

Abby Lodge
Galapagos Finch Evolution

To answer how so many species came to be, researchers are considering places that recently arose – such as the Galapagos islands. Researchers Peter and Rosemary Grant, started out with no long-term plan, they thought it would be two or three years of research. However, they started in 1973 and have returned every summer since. The Grants studied the famed Galapagos finches. In the video, Rosemary Grant pointed out that there 13 species of finches each adapted for their location and food source. Larger trees grow at higher elevations while lower islands have mainly cacti, grasses, and shrubs. She said that the warbler finch has a needle like nose for picking off insects, while the woodpecker finch has a more robust beak that concentrates on beetle larvae and termite larvae. There are also cactus finches that have a longer, sharper beak which probes into cactus flower. And there are large, medium, and small ground finches. I like the quote that beaks are tools and you need the right tools for the right jobs.

The finches look so different that Darwin first mistook them for entirely unrelated kinds of birds. The question then arises, could different kinds of finches have all come from the mainland separately or did the finches all evolve out on the islands? Now we know from DNA evidence that all the species are more related to each other than to a species on the mainland – this tells us that only one species arrived on the archipelago and diversified into the 13 species that we see now. They all have a single common ancestor. But how did one ancestral population give rise to many species with different adaptation? A crucial insight came into how adaption occurs came when the Grants focused on one species on the island of Daphne Major – medium ground finches. The island is convenient because it is small and therefore easy to follow every individual. The Grants caught, weighed, measured, and tagged all the finches year after year.

Over the first four years little seemed to change, then in 1997 a terrible drought began. Vegetation basically disappeared, except for a few trees without any leaves and cactus bushes. Ground finches had to compete for food – small seeds were scarce, so they had to compete for large woody, spiny seeds. The birds with the smallest beaks had the hardest time – 80% of medium ground finches had died that year. When they inventoried the surviving medium ground finches, what they found was one trait had made the greatest difference between life and death – the larger the beak the greater the chance of surviving the drought. More surprising was that the offspring of the next generation had a 4% increase in the size of their beak – natural selection had changed the beak size.

Was this a fluke or is it happening all the time? 5 years later in 1983, and unusually strong El Nino brought ten times more rain than normal. The island was overrun by vines that covered even the cactus, the rain changed the vegetation on the island so much that two years later when another drought struck, larger seeds become scarce. The birds with larger beaks now had difficulty picking up the more abundant small seeds produced by the vines – that year many more finches with small beaks survived and their offspring inherited smaller beaks. The selection had swung in the opposite direction.

Over millions of years, changes like these throughout the Galapagos generated all sorts of beak sizes and shapes. But that's only part of the story. How did finches with different beaks become distinct species? When two populations become separated geographically and undergo

enough change in their respective habitats, that if or when they come into contact again, they do not mate. But what keeps different species of finches from mating? The Grants noticed that the different species sing very different songs. They tested their hypothesis by playing a cactus finch song through a loud speaker and only cactus finches came – the medium ground finches completely ignored it. Males only respond to their own species' song. The Grants also tested if appearance played a role. They used stuffed female finches and the males only courted their own species and ignored others.

Geography and ecology are both keys to the evolution of the Galapagos finches. The history of the Galapagos finches offers a unique insight into why the world is populated with so many species – the more diverse the environment, the more opportunities for evolutionary change to produce those new species.