ScienceWatch-Finches That Sing a Different Tune

In 1859 Charles Darwin wrote *The Origin of Species* in which he proposed his revolutionary theory of evolution through natural selection. He reasoned that individuals born with small differences, which afforded them a survival advantage, would be more likely to breed and pass these characteristics on to their progeny. This process, which he called natural selection, would over time give rise to new forms, even new species. He based his theory partly on the variety of finches he observed during the five weeks he spent in 1835 on the small island chain known as the Galápagos 600 miles west of the coast of Ecuador.

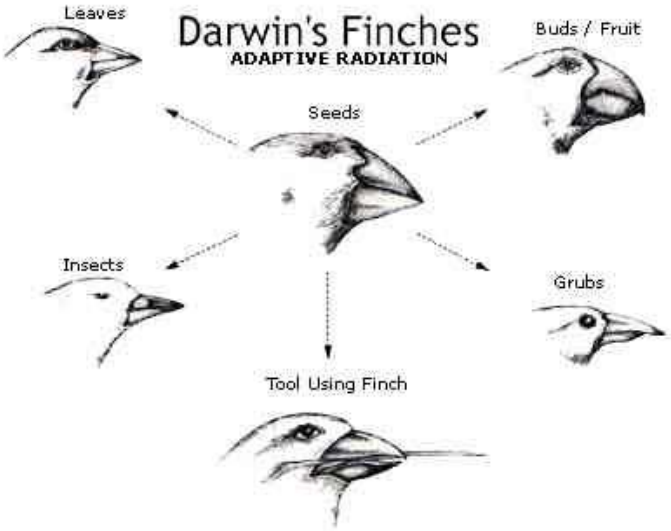
Darwin realized the varied finches had evolved from a single ancestral form that had made it from South America to one of the islands. ."

Today evolutionary biologists agree that adaptations in size and shape of beaks rapidly formed (in less than 3 million years) the 14 species now known as "Darwin's finches". This distinct group of birds, found nowhere else in the world, is considered a classic example of speciation by *adaptive radiation*, in which one species diversifies into many to exploit a wide range of habitats. The group includes ground-dwelling birds that feed on different sized seeds or cactus flowers and tree-dwelling birds that eat different sized insects or types of fruit. Now it appears that the songs they sing had much to do with finch speciation.

To better understand what happened on the islands we first need to know what a species is and what is needed for speciation to occur. A species is a group of individuals, freely interbreeding to produce viable, fertile offspring. Subsets of individuals within the group may differ in some characteristics, which make them recognizably different from other subsets, but as long as the subsets interbreed and produce viable, fertile young, they are a single species. For example, humans are a single species composed of several subsets (subspecies, races). Once two subspecies can no longer produce fertile young, they are *reproductively isolated* and are separate species. For example, horses and donkeys mate and produce young, but the resulting mule or ninny is sterile.

It is easy to see that two subspecies could become separate species if they are geographically isolated long enough for them to become reproductively isolated. However, the finches are all within easy flights of each other, so their reproductive isolation is not a result of any physical barrier. Yet, evolutionary biologists agree that the divergence of Darwin's finches into 14 species occurred quite rapidly. A study published in the January 11, 2001 issue of *Nature* tells us how that probably happened. Jeffrey Podos is an evolutionary biologist at the University of Massachusetts (Amherst) who studies the evolution of vocal behavior in birds. Podos spent two months collecting male birds from nine species of Darwin's finches on Santa Cruz Island. He recorded their

songs and took beak measurements. While the syrinx is the primary vocal organ for songbirds, Podos found that beak size affects the trill rate and frequency of their songs. Larger beaks produce both narrower frequency range and slower trill rates. Simply put, the larger, heavier beaks of seed crushers cannot move as fast as the thinner, more delicate beaks of the insect eaters.



What light does this finding shed on the rapidly occurring evolution of Darwin's finches? Given the many new feeding opportunities open to the colonizing birds, beak changes would have occurred rapidly. Podos suggests that changes in beak size and shape were pivotal in the adaptive radiation of the Gala□pagos finches. An altered beak would clearly result in reproductive isolation because it would change the song by which females choose their mates. Since sons tend to sing like their fathers and daughters prefer their father's song, circumstances would now favor lots of inbreeding and the rapid establishment of a new species. You never know your potential until you try singing a different tune.

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