

Evolutionary processes

Analyzing genotype frequencies

Types of natural selection

Other evolutionary mechanisms

Mating patterns

Evolution by natural selection

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Outline

Analyzing genotype frequencies

Types of natural selection

- Trait level

- Allele level

Other evolutionary mechanisms

- Genetic drift

- Gene flow

- Mutation

Mating patterns

- Inbreeding

- Sexual selection

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Example: ABO Blood groups have simple dominance

TABLE 20.1 The ABO Blood Group.

PHENOTYPE	GENOTYPE
A	<i>AA</i> or <i>AO</i>
B	<i>BB</i> or <i>BO</i>
AB	<i>AB</i>
O	<i>OO</i>

Table 20.1

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Example: flower color



There can be borderline cases



- The plant in the middle is a hybrid

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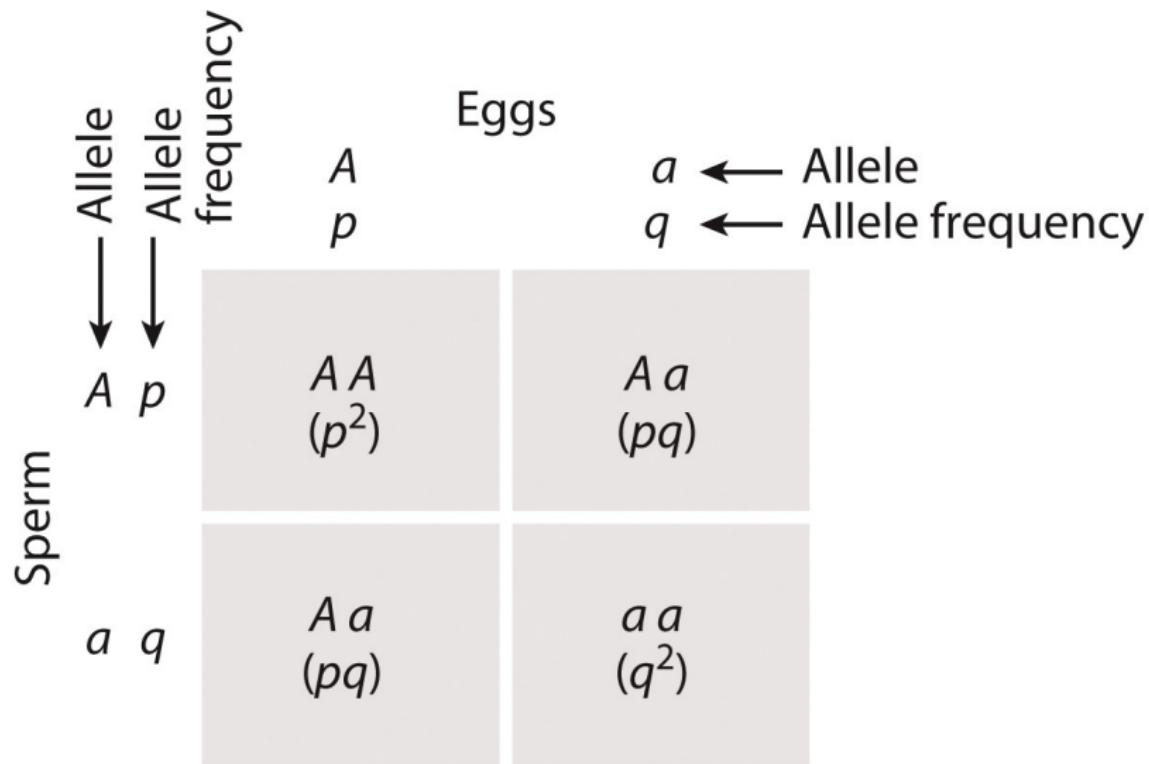
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How do you know a coin is perfectly fair?

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- ▶ Similarly, we never have evidence that a population is exactly in Hardy-Weinberg equilibrium
- ▶ We can only evaluate our evidence that it is far from (or close to) equilibrium
- ▶ What's another way to think about the evidence?
 - ▶ * How clear is it that we really have more (or less) homozygotes than expected?

Hardy-Weinberg equilibrium

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Example: Human HLA genes

Table 3

Observed and Expected Numbers of Heterozygotes and Homozygotes for Individuals Born Before 1954 and Those Born in 1954 or Later, for Males and Females

	Heterozygotes	Homozygotes
HLA-A:		
Born before 1954:		
Females	22	8
Males	22	7
Born 1954 or later:		
Females	22	12
Males	18	11
Total:		
Observed	84	38 ^a
Expected	73.57	48.43 ^a
HLA-B:		
Born before 1954:		
Females	25	5
Males	22	7
Born 1954 or later:		
Females	31	3
Males	23	6
Total:		
Observed	101	21 ^b
Expected	92.44	29.56 ^b

^a $P = .0317$.

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Outline

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Types of natural selection

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Allele level

Other evolutionary mechanisms

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Gene flow

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Mating patterns

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Sexual selection

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Directional selection

- Directional selection tends to move a population in a particular direction

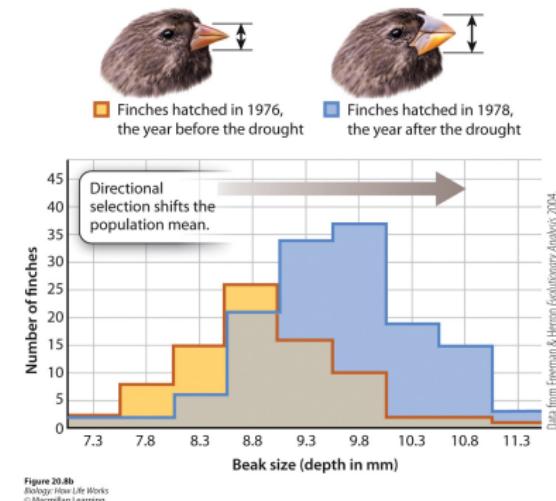


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Directional selection

- ▶ **Directional selection** tends to move a population in a particular direction
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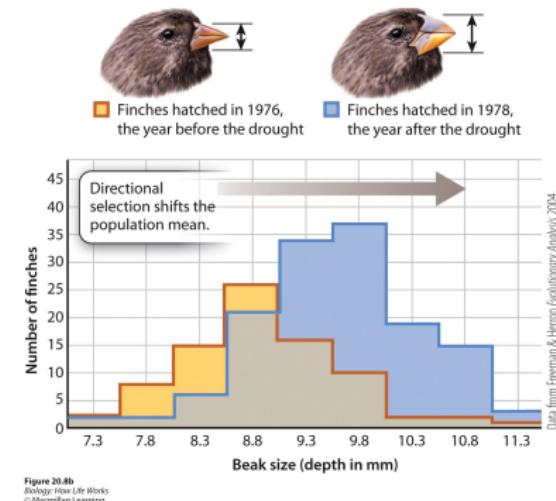


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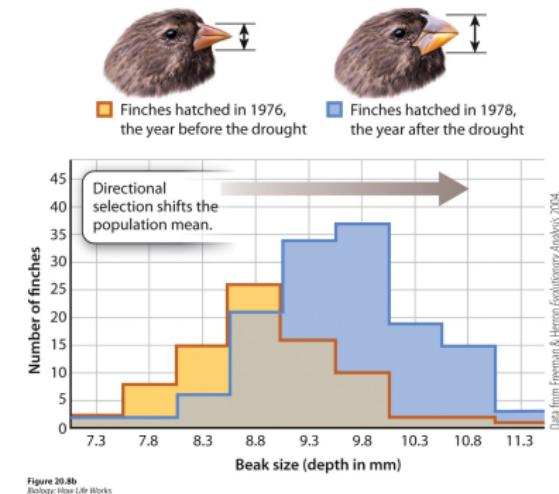
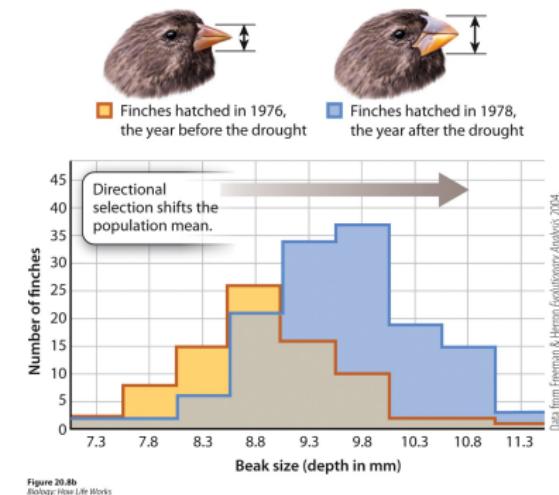


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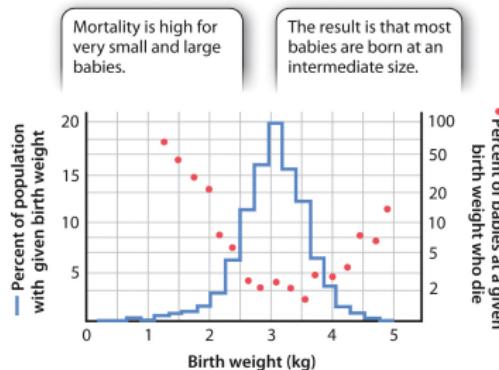


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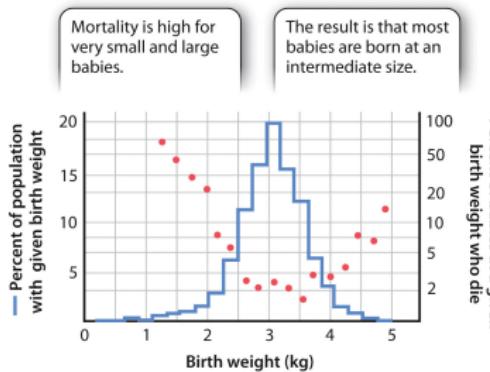


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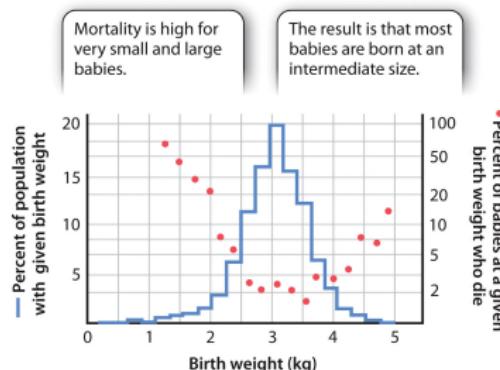


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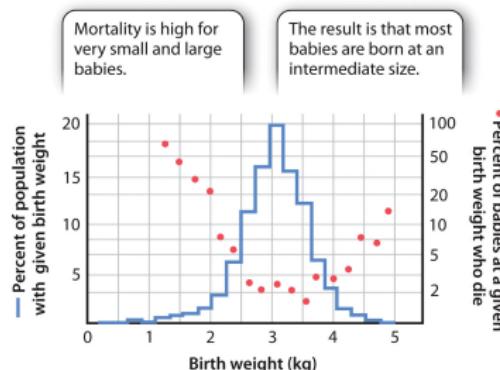


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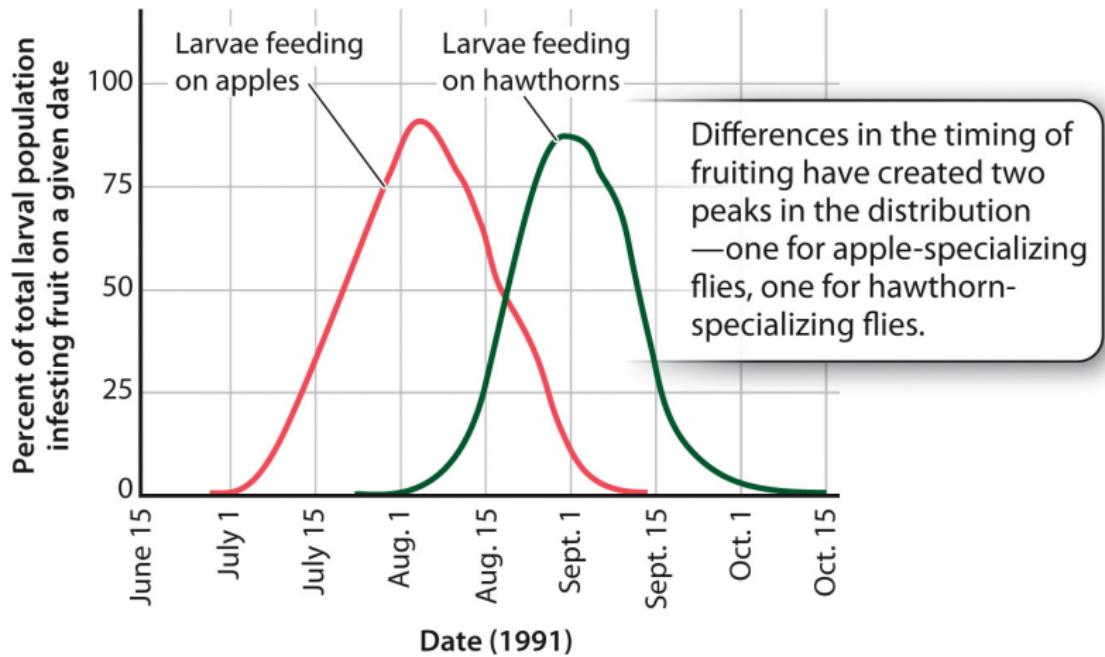
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Seedcrackers



Disruptive selection



Differences in the timing of fruiting have created two peaks in the distribution —one for apple-specializing flies, one for hawthorn-specializing flies.

Data from Filchak et al. 2000 *Nature* 407:739–742.

Figure 20.9b
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Outline

Analyzing genotype frequencies

Types of natural selection

Trait level

Allele level

Other evolutionary mechanisms

Genetic drift

Gene flow

Mutation

Mating patterns

Inbreeding

Sexual selection

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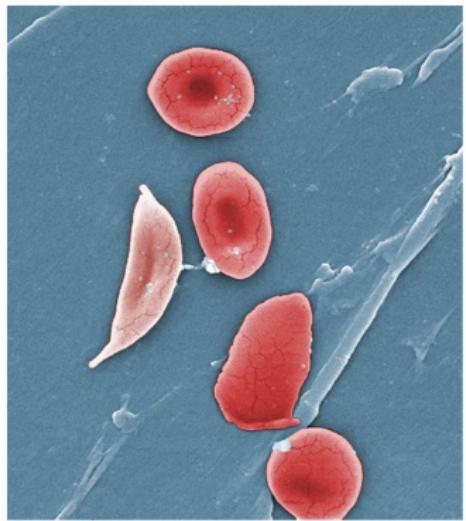
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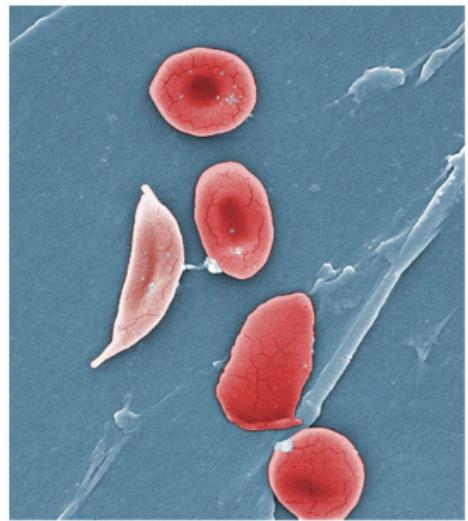
Example: The sickle cell phenotype

- Blood cells that can lose their shape and squash malaria parasites!



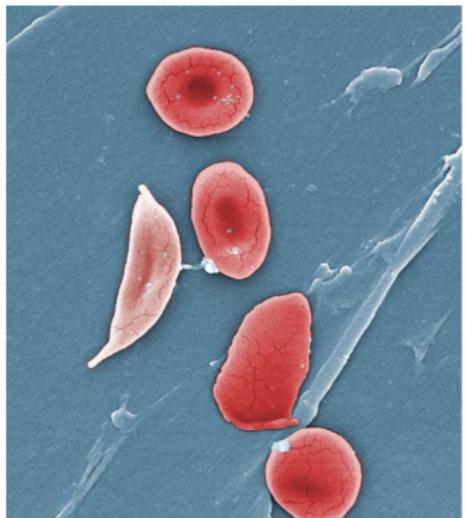
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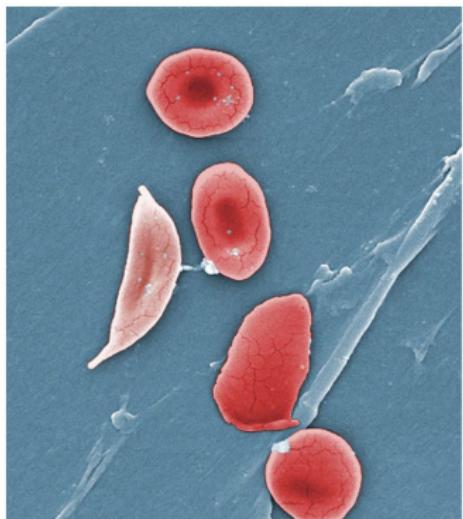
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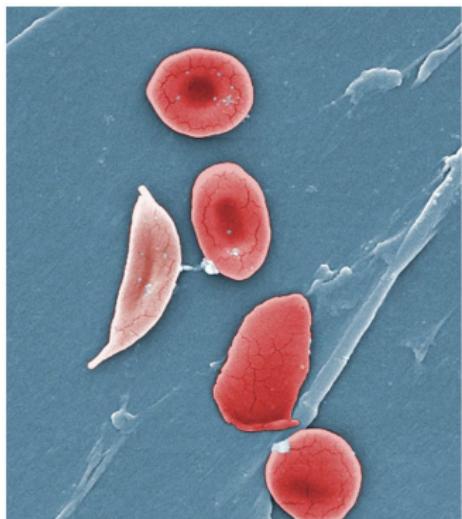
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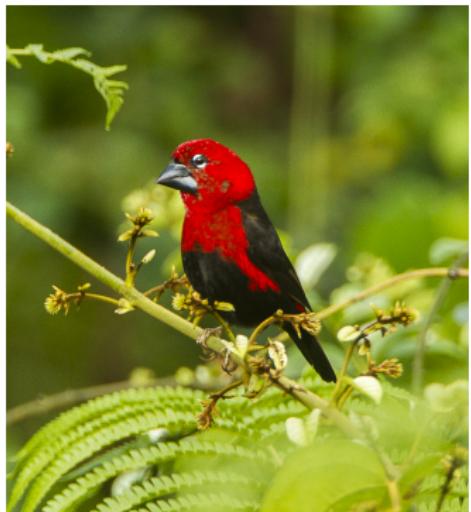
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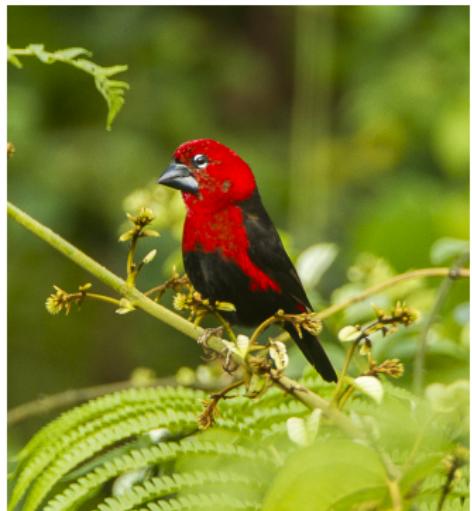
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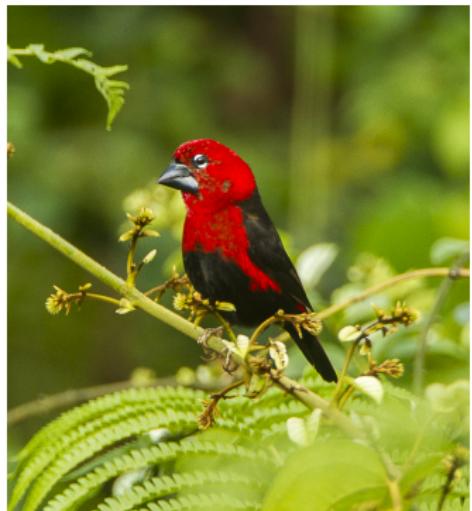
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Genetic drift

Population size = 4

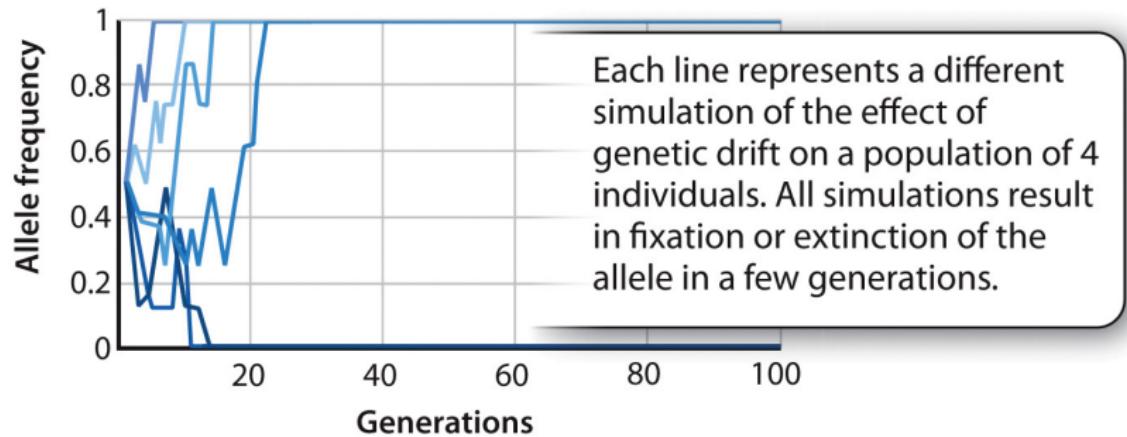


Figure 20.13b
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Genetic drift

Population size = 40

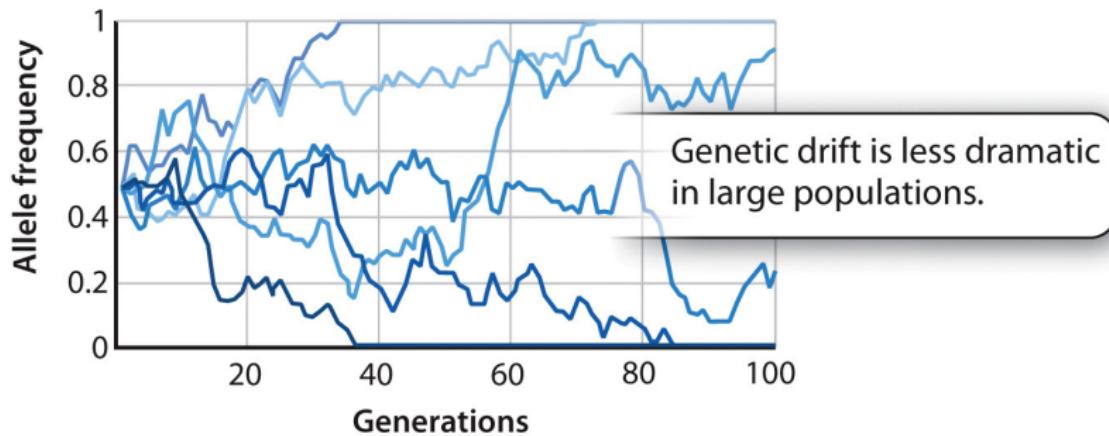


Figure 20.13c
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Genetic drift

Population size = 400

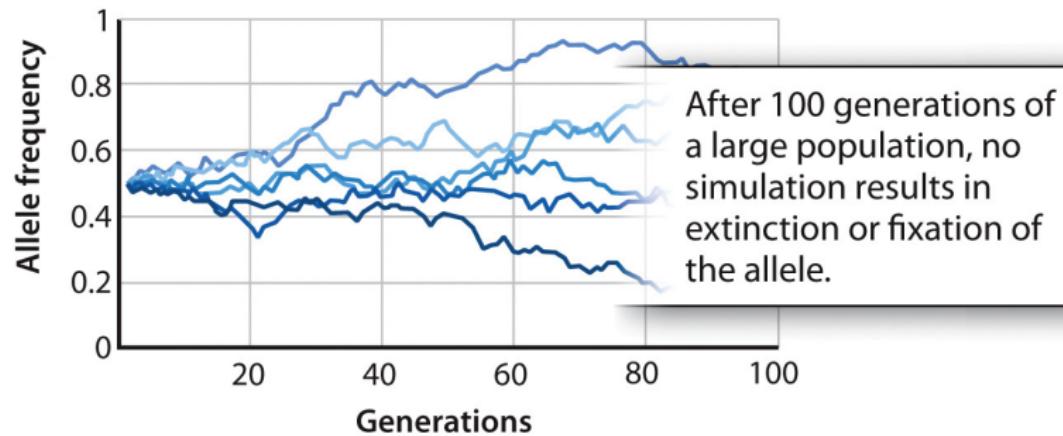


Figure 20.13d
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Allele level

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Gene flow

Mutation

Mating patterns

Inbreeding

Sexual selection

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Florida panthers



DenGuy/Getty Images

Figure 20.14
Biology: How Life Works
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 - ▶ * Yes, in some species of pipefish (related to seahorses) the males spend more time and energy caring for young than females

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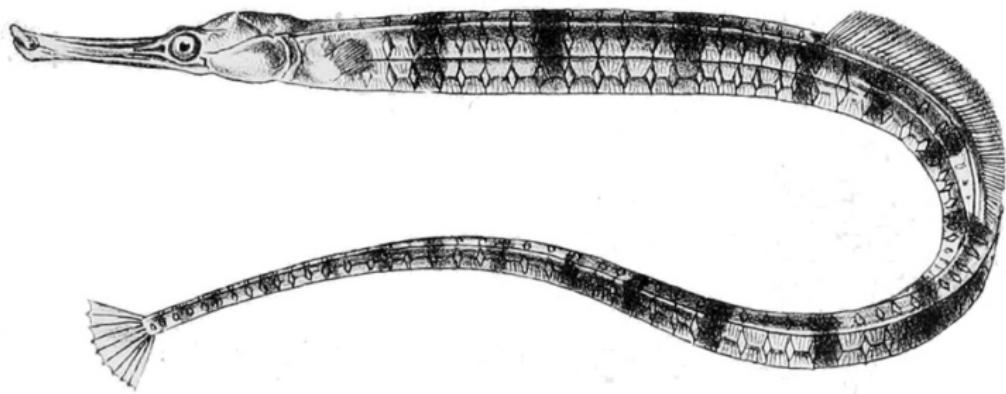
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