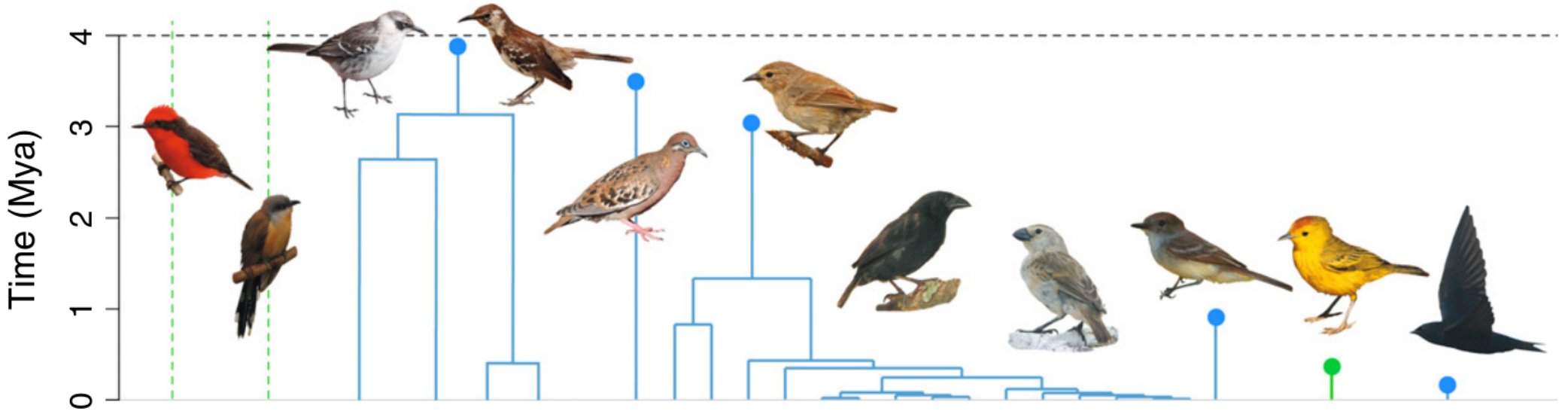


Why the Galapagos illustrate DAISIE badly...

Richel J.C. Bilderbeek

DAISIE

ECOLOGY LETTERS

Ecology Letters, (2015) **18**: 844–852

doi: 10.1111/ele.12461

LETTER

Equilibrium and non-equilibrium dynamics simultaneously operate in the Galápagos islands

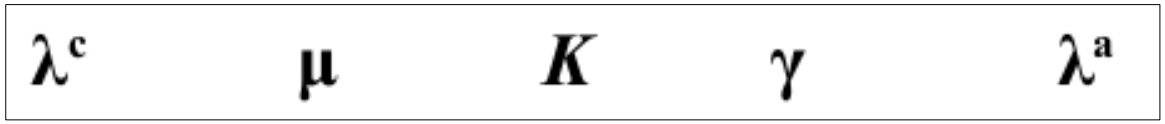
Luis M. Valente,[1]* Albert B. Phillimore[2] and Rampal S. Etienne[3]

Abstract

Island biotas emerge from the interplay between colonisation, speciation and extinction and are often the scene of spectacular adaptive radiations. A common assumption is that insular diversity is at a dynamic equilibrium, but for remote islands, such as Hawaii or Galápagos, this idea

DAISIE

“Here, we develop DAISIE (Dynamic Assembly of Islands through Speciation, Immigration and Extinction), a likelihood-based phylogenetic method that unifies the island biogeography framework of MacArthur & Wilson with the phylogenetic birth-death models popularised by Nee et al.”



DAISIE unifies island biogeography with birth-death models

Valente et al. (2015)

DAISIE

	Description
μ	Per-species extinction rate
γ	Per-species immigration rate
λ^c	Per-species cladogenesis rate
λ^a	Per-species anagenesis rate
K	Carrying capacity

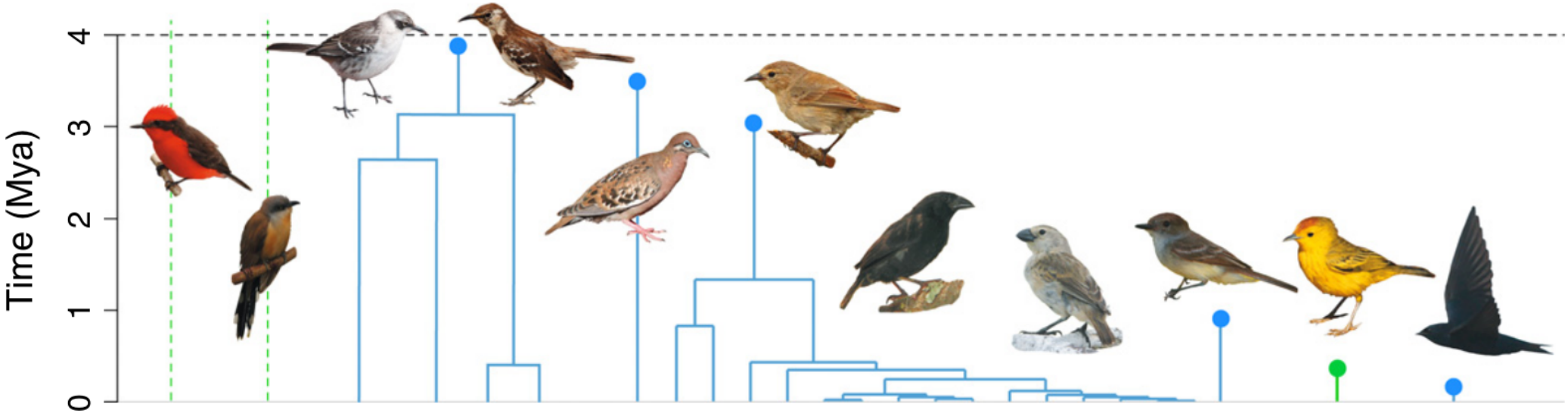
λ^c μ K γ λ^a

DAISIE unifies
island biogeography
with
birth-death models

Valente et al. (2015)

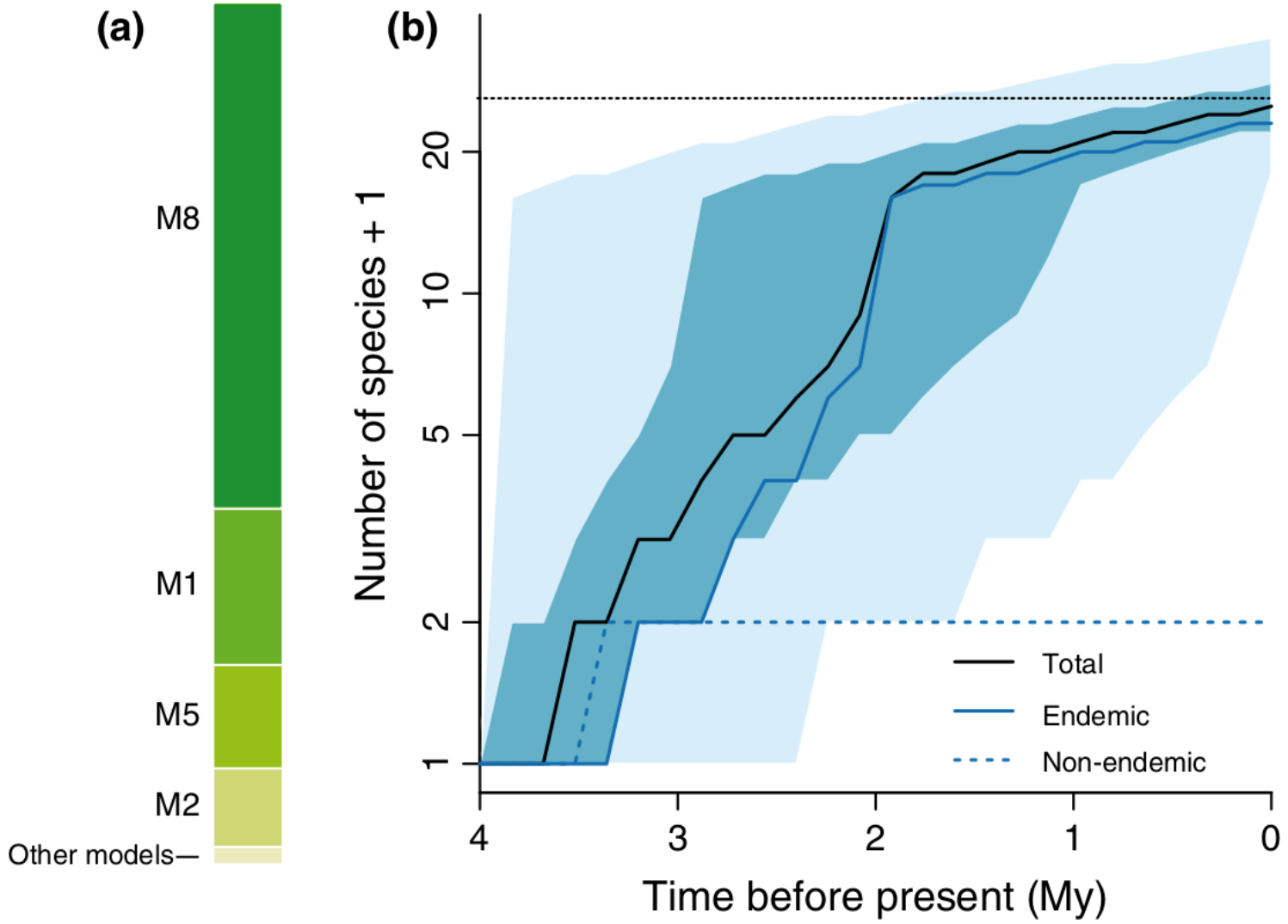
Figure 1

25 species, 8 clades



Valente et al. (2015)

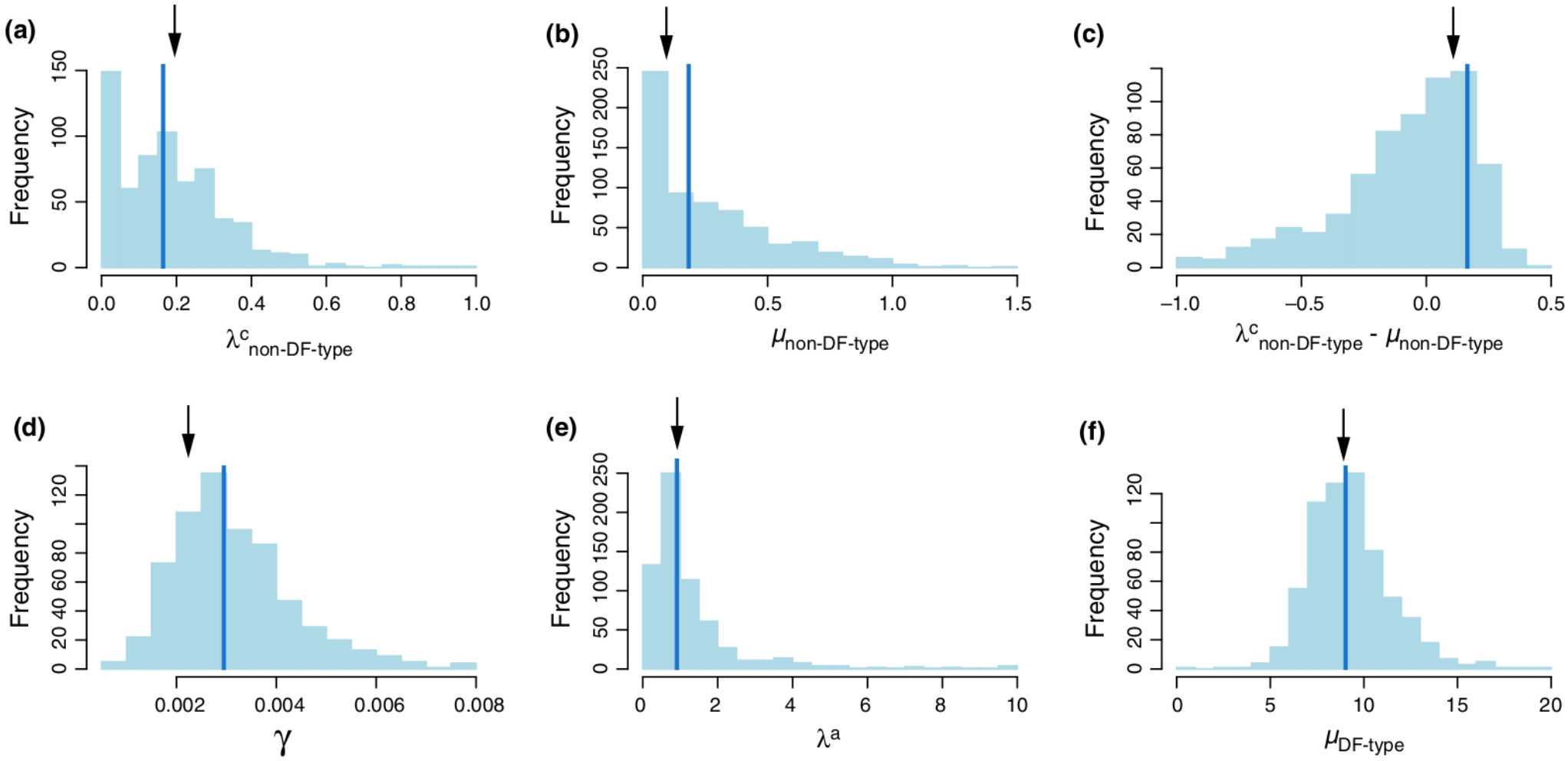
Figure 2



"According to the most strongly supported DAISIE model, the avifauna of the Galapagos islands does not tend towards a diversity steady state"

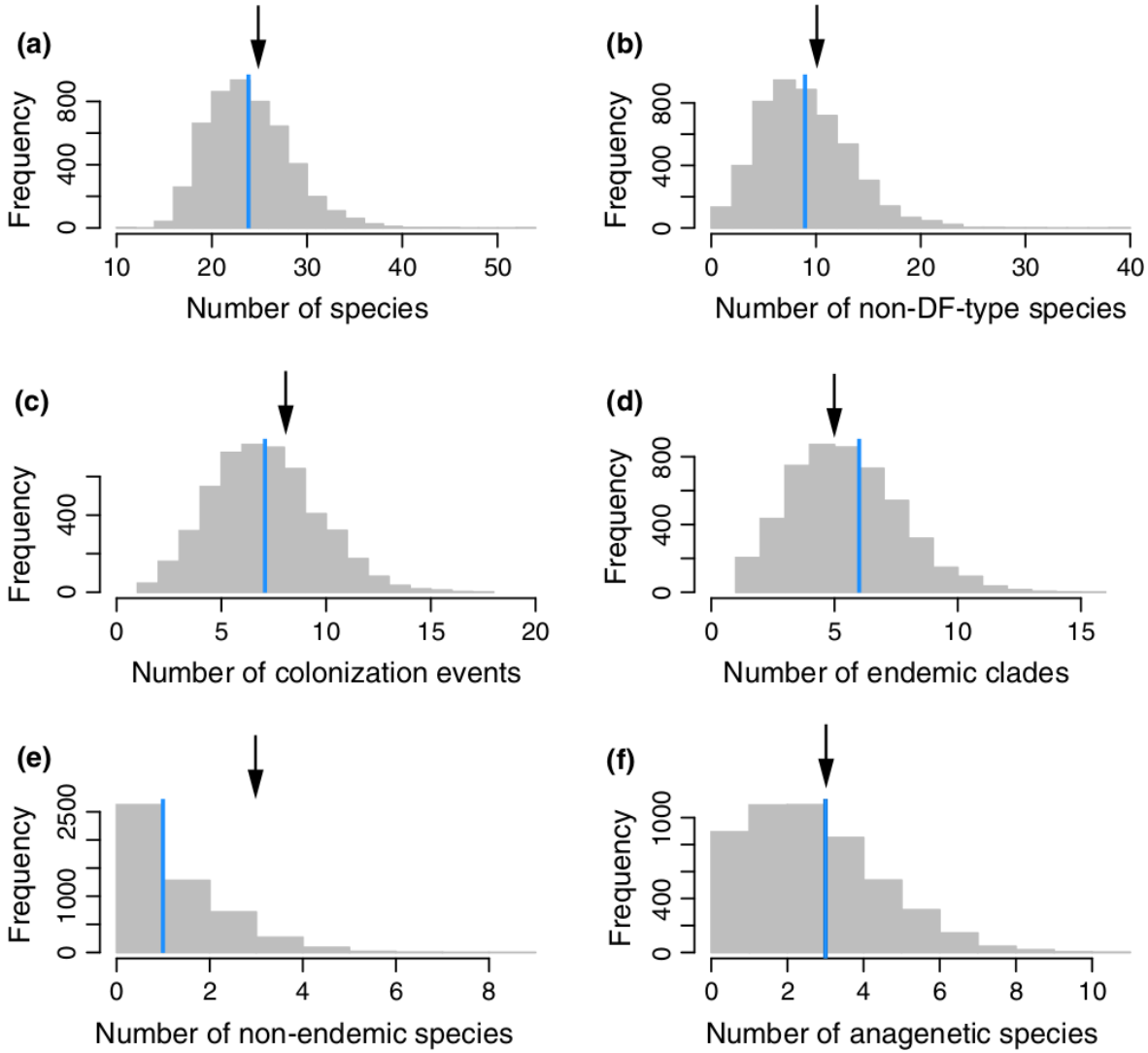
Valente et al. (2015)

Figure 3



Valente et al. (2015)

Figure 4



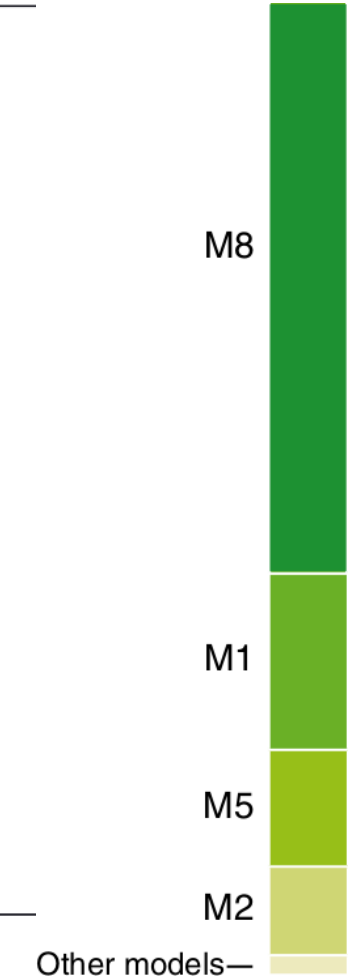
Valente et al. (2015)

My claim

The Galapagos are a bad illustration of DAISIE, because (1) the final result is weak, and (2) the figures oversell the story

The result

Name	Background					Darwin's finch type			Loglik	BIC	BIC weight
	λ^c	μ	K'	γ	λ^a	λ^c	μ	K'			
M1	2.55	2.68	-	0.009	1.01	-	-	-	-76.0	186.98	1.81×10^{-1}
M2	0.38	0.55	-	0.004	1.10	2.28	-	-	-72.3	188.36	9.14×10^{-2}
M3	2.48	2.70	-	0.009	1.02	-	2.25	-	-75.7	195.17	3.03×10^{-3}
M4	2.55	2.68	-	0.009	1.01	-	-	∞	-76.0	195.73	2.29×10^{-3}
M5	0.29	0.38	-	0.004	1.03	6.87	6.51	-	-67.7	187.81	1.20×10^{-1}
M6	0.38	0.55	-	0.004	1.10	2.28	-	∞	-72.3	197.10	1.15×10^{-3}
M7	2.48	2.70	-	0.009	1.02	-	2.25	∞	-75.7	203.92	3.83×10^{-5}
M8	0.20	0.09	-	0.002	0.87	$\gg \mu K'$	8.91	14.99	-61.7	184.64	5.86×10^{-1}
M1'	2.56	2.69	∞	0.009	1.01	-	-	-	-76.0	195.73	2.29×10^{-3}
M2'	0.42	0.52	23.7	0.004	1.10	2.27	-	-	-72.3	197.09	1.16×10^{-3}
M3'	2.65	0.46	3.7	0.003	1.32	-	2.07	-	-73.4	199.29	3.87×10^{-4}
M4'	1.84	0.49	4.0	0.003	1.25	-		∞	-74.5	201.52	1.26×10^{-4}
M5'	0.33	0.36	17.3	0.004	1.02	6.85	6.48		-67.7	196.53	1.53×10^{-3}
M6'	0.42	0.52	23.7	0.004	1.10	2.27		∞	-72.3	205.83	1.47×10^{-5}
M7'	2.65	0.46	3.7	0.003	1.32		2.07	∞	-73.4	208.03	4.88×10^{-6}
M8'	0.33	0.05	5.4	0.002	0.90	$\gg \mu K'$	8.91	14.99	-61.6	193.18	8.20×10^{-3}



Valente et al. (2015)

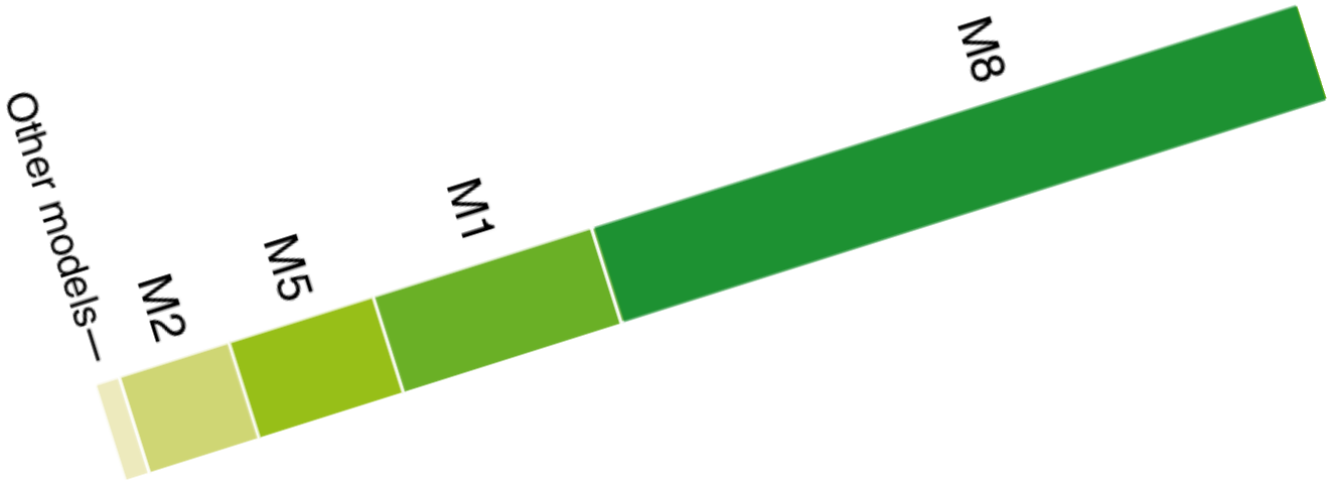
The results without DF

Name	Background					BIC weight
	λ^c	μ	K'	γ	λ^a	
M1	2.55	2.68	-	0.009	1.01	1.81×10^{-1}
M1'	2.56	2.69	∞	0.009	1.01	2.29×10^{-3}

Valente et al. (2015)

Top results

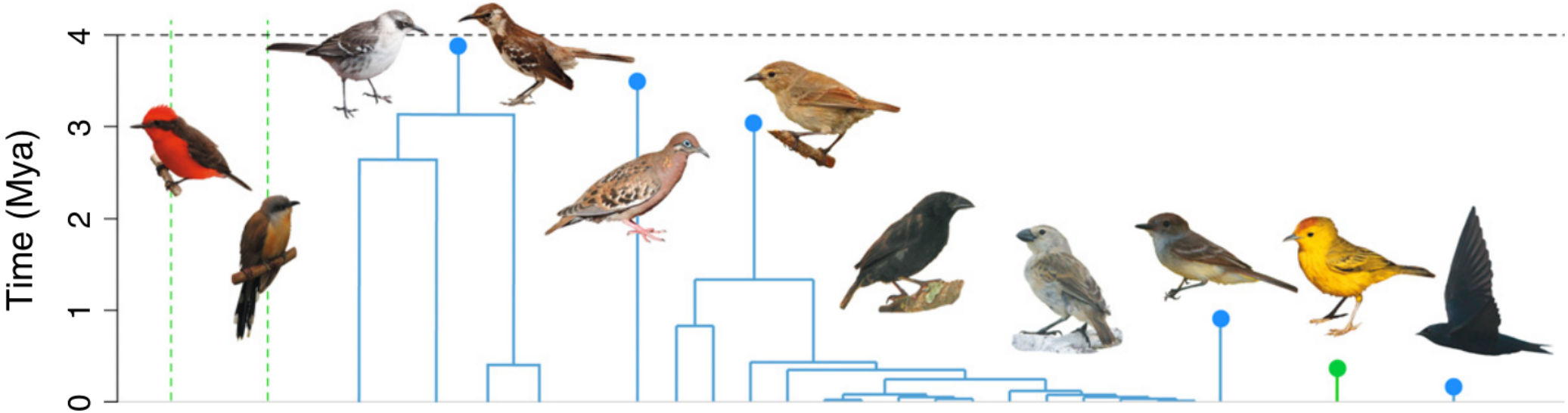
Name	Background					Darwin's finch type			BIC weight
	λ^c	μ	K'	γ	λ^a	λ^c	μ	K'	
M8	0.20	0.09	-	0.002	0.87	$\gg \mu K'$	8.91	14.99	5.86×10^{-1}
M1	2.55	2.68	-	0.009	1.01	-	-	-	1.81×10^{-1}
M5	0.29	0.38	-	0.004	1.03	6.87	6.51	-	1.20×10^{-1}
M2	0.38	0.55	-	0.004	1.10	2.28	-	-	9.14×10^{-2}



Valente et al. (2015)

What does the result work on?

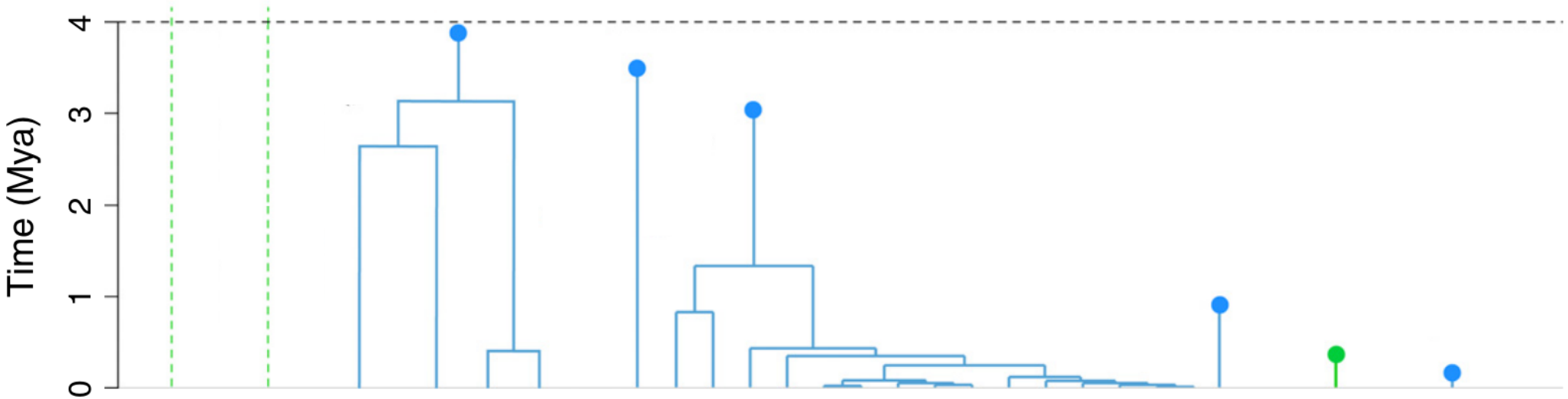
Pretty birds, 25 species, 8 clades



Valente et al. (2015)

What does the result work on?

25 species, 8 clades

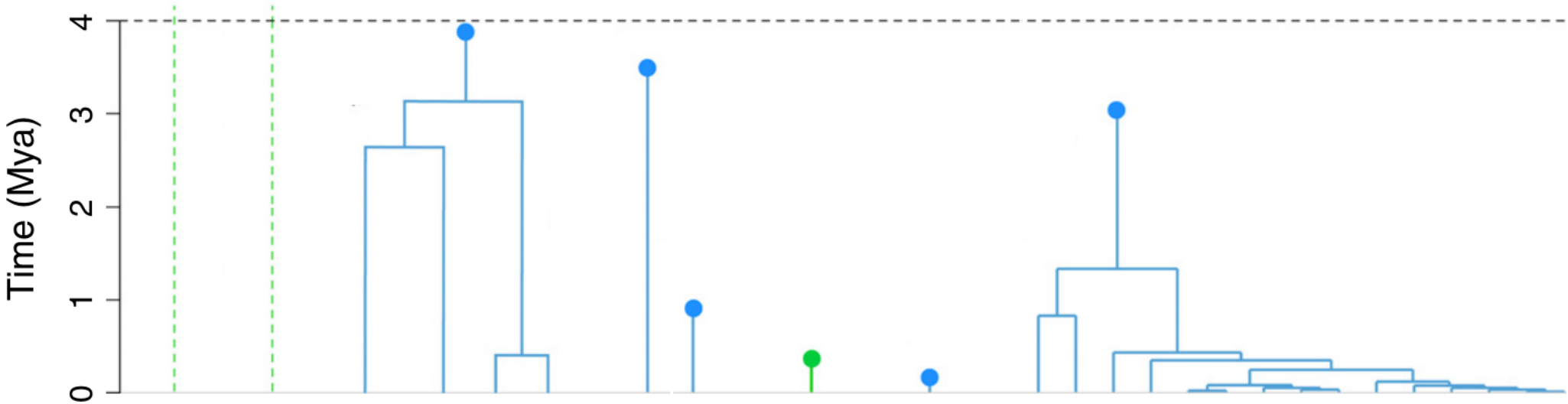


Modified from Valente et al. (2015)

What does the result work on?

7 clades with 10 species

1 clade with 15 species



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DAISIE unifies
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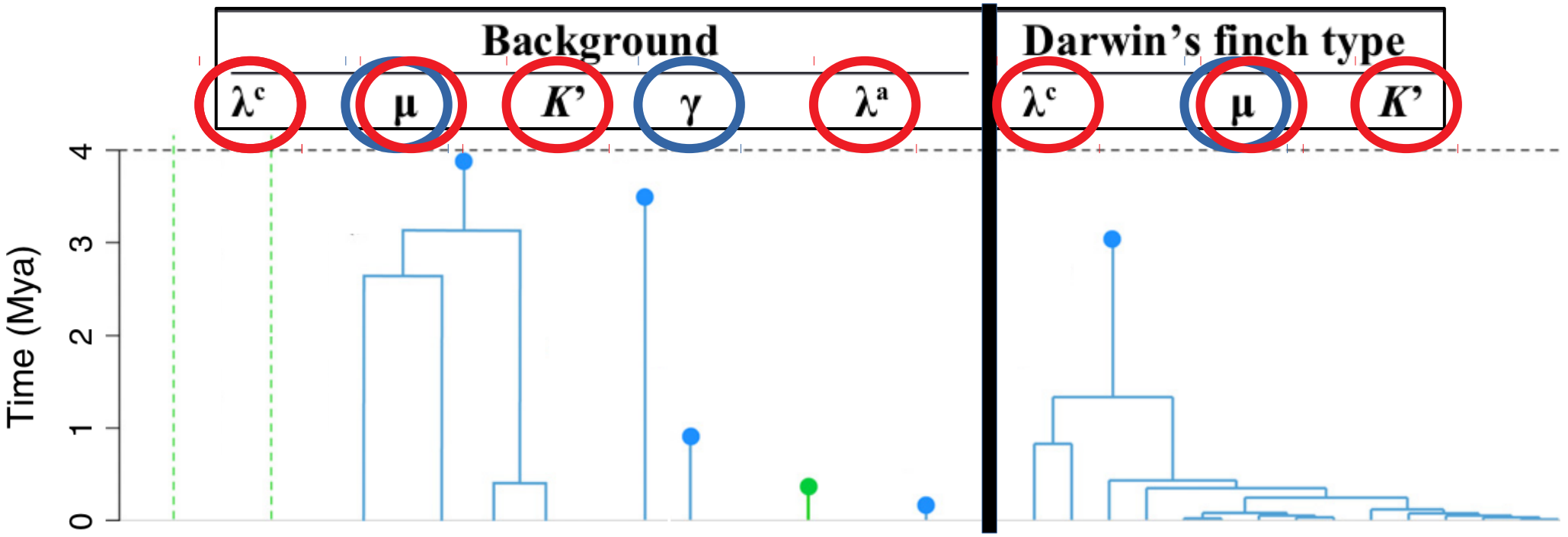

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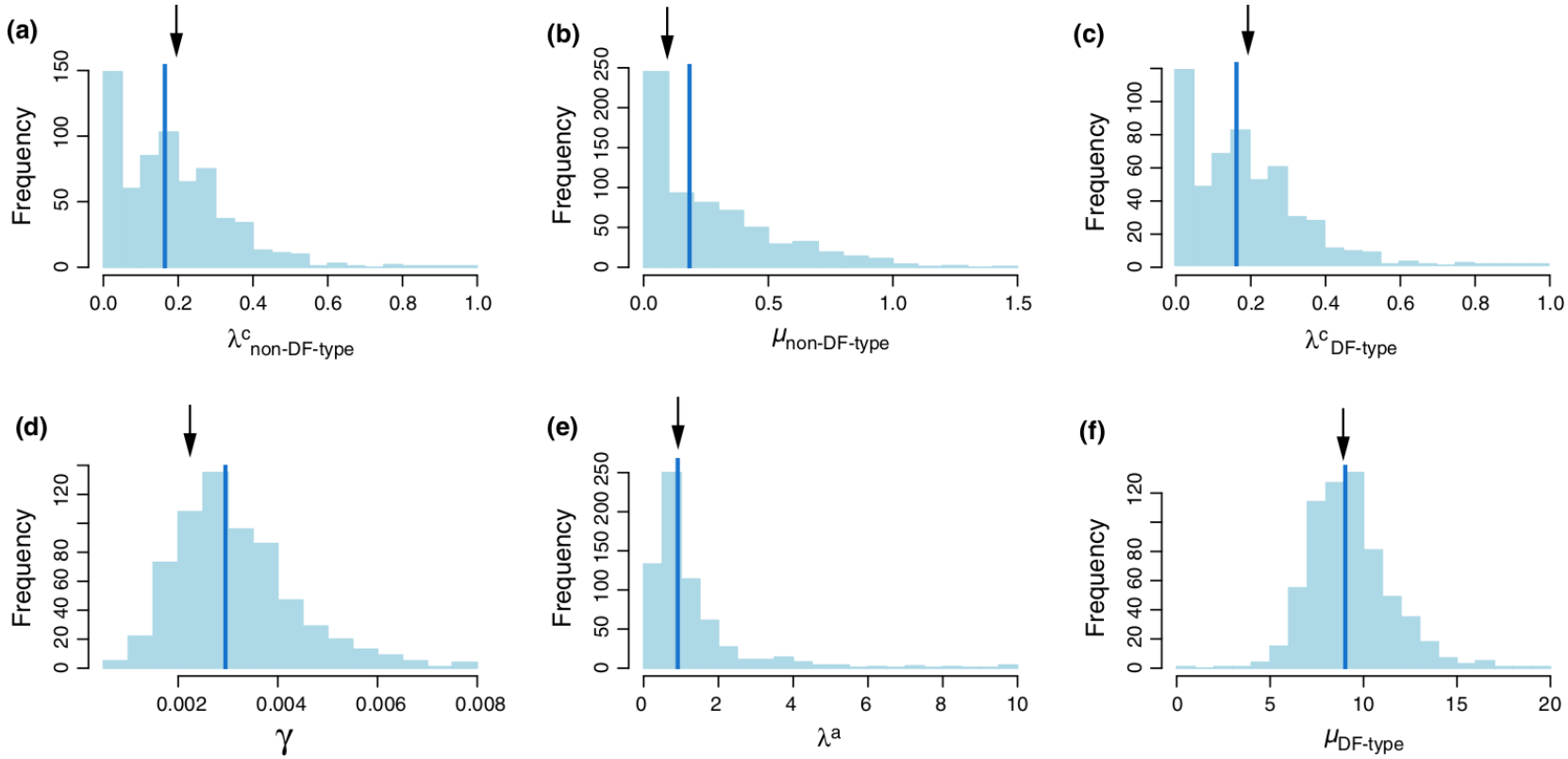
The Galapagos are a bad illustration of DAISIE, because (1) the final result is weak, and (2) the figures oversell the story

(1) there is no unification

Figures, expected

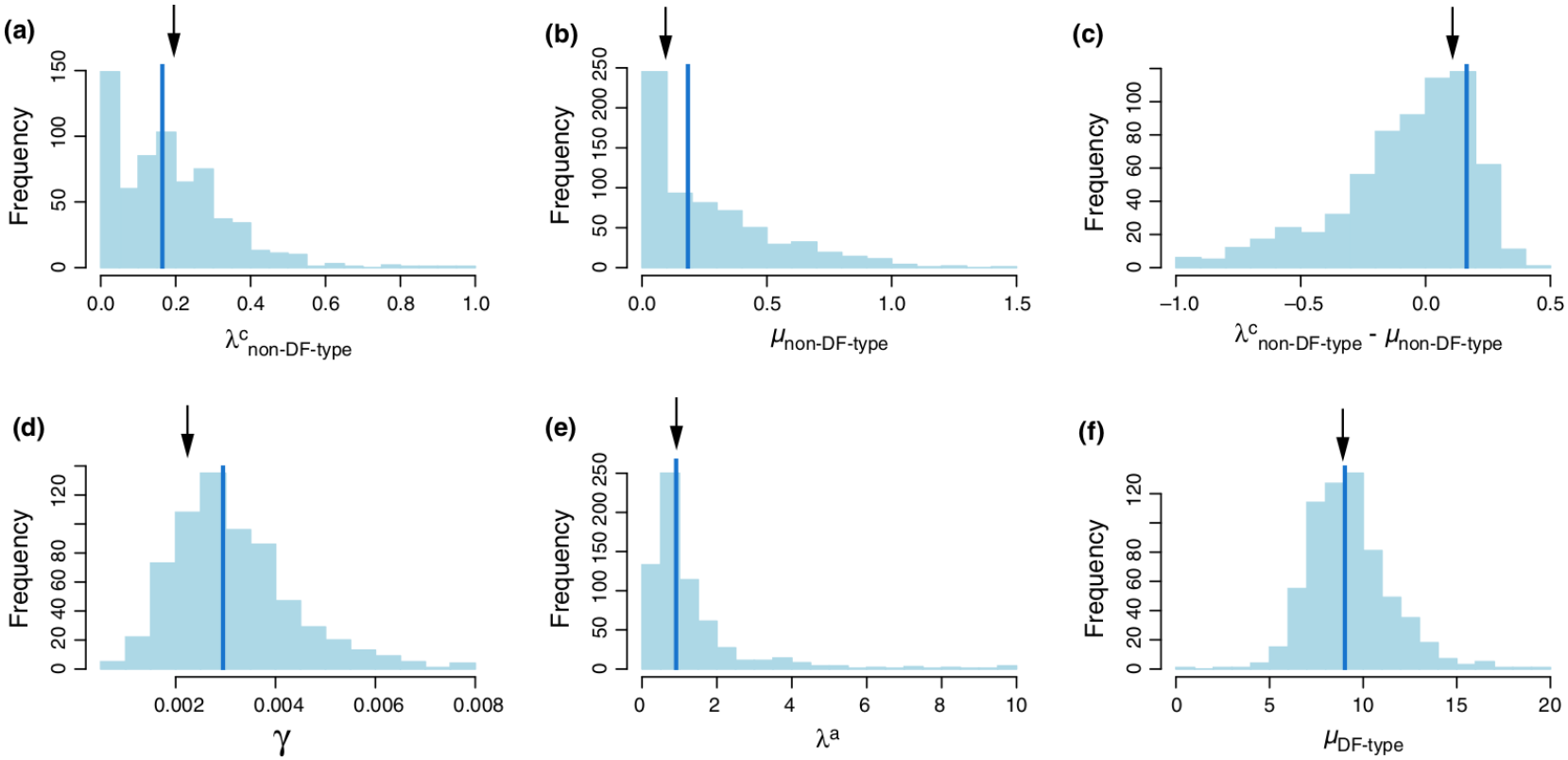
Name	Background					Darwin's finch type		
	λ^c	μ	K'	γ	λ^a	λ^c	μ	K'
M8	0.20	0.09	-	0.002	0.87	$\gg \mu K'$	8.91	14.99



Modified from Valente et al. (2015)

Figures

Name	Background					Darwin's finch type		
	λ^c	μ	K'	γ	λ^a	λ^c	μ	K'
M8	0.20	0.09	-	0.002	0.87	$\gg \mu K'$	8.91	14.99



Valente et al. (2015)

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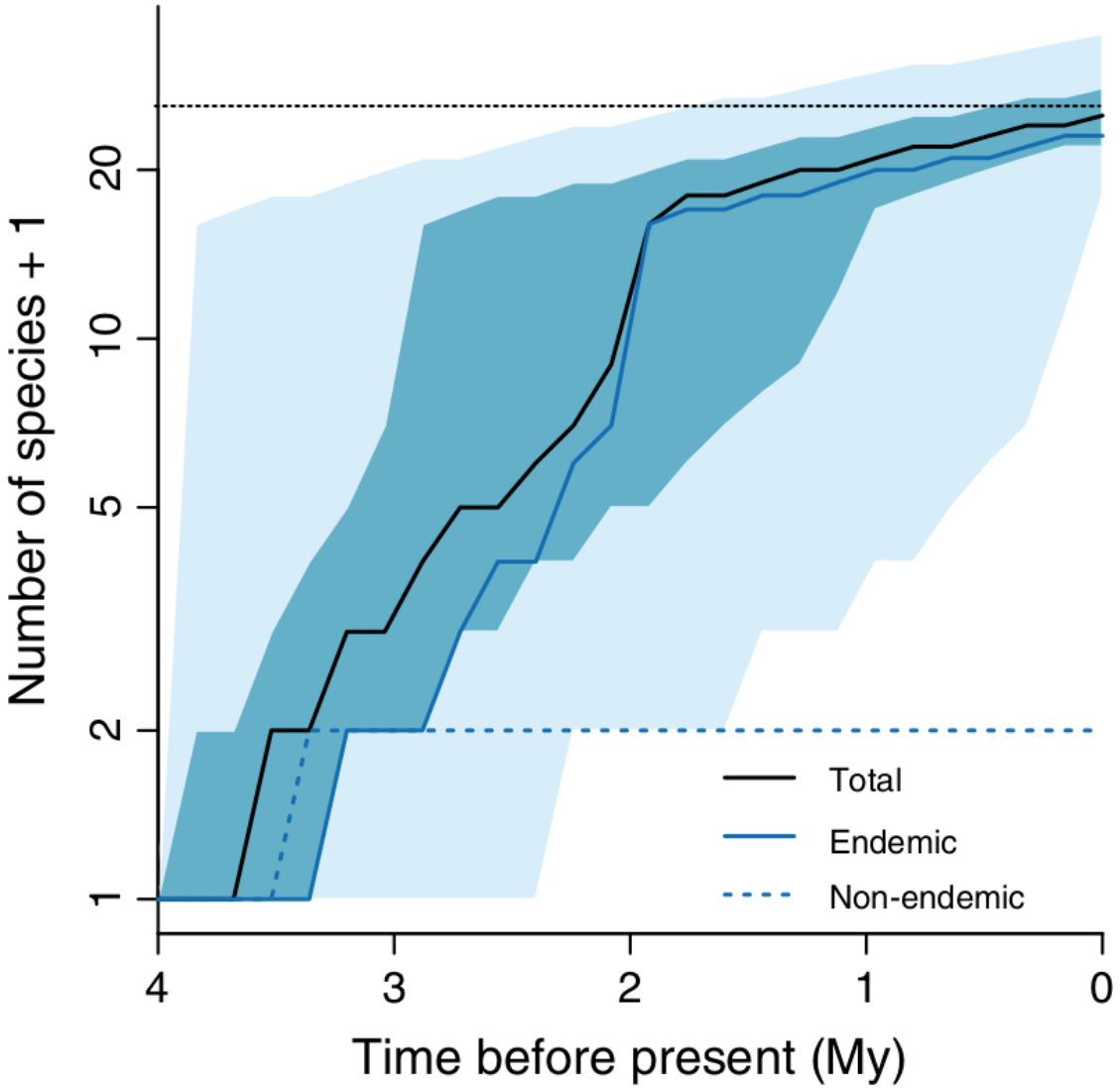

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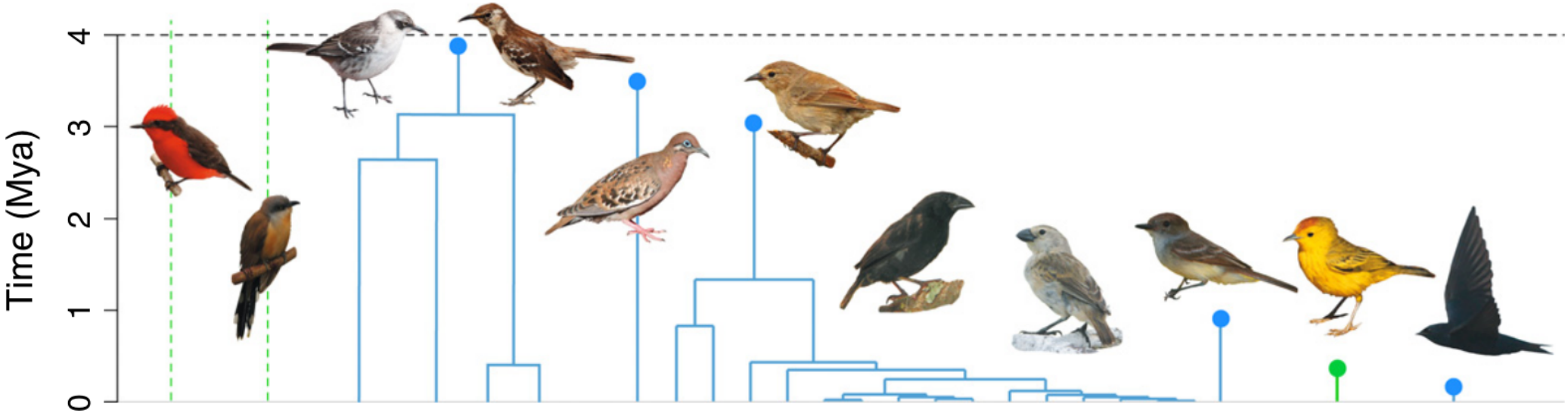

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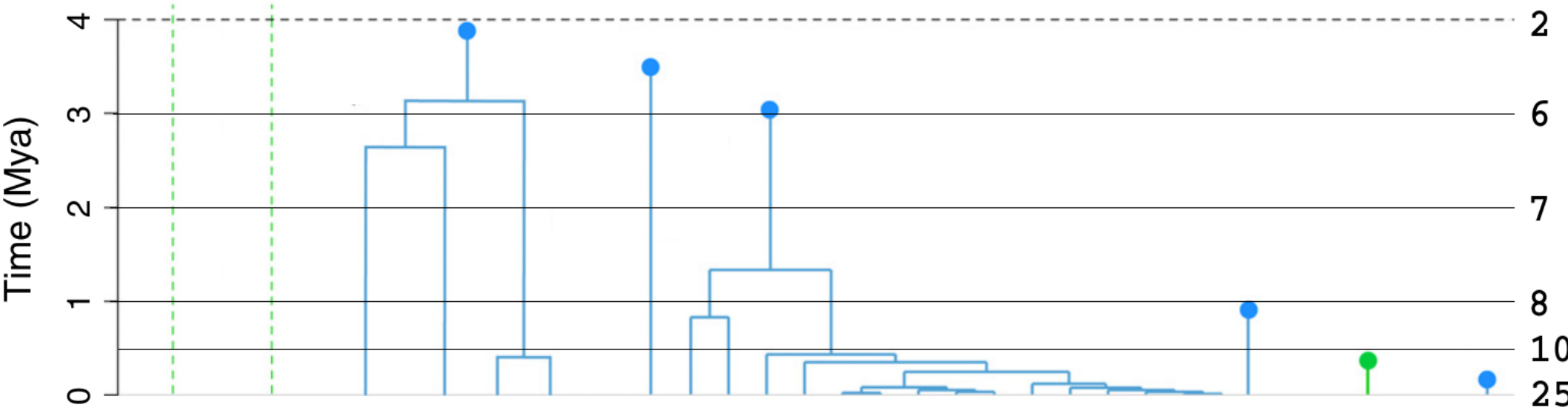

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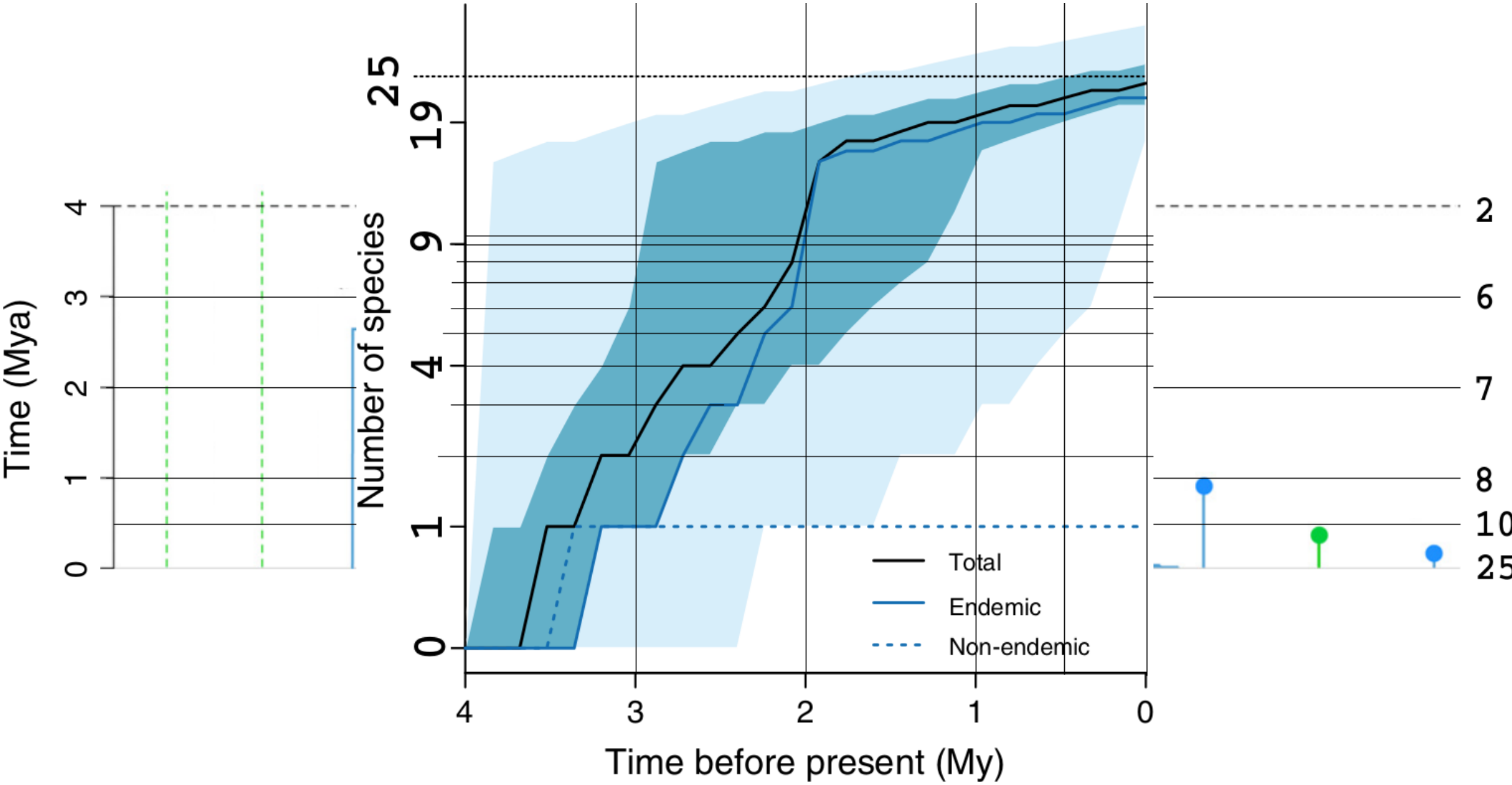

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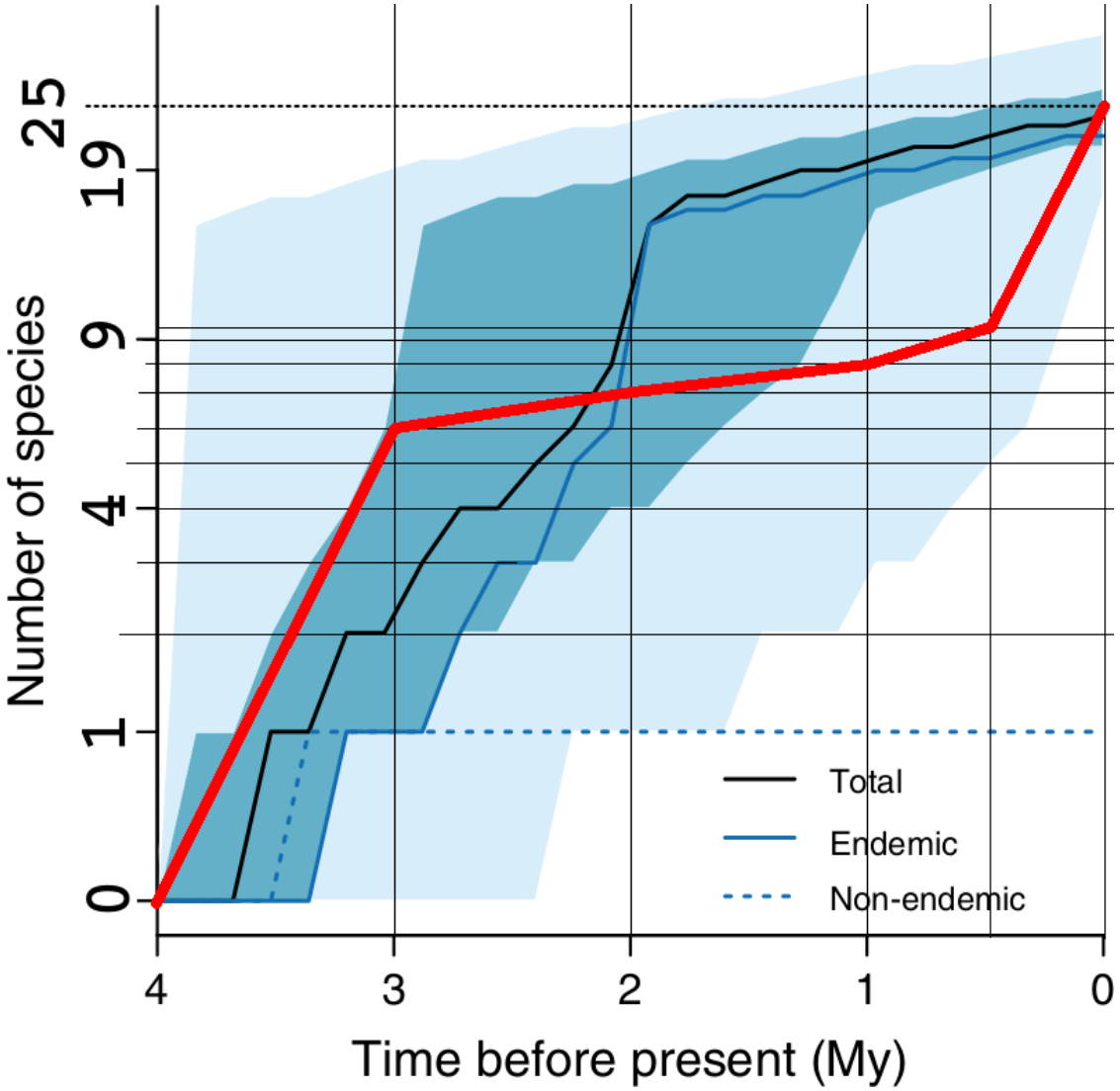

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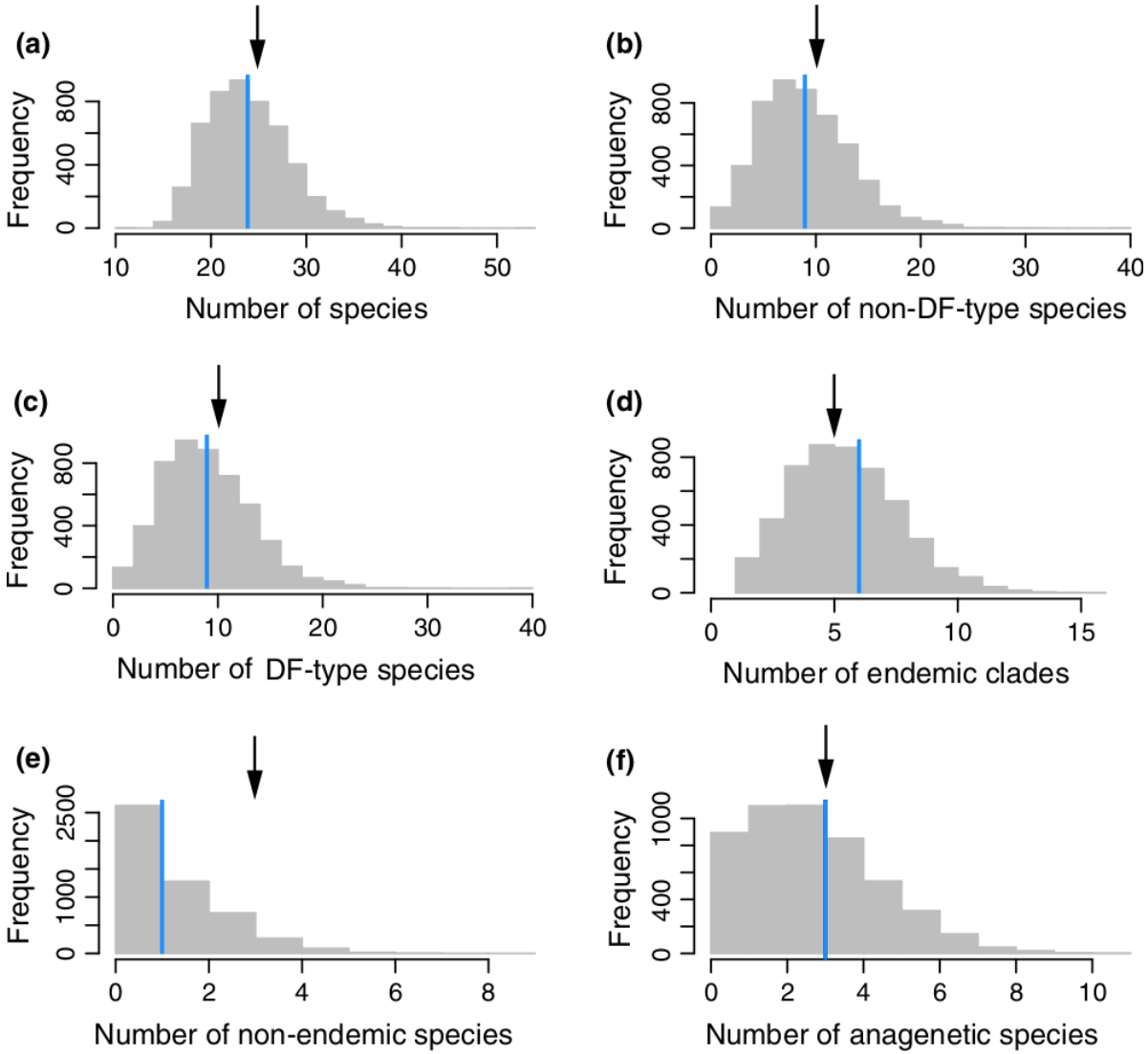

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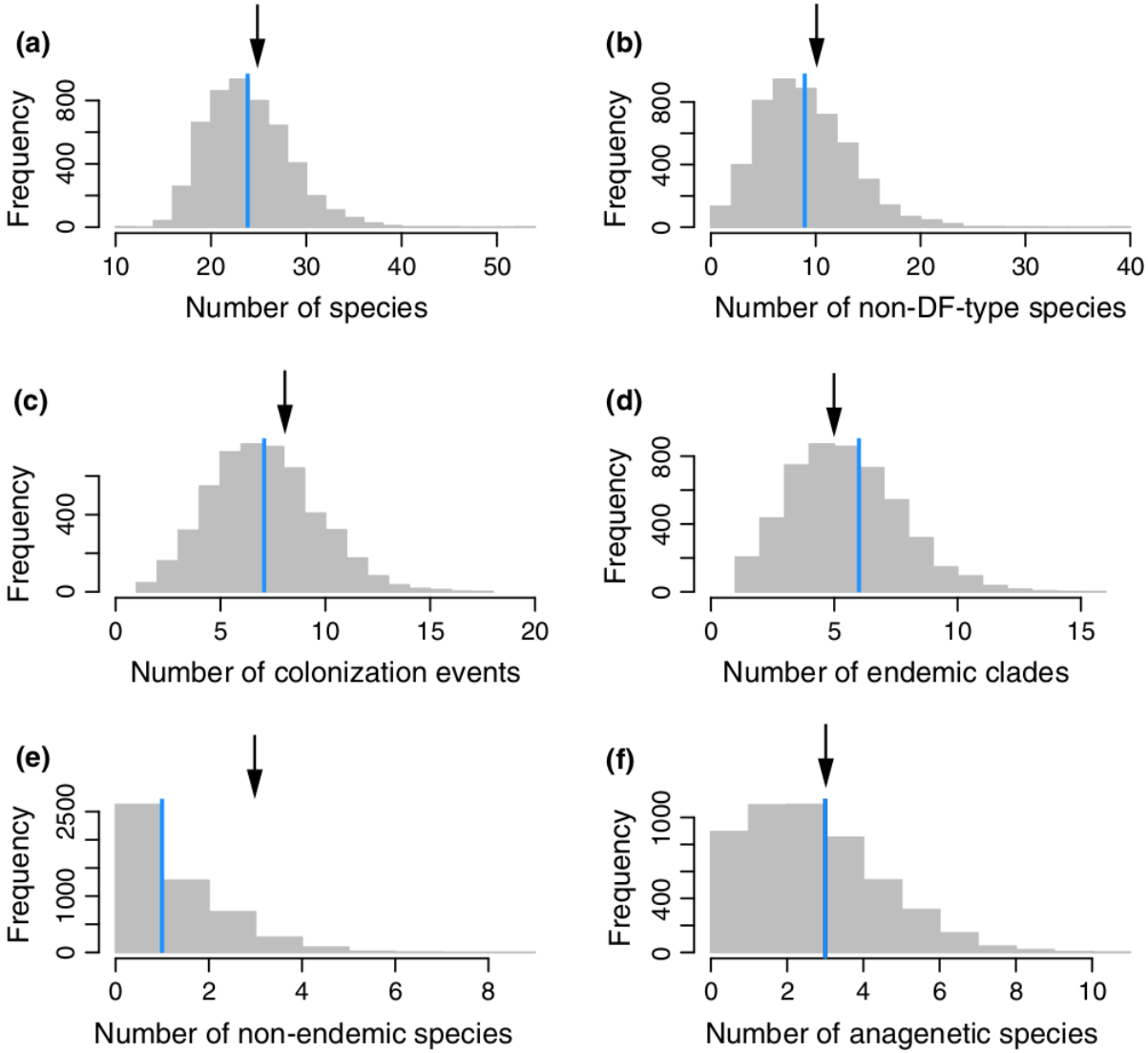

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(1) there is no unification

(2) ugly results are omitted

Questions

What do you think?