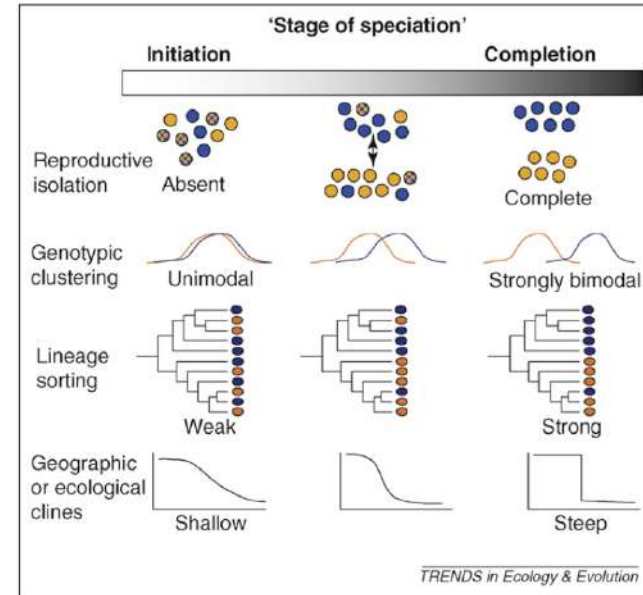
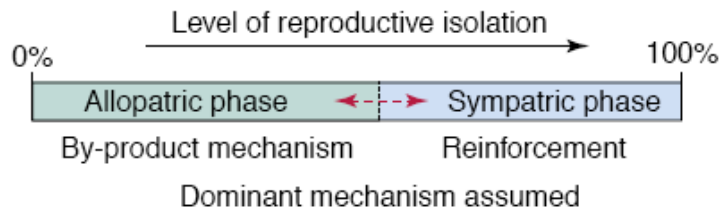


Modes of SPECIATION

Examples

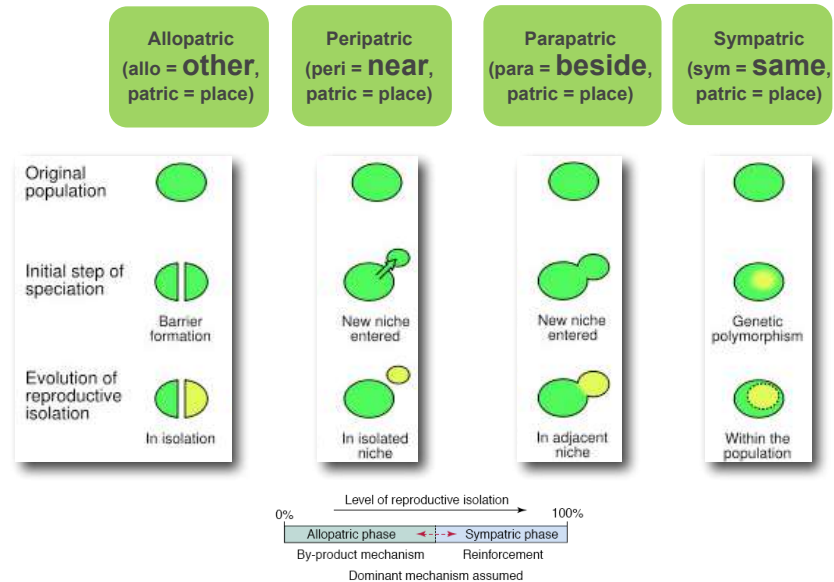


• Speciation modes and tempo •



TRENDS in Ecology & Evolution

• Speciation modes and tempo •



Examples

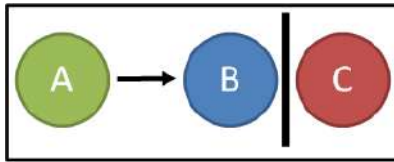


Figure 1: Allopatric speciation occurs when a population is isolated by a geographic barrier.

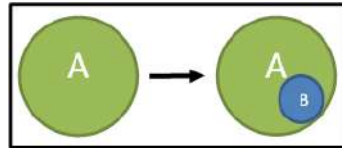


Figure 2: Sympatric speciation occurs as a new species evolves in the same area as the ancestral species.

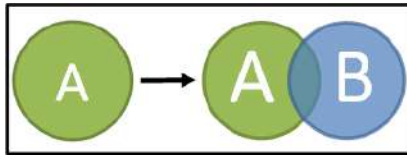
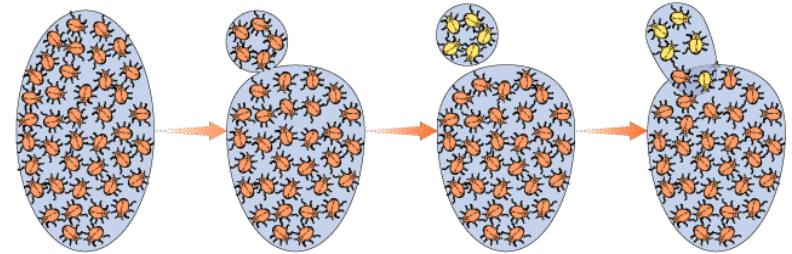


Figure 3: Parapatric speciation occurs when two populations share an overlapping range, but still diverge into two sister species.

• Speciation modes and tempo •

The Process of Speciation

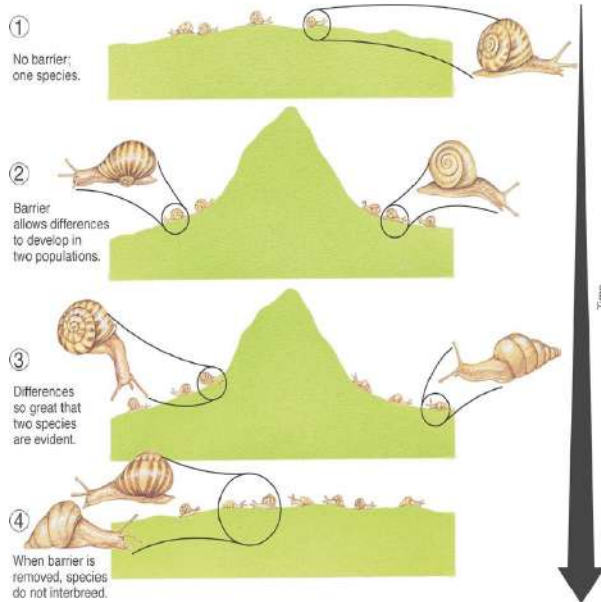


One species (set of interbreeding organisms)

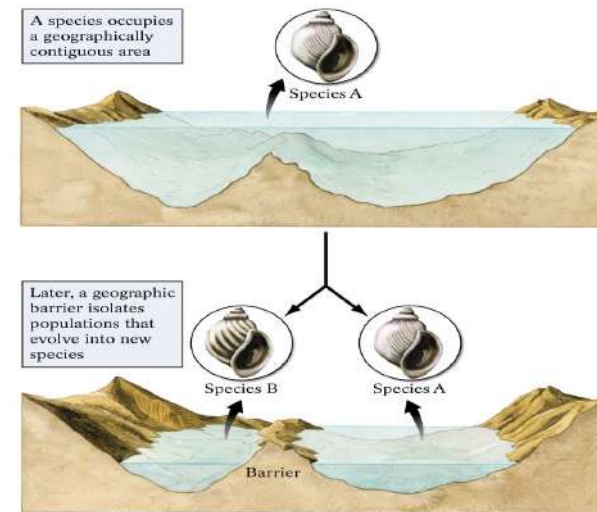
Genetic variant spreads through part of the species; bearers of this variant must mate only with other bearers of the same variant

Two species. Further phenotypic, behavioural and ecological differences may evolve

How a single species becomes two or more species?



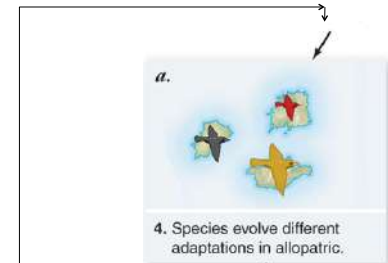
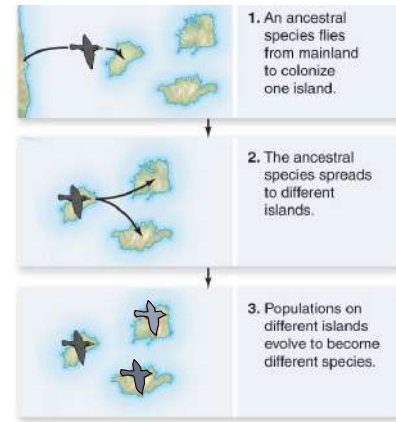
• Speciation modes and tempo •



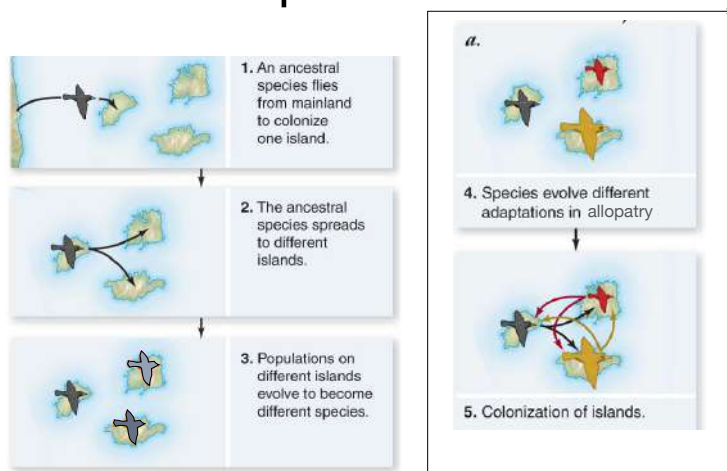
Adaptive Radiation

“Closely related species that have recently evolved from a common ancestor by adapting to different parts of the environment”

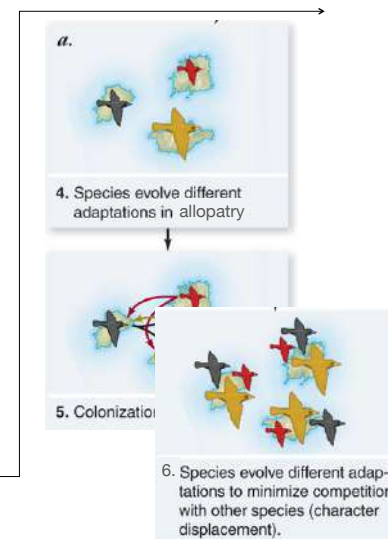
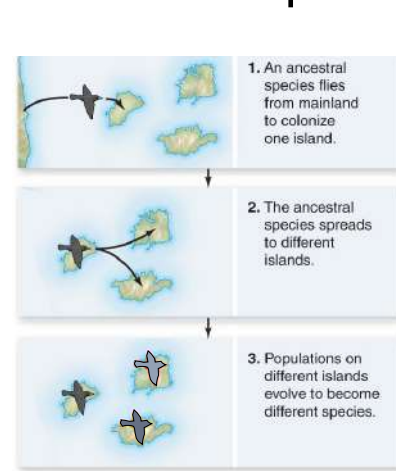
Adaptive Radiation



Adaptive Radiation



Adaptive Radiation



Adaptive Radiation

“Closely related species that have recently evolved from a common ancestor by adapting to different parts of the environment”

Character Displacement

“Process of *phenotypic* evolution in a species generated or maintained by resource competition with one or more coexisting species” Schluter 2000

Divergent character displacement is the most relevant to adaptive radiation

Convergent and parallel Displacement

Possible, but there are no examples

The geography of speciation

(b) Vicariance

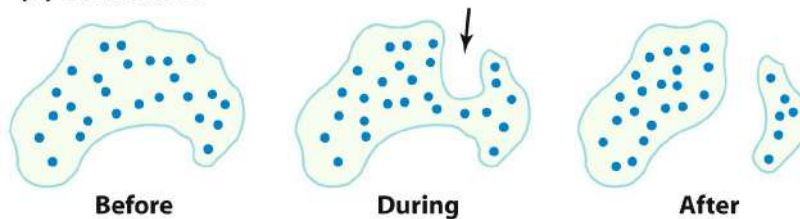
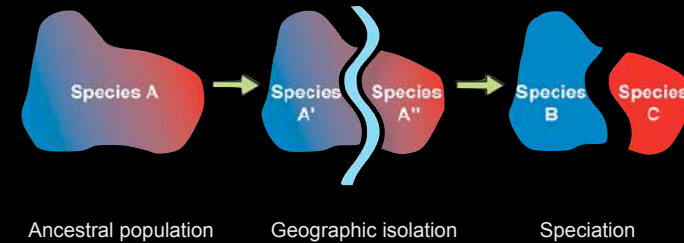


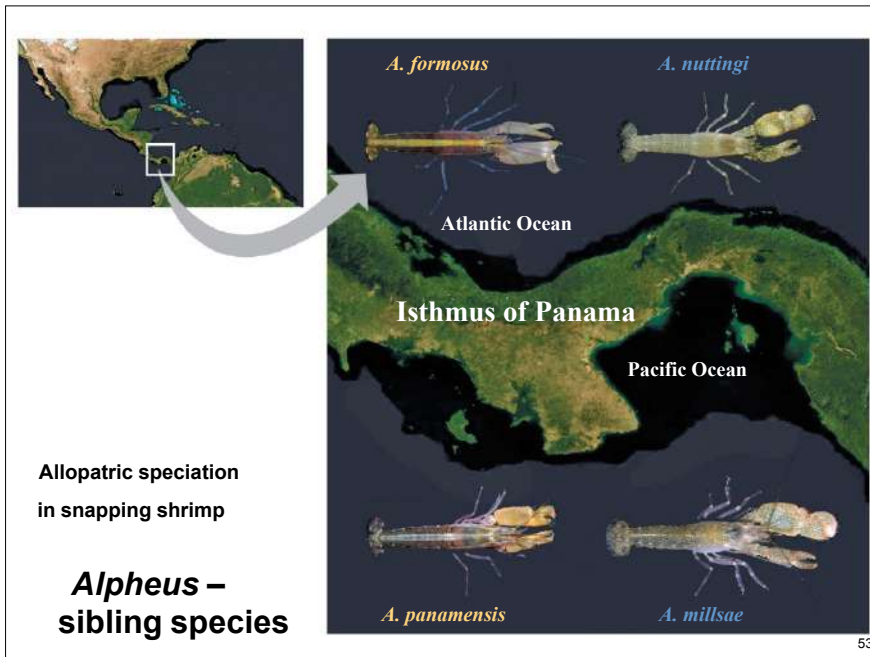
Figure 16-5 Evolutionary Analysis, 4/e
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ALLOPATRY

Vicariance



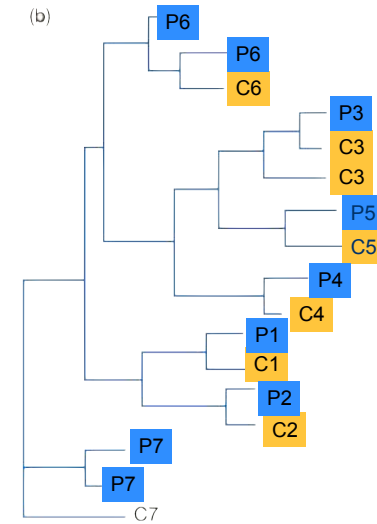
- 1 A geographic barrier creates isolation between two or more portions of a population
- 2 The descendant populations **diverge** genetically (due to drift and selection)
- 3 The reproductive isolation is completed



• Speciation modes and tempo •

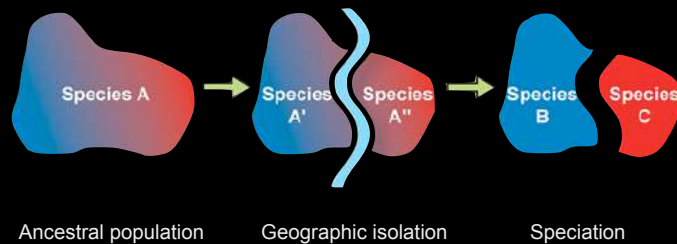
Knowlton et al. (1993) created a phylogeny of Pacific (P) and Caribbean (C) species pairs of *Alpheus*

In 6 out of 7 cases, the closest relative of a species was on the other side of the Isthmus



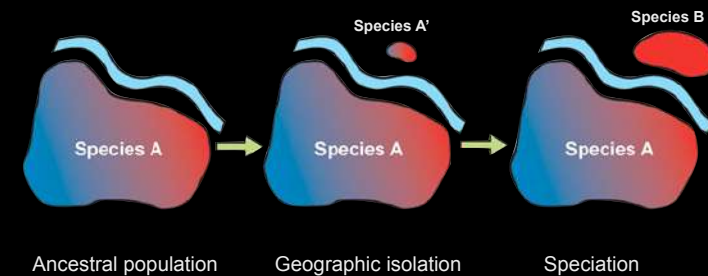
ALLOPATRY

Vicariance



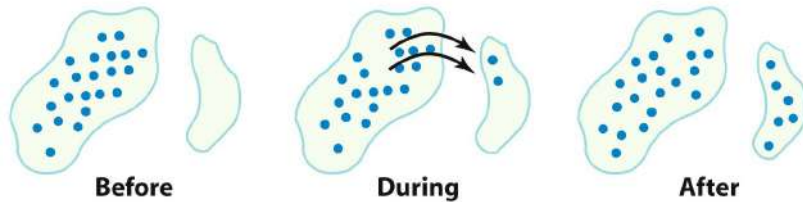
ALLOPATRY

Dispersal

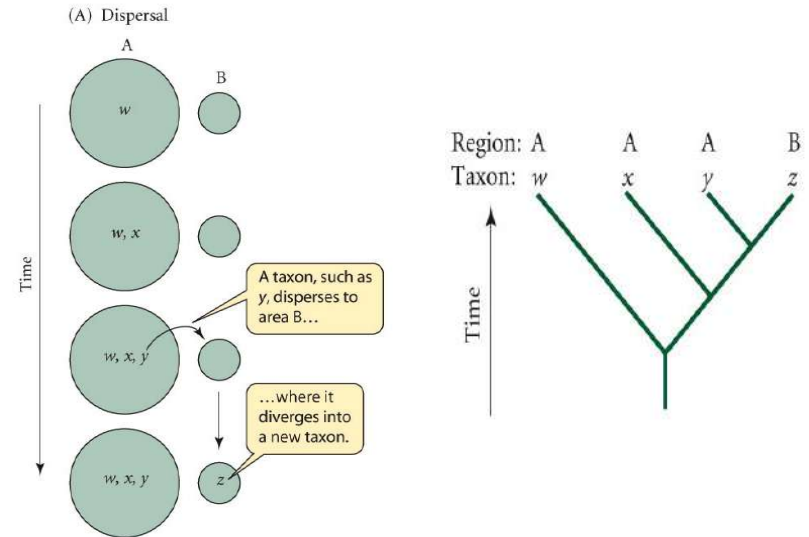


Allopatric speciation through "dispersal and colonization"

(a) Dispersal

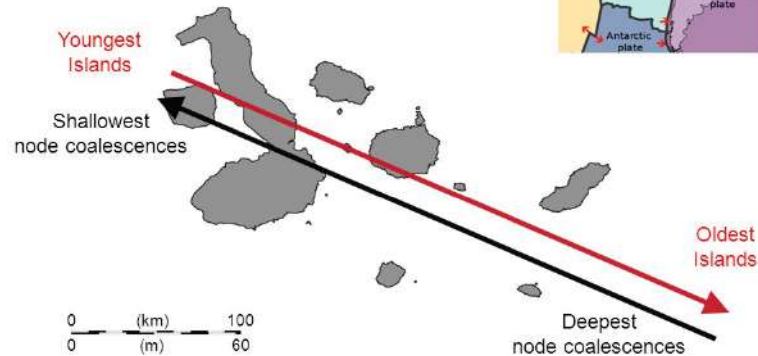


Testing hypothesis in biogeography



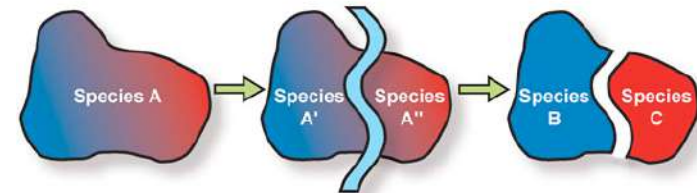
Examples

Patterns of colonization & diversification linked to geological history

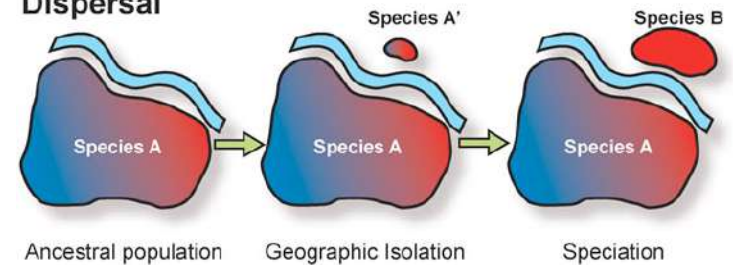


• Speciation modes and tempo •

Vicariance



Dispersal



• Speciation modes and tempo •

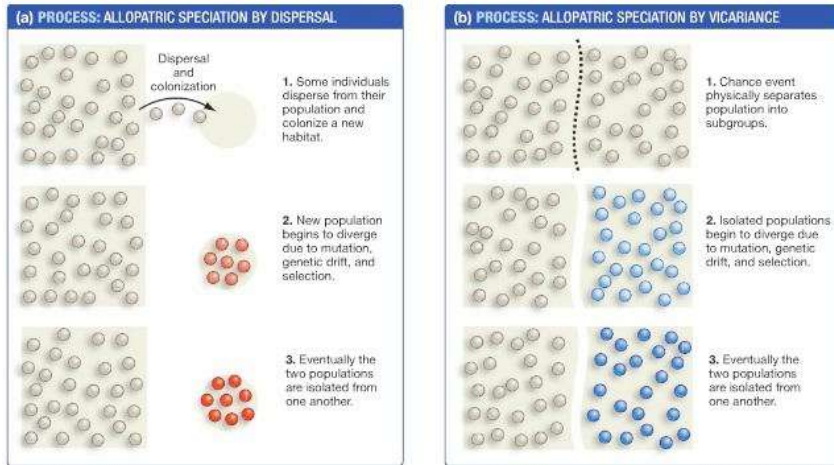
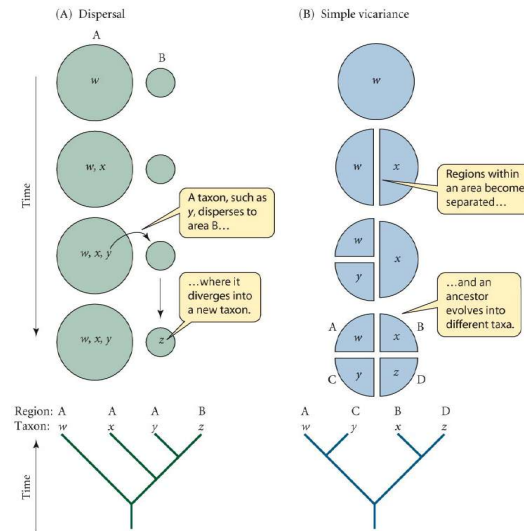
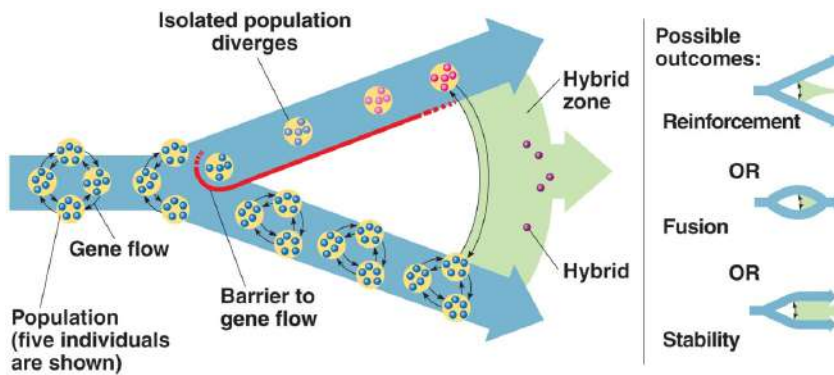


FIGURE 26.4 Allopatric Speciation Begins via Dispersal or Vicariance. (a) When dispersal occurs, colonists establish a new population in a novel location. (b) In vicariance, a widespread population becomes fragmented into isolated subgroups.

Testing hypothesis in biogeography



Species concepts • Isolating mechanisms • Speciation modes and tempo • Hybrids



• Speciation modes and tempo •

The reproductive isolation is completed

this occurs after "secondary contact" between allopatric populations
a crucial step, why?

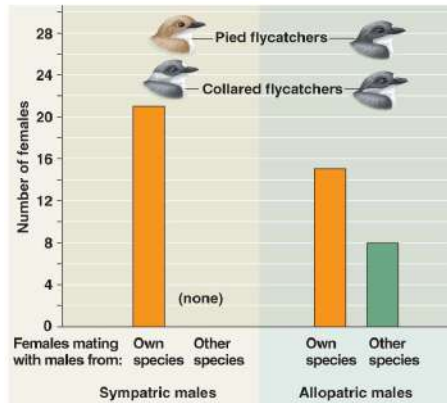
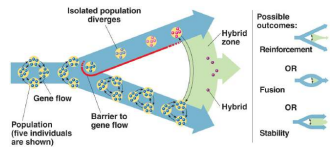
*secondary contact is common
without complete reproductive barriers, species
will re-fuse*



Sympatric male pied flycatcher

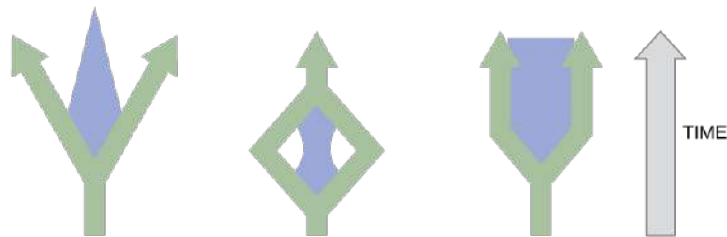
Allopatric male pied flycatcher

Reinforcement example



Modes of SPECIATION

Changes in the Hybrid Zone over Time



Reinforcement:
Hybrids are less fit than either purebred species. The species continue to diverge until hybridization can no longer occur.

Fusion:
Reproductive barriers weaken until the two species become one.

Stability:
Fit hybrids continue to be produced.