

Evolutionary history of eastern subterranean termites:
Distributional shifts and postglacial expansion in the Appalachian Mountains

Chaz Hyseni

and

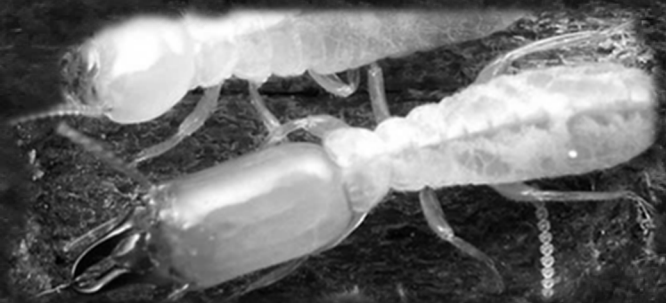
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MISSISSIPPI**

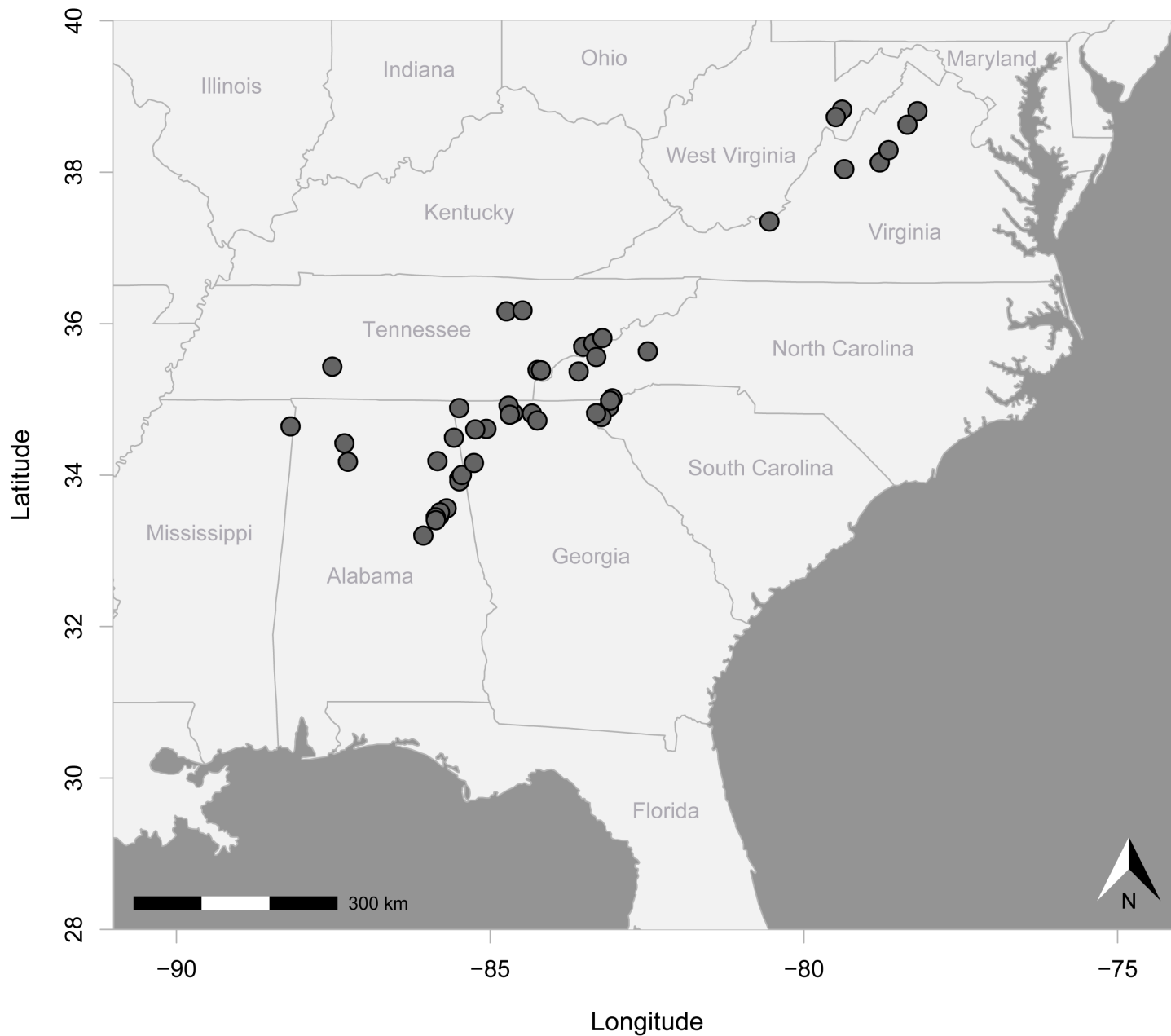




Cordilleran
Ice Sheet

Laurentide Ice Sheet

Sampling



46 sites:

50 logs:

128 individuals

Genetic Data Collection



DNA sequencing:

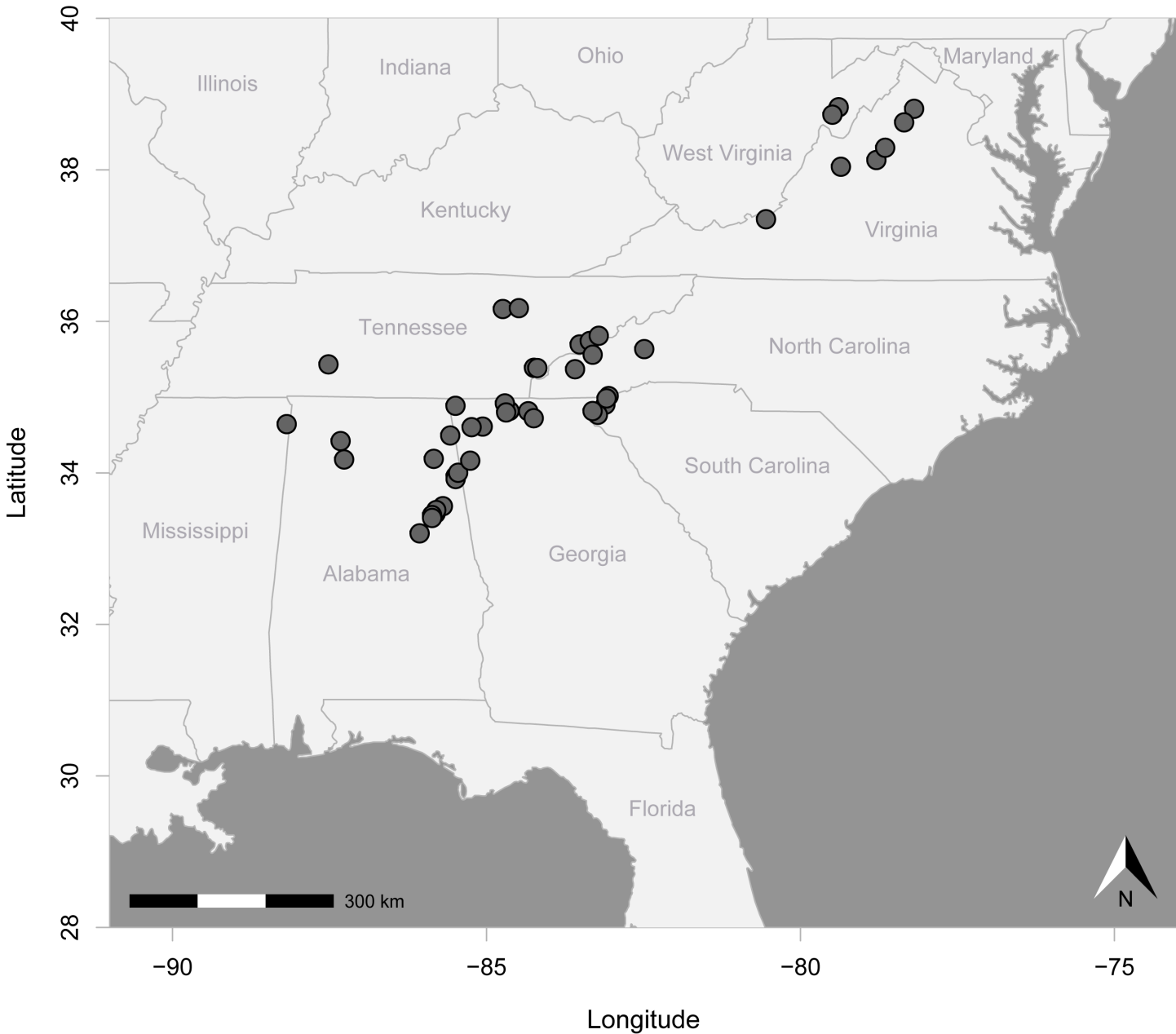
2 markers:

1 nuclear:

endo-beta-1,4-glucanase
(seq. length: 251 bp)

1 mitochondrial:

cytochrome c oxidase I and II
(seq. length: 1,117 bp)



Evolutionary History of *Reticulitermes flavipes*

Divergence of genetic lineages → dealing with environmental change

Population size dynamics → is population size increasing?

Geographic distribution → is geographic distribution shifting/expanding?

Evolutionary History of *flavipes*: Questions

- How many lineages of *flavipes*?
- When did these lineages arise and how did they change through time?
- Did distributional change affect genetic divergence of *flavipes*?

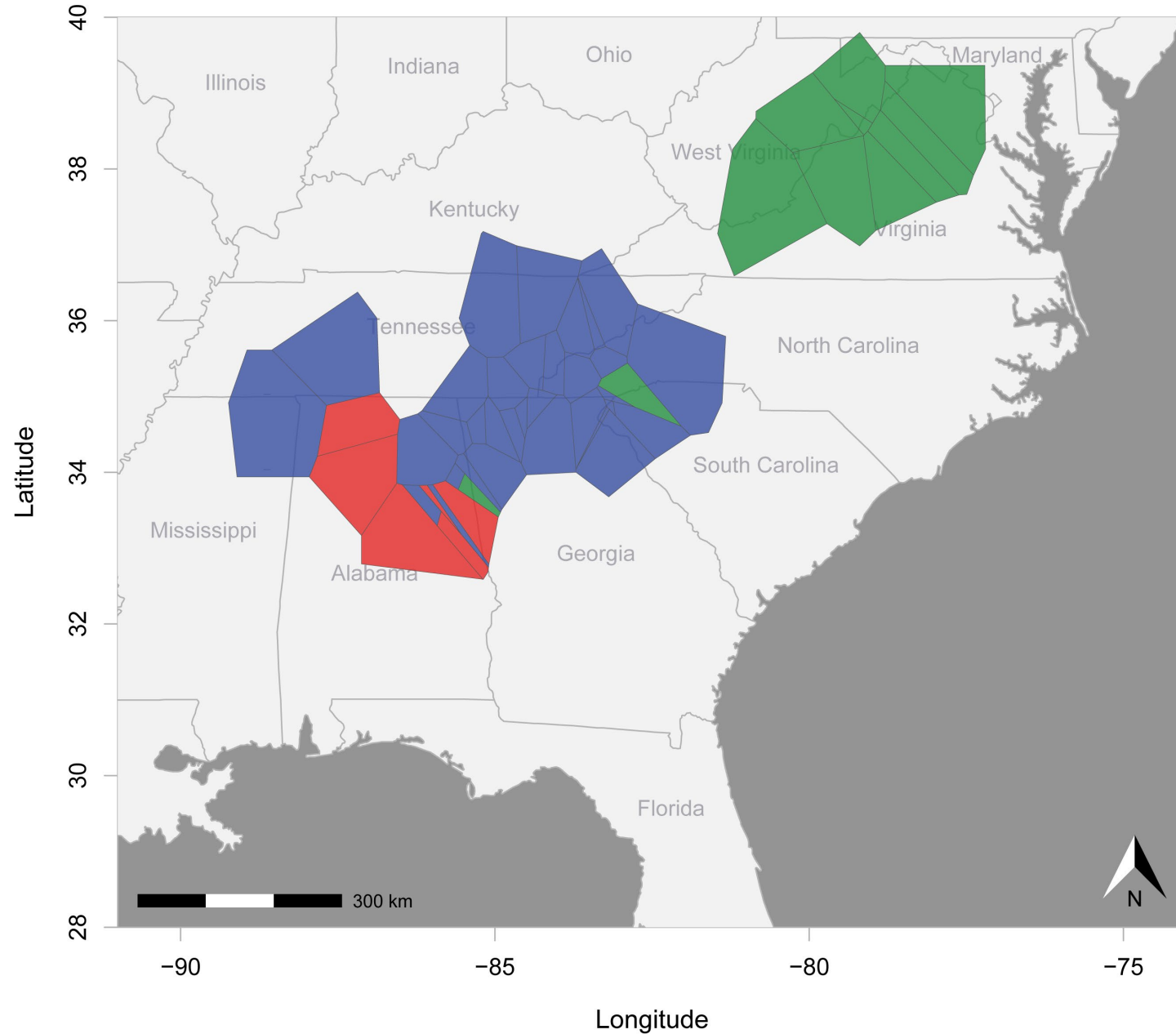
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Evolutionary History of *flavipes*: Questions

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How many lineages?



Three Lineages:

N = Northern

C = Central

S = Southern

When did *flavipes* lineages arise and how did they change through time?

Approximate Bayesian Computation

Competing evolutionary history hypotheses characterized using:

Divergence time

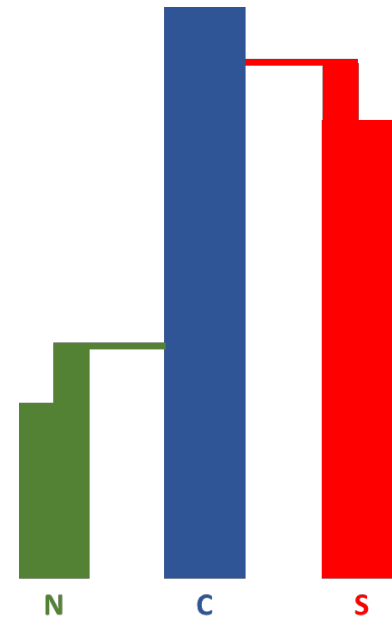
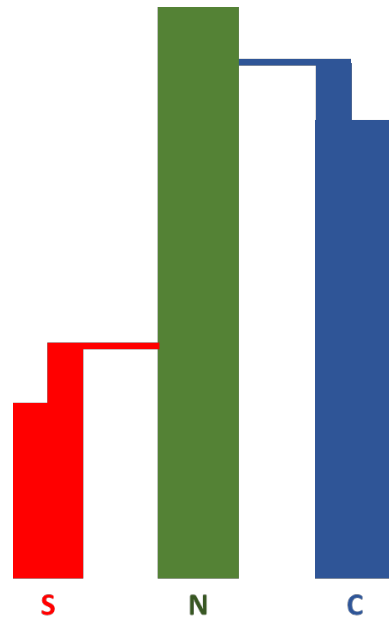
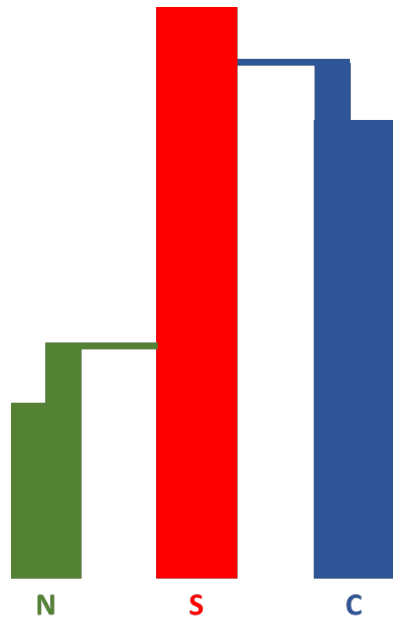
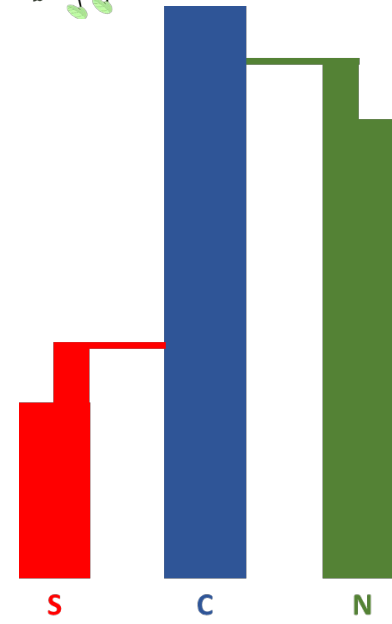
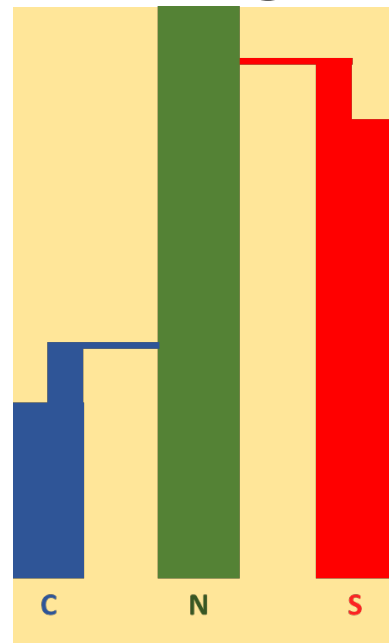
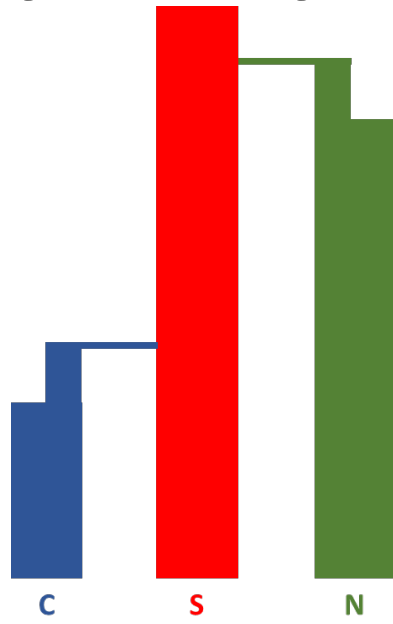
Population

Best-fit hypothesis: closest match between simulated and empirical data:

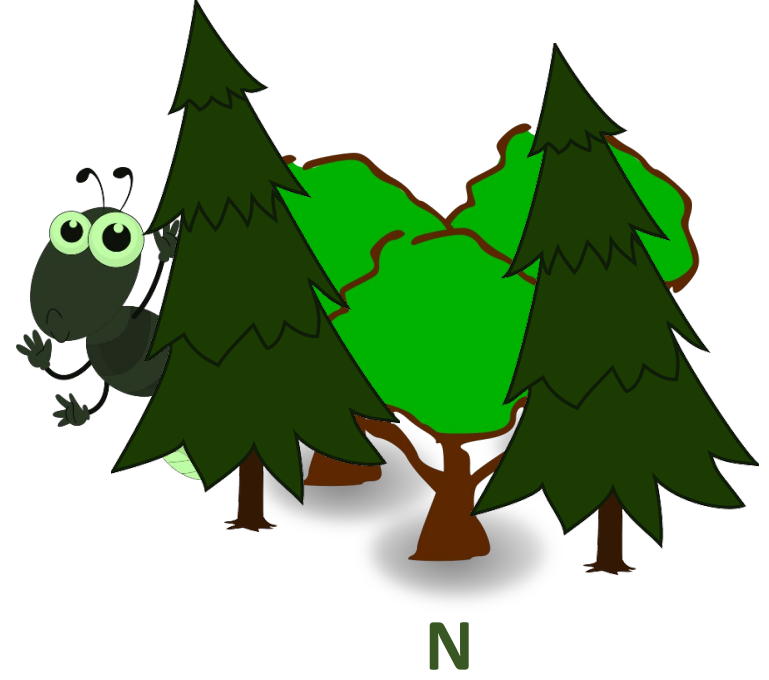
1 million simulated datasets for each hypothesis

Compare simulated data with empirical data

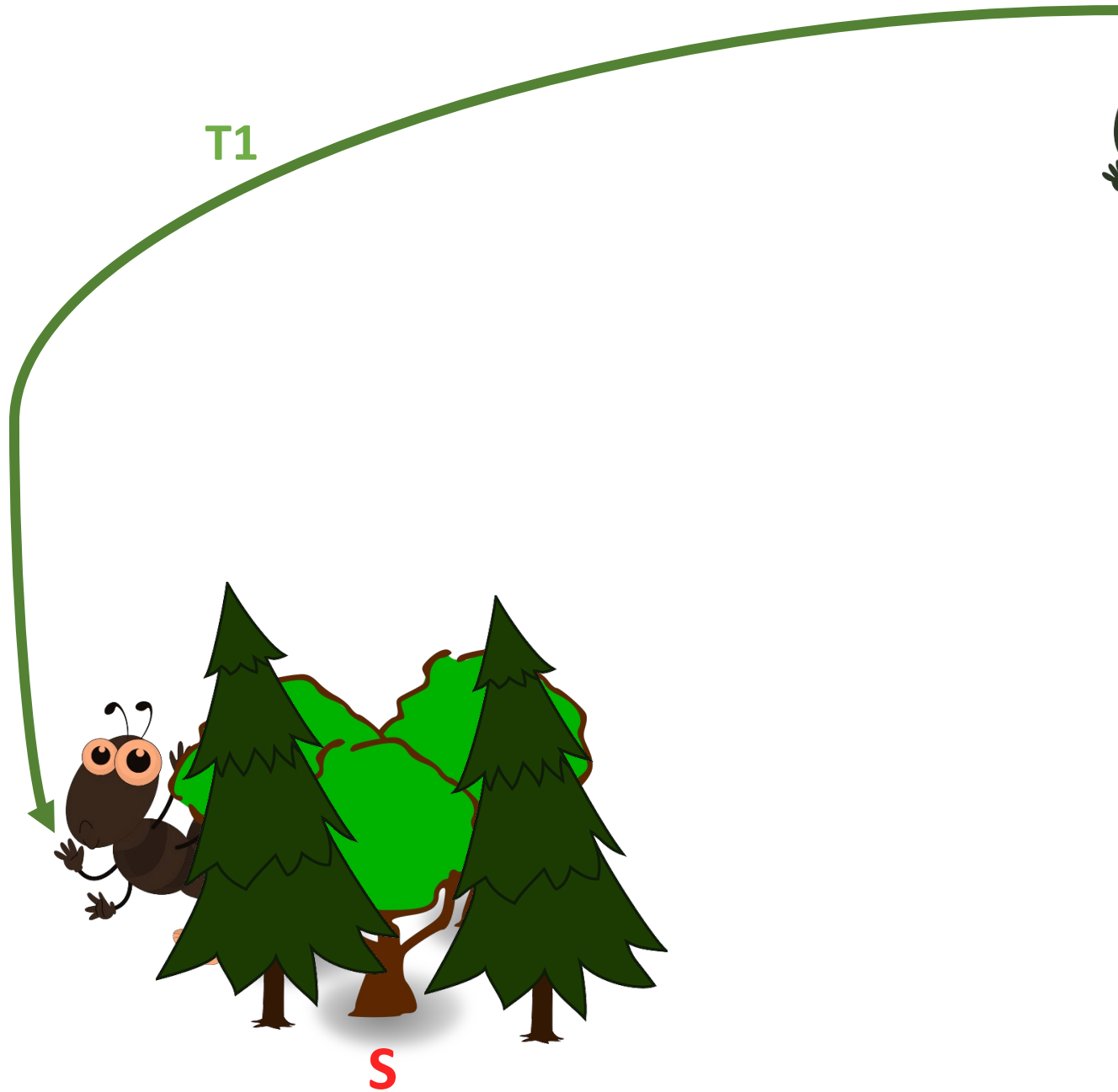
Evolutionary History Hypotheses: Single Source



Single Source: N

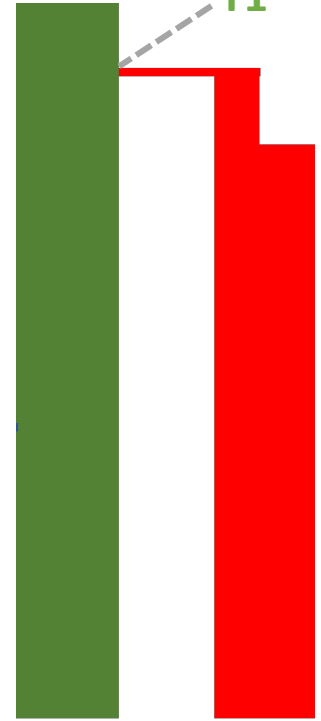


Single Source: $N \rightarrow S$



N

T1

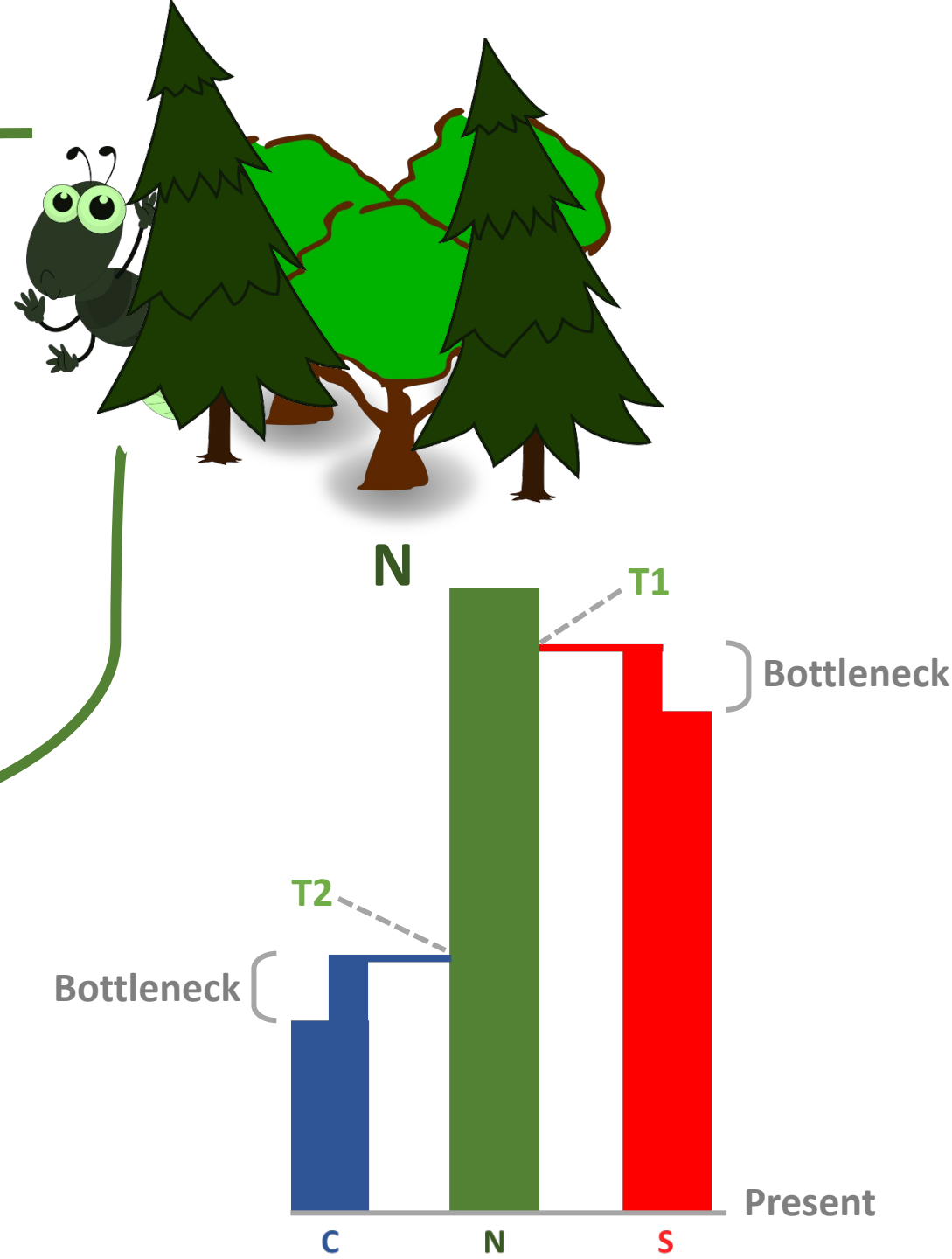
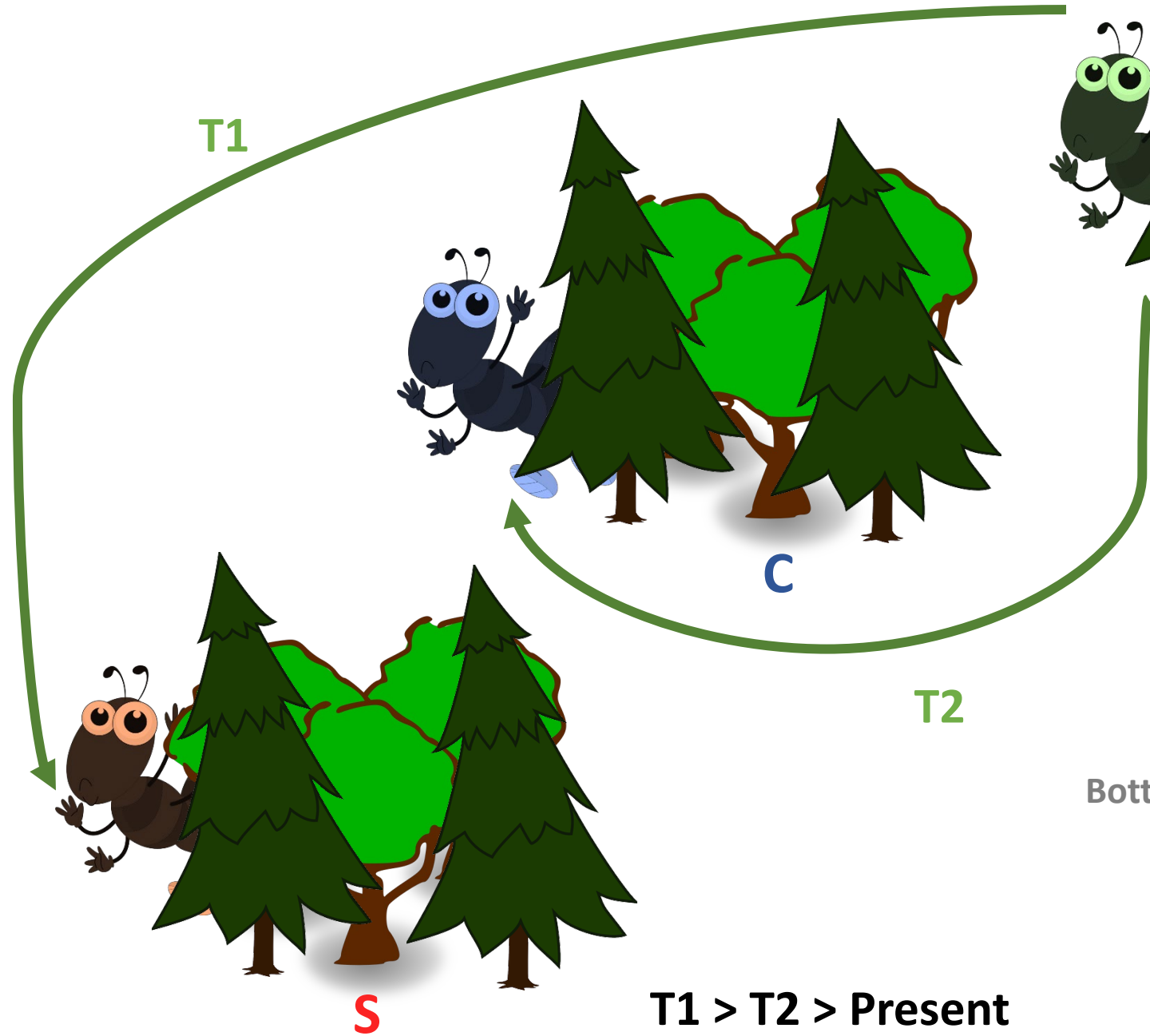


Bottleneck

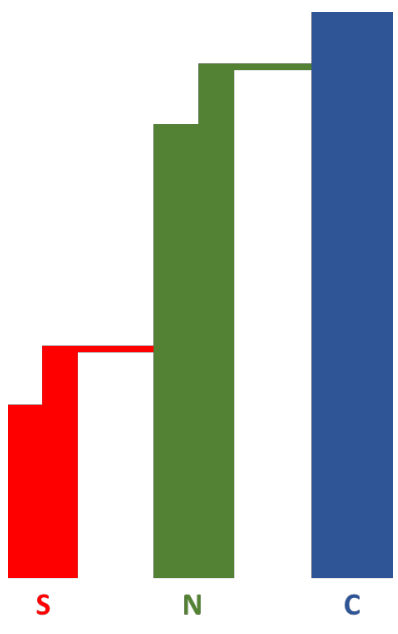
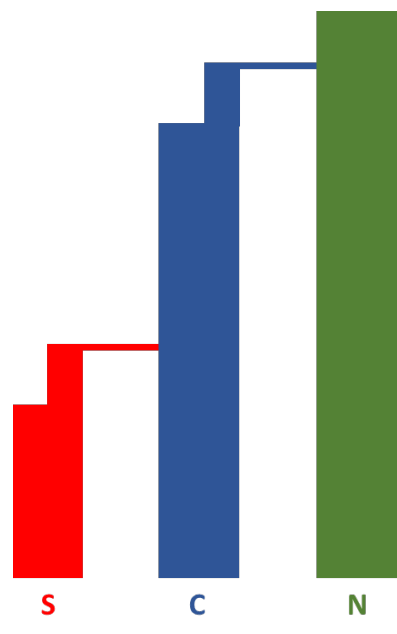
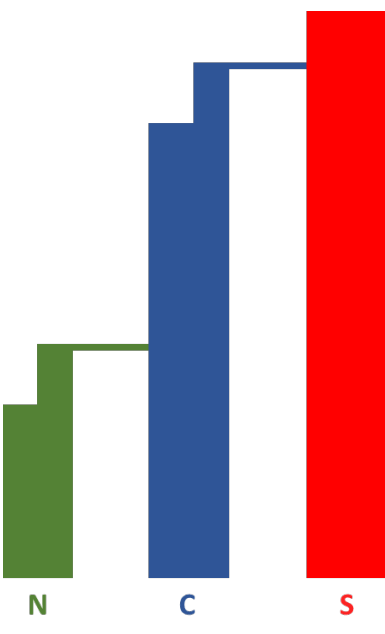
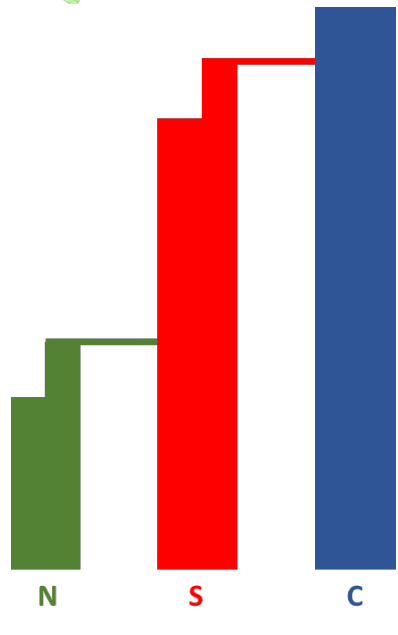
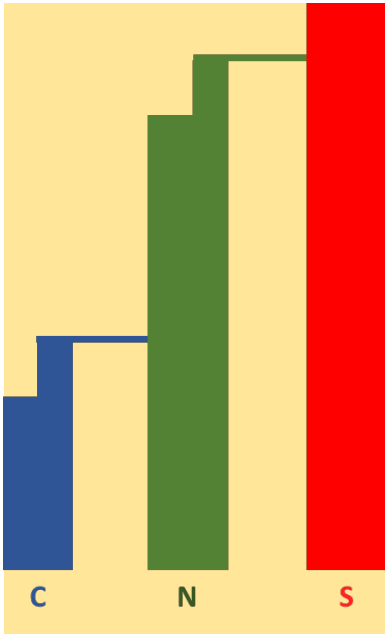
N

S

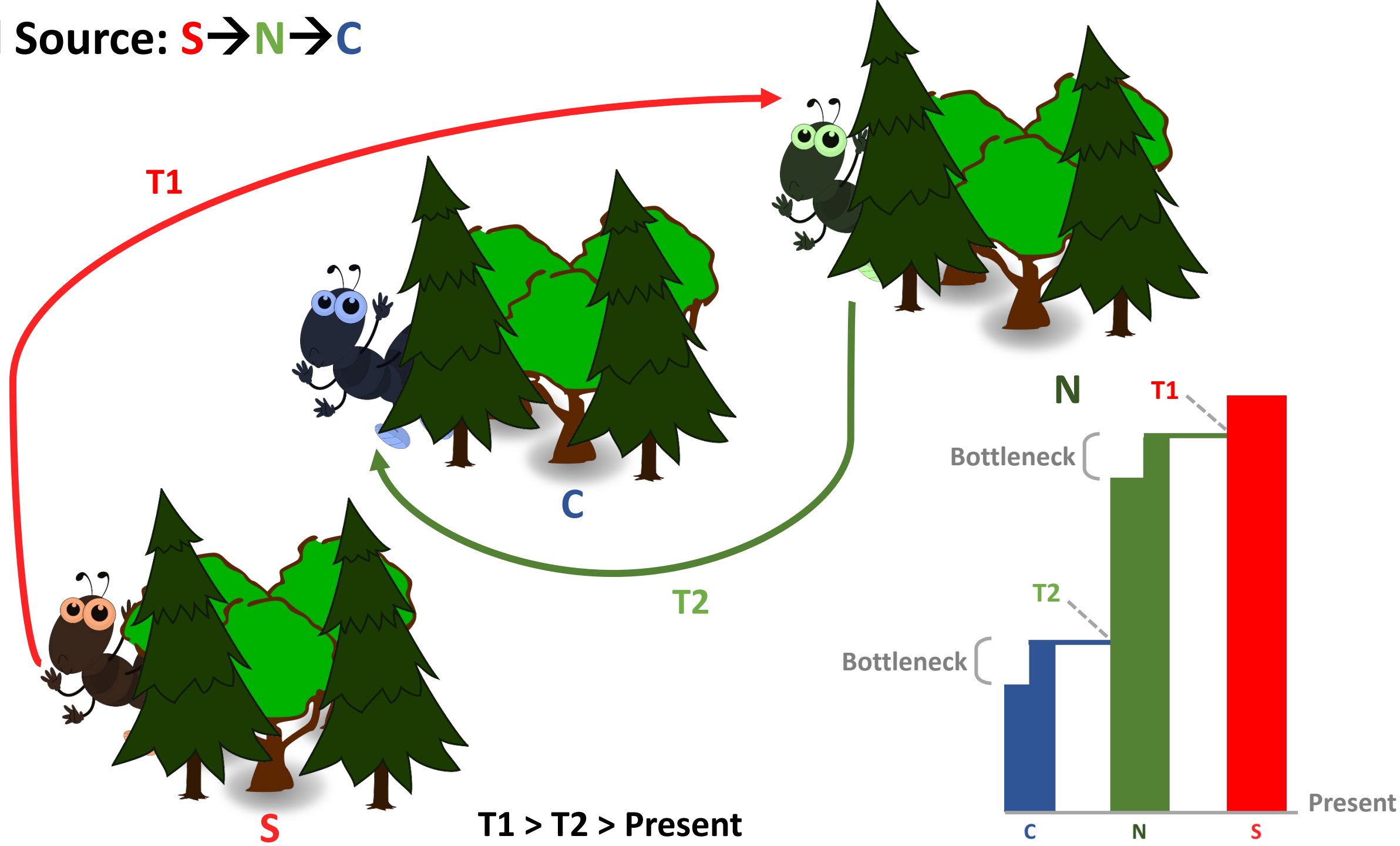
Single Source: $N \rightarrow S$; $N \rightarrow C$



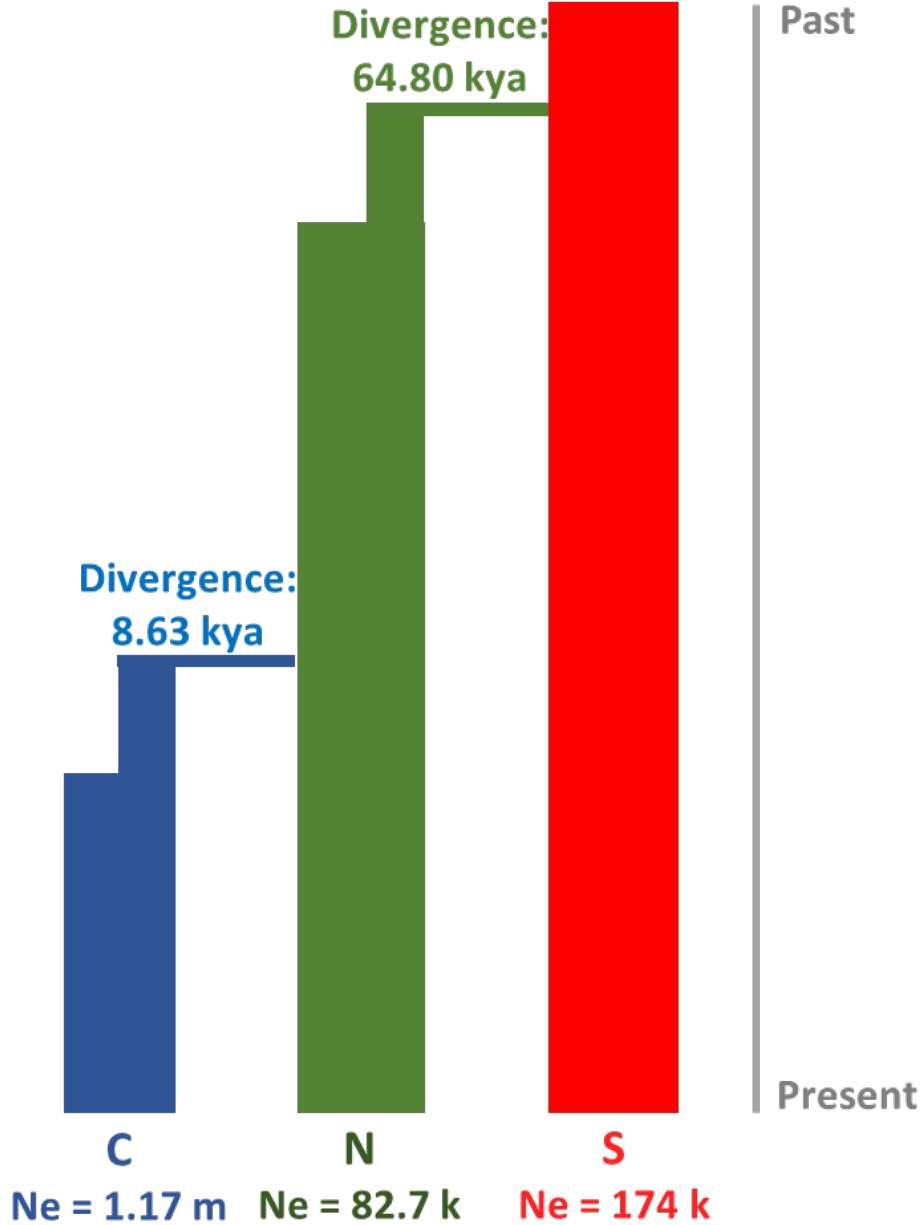
Evolutionary History Hypotheses: Dual Source



Dual Source: $S \rightarrow N \rightarrow C$

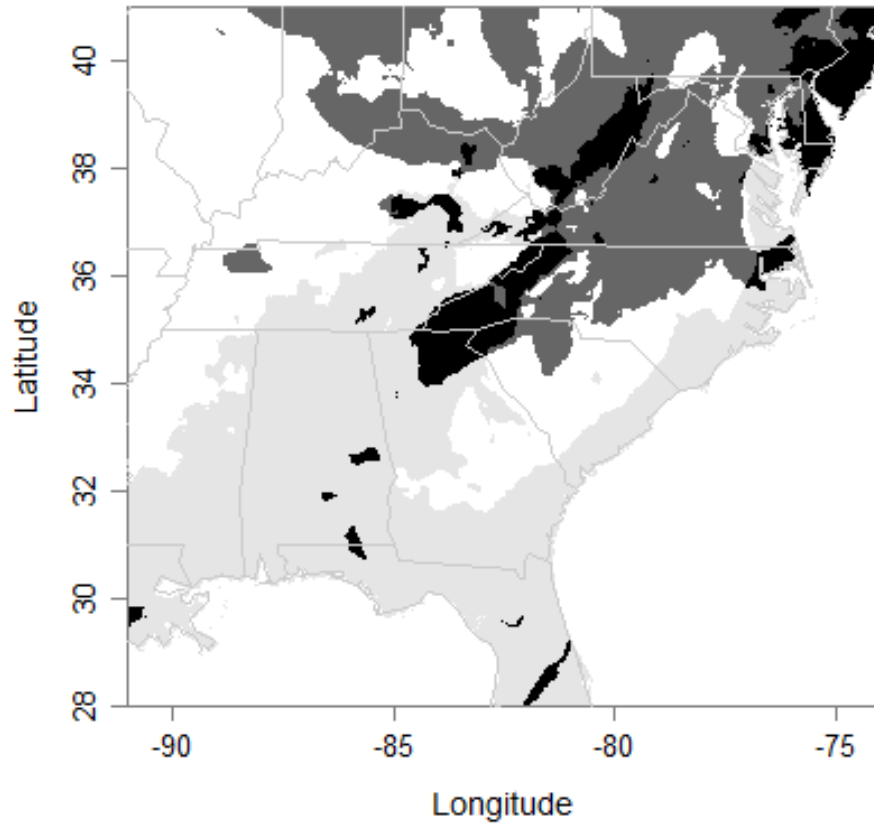


Best-Fit Hypothesis

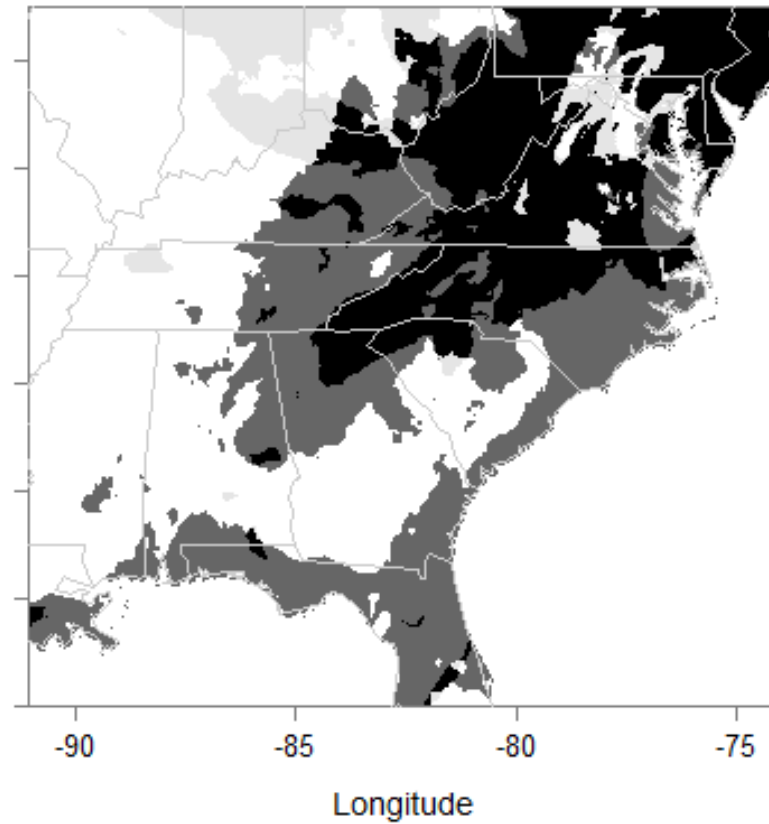


Did distributional change affect genetic divergence of *flavipes*?

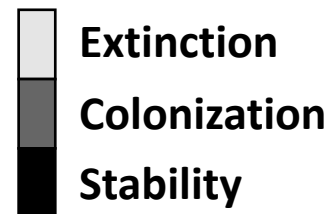
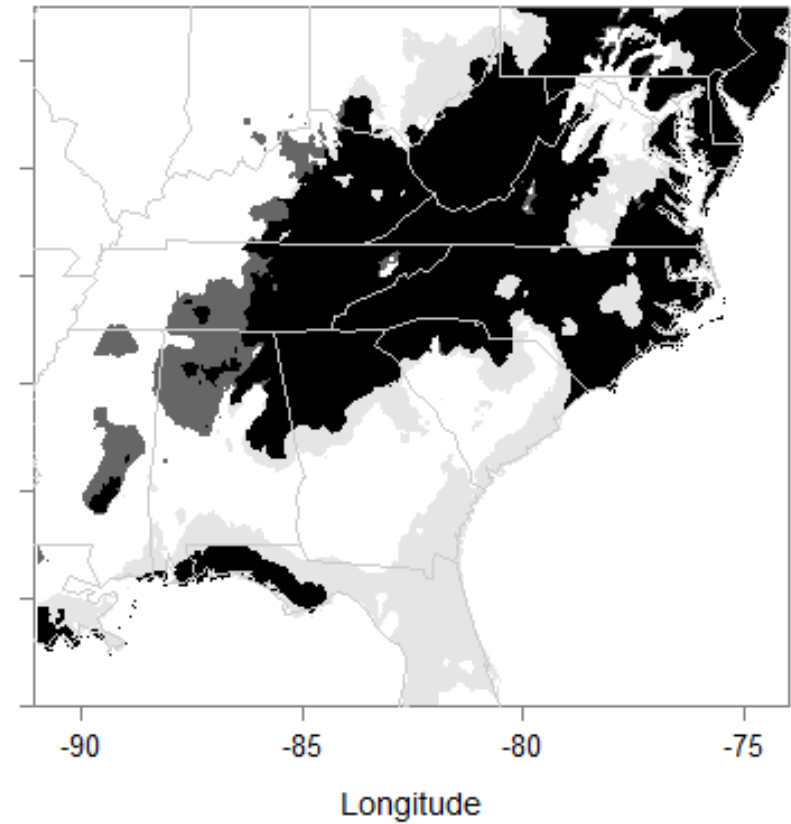
120,000 to 22,000



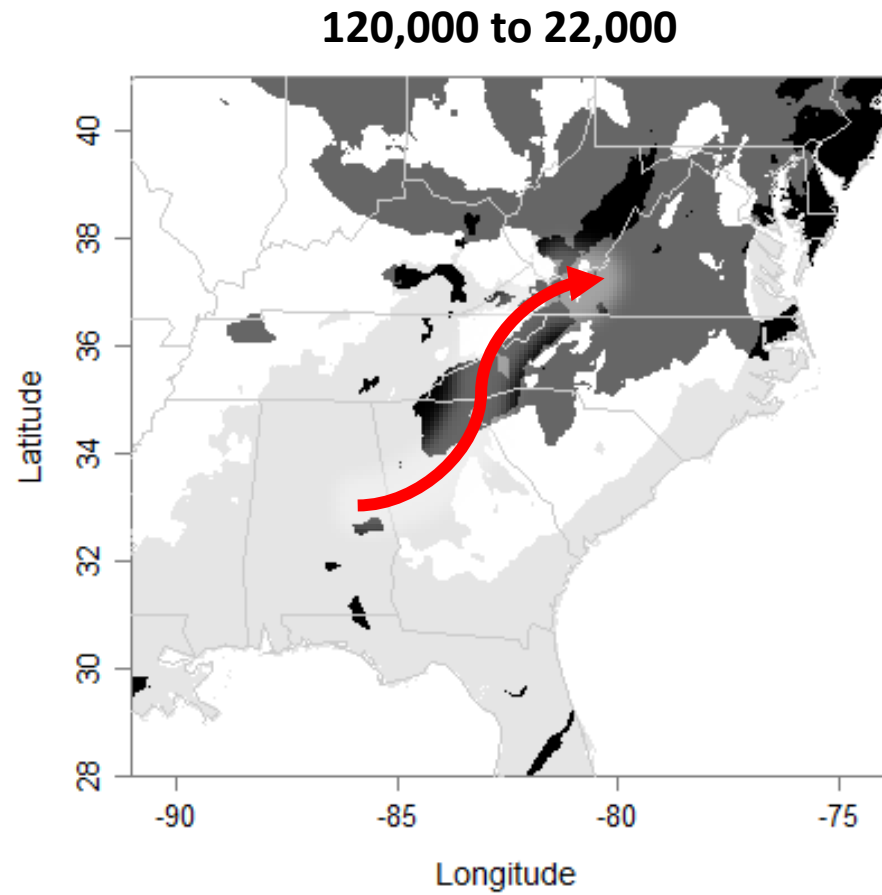
22,000 to 6,000



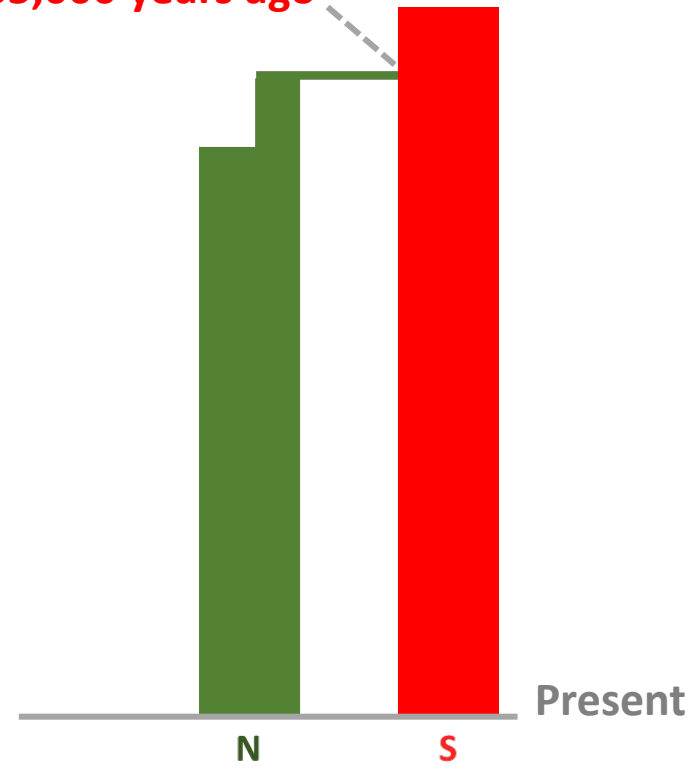
6,000 to present



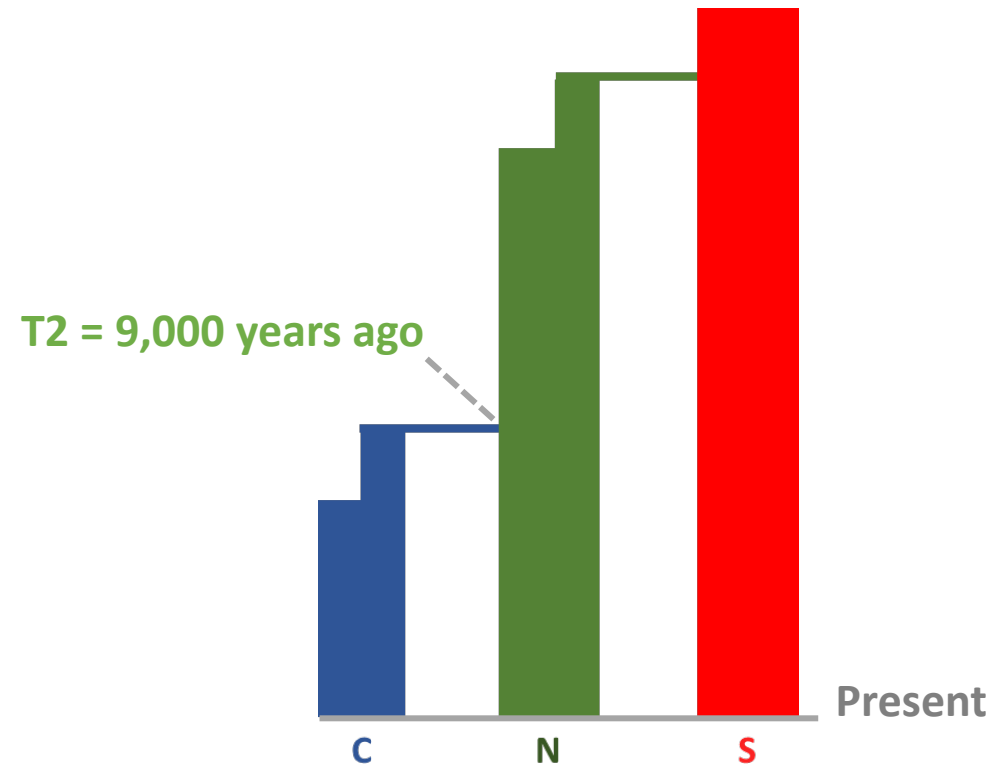
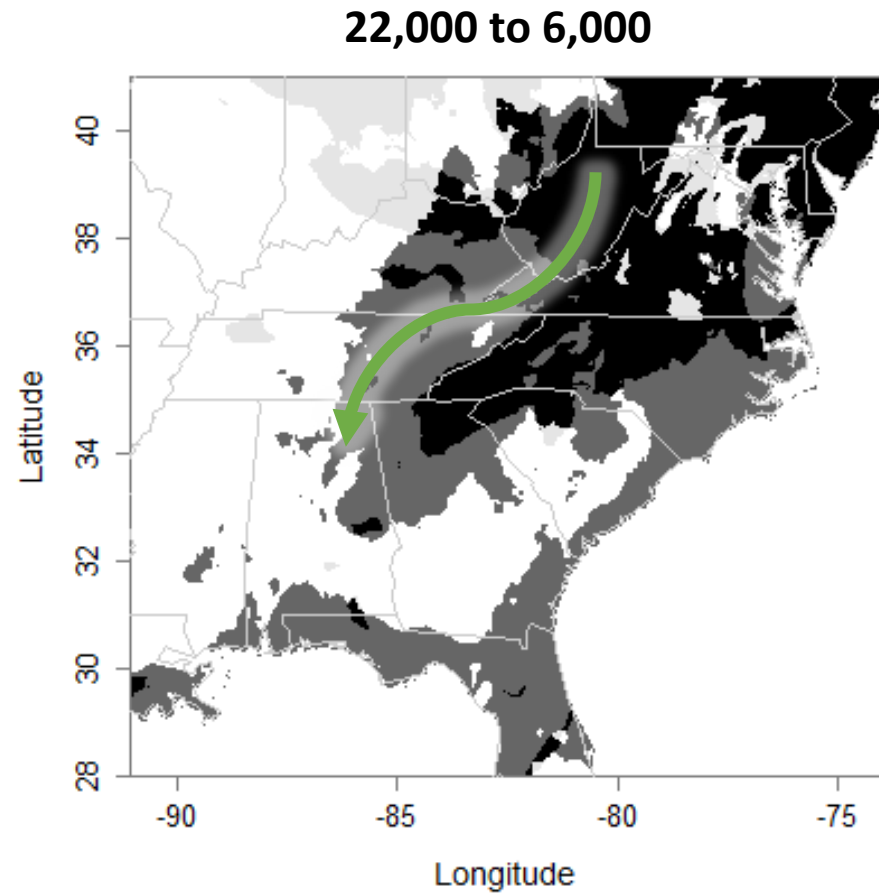
Distributional Shift: South-to-North



T1 = 65,000 years ago

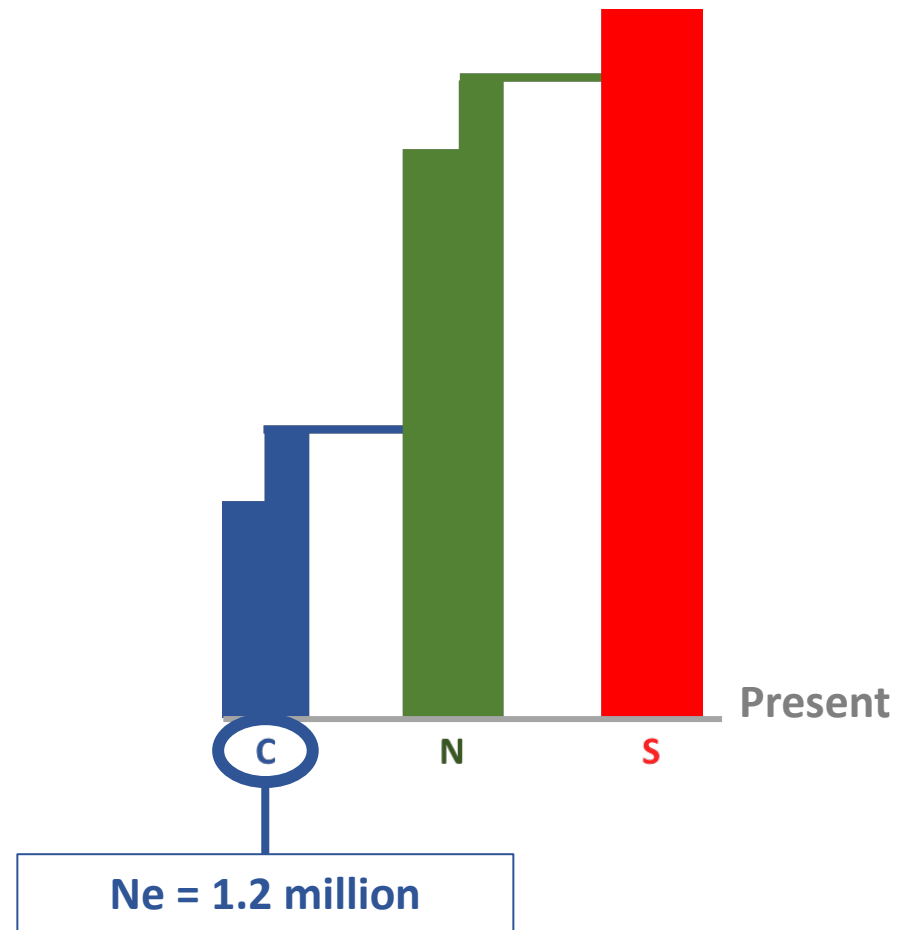
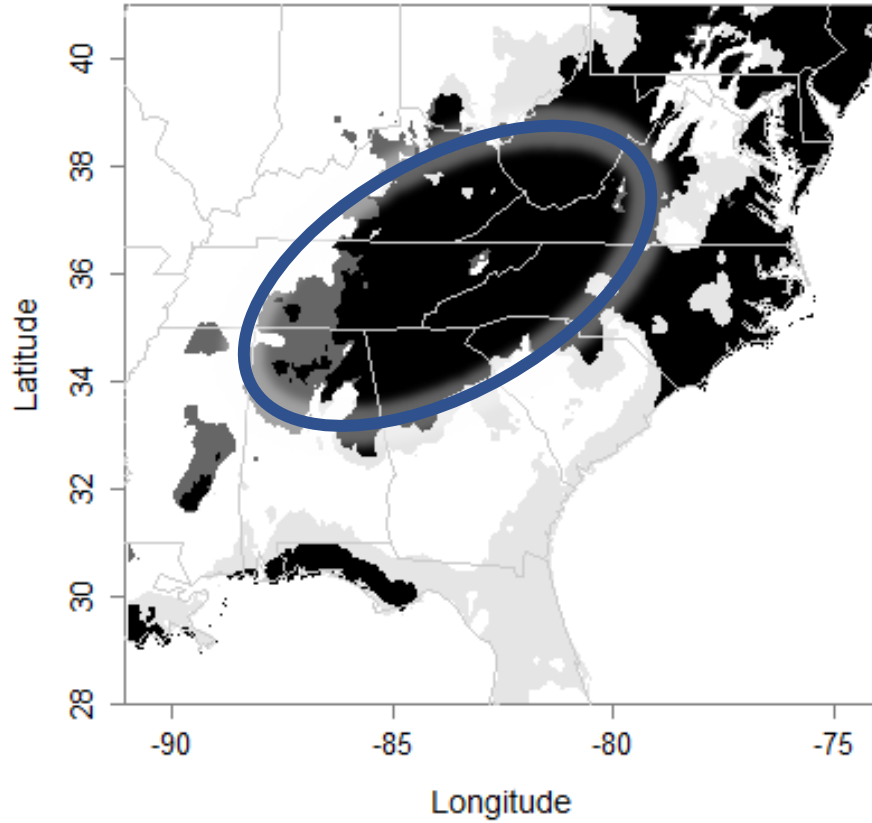


Distributional Shift: North-to-Center



Central Expansion

6,000 to present



Correspondence between distributional change and genetic divergence

South-to-North

North-to-Center

Central Expansion

120,000 to 22,000

22,000 to 6,000

6,000 to present

