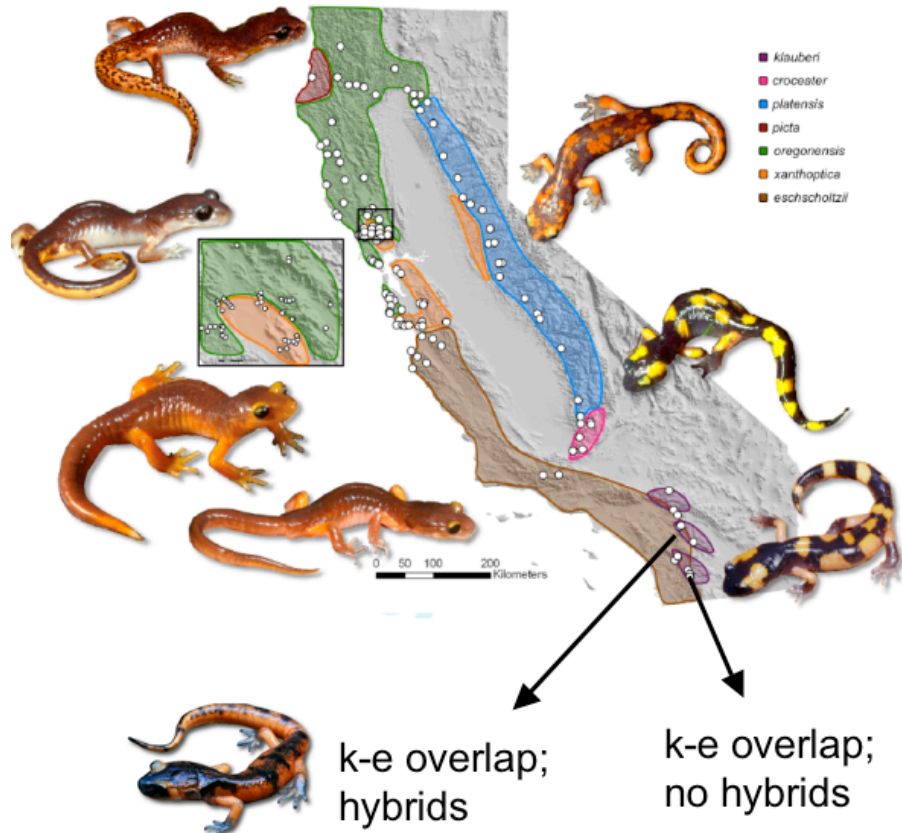


Ensatina eschscholtzii

- Salamanders mimic newts with yellow stripes over their eyes (in the Bay Area)
- Their geographic range covers much of California, excluding the Central Valley:



- The ancestral range was in the redwood forests of the north, but they have migrated independently along the west coast and the Sierra Nevadas
- There are gradual transitions along the coasts: on the west, the salamanders are plain and cryptic; on the east, they are disrupted (disruptive against leaf litter background), blotched, and highly colored
- In the foothills of the Sierra Nevada, there is a hybrid zone where the coastal form and Sierra form have come back together
- In some mountains behind San Diego, the plain and blotched overlap. Yet, just to the north at Palomar, they overlap and form hybrids.
- Could be considered a “ring species” because they make a loop of gradual transitions with RI at the terminus
- Current taxonomy is that there is one species with 7 sub-species, but they could be classified as having two species or 11+ species
- Since these species are in the process of evolving, there is much gray area between populations, causing classification problems

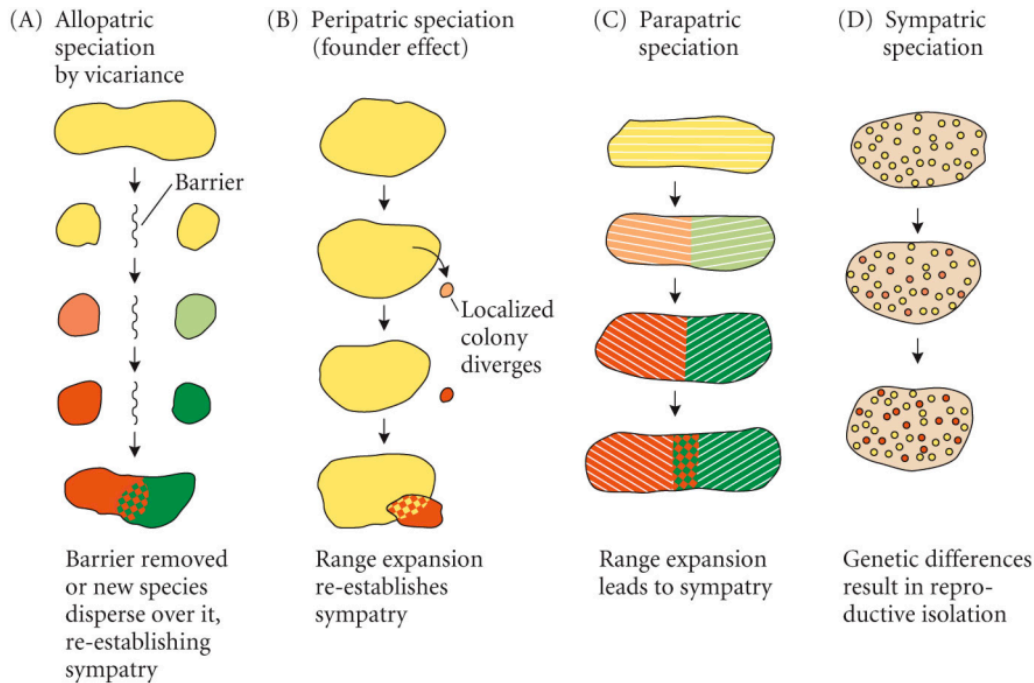
Speciation

Recall that:

Disruptive Selection increases population divergence

Genetic Drift increases population divergence

Migration decreases random mating and divergence

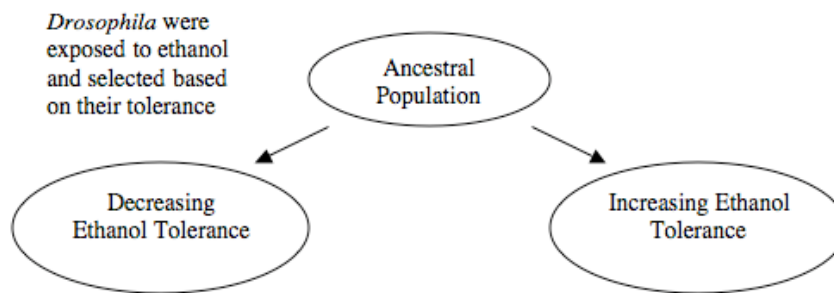


EVOLUTION 2e, Figure 18.1 Futuyma 2005

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Allopatric:

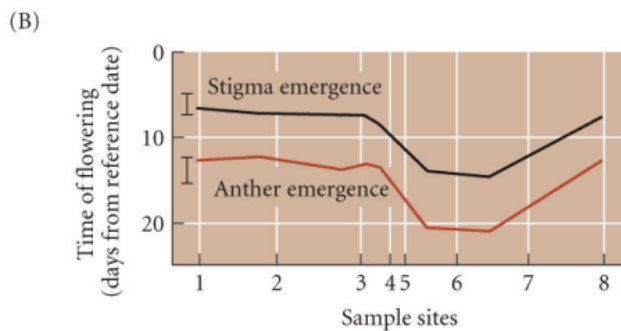
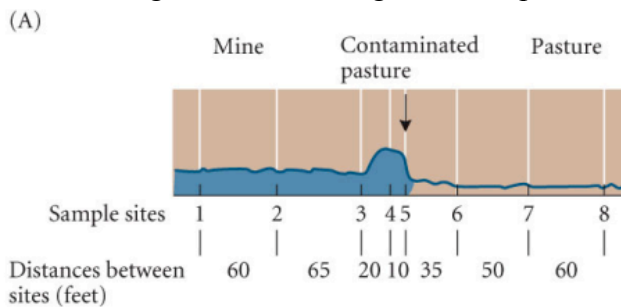
- A geographical barrier arises so that a population is separated, and over time (though this is a relatively quick method of speciation), two new species form, one or both groups that are very different from the ancestral population
- This is the dominant form of speciation
- Enhanced with divergent selection
- Experimental example: tiny tropical frogs on adjacent mountains diverge into sister species (they are each others' closest relatives)



- When the two groups of flies were brought back together, there was some reproductive isolation (in as short a time as 5 years—something Darwin would have found unbelievable)

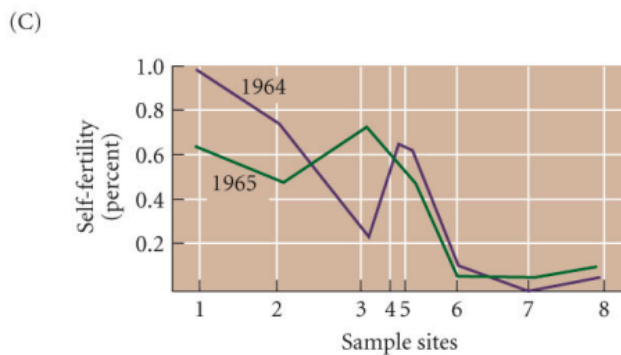
Parapatric:

- Lacks a concrete boundary like allopatric speciation...instead it occurs in adjacent diverging populations
- Needs divergent (disruptive selection) and non-random mating to function as a mechanism of speciation
- Recall the grasses living on adjacent mine sites in which phenotype frequency changed based on the grasses' respective habitats:



Here, the grasses shift in times of flowering (creating non-random mating because each habitat's grass mates at a different time)

The mine site grasses flower earlier (temporal isolation) and have an increased rate of self-fertilization. There is also the post-zygotic isolation of the fitness of the mine grass versus the non-mine grass.



EVOLUTION 2e, Figure 18.20

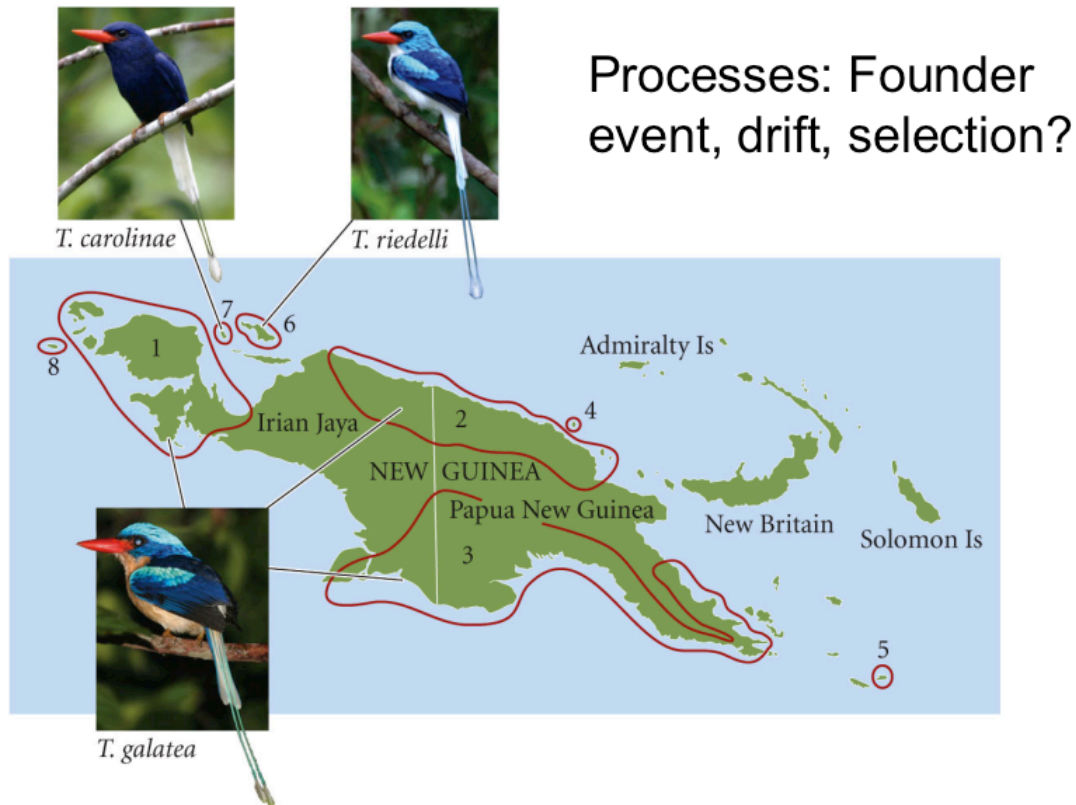
Sympatric:

- Though these populations overlap geographically, divergent selection is at work with pre-zygotic isolation as a side effect
- Non-random mating must arise, and it does in the form of the groups isolated by disruptive selection mating only with members of their own groups

- Example: Lord Howe palms on Islands near Australia with sister species of palms that differ in important ecological characteristics (i.e. soil types)
- Different sister species on different soil types flower at different times, reproductively isolating themselves

Peripatric:

- May particularly apply to islands because it refers to a Founder-like speciation in which a small group of individuals (colonists) breaks off from a large population (continental group)
- The novel environment of the island gives rise to divergent selection
- Example: the Paradise-Kingfishers of New Guinea



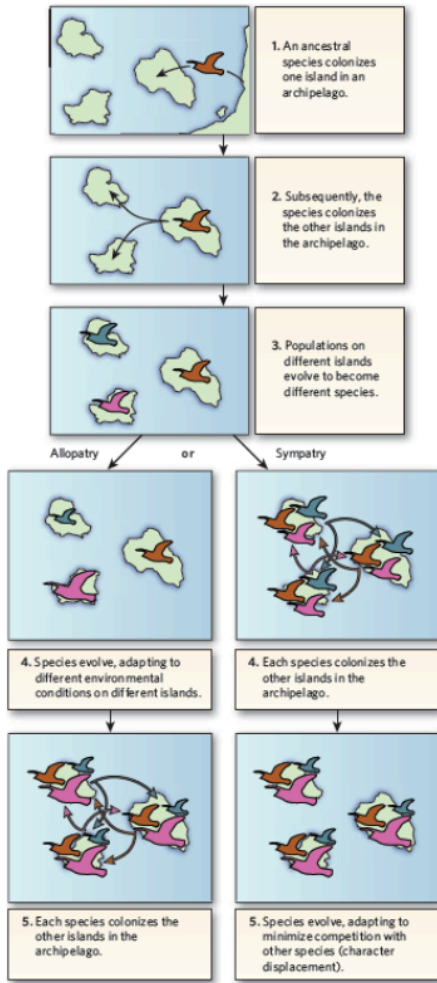
EVOLUTION 2e, Figure 18.17

Futuyma 2005

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Adaptive Radiation

- The rapid proliferation of species driven by ecologically-mediated divergent selection
- Seen most often on remote islands where there is little pressure from gene flow and great ecological possibility
- We've seen this in the finches and mockingbirds of the Galapagos where one founding species quickly adapted to the many unfilled niches on remote islands
- From Losos and Ricklefs Paper:



This cartoon shows the progression of one continental species onto an island, and the adaptive radiation that occurs from there