Evolutionary Thinking 2022
TA session
week 5 – Selection

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Outline

1. Learning outcome of this week

Selection

Trajectories of mutation under selection

What patterns of selection will create?

2. Exercises

Selection

Quick discussion (2 minutes)

What creates the selection ?

(
Hints: selection in halploids/diaploids
)

Selection

Quick discussion (2 minutes)

What creates the selection?

(
Hints: selection in haploids/diploids
)

Viability difference among allele types

Selection

Quick discussion (2 minutes)

How do we quantify the strength of selection?

Selection

Quick discussion (2 minutes)

How do we quantify the strength of selection?

Quantify the difference between viability

- selection coefficient

$$\frac{w_a}{w_A} = 1 - s$$

$$\frac{v_{Aa}}{v_{AA}} = 1 - s_{Aa}$$

Selection

Quick discussion (3 minutes)

Type of selection

$$\frac{v_{Aa}}{v_{AA}} = 1 - s_{Aa}$$

$$\frac{v_{aa}}{v_{AA}} = 1 - s_{aa}$$

Selection

Quick discussion (3 minutes)

Type of selection

Directional

Heterozygous advantage

$$\frac{v_{Aa}}{v_{AA}} = 1 - s_{Aa}$$

$$\frac{v_{aa}}{v_{AA}} = 1 - s_{aa}$$

Trajectories of a mutation under selection

How do we do the simulation?

$$f_A' = f_A \frac{v_{AA}f_A + v_{Aa}(1 - f_A)}{v_{AA}f_A^2 + 2v_{Aa}f_A(1 - f_A) + v_{aa}(1 - f_A)^2}$$

Trajectories of a mutation under selection

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Strong positive selection

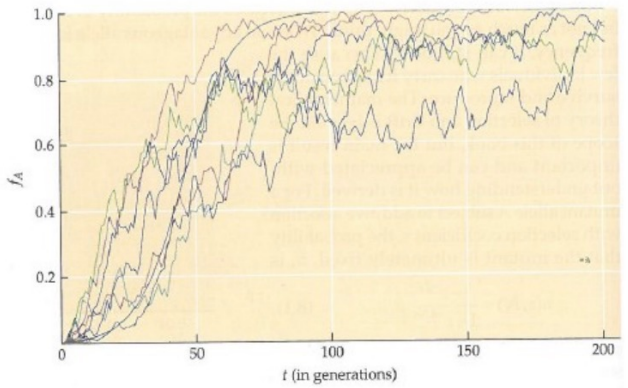


Figure 8.5 Fifty replicate trajectories for a strongly advantageous allele subject to additive selection with $s = 0.1$ and $N = 100$.

Weak positive selection

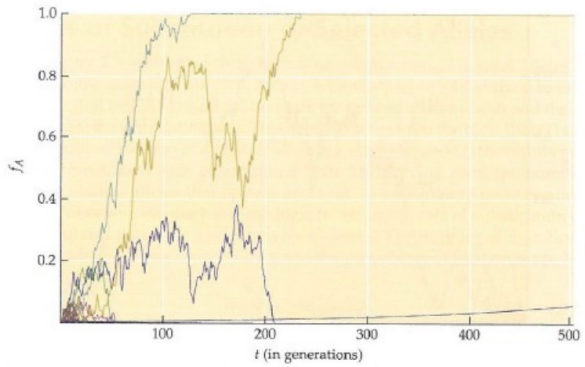


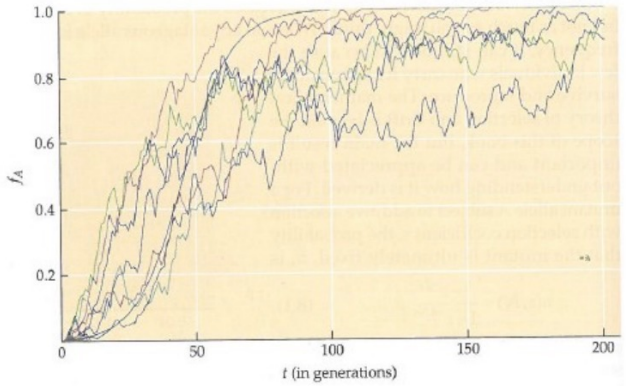
Figure 8.6 Fifty replicate trajectories of a weakly advantageous allele subject to additive selection. $s = 0.01$, $N = 100$.

Trajectories of a mutation under selection

What influence the fixation rate of a beneficial allele?

$$u(s,N) = \frac{1-e^{-2s}}{1-e^{-4Ns}}$$

Strong positive selection



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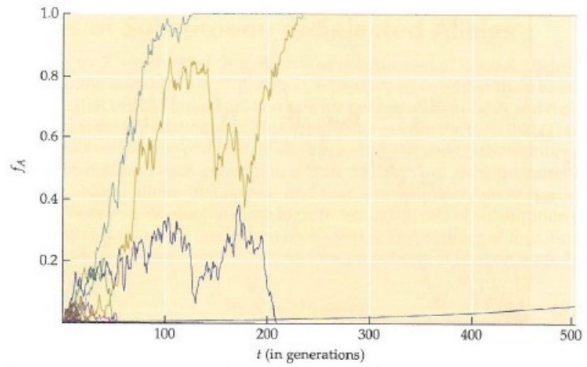


Figure 8.6 Fifty replicate trajectories of a weakly advantageous allele subject to additive selection. $s = 0.01$, $N = 100$.

Trajectories of a mutation under selection

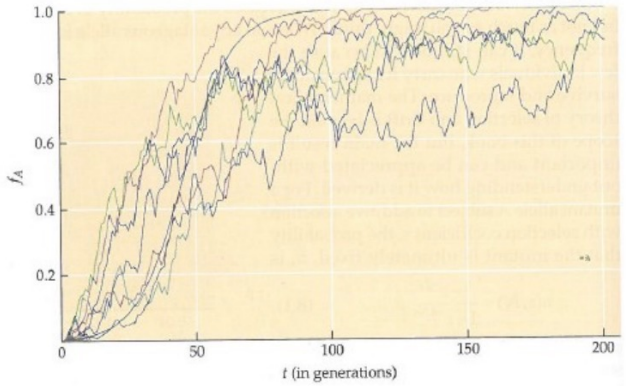
What influence the fixation rate of a beneficial allele?

selection coefficient

N – effective population size

$$u(s,N) = \frac{1-e^{-2s}}{1-e^{-4Ns}}$$

Strong positive selection



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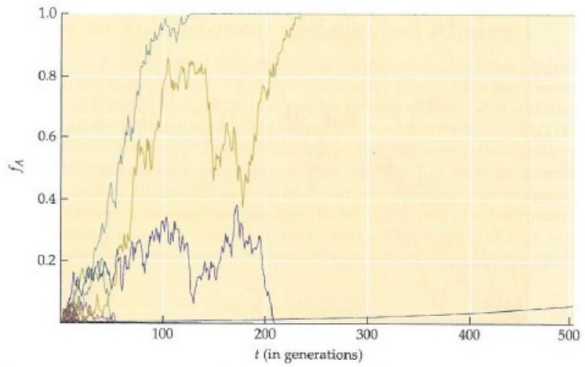

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$2Ns > 1, strongly\ advantages$

What patterns will selection leave

Hints:
Only thinking of directional selection right now.

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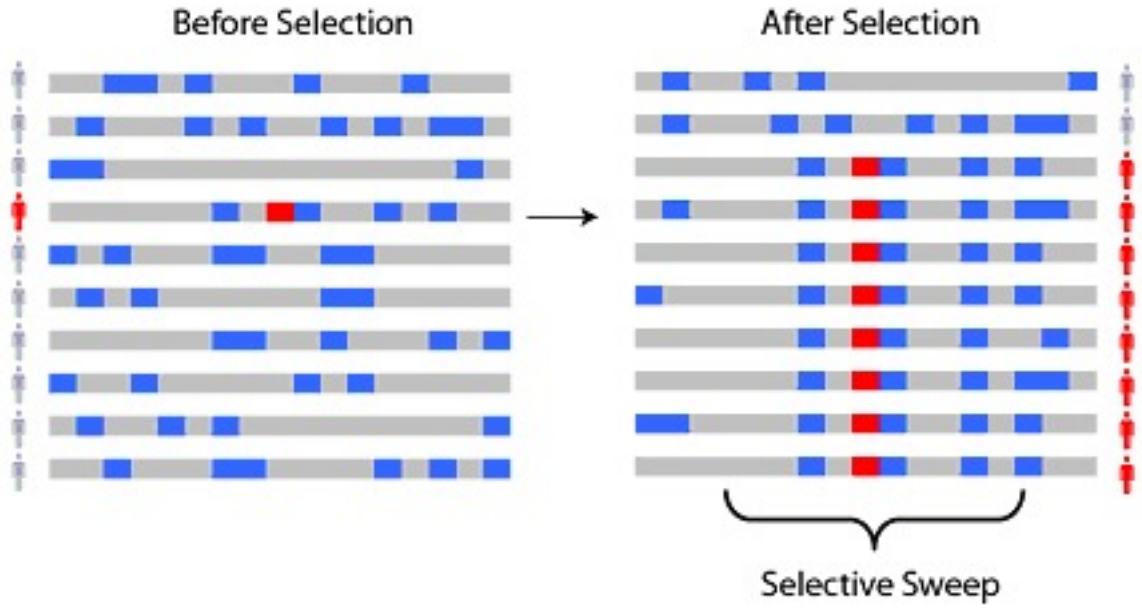
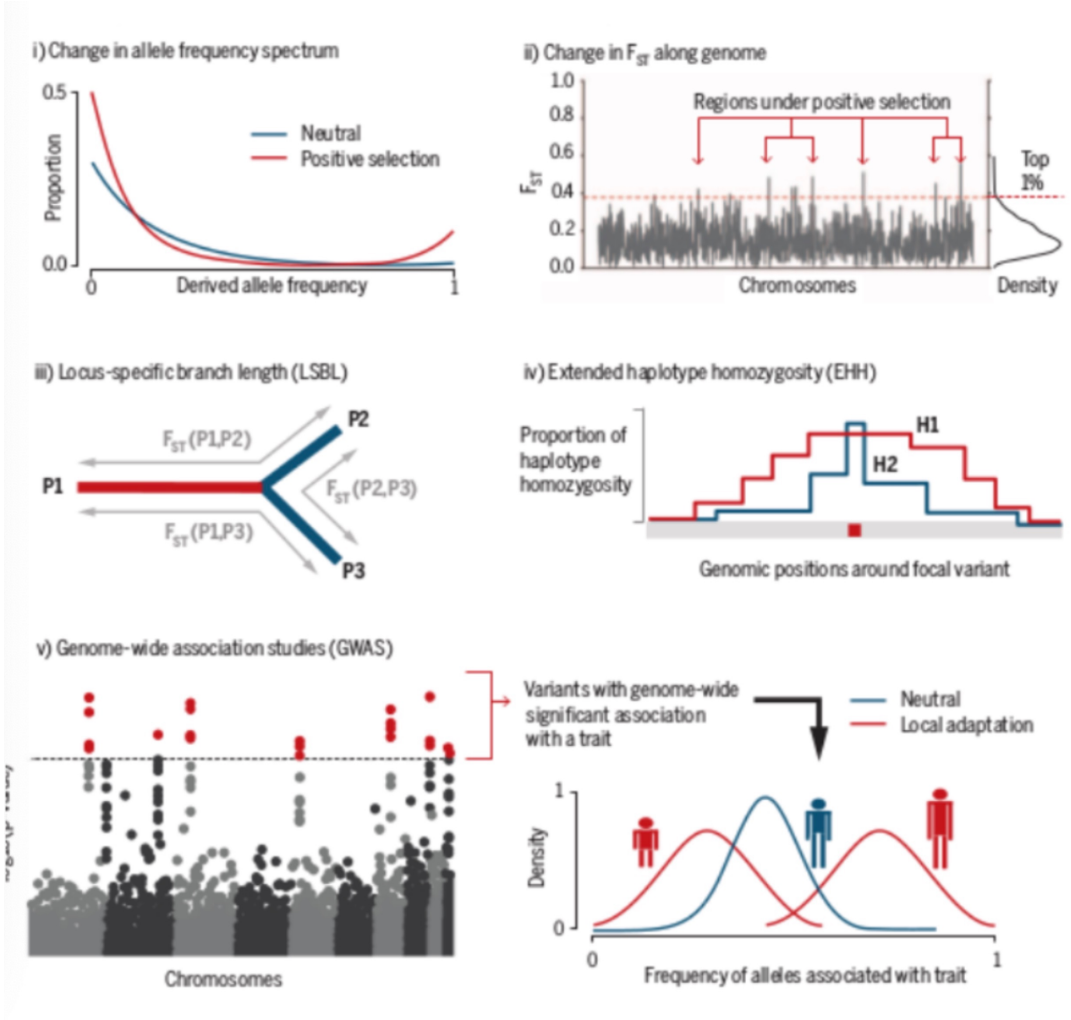


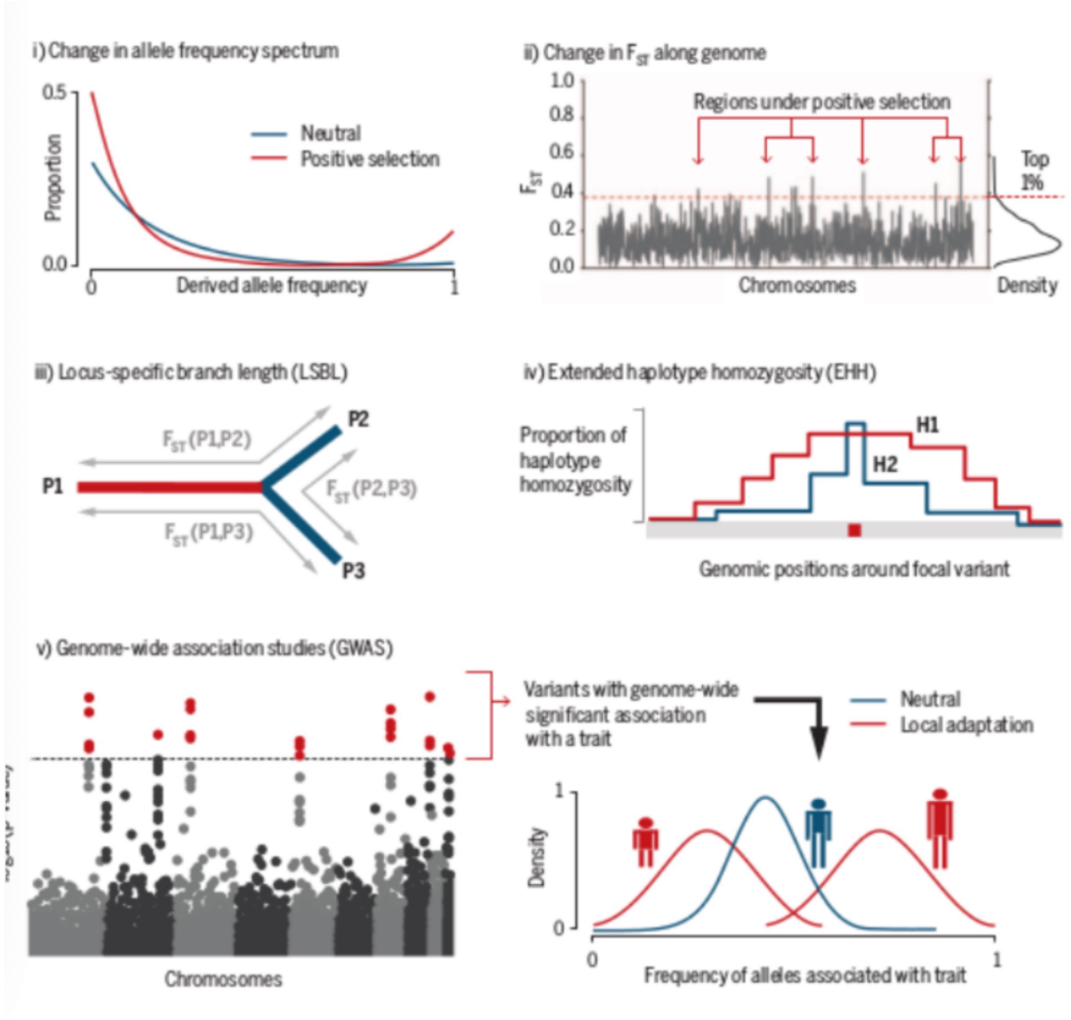
Test of selection – Chapter 9



dn/ds measurement

Slides from Anders Albrechtsen

Test of selection – Chapter 9



dn/ds measurement

The central idea:

Deviation from neutrality

Slides from Anders Albrechtsen

Test of selection – Chapter 9

Hints:
Only thinking of directional selection right now.

Exercises

Chapter 7:
7.1-7.3
7.7

Chapter 8:
8.1-8.3
8.5-8.7

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