

Chapter 56

Evolutionary Aside 56.1--Ecological Versus Evolutionary Explanations for Differences Among Sympatric Species

If sympatric species compete for limited resources, natural selection can lead to evolutionary divergence so that the species use different resources and are thus able to coexist. This process of character displacement can produce communities in which the species are phenotypically different and use different resources.

However, interspecific competition can lead to communities of dissimilar species in a very different way. Imagine an initially empty oceanic island. As species arrive, competition prevents colonists whose use of resources is too similar that of an established species from successfully colonizing; only dissimilar species can persist. The result is a community of dissimilar species, in this case resulting, not from evolutionary divergence (that is, character displacement), but from the ecological process of competitive exclusion of similar species.

Both of these processes occur in nature. In islands in the Lesser Antilles in the Caribbean, when two species of *Anolis* lizards co-occur, they are greatly different in size and eat different prey. These size differences are the result of evolutionary change from medium-sized ancestors, one species getting larger and the other getting smaller. By contrast, on islands in the Gulf of California, when two species of whiptail lizards (genus *Cnemidophorus*) co-occur, it is the result of competitive exclusion. Whiptails evolved their size differences a long time ago, and co-occurrence happens today only when different-sized species colonize the same island.

As a result, the observation that co-occurring species use different resources may suggest that interspecific interactions have shaped community composition (although other explanations, or just chance are also possible), but whether it has done so through ecological or evolutionary means requires further investigation.