Hidden States and Threshold Traits: Dimensions of Avian Migration

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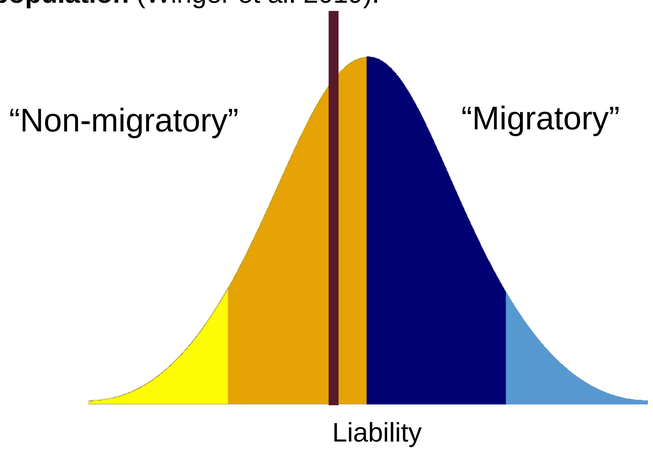
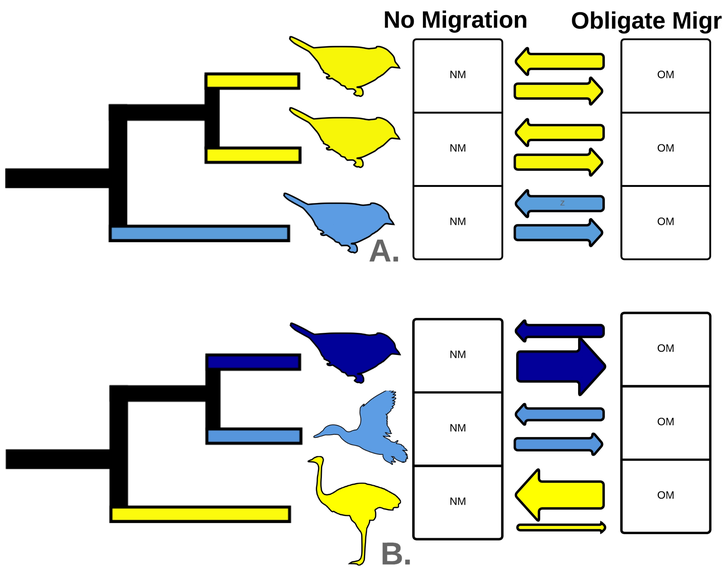
How should we think about migration as a trait?

Migratory status is highly variable between and within species, making it hard to encode

Evolution of migration may be understood as the variable intensification of behavior in any given population (Winger et al. 2019).

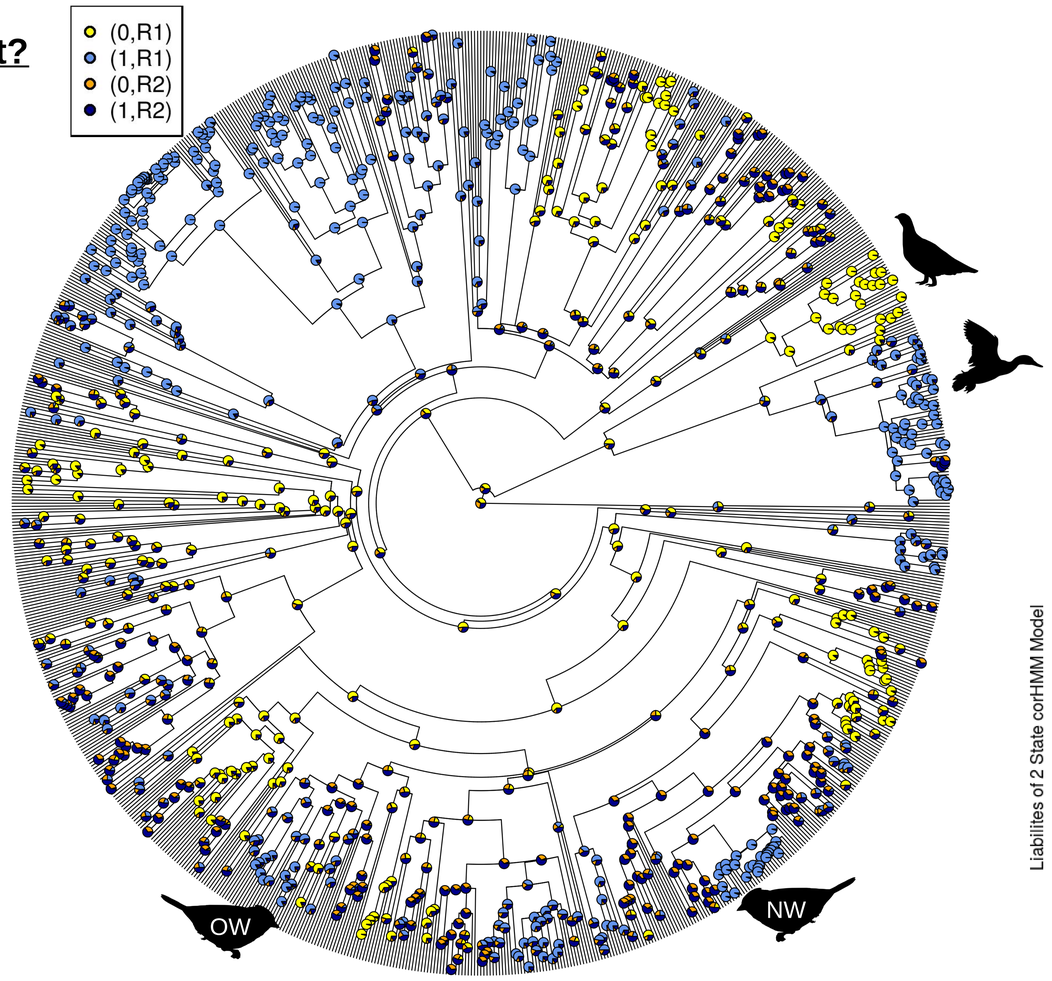


Evolutionary Precursor Hypothesis: Not all birds are equally likely to evolve migratory behavior (Outlaw and Voelker 2006)



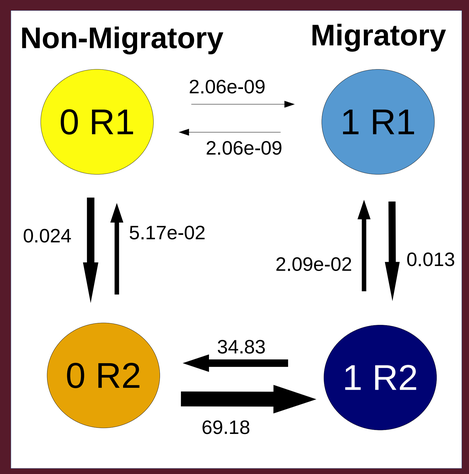
A. Previous studies treating migration as a binary character, suggesting all birds have the same ability to transition between migratory states

B. Hidden-rate Markov modeling accounts for heterogeneity by allowing varying rates between unobserved states



Transitions mostly occur between similar states (R1 → R2) or between “fast” states (R2 →R2),

Number of Hidden States	Δ AIC
0 states	+60
2 states	0
4 states	+16



References

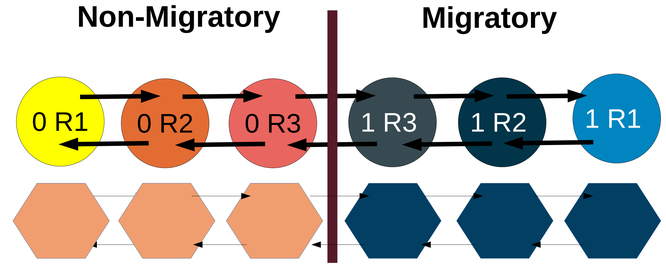
Winger et al, *Biological Reviews* 2019

Outlaw & Voelker, *The Auk*, 2006

Acknowledgments

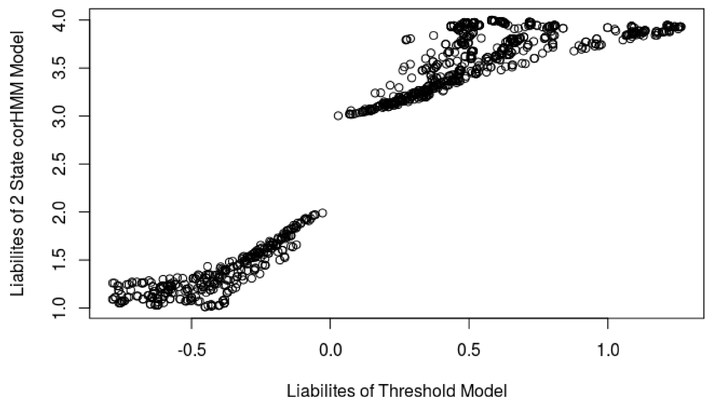
Thanks are owed to helpful suggestions from the Uyeda lab group.

Migration as a threshold trait



Structure of best supported model suggests migration is a threshold trait

Migration may best explained with multiple dimensions



Suggestions?

What traits could help explain away these hidden states?