BOOK REVIEW: *The Beak of the Finch*

by John C. Kricher

The Beak of the Finch: A Story of Evolution in Our Time by Jonathan Weiner, illustrations by K. Thalia Grant, New York: Alfred A. Knopf. 1994. 334 pages with black-and-white illustrations throughout. $25.00 (hardcover).

When Charles Darwin first set foot on Chatham Island (the island is now named San Cristobal by the Ecuadorean government), the easternmost large island of the Galapagos Archipelago, he was not favorably impressed by his surroundings. "Nothing could be less inviting than the first appearance," he wrote in his journal, later published as *The Voyage of The Beagle*. Darwin, then a mere 26 years old, had left his native England nearly four long years earlier, on December 27, 1831, to serve as naturalist aboard the H.M.S. "Beagle," and, more importantly, to provide companionship at the appropriate social level for the ship's young aristocratic and temperamental captain, Robert FitzRoy. What Darwin learned over the course of his five-year voyage was enough to inspire thoughts that would culminate almost a quarter of a century later in *The Origin of Species*, a book that would change all of biology, to say nothing of western philosophy. But on September 17, 1835, Chatham Island looked foreboding, a remote, arid, black volcanic island where even the stark, leafless palo santo trees seemed to emit a foul odor. Little wonder that young Darwin paid scant attention to the nearly tame little brown and black birds that abounded on the island. But Darwin's insatiable curiosity soon got the better of him, and he began to notice the extraordinary uniqueness of the Galapagos flora and fauna. In describing the land birds that tenanted the islands, he discussed what he termed "a most singular group of finches, related to each other in the structure of their beaks, short tails, form of body, and plumage." These finches were intriguing. Some had very large, powerful, nutcracker-like bills, similar to those on grosbeaks. Some had more moderate seed-crushing bills, such as are found on various sparrows. One species had a thin, forcepslike bill, like that of a warbler. Yet, in spite of the differences in bill characteristics, all the finches otherwise bore compelling similarities to one another. As Darwin wrote, "Seeing this gradation and diversity of structure in one small, intimately related group of birds, one might really fancy that from an original paucity of birds in this archipelago, one species had been taken and modified for different ends." He collected study skins (as did Captain FitzRoy, who was also somewhat intrigued by the finches), and, upon returning to England, learned from the prominent British ornithologist John Gould that there are actually thirteen species of finches on the Galapagos (the thirteen species that Gould named are not precisely those identified as species today). More importantly, thanks in large part to Gould's analysis of the finches, Darwin became quickly convinced that

the thirteen species were not separately created, but instead arose from a common ancestor, what he later termed "descent with modification." These finches, which eventually came to be known as Darwin's finches, are, quite simply, the Rosetta Stone of organic evolution.

Following Darwin's epiphany, little scientific study of the finches was made until the British ornithologist David Lack's landmark work (1947) that not only formally christened the birds "Darwin's finches," but also suggested how competition among species could act as a powerful force in affecting evolutionary change, an insight responsible for much subsequent ecological research throughout the next several decades.

Today, research on Darwin's finches is more active than ever. For the past two decades teams of researchers from Princeton University, under the leadership of Peter and Rosemary Grant, have made meticulous studies of Darwin's finches, especially on the island of Daphne Major. Their studies have confirmed in the finest detail that Darwin's principal mechanism for evolution, natural selection, is real. It works, and often with frightening efficiency. If Nobel Prizes were awarded in the field of evolutionary biology, there would be little doubt that the Grants' research would make them strong candidates. *The Beak of the Finch* is a timely account of the voluminous research conducted by the Grants and their colleagues and students. The author, Jonathan Weiner, was apparently granted total access to the Grants, their field stations, and their laboratories at Princeton. Weiner skillfully describes in layman terms just what natural selection is and how the changing fortunes and misfortunes of several species of Darwin's finches have served to demonstrate both the reality as well as the power of natural selection.

The title of the book is taken from the fact that natural selection works particularly strongly on bill characteristics among the finches, because bills are so critical to food acquisition. The beaks change, sometimes increasing in size, sometimes decreasing, in direct response to changing patterns of rainfall abundance as it affects plants and the seeds they produce. Evolutionary change occurs over generations, just as Darwin hypothesized, by a process of differential reproduction: in drought years large-billed birds survive better than small-billed birds, because the larger billed individuals can crack the hard seeds that are essentially the only ones available during times of extreme water shortage. These survivors reproduce, so genes that make larger bills proportionally increase in the next generation, a result of the survival of the fittest. But in wet years, large-billed birds have no particular advantage, and may even be disadvantaged, resulting in differential survival and reproduction of smaller-billed birds. Natural selection is opportunistic, acting on the moment. The rapidity with which bill characteristics can evolve would surprise even Darwin. Natural selection is no weak force.

The Grants know all this because they know every single finch on Daphne

Major. Each bird has been individually marked with combinations of leg bands. Similarly, each bird's parents and grandparents and great grandparents are known because all of those were individually marked. Thus far, nearly 19,000 birds have been banded over the long course of the research, representing uninterrupted data from about two dozen generations of finches. The Grants, unlike Darwin, are not confined to talking in terms of what evolution could or might do. They talk in terms of what it is doing and has done and continues to do. Their vast computer banks of numbers have translated Darwin's Rosetta Stone into spreadsheets and graphs that abundantly confirm his theory as well as add to it.

Weiner not only explains the Grants' elaborate research but puts it in appropriate historical perspective by weaving Darwin's ideas throughout the book. In addition, Weiner makes appropriate comparisons with research being done by the Grants' contemporaries. There is a nice balance of history and modern biology juxtaposed throughout the book. The reader gets to know Darwin as well as the Grants. Birders may develop a new respect for domestic pigeons knowing that Darwin used pigeon breeds to show the power of selection (in this case artificial selection), arguing convincingly that even the most exotic looking domestic pigeon breeds each originated from a common ancestor, the Rock Dove, an example Darwin described in detail in the first chapter of *The Origin of Species*. Throughout the book, Weiner provides excellent examples of modern evolutionary research. For instance, Weiner describes the rapid evolution of pesticide resistance in a species of moth that severely damages cotton crops. The irony of the fact that this moth, the very paradigm of Darwinian natural selection, lives and wreaks its havoc in the southern "Bible Belt," an area dominated by creationists, most of whom would prefer that evolution not be taught, is not lost on Weiner. This book is one of the best introductions to evolutionary biology currently available. It ranks with Richard Dawkins' *The Blind Watchmaker*, Edward O. Wilson's *The Diversity of Life*, and the various books by Stephen Jay Gould for overall information content and clarity of writing.

No, this is not strictly a bird book. It will not even tell you how to identify the finches. But birders think a lot about what defines a species and how species form in nature, and thus they can learn much from this book. Most of it is, after all, about birds, one small group of them, that provided the kindling that started an intellectual fire that rapidly became a conflagration. Sure, you can spend your money and go to Brazil or east Africa and see many more bird species than you will on the Galapagos. But you won't see the finches — THE finches.

JOHN C. KRICHER serves Bird Observer as a member of the board and as a department head. He is currently at work on a book about the natural history of the Galapagos Islands that will be published by the Smithsonian Institution Press.