

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

Directional selection

Stabilizing selection

Disruptive selection

Other evolutionary mechanisms

Genetic drift

Gene flow

Mutation

Mating patterns

Inbreeding

Sexual selection

Genotypes and phenotypes

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Example: Human blood groups

TABLE 26.1 The MN Blood Group of Humans: Observed and Expected Genotype Frequencies

The expected genotype frequencies are calculated from the observed allele frequencies, using the Hardy-Weinberg principle.

Population and Location	Data Type	Genotype Frequencies			Allele Frequencies	
		MM	MN	NN	M	N
Inuit (Greenland)	Observed	0.835	0.156	0.009	0.913	0.087
	Expected	0.834	0.159	0.008		
Native Americans (U.S.)	Observed	0.600	0.351	0.049	0.776	0.224
	Expected	0.602	0.348	0.050		
Caucasians (U.S.)	Observed	0.292	0.494	0.213	0.540	0.460
	Expected	0.290	0.497	0.212		
Aborigines (Australia)	Observed	0.025	0.304	0.672	0.176	0.824
	Expected	0.031	0.290	0.679		
Ainu (Japan)	Observed	Step 1 0.179	0.502	0.319	Step 2 Step 3 Step 4	
	Expected					

DATA: W. C. Boyd. 1950. Boston: Little, Brown and Company.

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TABLE 26.2 *HLA Genes of Humans: Observed and Expected Genotypes*

The expected numbers of homozygous and heterozygous genotypes are calculated from observed allele frequencies, according to the Hardy–Weinberg principle.

Genotype Counts ($n = 122$)			
Gene	Data Type	Homozygotes	Heterozygotes
HLA-A	Observed	38	84
	Expected	48	74
HLA-B	Observed	21	101
	Expected	30	92

DATA: Markow, T., P. H. Hedrick, K. Zuerlein, et al. 1993. *Journal of Human Genetics* 53: 943–952, Table 3.

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Example: Human HLA genes

- ▶ HLA genes are used by the immune system to recognize disease-causing organisms
- ▶ Researchers hypothesized that heterozygous individuals may recognize more bacteria and viruses
- ▶ Data shows that more people are heterozygous for HLA genes than would be expected under the Hardy-Weinberg assumption

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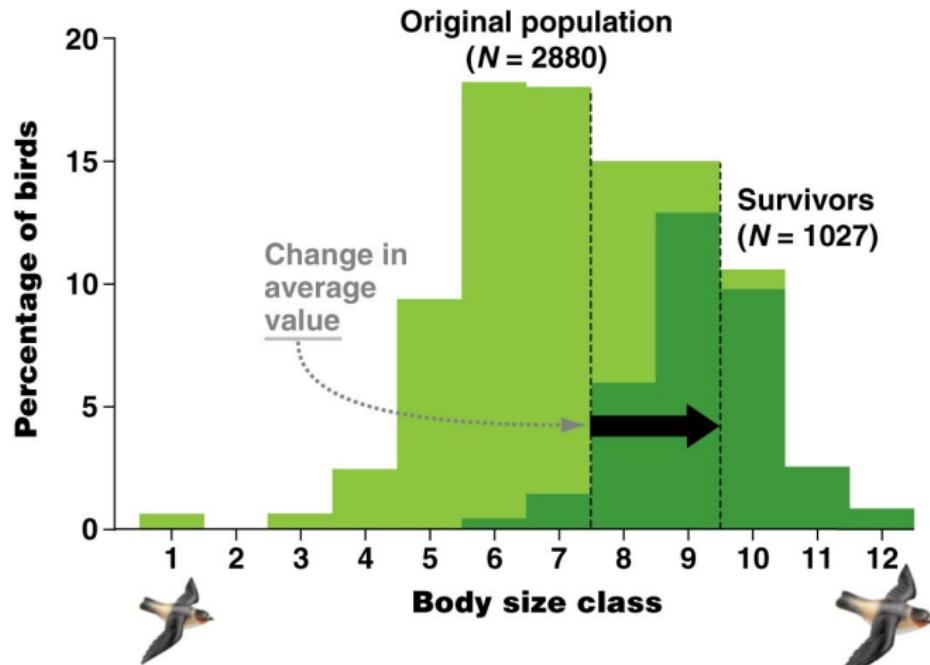
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Cliff swallow example



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(b) For example, directional selection caused average body size to increase in a cliff swallow population.



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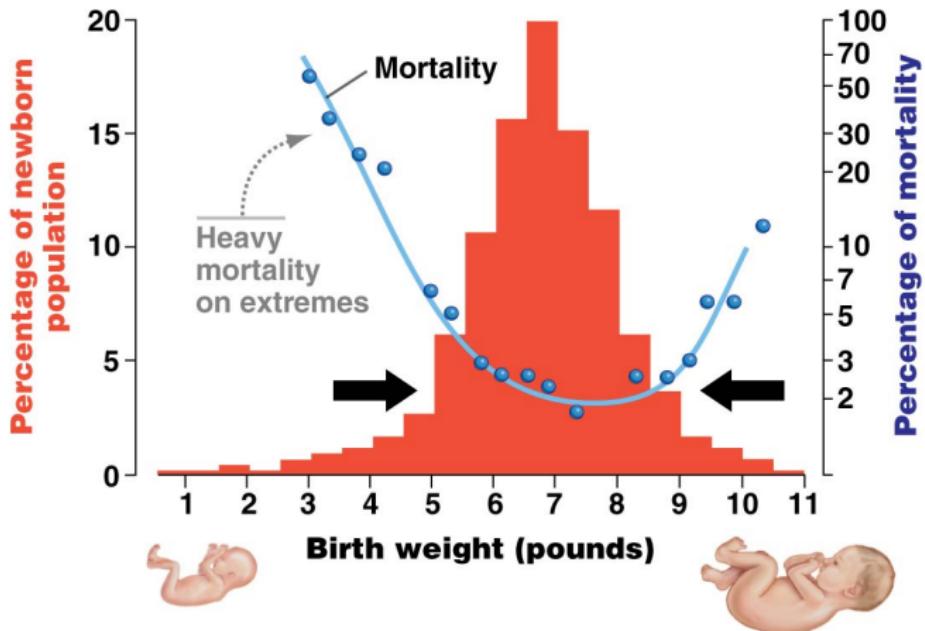
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(b) For example, very small and very large babies are the most likely to die, leaving a narrower distribution of birthweights.



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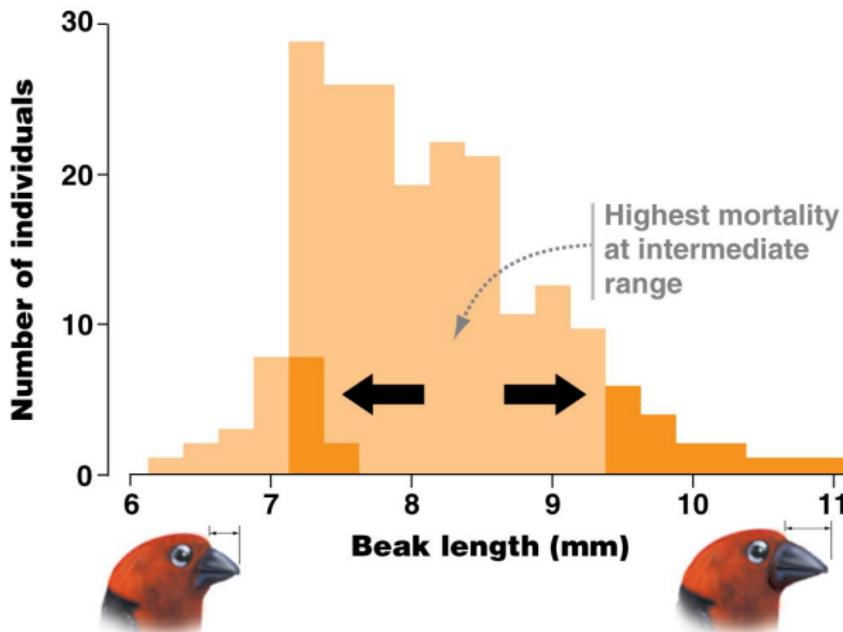
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Seedcrackers



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(b) For example, only juvenile black-bellied seedcrackers that had short or extremely long beaks survived long enough to breed.



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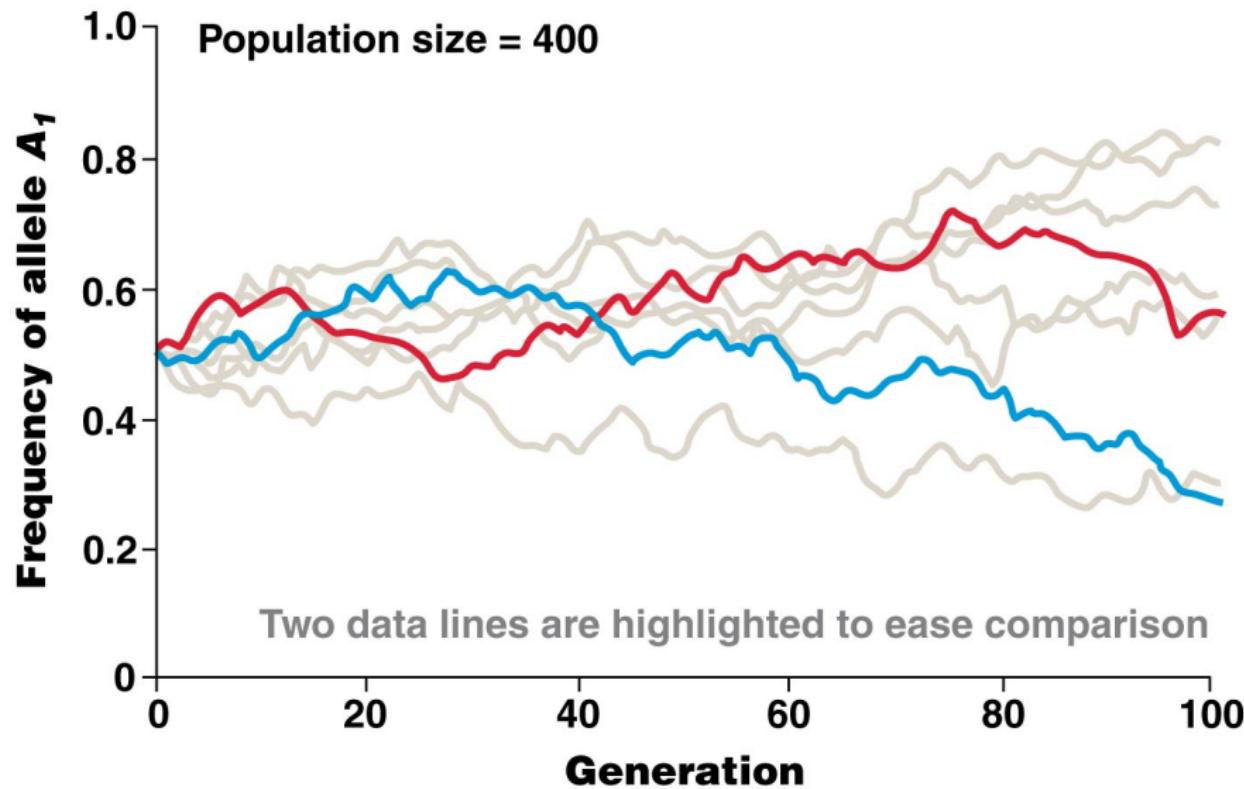
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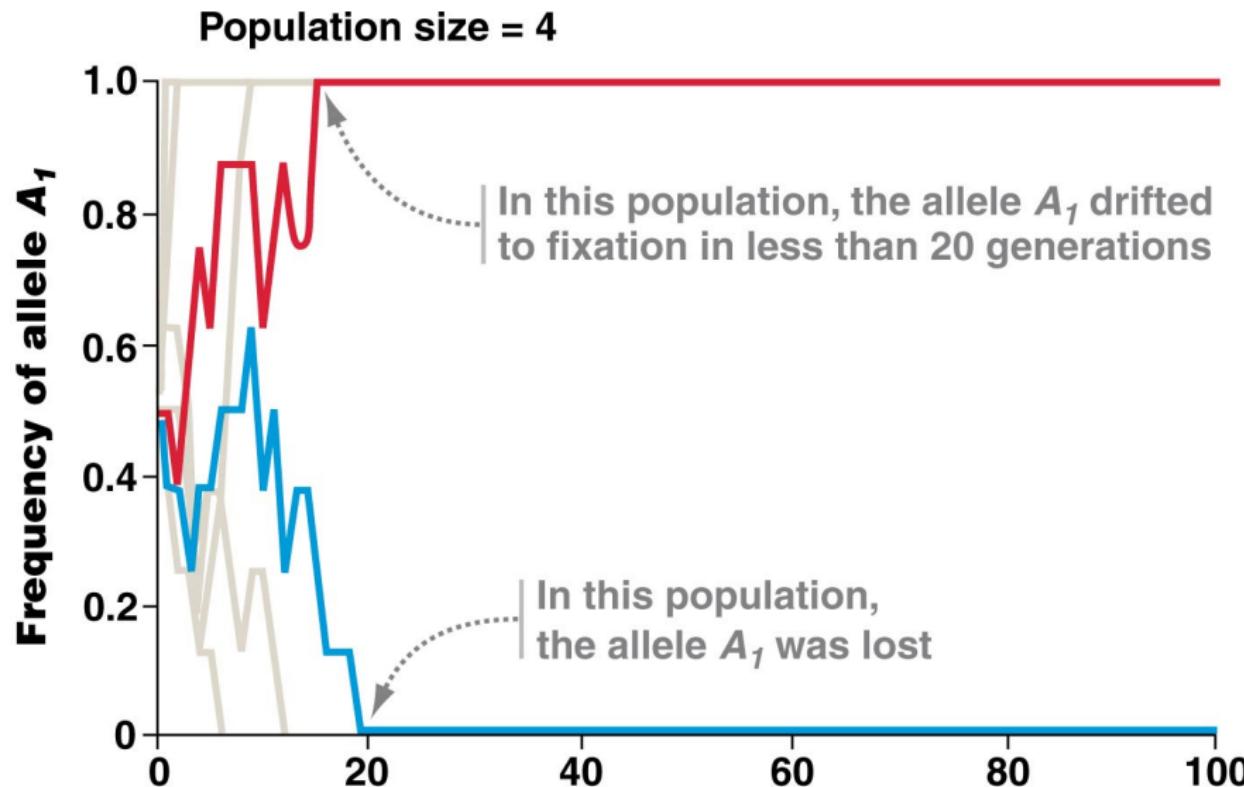
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ADD F25.17

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Elephant seals

ADD F25.19 (or something better)

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