

Speciation

How are species defined?

Species divergence in allopatry

Species divergence in sympatry

Reuniting

Outline

How are species defined?

- Biological species concept

- Morphological species concept

- Ecological species concept

- Phylogenetic species concept

Species divergence in allopatry

- Dispersal

- Vicariance

Species divergence in sympatry

- Disruptive selection

- Genetic incompatibility

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- Fusion

- Reinforcement

- Hybrid zones

- Exclusion

- New species

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An ancestral
population

Population
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Large ground finch



Medium ground finch

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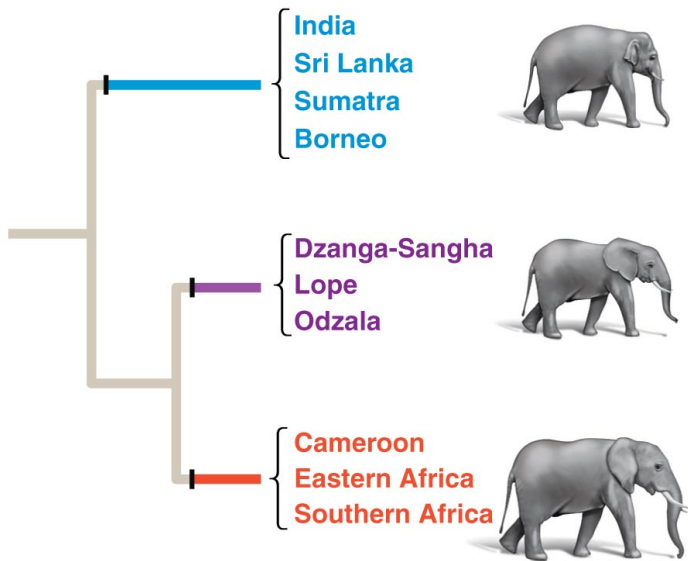
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(a) PROCESS: ALLOPATRIC SPECIATION BY DISPERSAL

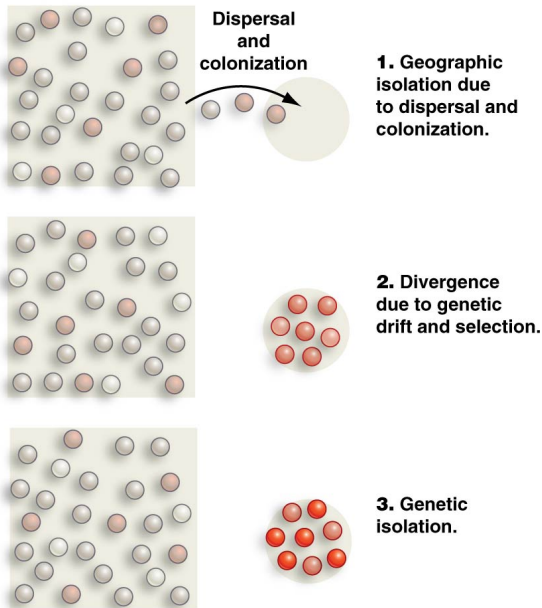
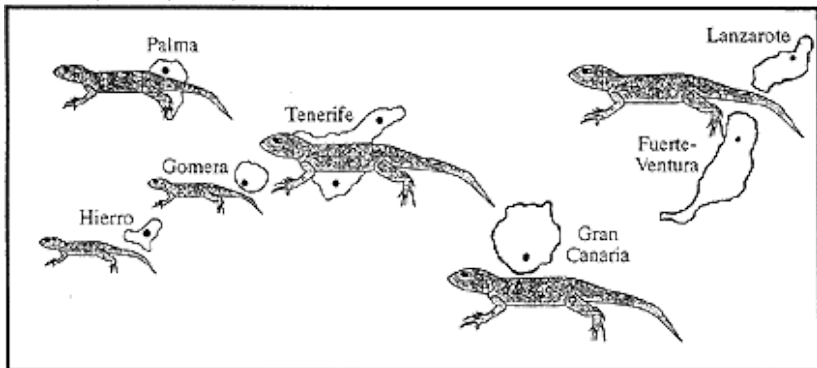


Figure 2. The relative sizes of typical lizards from each population are shown. (Redrawn from Thorpe et al., 1994.)



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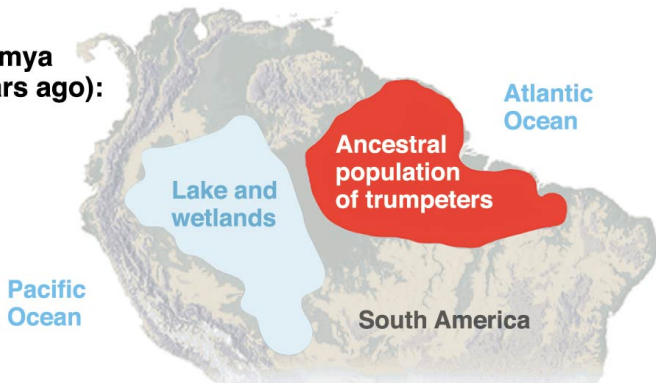
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Vicariance

- ▶ Isolated populations of the same species can develop when a population is split by a geographical or ecological barrier
- ▶ Such splits are called **vicariance** events.
 - ▶ Rivers change course, mountains appear or disappear, continents split and join
 - ▶ When temperature changes, some species may only be able to survive in “refuges”, small, protected parts of their original range

**(a) 3.0–2.7 mya
(million years ago):**



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(b) 2.7–2.0 mya



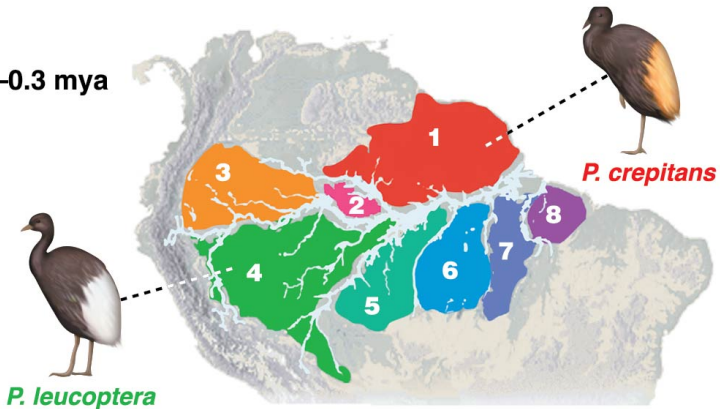
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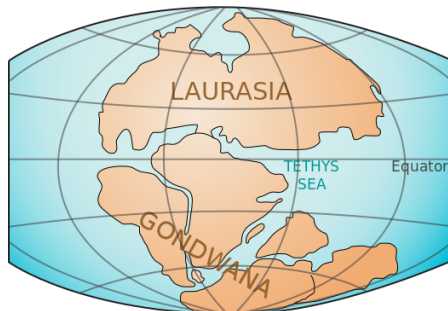
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(d) 0.8–0.3 mya



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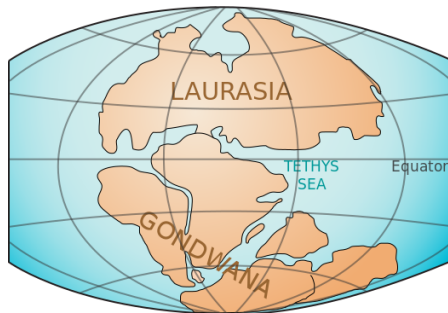
Example: ratites



TRIASSIC
200 million years ago

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- Dispersal

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- Disruptive selection

- Genetic incompatibility

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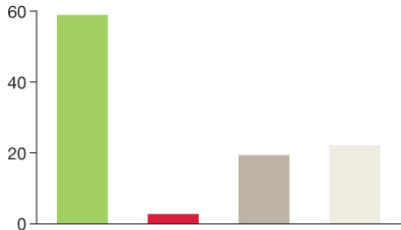


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Apple flies

Percentage of individuals that fly to scent
($n = 129$)



Hawthorn flies

Percentage of individuals that fly to scent
($n = 203$)

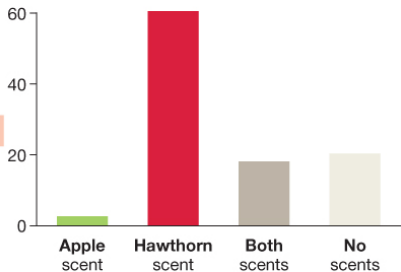


Figure 24.8 Disruptive Selection on Fruit Preference in Flies.

Each fly was tested with four types of scent, one at a time, in a laboratory setting.

SOURCE: Based on data from Dambroski, H. R., C. Linn Jr., S. H. Berlocher, et al. 2005. *Evolution* 59: 1953–1964.

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(a) If chromosome doubling occurs, allopolyploid offspring can be fertile and form new species.

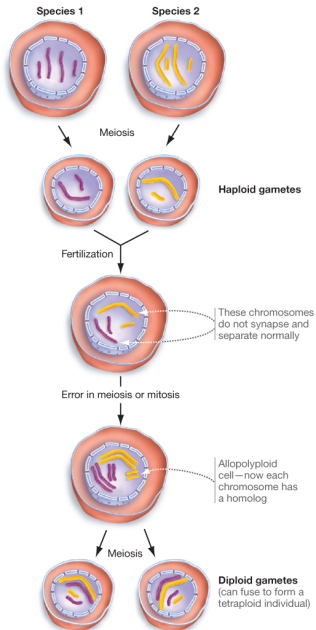
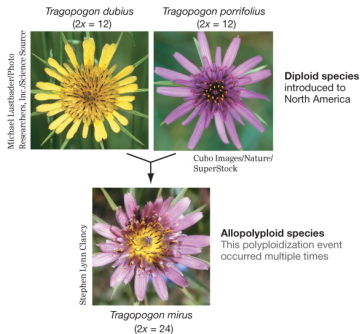


Figure 24.10 Allopolyploids Can Form New Species.

(b) An allopolyploid species that formed recently.





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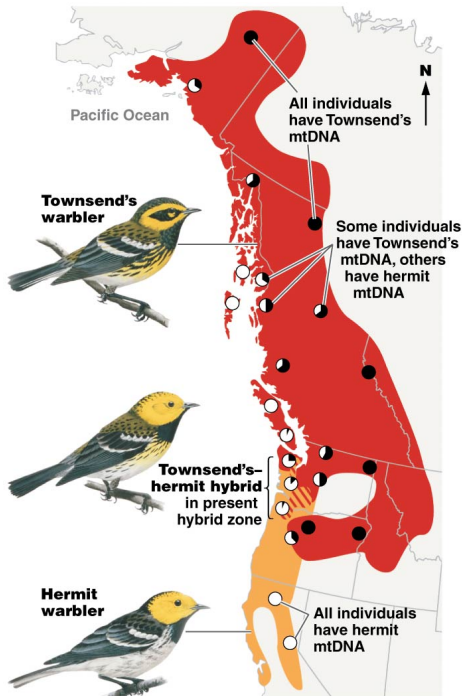
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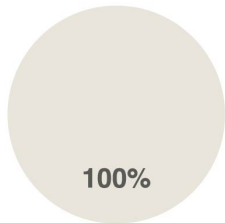
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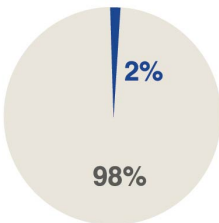
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Modern Africans



**Modern Europeans,
Asians, and Americans**

Neanderthal genes

Modern human genes

Source: Prüfer, K., et al. 2014. *Nature* 505: 43–49.

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