

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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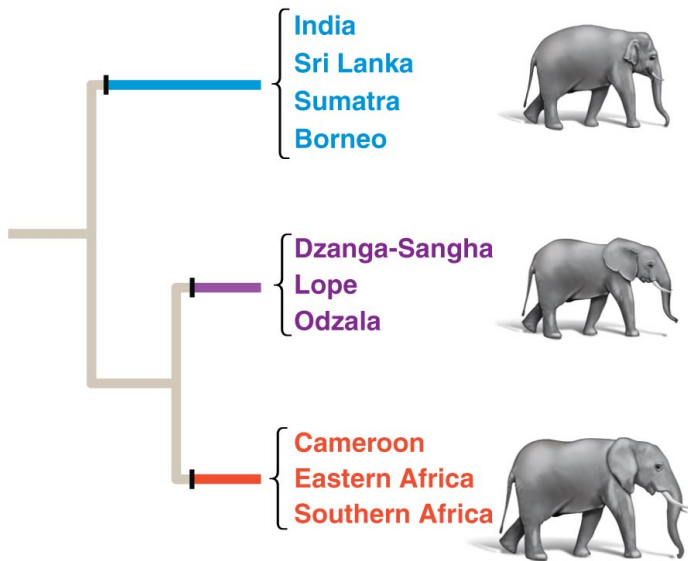
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(a) PROCESS: ALLOPATRIC SPECIATION BY DISPERSAL

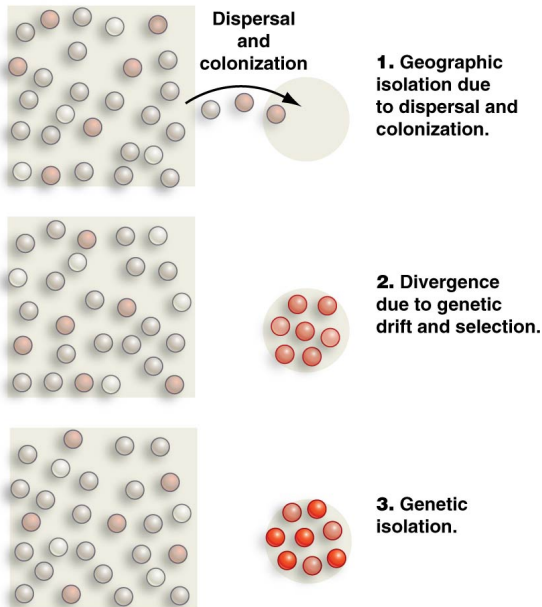
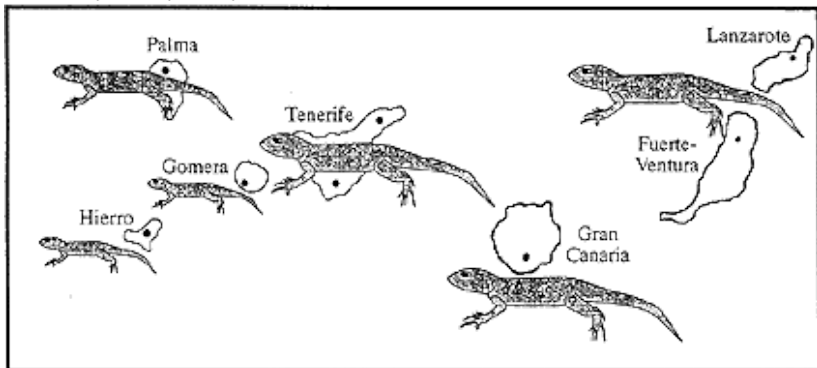


Figure 2. The relative sizes of typical lizards from each population are shown. (Redrawn from Thorpe et al., 1994.)



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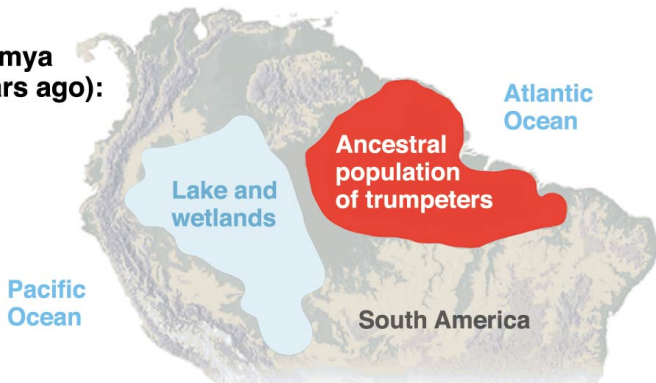
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**(a) 3.0–2.7 mya
(million years ago):**



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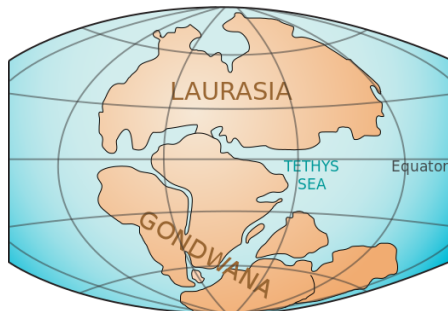
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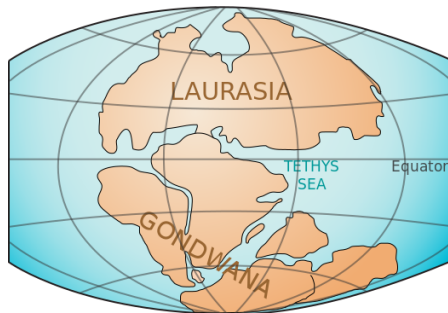
Example: ratites



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200 million years ago

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- Dispersal

- Vicariance

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- Disruptive selection

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

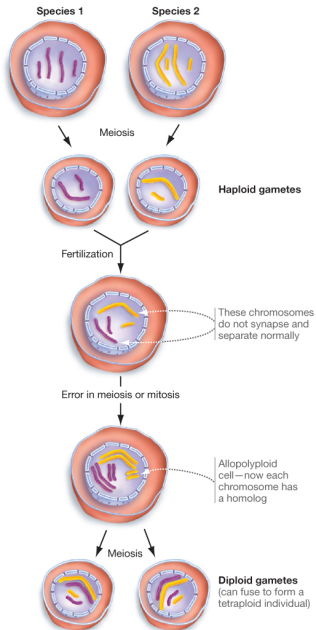
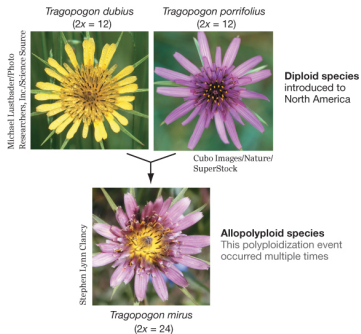


Figure 24.10 Allopolyploids Can Form New Species.

(b) An allopolyploid species that formed recently.





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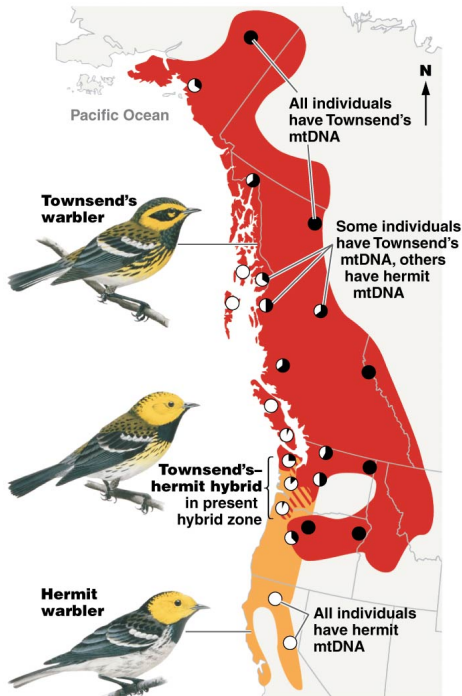
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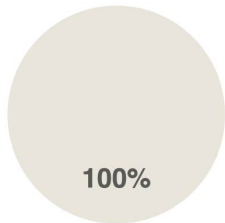
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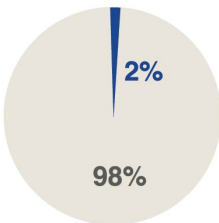
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Modern Africans



**Modern Europeans,
Asians, and Americans**

Neanderthal genes

Modern human genes

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

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 - ▶ Particularly if we want definitions that include both asexual and sexual species

Conclusion

- ▶ The diversity we see in the world arises from speciation events; mostly by single species splitting into two
- ▶ Species splits typically involve isolation and divergence
 - ▶ Isolation can happen allopatrically or sympatrically
 - ▶ New species can also sometimes arise from hybridization between related species
- ▶ Defining species can be complicated
 - ▶ Particularly if we want definitions that include both asexual and sexual species