

Preface



DARWIN'S *ORIGIN OF SPECIES* (1859, p. 1) begins: "When on board H.M.S. 'Beagle,' as naturalist, I was much struck with certain facts in the distribution of the inhabitants of South America, and the geological relations of the present to the past inhabitants of that continent. These facts seemed to me to throw some light on the origin of species—that mystery of mysteries, as it has been called by one of our greatest philosophers." We followed in his footsteps 138 years after his visit to the Galápagos, with the same quest in mind. Our book describes what we learned by studying Darwin's finches (fig. P.1) for 40 years on Daphne Major (fig. P.2), a small island in the center of the Galápagos archipelago (fig. P.3).

Genetic variation is the raw material for evolution. Although much has been learned about genetic variation from theoretical and laboratory research, long-term field studies in natural environment have been relatively neglected. Knowledge of how genetic and phenotypic variation interacts with environmental variation is fundamentally important for understanding evolution in nature. It can be achieved by long-term field studies of evolution with well-chosen organisms in well-chosen environments when coupled with the benefits of laboratory science. This is what we have attempted to do. By taking a multidimensional approach to questions of evolution and speciation, carefully documenting genetic, ecological, and behavioral factors responsible for evolution of finches across 40 years, we have made discoveries about speciation far beyond our initial expectations. And although finches are the focal organisms of the study, the principles of their evolution apply broadly to all organisms.

These are exciting times to be an evolutionary biologist. Changes in technology are proceeding at an ever-increasing pace, giving us the tools for expanding our knowledge and understanding of how evolution occurs in the natural world. In view of this it is worth reflecting on the state of knowledge in 1973 (Mayr 1970, Dobzhansky 1970), on the methods and tools available for evolutionary investigations at that time, and the transformation that studies of speciation have undergone since then. Techniques we take for granted now did not exist. Electrophoresis (Hubby and Lewontin 1966) was only just becoming widely available as a method of detecting allozyme variation if the appropriate buffers could be worked out. It required a power source, which ruled it out for most studies on uninhabited islands. Cladistics (Hennig 1966)

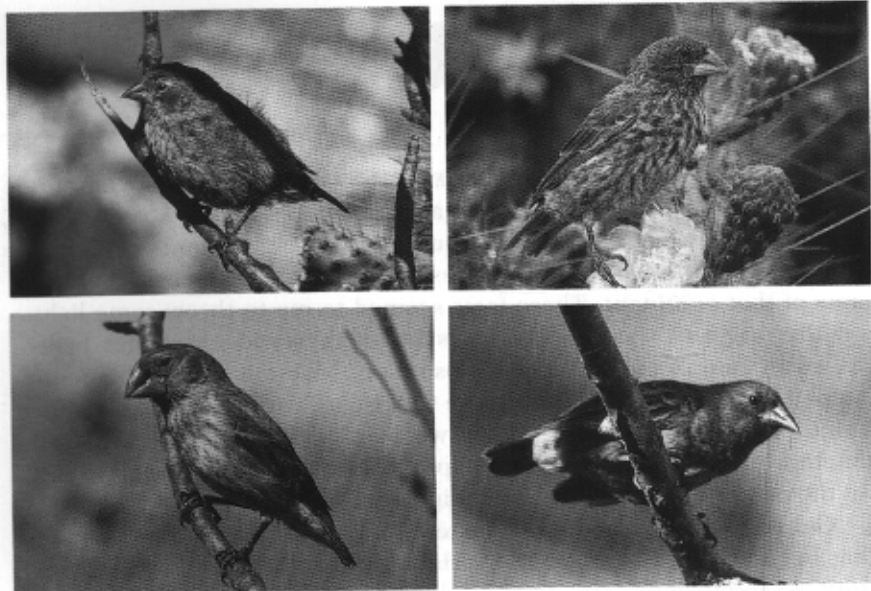


Fig. P.1 The four species of finches. Upper left: Small Ground Finch, *G. fuliginosa*. Upper right: Medium Ground Finch, *G. fortis*. Lower left: Large Ground Finch, *G. magnirostris*. Lower right: Cactus Finch, *G. scandens*. From Grant and Grant (2008a).

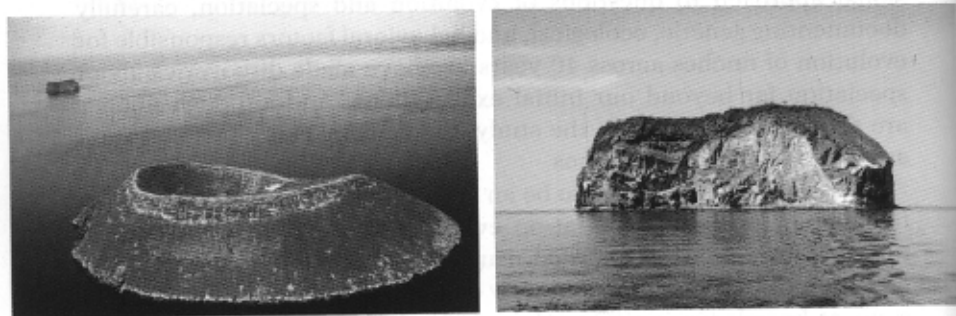


Fig. P.2 The two Daphnes. Left: Daphne Major, with Daphne Minor (Chica) in the background (D. Parer and E. Parer-Cook). Right: Daphne Minor, 1976. Daphne Minor has been climbed once, with ropes. Two immature *fortis* banded on Daphne Major were seen at the top (Grant et al. 1980).

not central to it. In some cases these discussions have been supplemented with numbers in tables and figures.

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Data used in constructing the figures have been deposited in Dryad (doi:10.5061/dryad.g6g3h). Two educational films illustrate features of the book. One, made by the Howard Hughes Medical Institute for high schools, illustrates natural selection on Daphne. It is entitled *The Origin of Species: The Beak of the Finch* (www.biointeractive.org). We are preparing another that is designed to illustrate all the main topics of the book.

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