

Evolutionary processes

Analyzing genotype frequencies

Types of natural selection

Other evolutionary mechanisms

Mating patterns

Evolution by natural selection

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Outline

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Types of natural selection

- Directional selection
- Stabilizing selection
- Disruptive selection
- Balancing selection

Other evolutionary mechanisms

- Genetic drift
- Gene flow
- Mutation

Mating patterns

- Inbreeding
- Sexual selection

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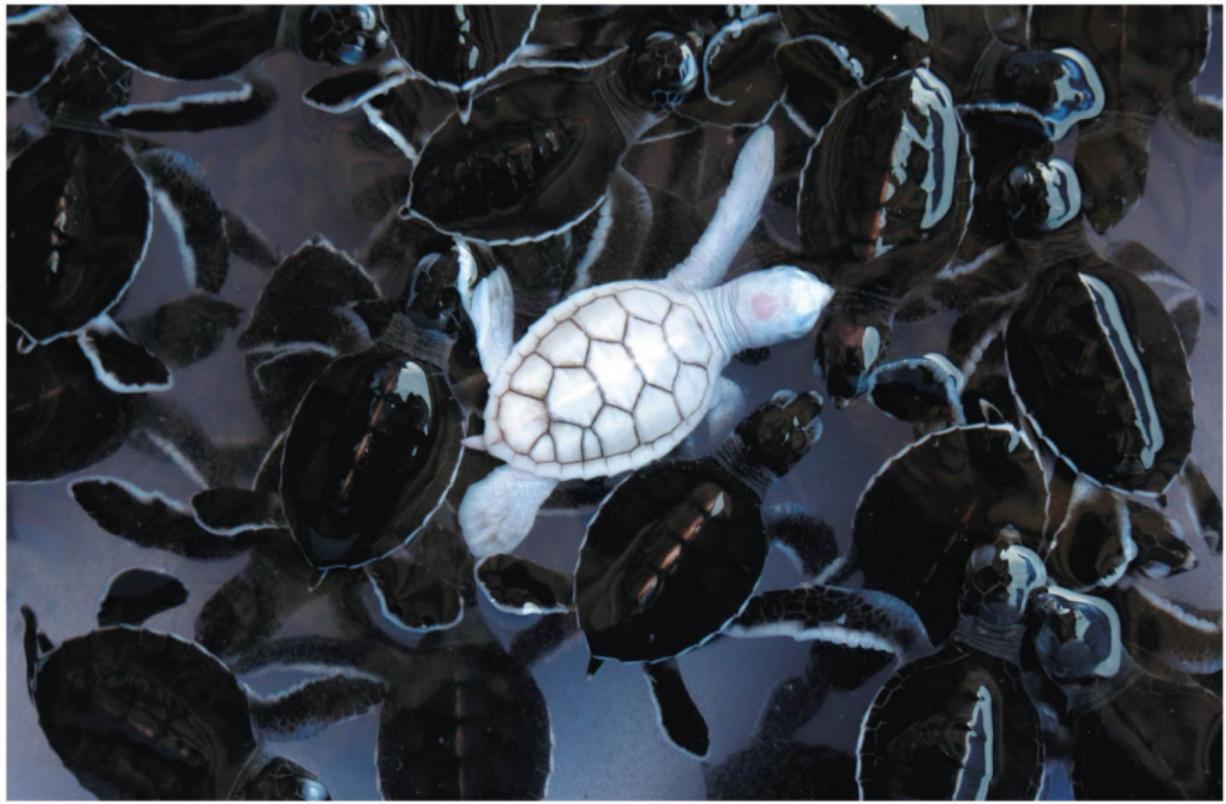
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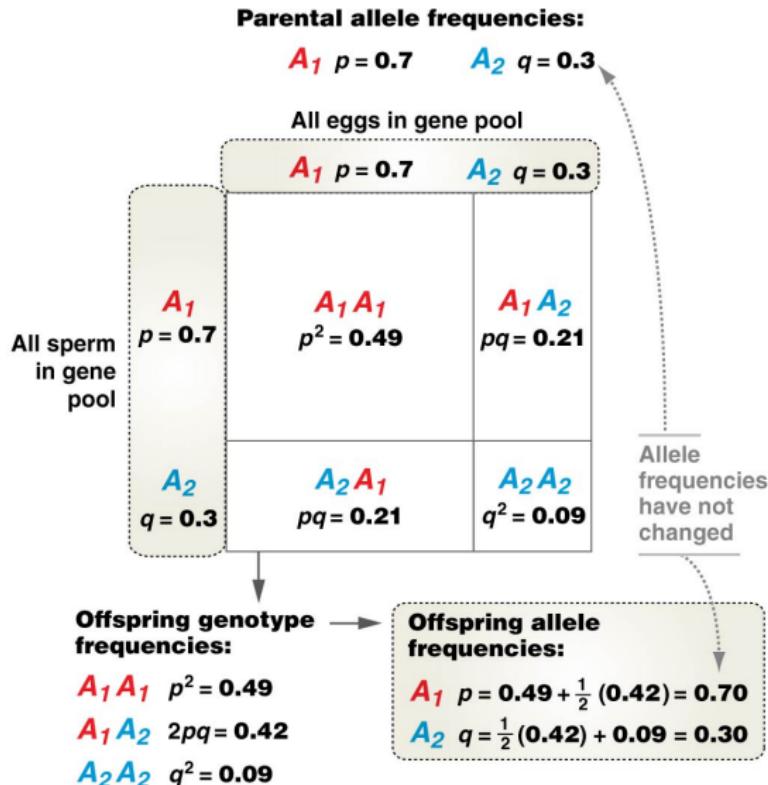
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Example: Human blood groups

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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Example: Human HLA genes

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.

Example: Human HLA genes

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Directional selection

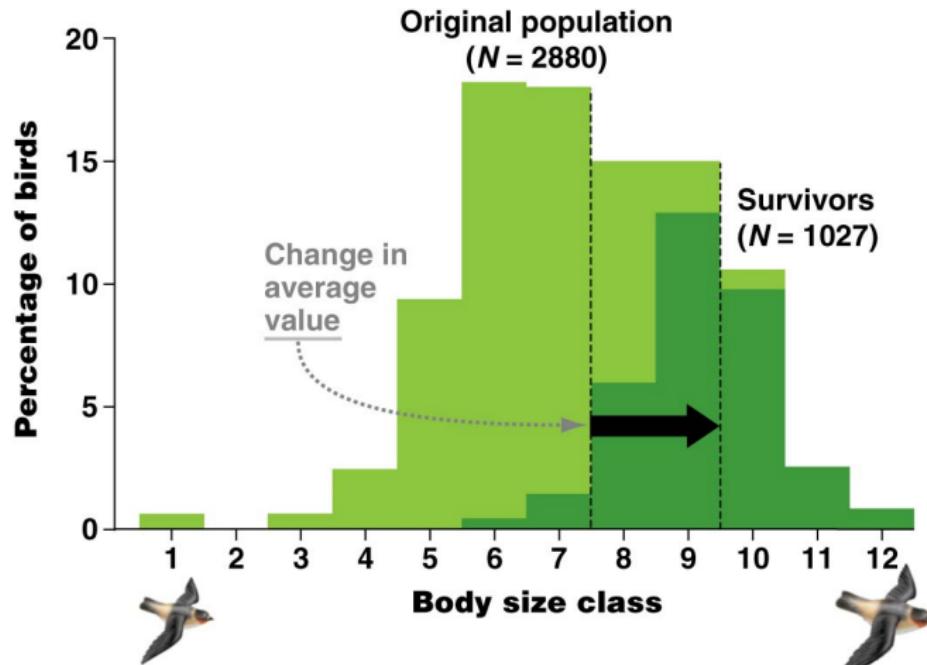
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Cliff swallow example



Cliff swallow example

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



Multi-directional selection

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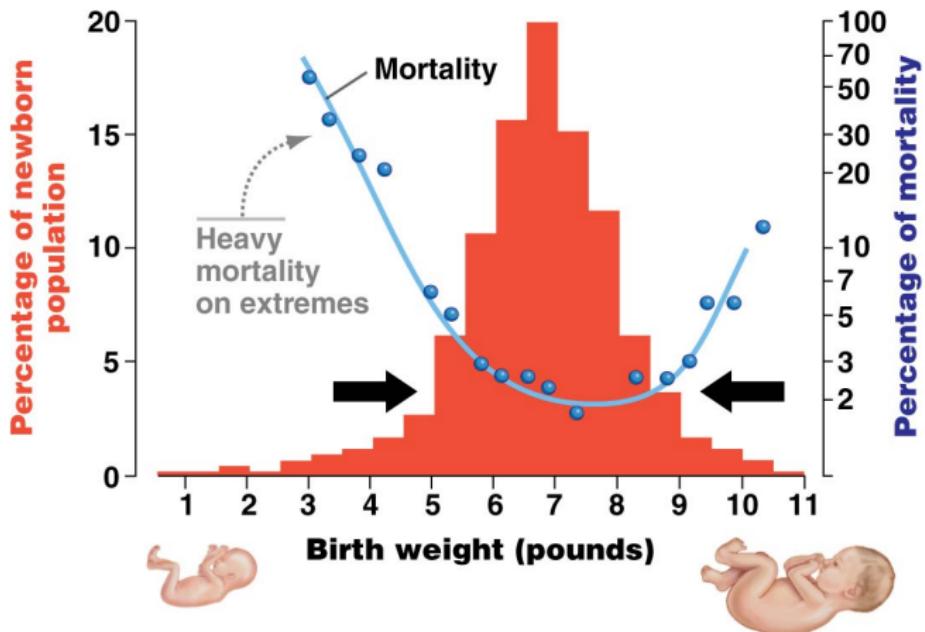
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 - ▶ Example: human birthweights

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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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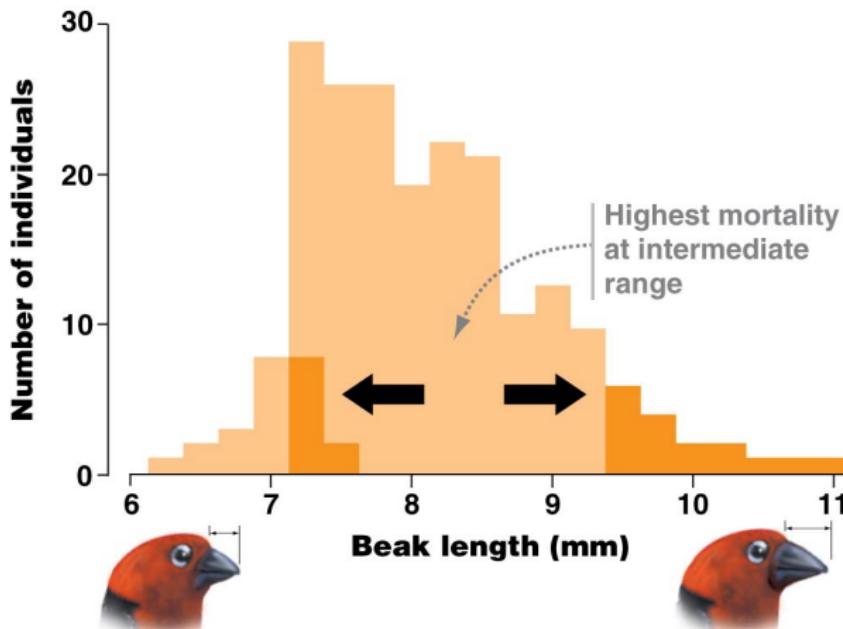
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Seedcrackers



Disruptive selection

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



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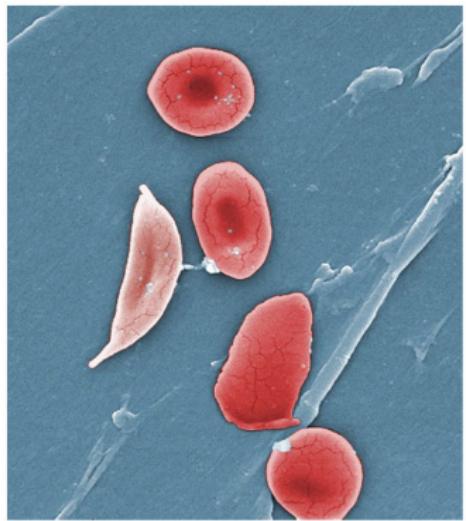
- ▶ Balancing selection tends to maintain allele diversity
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Example: The sickle cell phenotype

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



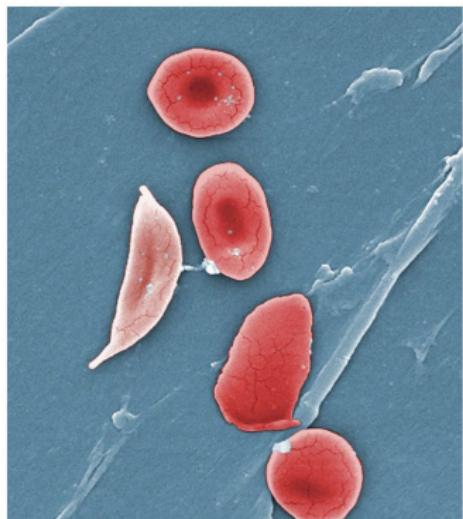
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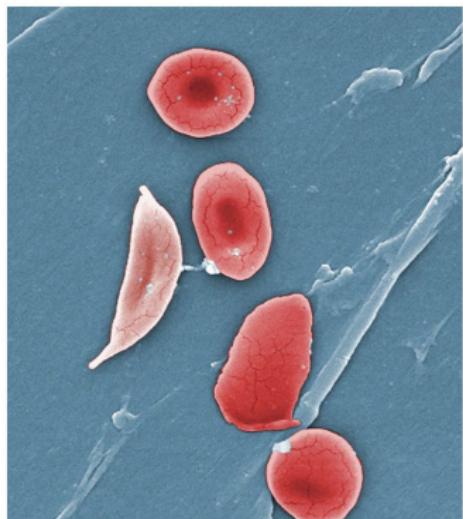
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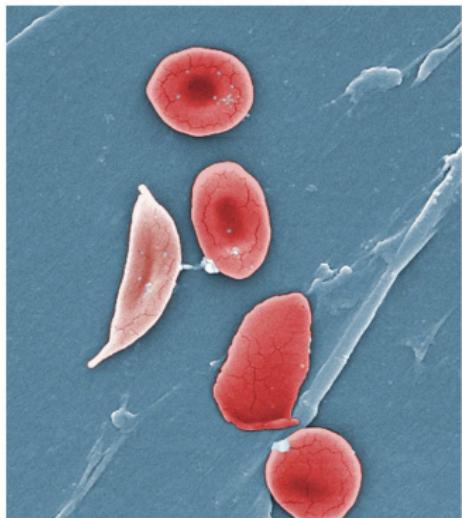
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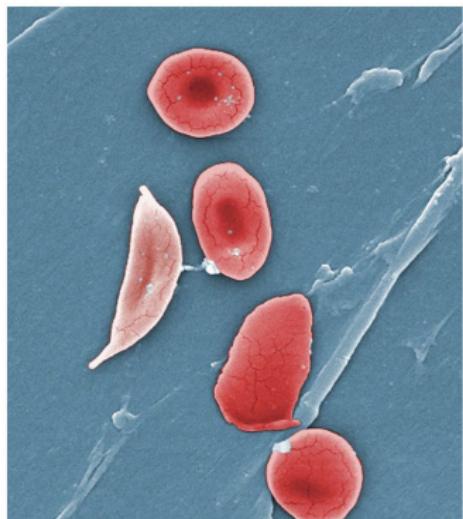
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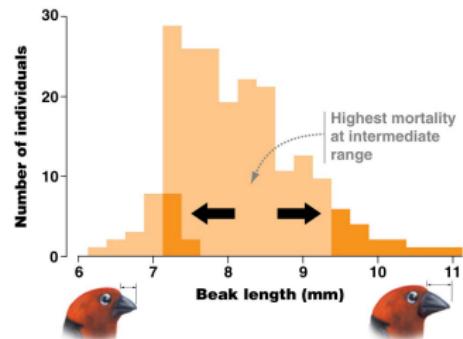
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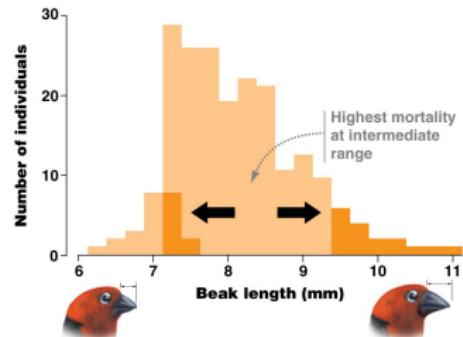
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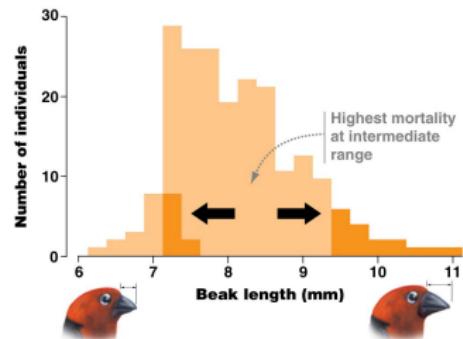


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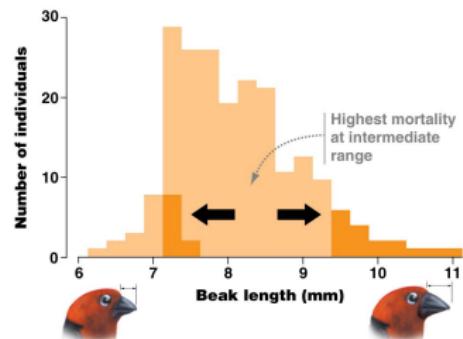


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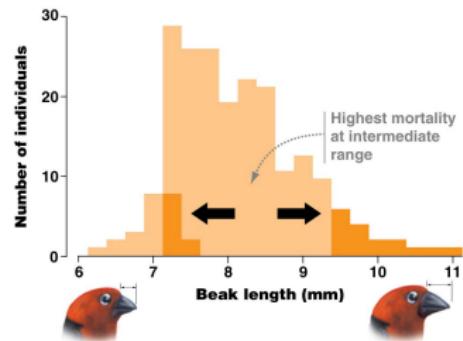
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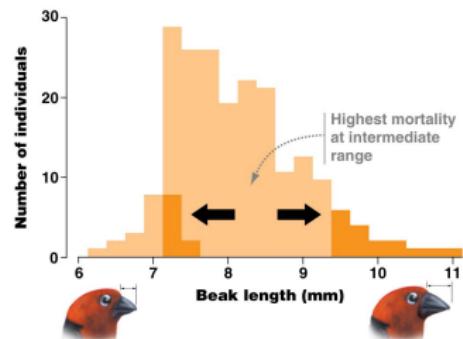


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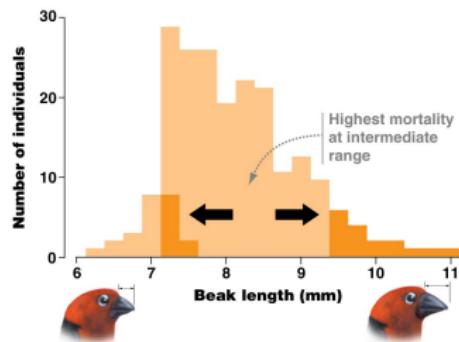


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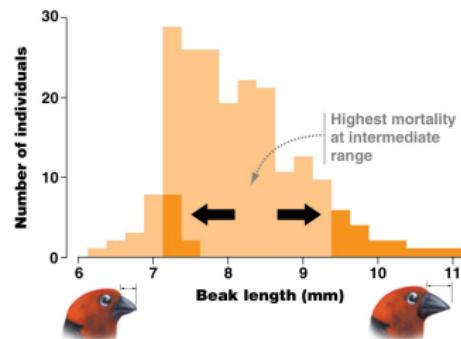


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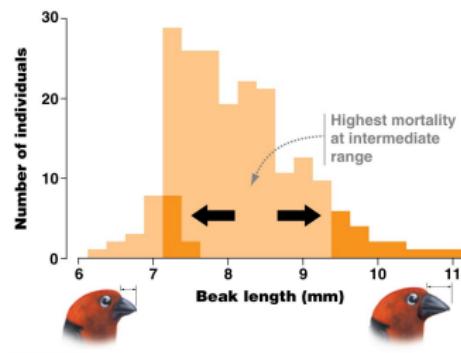


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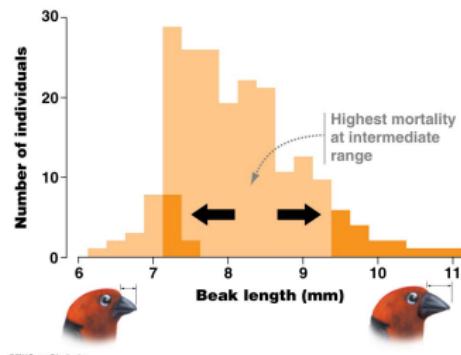
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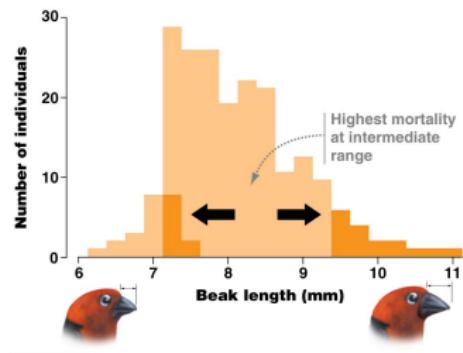


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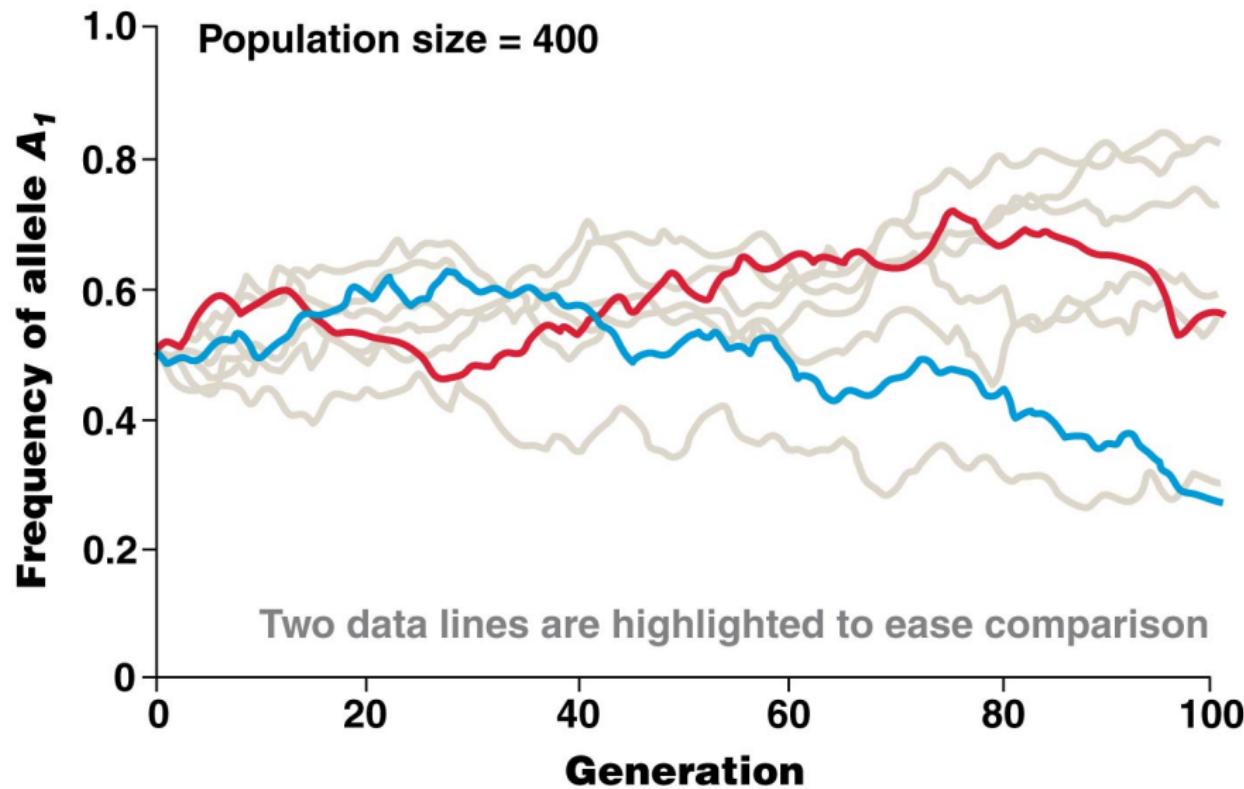
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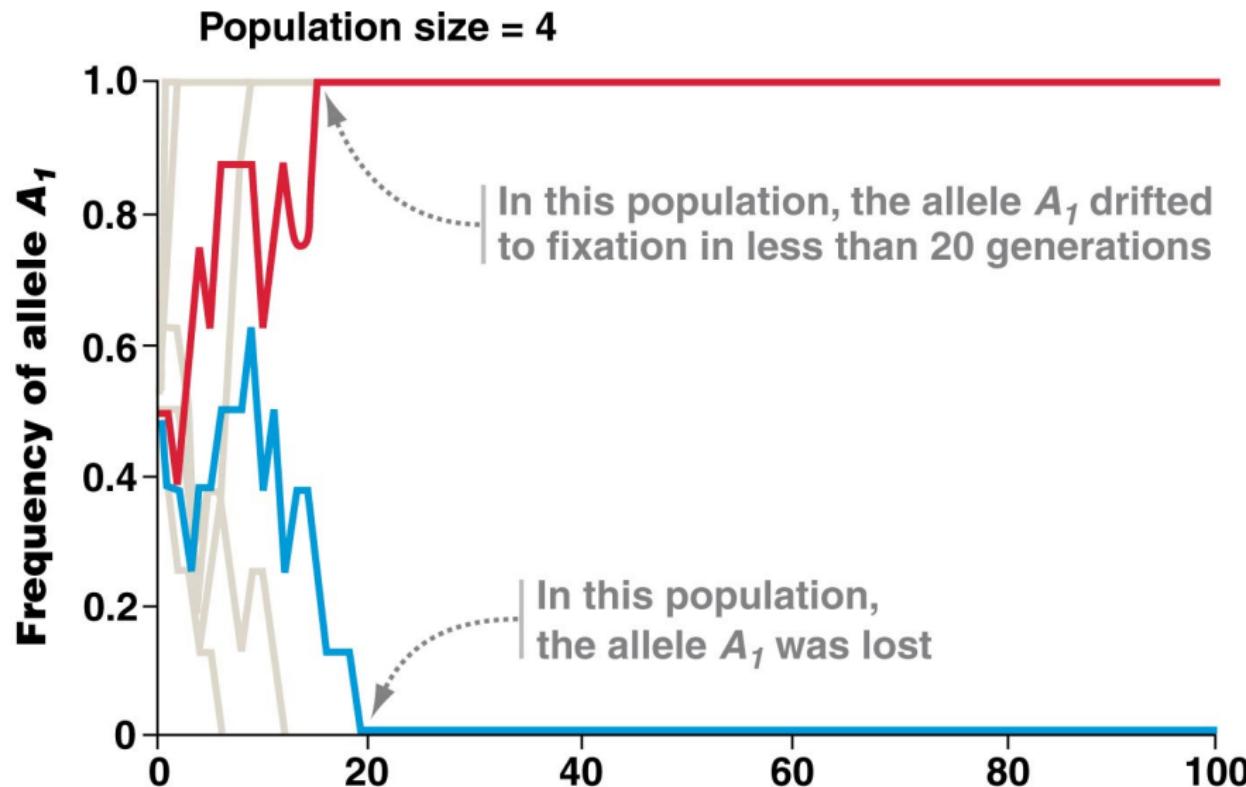
Genetic drift

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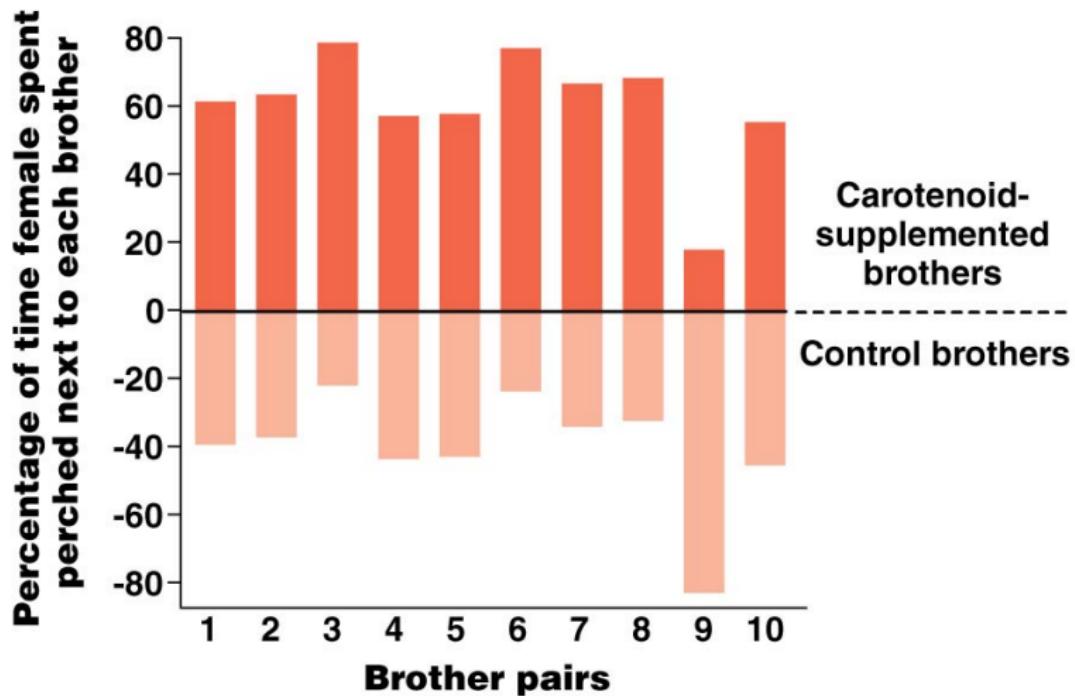
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Finch results

(b) Female choice for colorful beaks



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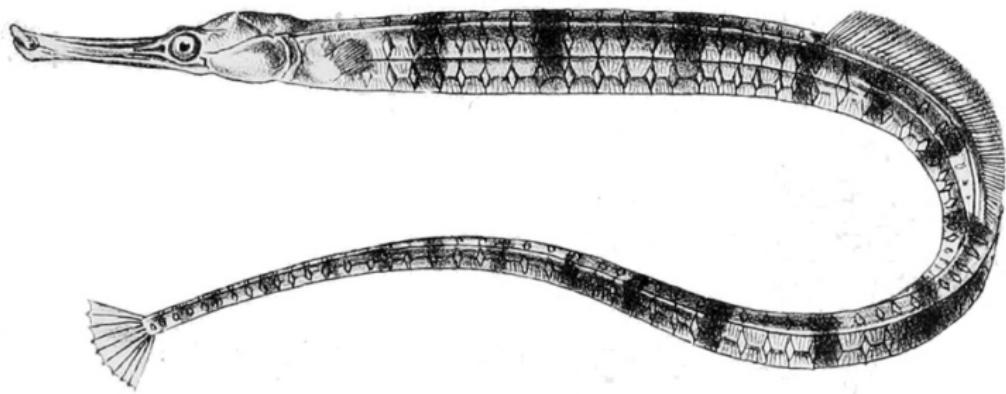
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