

Exercise walk-through

7.10

Speciation

AP Biology

Speciation and phylogeny

A **species** : members that breed fertile offspring. New species need **reproductive isolation** :

- **allopatric** – a physical barrier splits them
- **sympatric** – split in the same place

A **phylogenetic tree** shows relatedness; recent branch points = close cousins.



Isolation and extreme habitats can split lineages

Speciation, and reading a phylogenetic tree

speciation

the origin of new species, when populations become **reproductively isolated** and diverge

allopatric

a **geographic** barrier separates the populations

sympatric

divergence **without** physical separation – polyploidy, or a shift in habitat or mating time

a phylogenetic tree

a cladogram diagramming evolutionary relationships

branch points

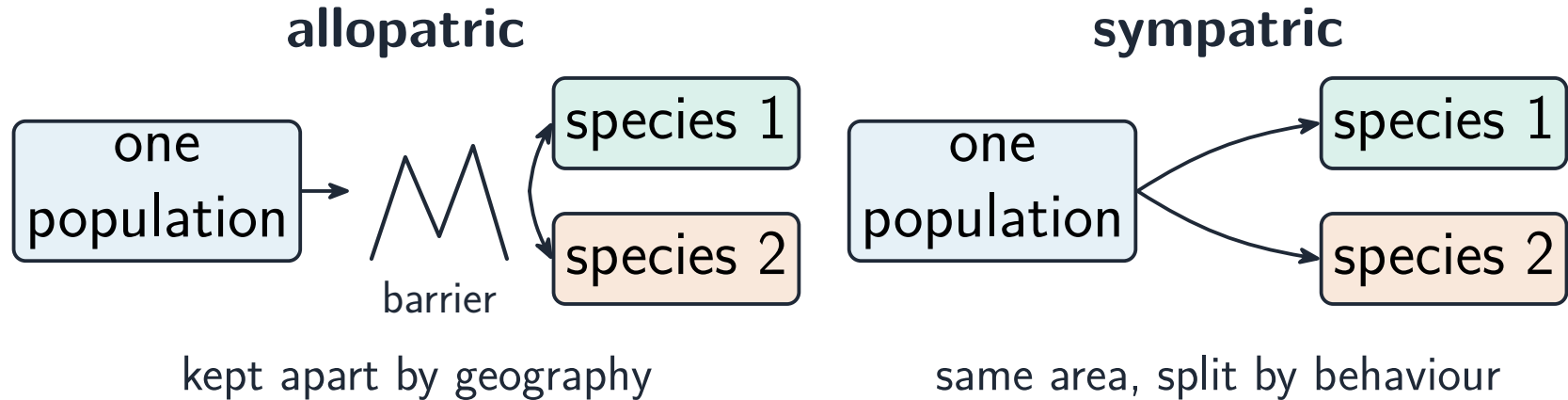
mark **common ancestors**; the shared derived characters define each clade

reading it

relatedness is read from **how recently two lines share a node**, never from proximity across the page

Two tips drawn next to each other can be distantly related. Trace back to the shared node – that is the only thing a tree asserts.

Allopatric and sympatric speciation



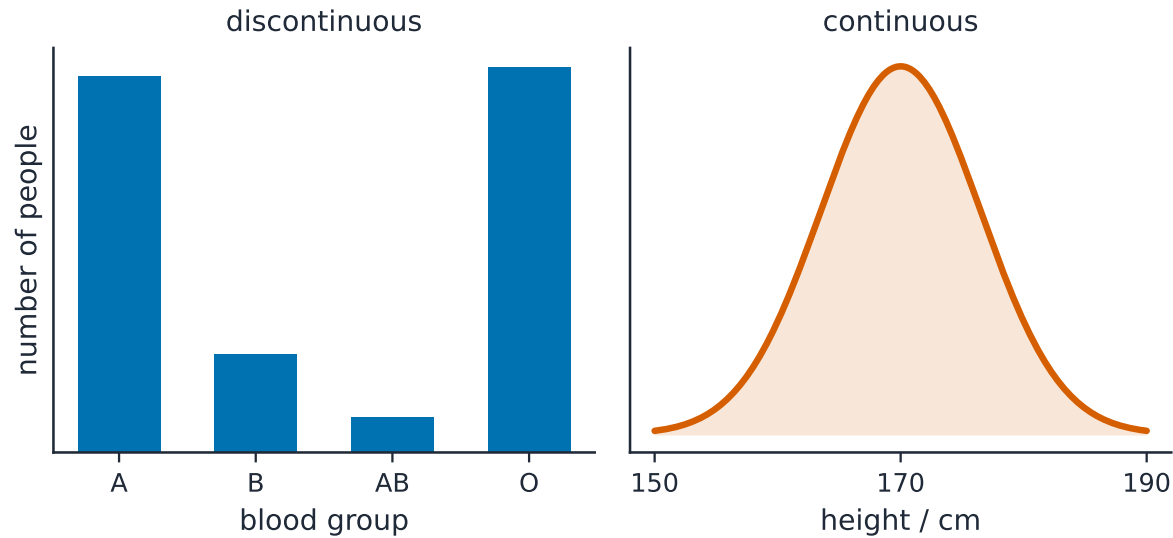
Allopatric and sympatric speciation

Variations in Populations

Genetic **diversity** helps a population survive change – if conditions shift, some variants may already be suited to them.

Low diversity (as in an endangered species) leaves a population vulnerable.

Variations in Populations, in detail



Discontinuous and continuous variation

Exercises 2.1-2.3

2.1 Define a species (biological species concept).

[1]

2.2 What must happen for speciation to occur?

[1]

2.3 Which type of speciation involves a geographic barrier?

[1]

Exercises 2.1-2.3

2.1 Define a species (biological species concept). [1]

2.1

- A group that can interbreed and produce fertile offspring
-

2.2 What must happen for speciation to occur? [1]

2.2

- The populations must become reproductively isolated (gene flow stops)
-

2.3 Which type of speciation involves a geographic barrier? [1]

2.3

- Allopatric speciation

Exercise 3.1

3.1 Speciation requires that populations become

[1]

☐

A larger

B reproductively isolated

C identical

D extinct

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[1]

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3.1 B

- reproductively isolated

Exercise 3.2 (a)

3.2 A mountain range separates one population into two, which evolve differently.

(a) Name this type of speciation.

[1]

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[1]

(a)

- Allopatric speciation

Exercise 3.2 (b)

3.2 A mountain range separates one population into two, which evolve differently.

(b) Explain how two species can form from one.

[3]

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(b) Explain how two species can form from one.

[3]

(b)

- The barrier stops gene flow between the two groups; each accumulates different mutations and adaptations; eventually they diverge so much they can no longer interbreed – two species

Exercise 3.3

3.3 Explain how sympatric speciation can occur without a physical barrier. [2]

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3.3

- Populations in the same area can be isolated by differences in mating time, habitat, or behavior, so they stop interbreeding and diverge without a physical barrier