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
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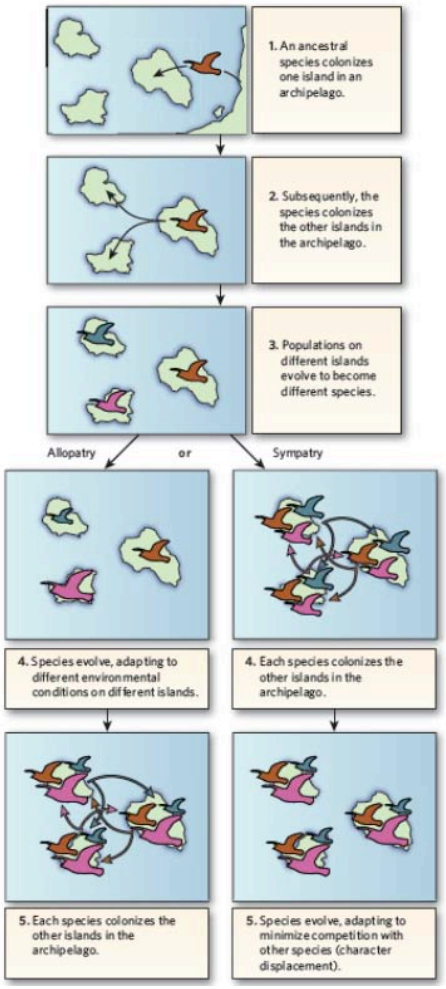
- From Losos and Rickleffs Paper:



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

Hybridization

What happens when two independently evolving lineages meet? When two lineages that evolved from a single ancestral population encounter each other once again, it is called secondary contact. There are several possible outcomes on secondary contact:

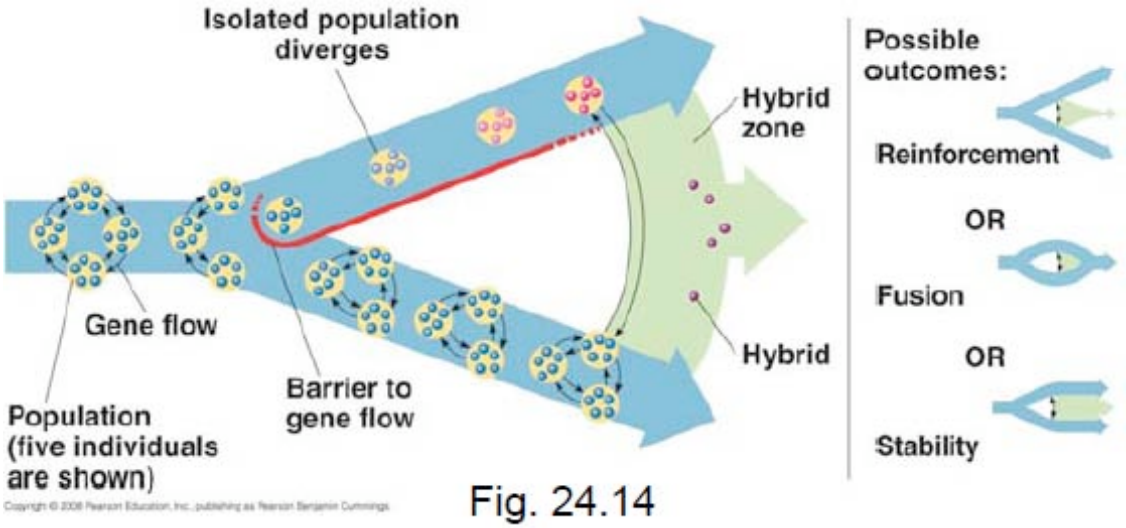


Figure 2: Possibilities of secondary contact: reinforcement, fusion, stable hybrid zone
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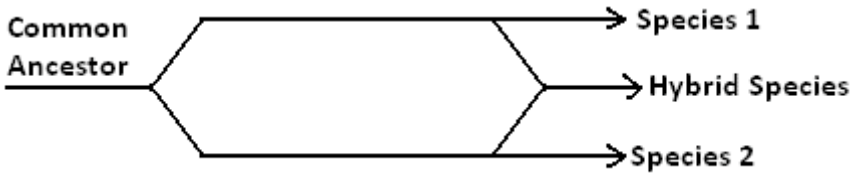

Figure 3: possibilities of secondary contact: Hybrid Speciation
Christopher Pavia, 2009.

1. No **hybridization** occurs; if these two lineages occupy different ecological niches and can exist sympatrically (in the same environment) they are "good species" by any criterion.
2. **Fusion:** members of the two lineages mate together, forming hybrids with normal fitness, and eventually collapse into one species. Note that since independent evolution has been occurring while the two populations were separate, resulting in a linage that will not be identical to the ancestral lineage. Typically this new lineage will be regarded as the same species, however.
3. Stable **hybrid zone:** each lineage maintains its own range separate of each other save for some areas of overlap. In those regions, the hybrids have reduced fitness and the hubrid zone is maintained by immigration from adjacent parent populations.
4. **Reinforcement:** selective pressure to avoid mating (hybrids are either inviable or infertile) will eventually lead to choice #1.
5. **Hybrid speciation:** formation of a 3rd species (lineage) if the hybrids are diploid (or rather, have the same chromosome number as their parent species) but ecologically different; as hybrids are fit, requires some form of prezygotic isolation. Also, consider plant hybrids and polyploidy, also known as "allopolyplody:" in this case, the new hybrid taxon has another set of chromosomes (e.g. 4N) and hybrids with their parental species (4N x 2N = 3N) will be sterile.

For examples, consider the *Ensatina* lizards from the previous lecture. Each subspecies (i.e. lineage) has its own distinct range. Some of these lineages overlap, especially in southern California. Some of these overlaps form **stable hybrid zones**, where the hybrids are viable. In other overlaps of the same two lineages there is strong reproductive isolation, and thus no hybrids.

An example of hybrid speciation is seen in sunflowers from texas. One (diploid) species arose via hybridization from two others, but the hybrid lineage is now ecologically (and geographically) isolated from its progenitors, so no fusion occurs.