

# Macroevolutionary signals of insular adaptive radiations



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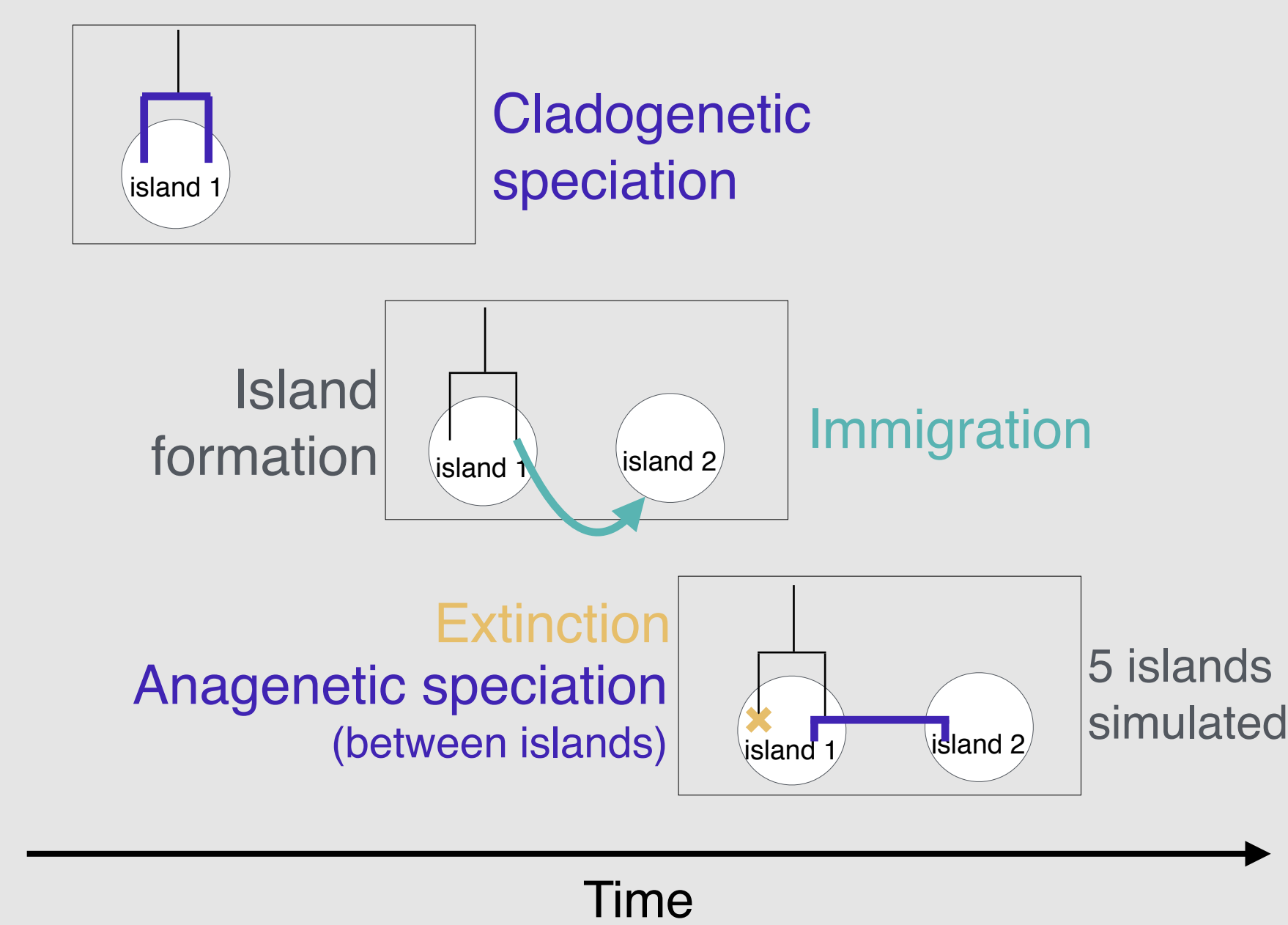
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## Introduction

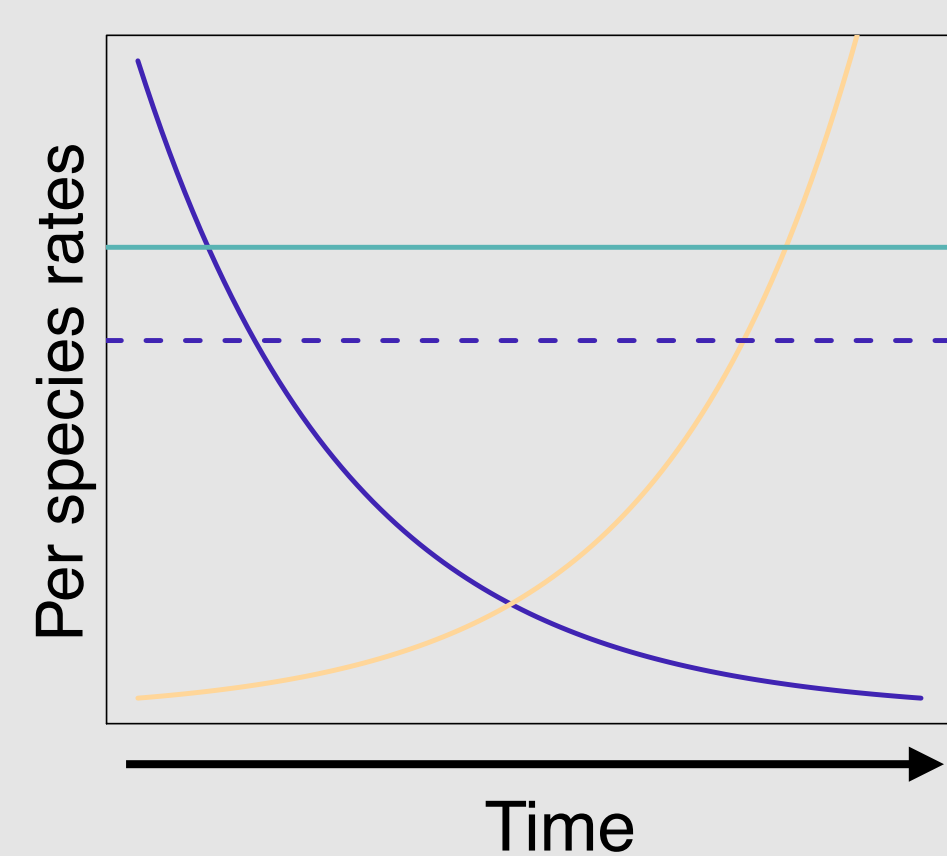
- Whether macroevolutionary rates can be inferred from phylogenies is debated<sup>[1, 2]</sup> but often critical for studies of diversification, thus new statistical methods are needed
- It remains unclear what kinds of evolutionary scenarios (distinguished by differing rates of speciation, extinction and immigration) lead to insular adaptive radiations<sup>[3, 4]</sup>
- Hotspot archipelagos, because of their discrete formation in space and time, provide a framework for examining diversification rates
- Here we present simulation results demonstrating
  - the statistical identifiability of macroevolutionary rates
  - different phylogenetic patterns emergent from different tempos and modes of diversification

## Methods

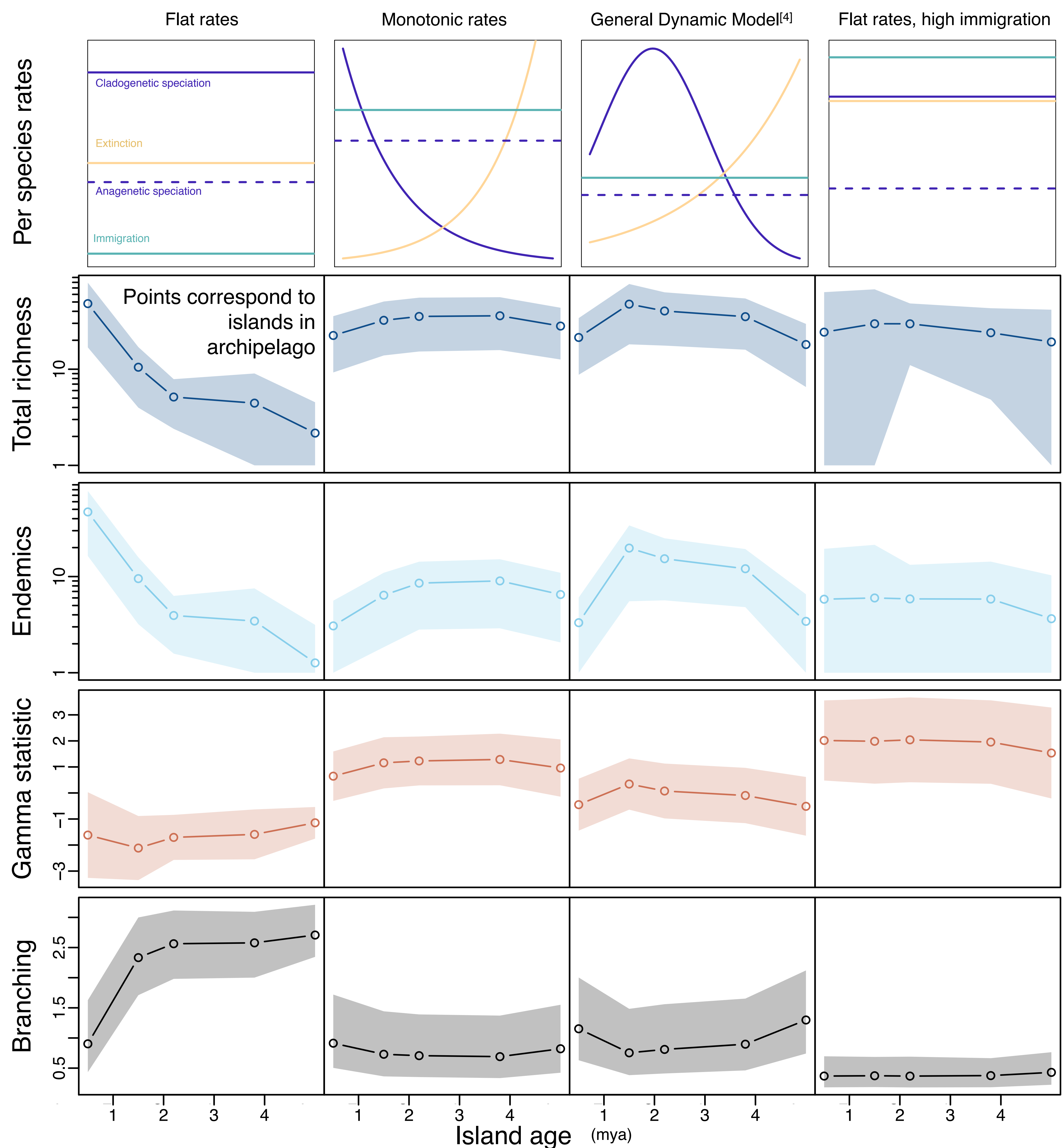
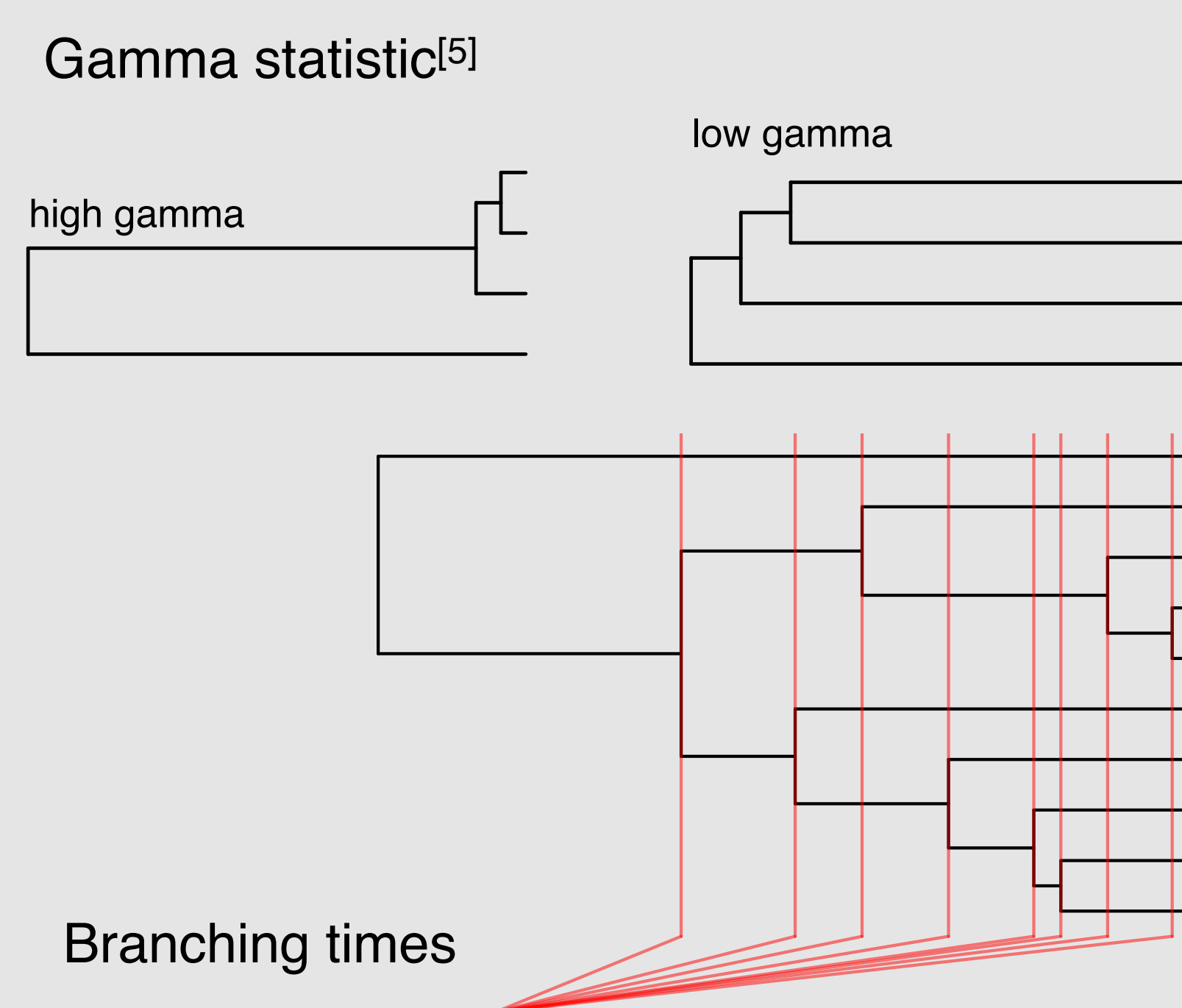
### Simulate phylogenies from diversification scenarios across actively forming archipelago



### Evolutionary rates can vary through time



### Calculate phylogenetic metrics



## Discussion

- Different evolutionary scenarios can be identified based on the signatures they leave in gross patterns of phylogenetic structure and species richness across simulated hotspot archipelagos; thus age-structured landscapes are statistically ideal for studying macroevolution
- The pattern of peak richness being found on middle aged islands, characteristic of many adaptive radiations<sup>[3]</sup> is most commonly produced by evolutionary scenarios with time-variable rates; however, overshoots are possible, but rare, without time variable rates
- Joint modeling of multiple related clades could help distinguish whether overshoots are the rare outcomes of time-homogeneous diversification
- The gamma statistic is most indicative of immigration (as seen in the figure, immigration rate increases from left to right as does the gamma statistic), not speciation and extinction processes. Therefore, gamma should not be used to infer those rates

## Notes & Acknowledgements

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- [4] Whittaker RJ, Triantis KA & Ladle RJ (2008) *Journal of Biogeography* 35:977-994.
- [5] Pybus OG & Harvey PH (2000) *Proceedings of the Royal Society of London. Series B* 267:2267-2272.

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