**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

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.

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

Processes: Founder event, drift, selection?

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