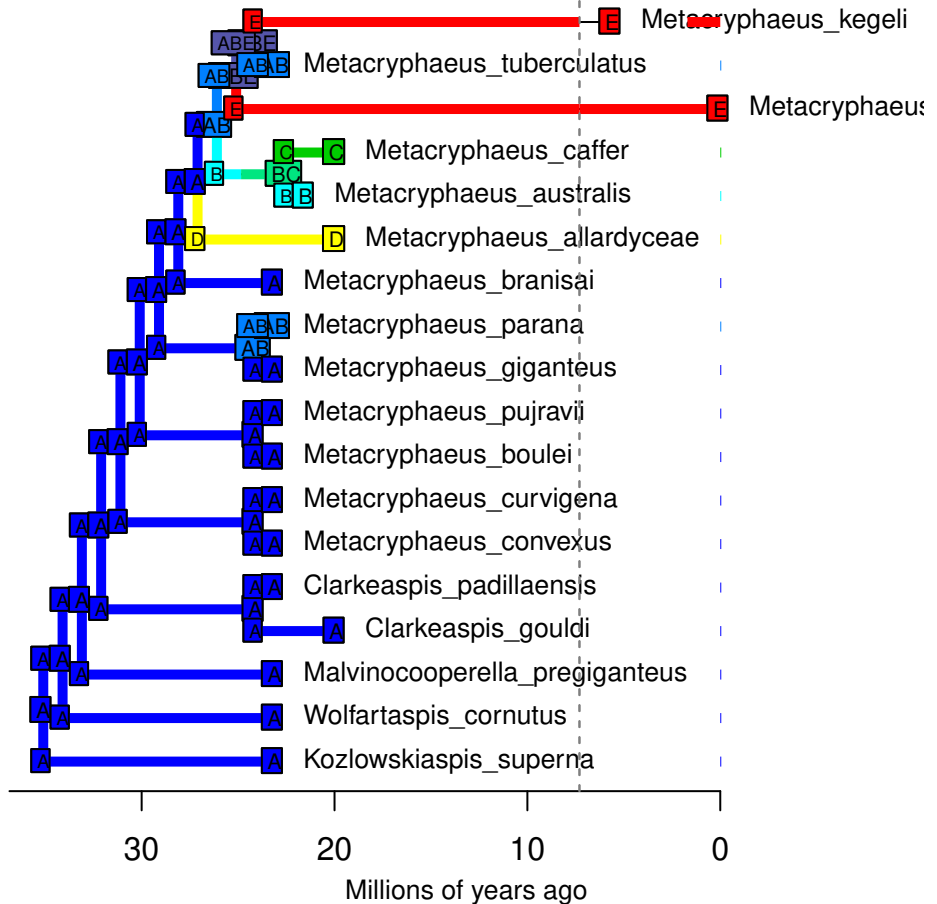
# DECwj – Stochastic Map #86/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



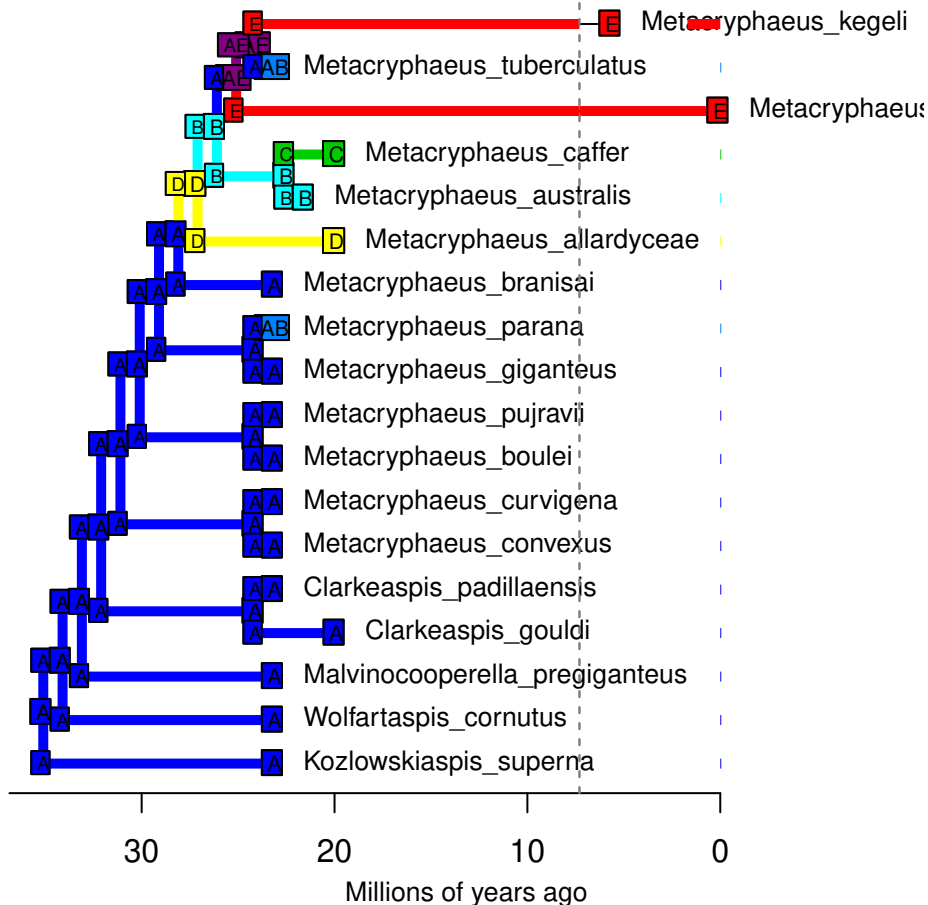
# DECwj – Stochastic Map #87/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



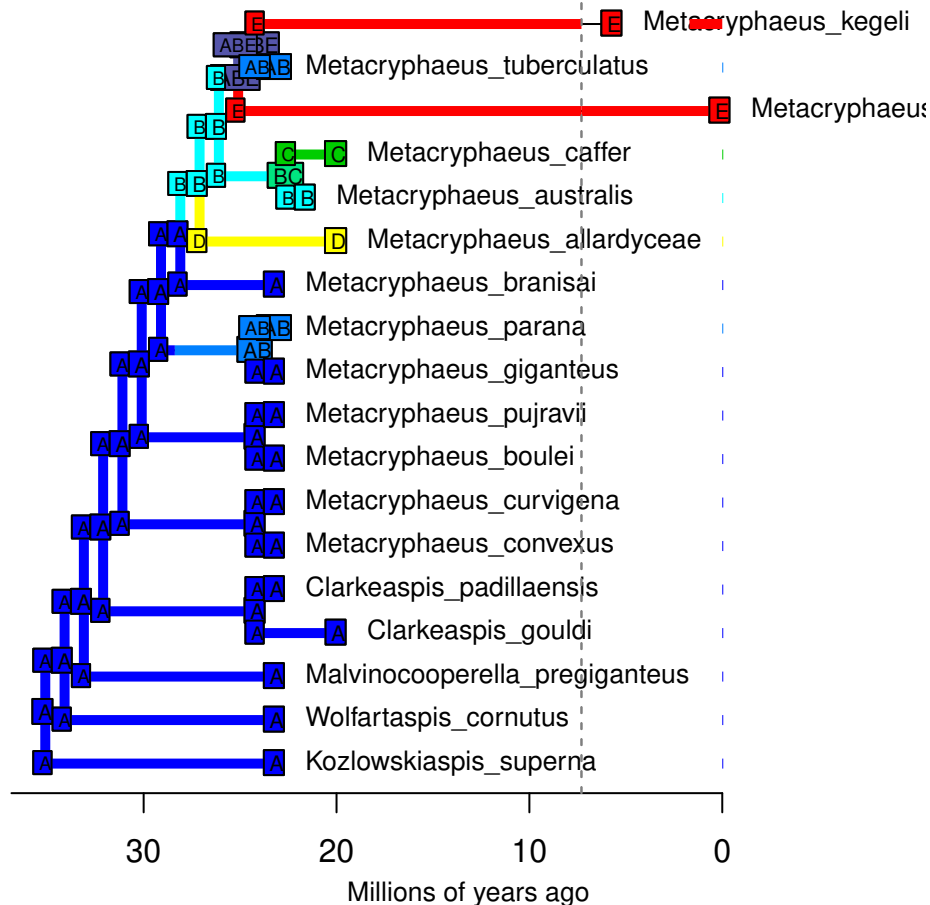
# DECwj – Stochastic Map #88/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



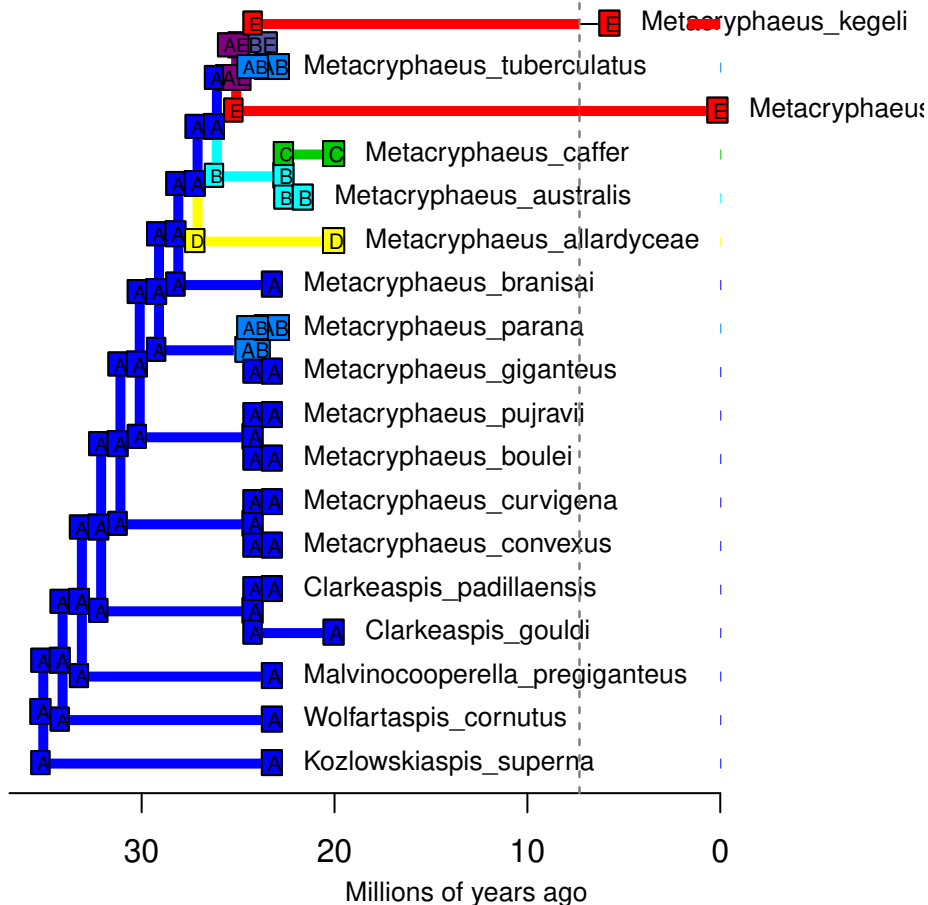
# DECwj – Stochastic Map #89/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #90/100

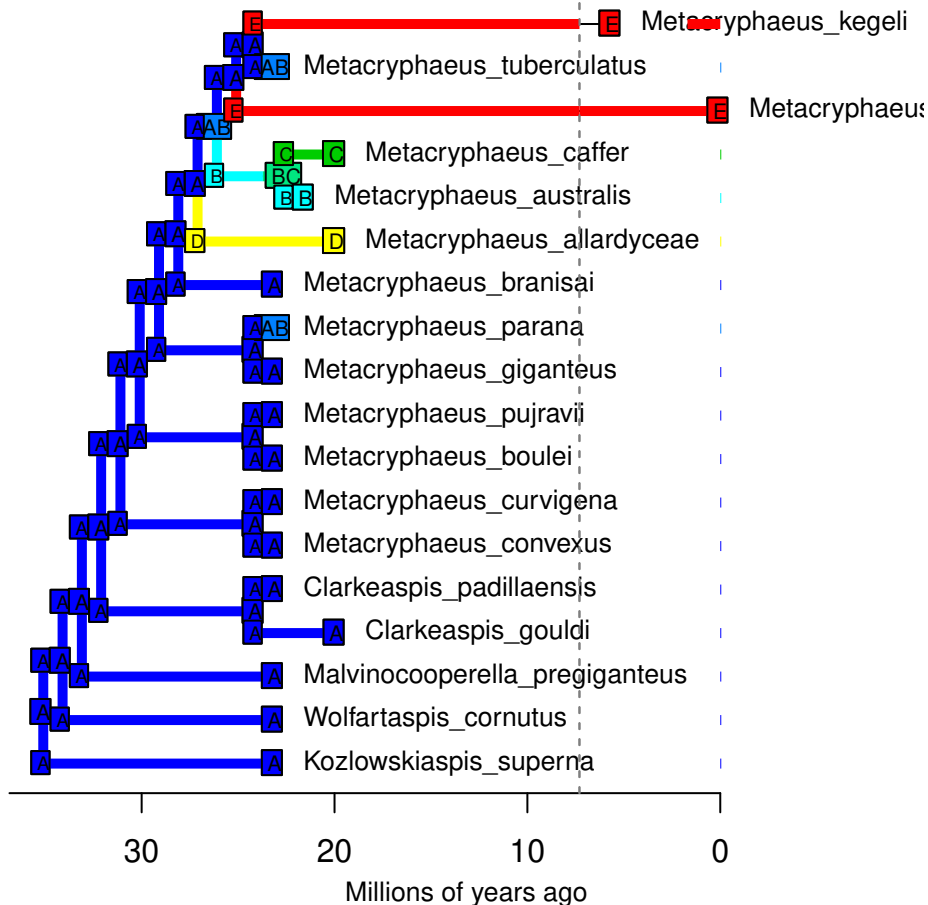
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





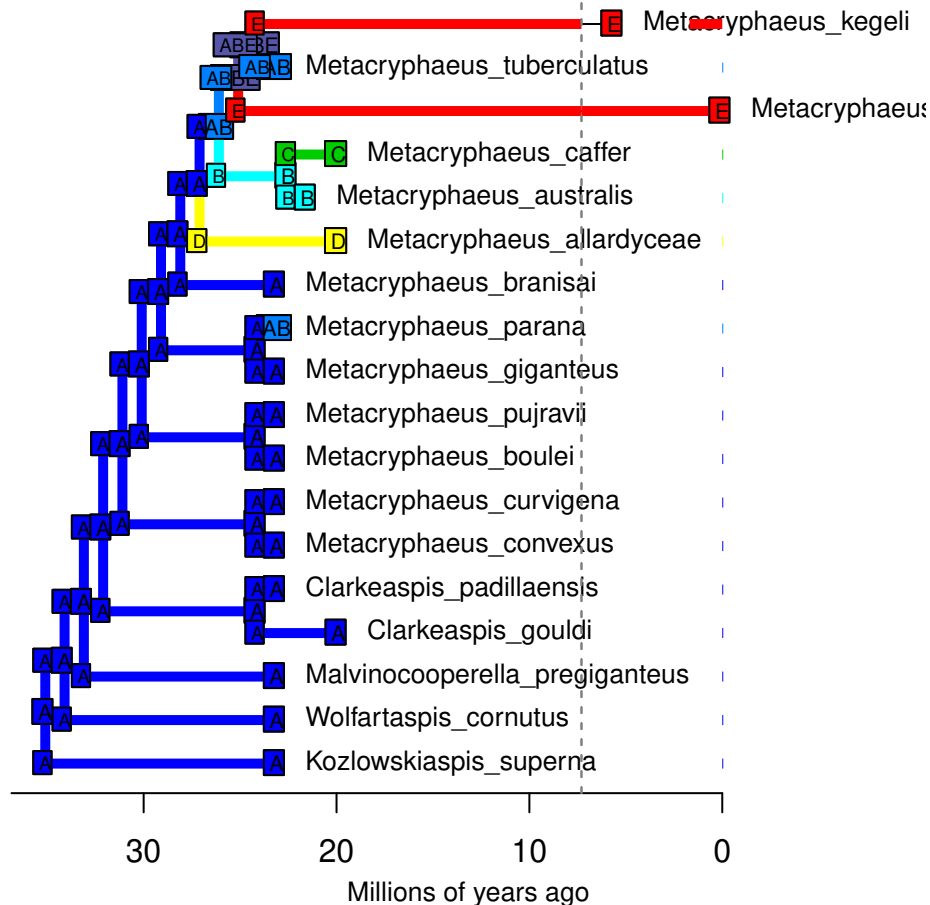
# DECwj – Stochastic Map #91/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



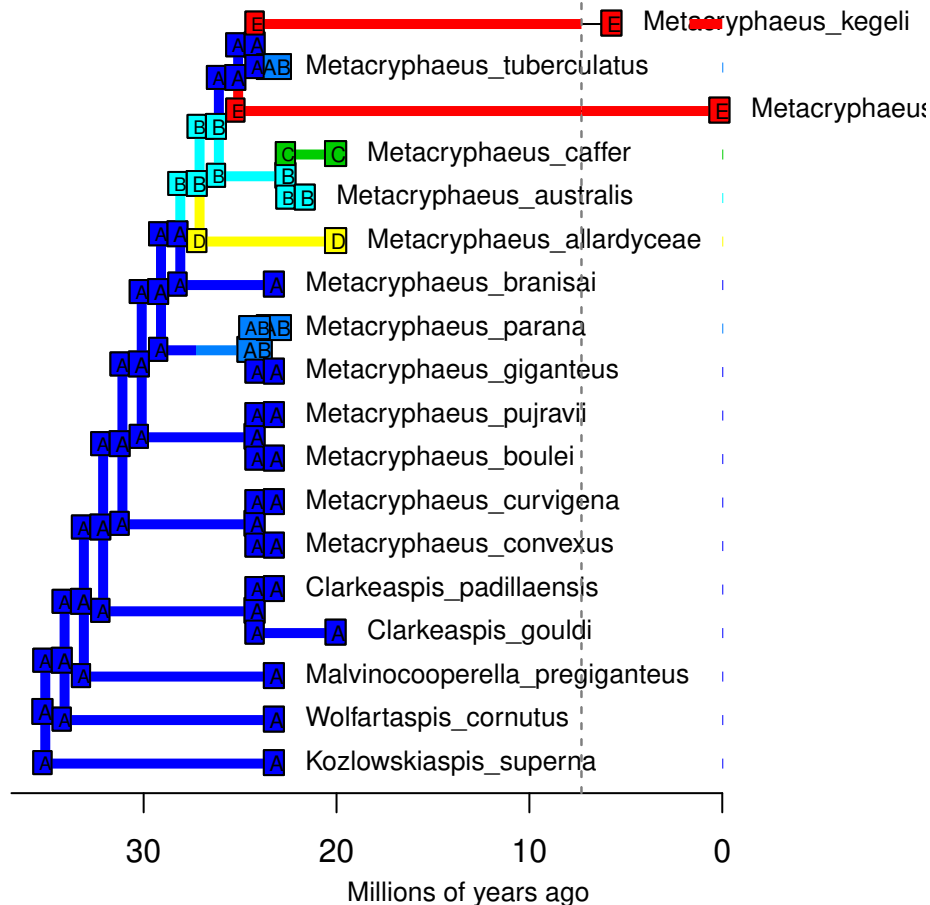
# DECwj – Stochastic Map #92/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



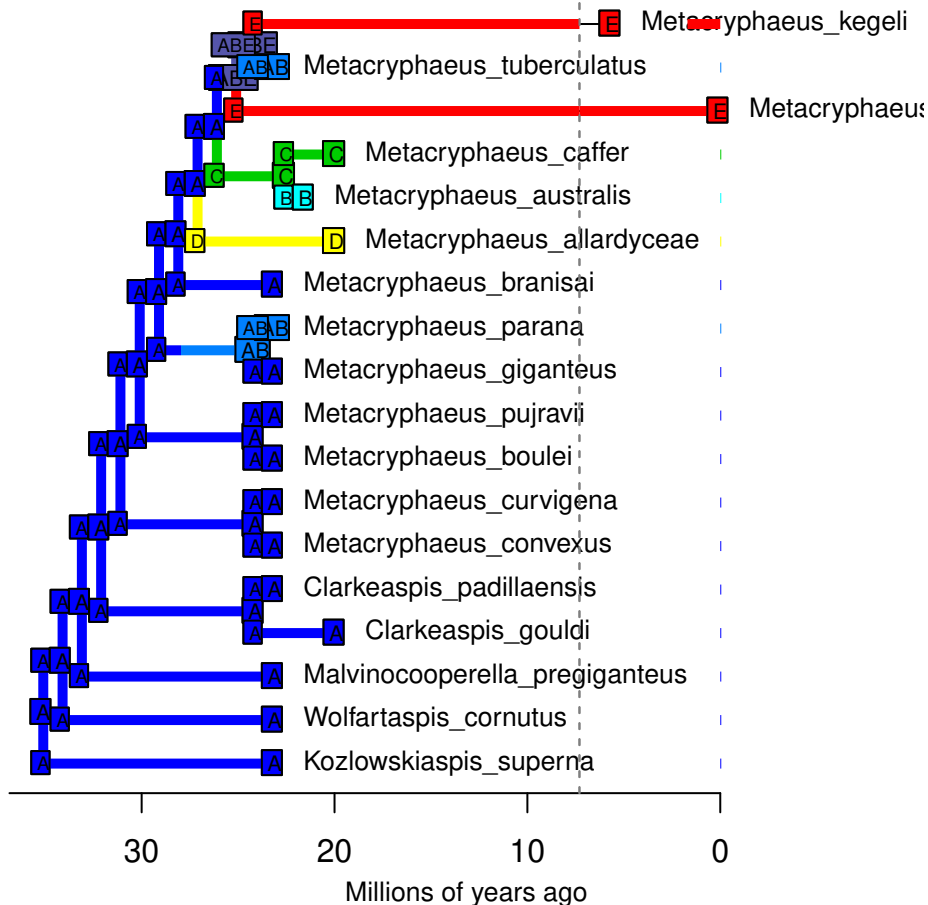
# DECwj – Stochastic Map #93/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



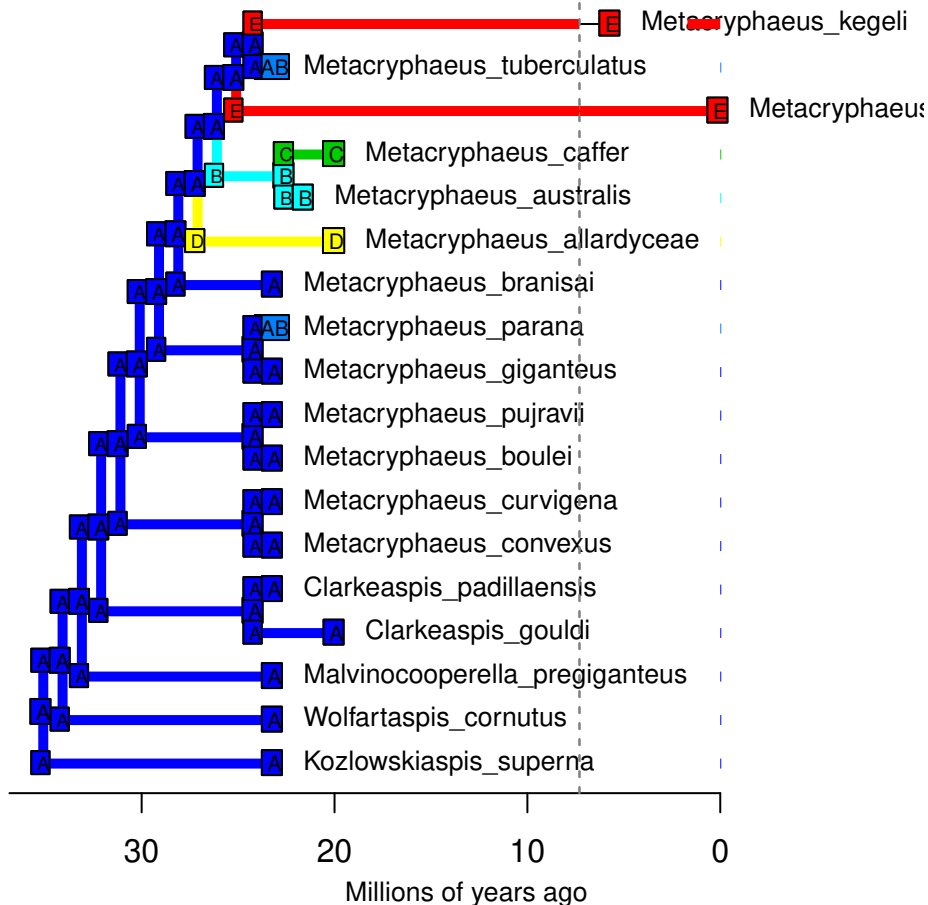
# DECwj – Stochastic Map #94/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



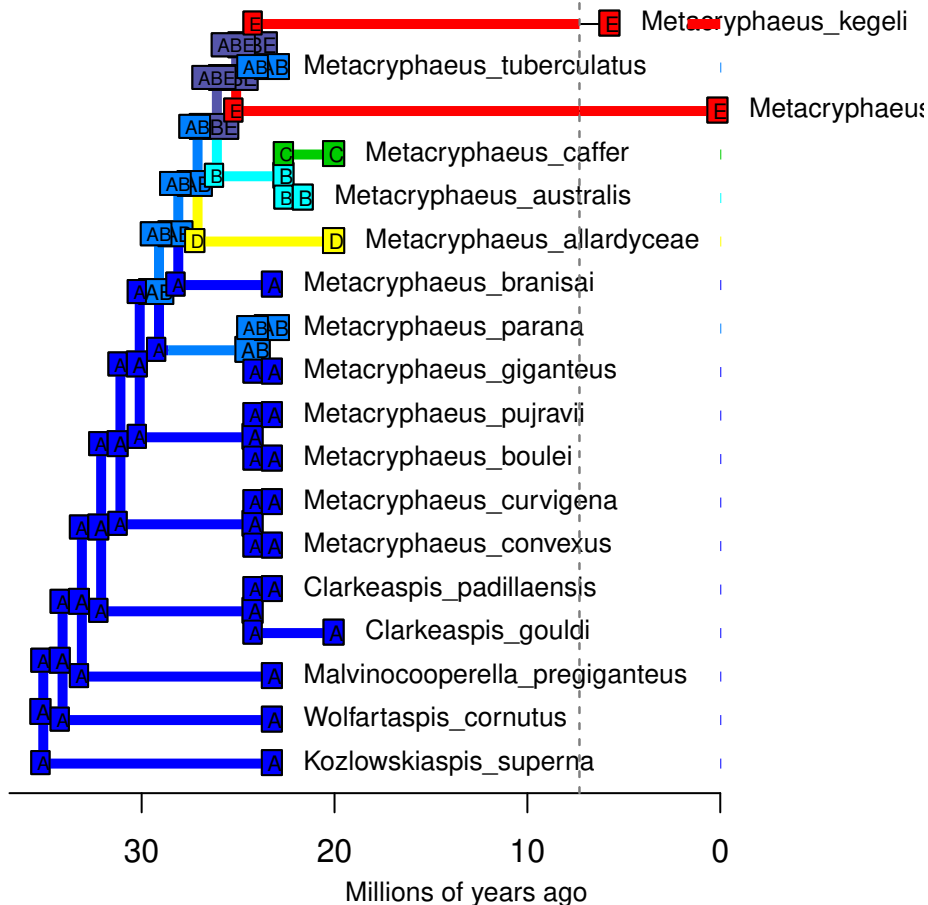
# DECwj – Stochastic Map #95/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



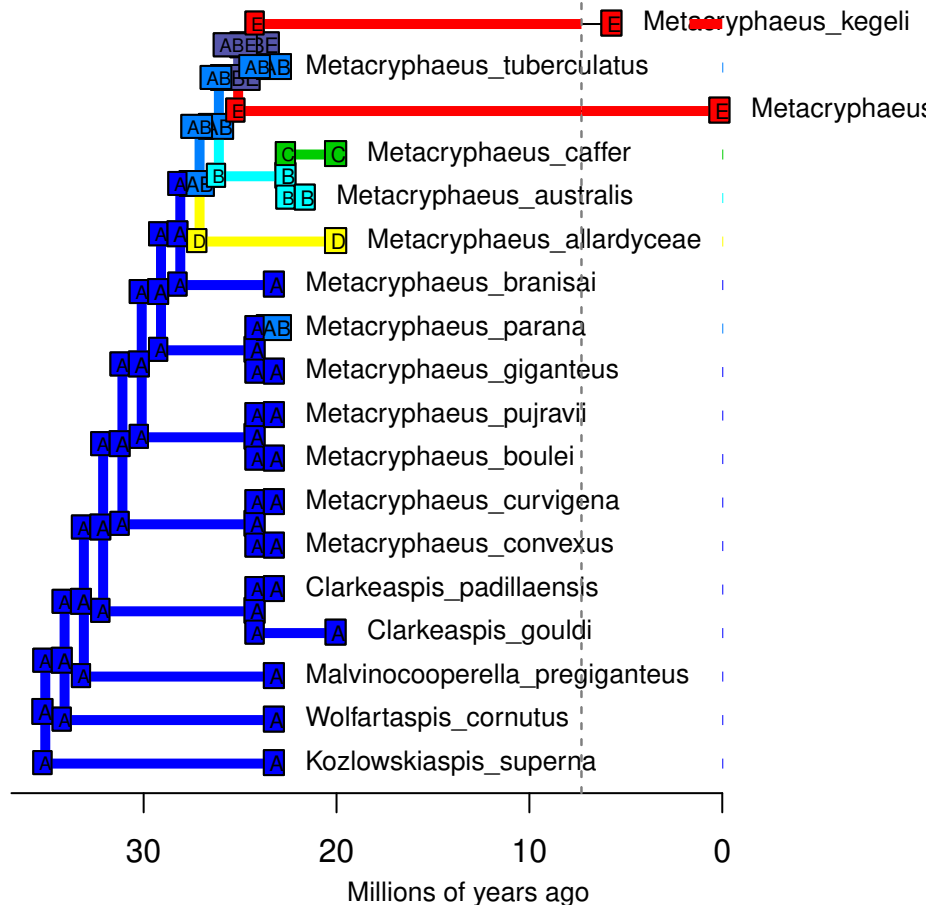
# DECwj – Stochastic Map #96/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



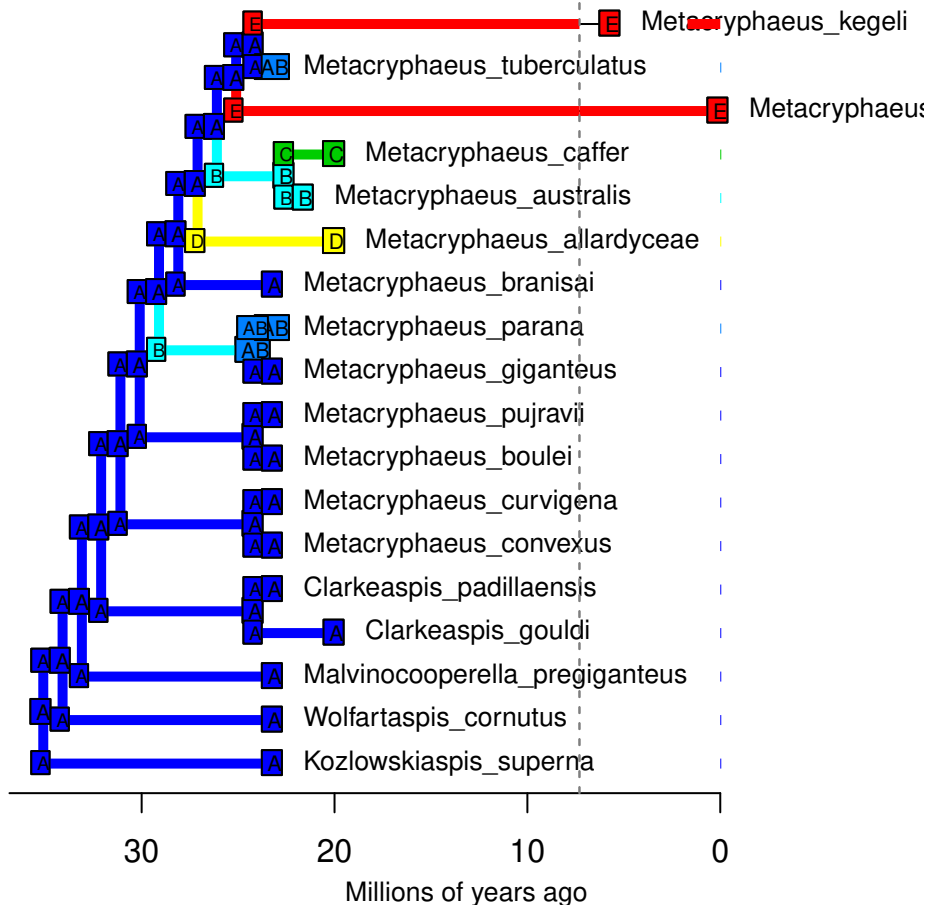
# DECwj – Stochastic Map #97/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #98/100

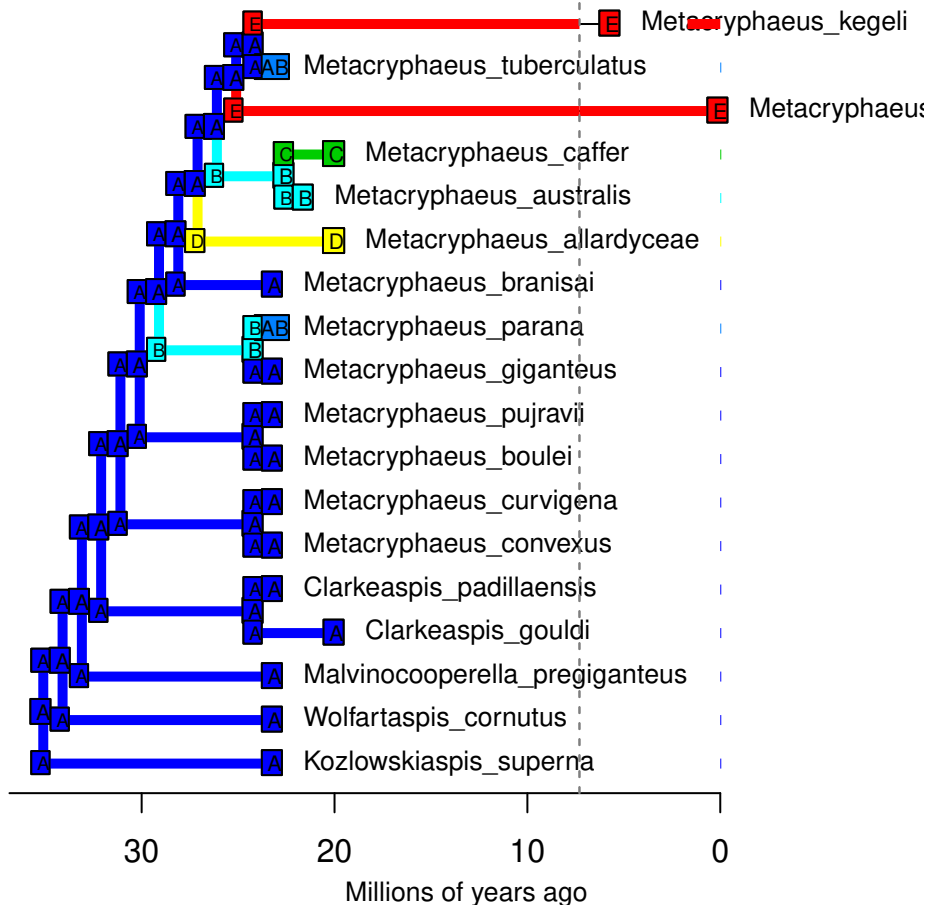
ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90





# DECwj – Stochastic Map #99/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90



# DECwj – Stochastic Map #100/100

ancstates: global optim, 3 areas max. d=0.0133; e=0; w=2.1481; j=0.0968; LnL=-29.90

