

novice to grasp the magnitude and complexity of the problems discussed. The book is primarily concerned with soils, water, forests, wildlife, and the atmosphere, but there are appropriate sections relating man's use and misuse of these basic resources to the maze of problems that are becoming more evident as the human population grows beyond the carrying capacity of the environment.

This book is not the product of emotion, as are so many these days; rather, it is a very interesting, factual, and sound approach to a very broad subject. High school and college teachers will find it useful as an introductory textbook and a work of reference.

Kingsley L. Greene
State University of New York
Morrisville

THE BLUE WHALE, by George L. Small. 1971. Columbia University Press, New York. 261 p. \$9.95.

Wesley Marx has written that a whale is a living monument to the grandeur of the ocean. George Small writes, "Today the blue-whale population [estimated at 150,000 when Antarctic whaling began] probably numbers something between 0 and 200 individuals. What a monument to man's power of destruction . . . What, then, are the chances for the survival of the blue whale? None. . . . If the reader is deeply attached to the wildlife of the earth, you are by now probably reading on in hope of a miracle—much as a man at the bedside of a dying loved one seeks a miracle." It is to be feared that this important summation of the problems of conservation is likely to be an obituary, a requiem, an epitaph.

We have often discussed while at sea on oceanographic ships whether the blue whale does in fact still exist. We have watched sperm whales, fin whales, humpback whales, pothead whales, and killer whales and myriad porpoises over many years, but we have never seen a living blue whale; nor in 50 years do I recall having discussed the blue whale with a biologist who had seen a living adult. Most of us are resigned to never seeing one.

Small takes pains to point out that the relatively tiny catcher boats of the whaling fleet weathering an Antarctic storm have come all the way from Europe to perform their function, are maintained by the factory ship while hunting, and will return to Europe at the season's end. There is an undercurrent of adventure to tragedy.

Small sets out to answer three principal questions: "Why were the nations of the world unable to restrain their own whalers?" "Why did they [the whaling companies] continue killing when they knew it would lead inevitably to their own financial ruin?" "Are

there enough [blue whales] now alive to avert biological extinction?"

In part, the tragedy stems from the fact that convincing data as to the number of whales, size at sexual maturity, reproductive life-span, reproductive rate, age-span, size at birth, and number of varieties were so difficult to obtain. Biologic studies of the blue whale did not begin until the fishery had moved to the Antarctic, far from research centers; this meant that blue-whale biologists had to do their work aboard the whaling vessels themselves. "Little imagination is required to understand the problem of searching for and counting [past ovulations] in the midst of stinking entrails steaming in the cold Antarctic all on the busy deck of a factory ship," Small says. Yet this information had to be obtained to understand reproductive potential (at first seriously overestimated). There would still be little data available on blue-whale weights had not American inspectors placed aboard Japanese whalers after World War II required that a normal-sized blue whale be weighed for every undersized one killed. Not so many as 30 have yet been weighed, but the weights obtained suggest that the fattest blue whales (never weighed) reached more than 400,000 pounds. Imagine a heart weighing 1,000 pounds, a tongue "bigger than a taxicab," 15,000 pints of blood in an individual, and testes weighing 22 pounds!

Unfortunately, the study of moribund animals could reveal nothing of intelligence (probably high), behavior (it is believed that blues mated for life and that the male would not abandon his mate), and hearing and communication ("Man's ignorance of the ability of the blue whale to communicate is complete. He knows nothing about it.") Without adequate data, it was impossible to quench the thought that a limitless stock existed somewhere—even while catches declined and whales disappeared from the seas. Through the 1950s and 1960s and even in 1970 new catching boats were sent to the Antarctic, and in 1962 the Russians launched the two largest factory ships of all time. Four years later they had nothing to process.

Why pursue the blue whale? For one thing, there is a substantial market for whale meat in some countries. Another reason—underestimated, I feel, in Small's book—is well stated in the June 1970 issue of *Simrad Echo*, a Norwegian periodical read by commercial fishermen: "Since the turn of the century whaling has been considered by many as the only true adventure of the sea." Man's quest for adventure may have extinguished the blue whale. Let us hope that a more creditable stretching of our imagination may replace the adventure of killing the marine mammals. It needs only the encouragement of government, which is just beginning,

and the effectual cooperation of nations and international commissions.

Small's book (which includes pictures and tables) can be read with profit by students of government as well as by biologists and ecologists. The sorry history of international whaling "control" is a story in itself, threaded through the book and summarized in the closing chapters. The book is highly recommended for college, scientific-institution, and public libraries. It is a bargain in good reading. It is an excellent textbook for a study of extinction.

James M. Moulton
Bowdoin College
Brunswick, Maine

EVOLUTION

METHODS OF STUDY IN NATURAL HISTORY, by Louis Agassiz. Reprint ed., 1970. Arno Press, New York. 319 p. \$13.00.

This book, originally published in 1863, was Agassiz's attempt to popularize views he had expressed in the earlier *Essay on Classification*. Agassiz wanted to (i) provide insight into the methodology of science and (ii) argue against the view that species change through time (transmutation theory). His view of methodology was Baconian: statement of generalizations from facts. Essentially, he opposed the theory of evolution and some aspects of the natural-selection mechanism.

This is a book for a very limited audience. To those interested in the methodology of science the title is quite misleading: "I wandered from my subject and [have] forgotten the title of these articles," Agassiz says at one point. However, this is a book for the historian of biology who is interested in the growth of the science of classification; and it is a must for the evolutionist who wishes to examine arguments against evolution that are derived from Agassiz's interpretation of facts. Chapter 1 provides a brief résumé of progress in natural history from Aristotle through Linnaeus, Cuvier, Lamarck, and Ehrenberg. Chapters 2 and 3 deal with the mechanics of classification. In chapter 4, "Classification and Creation," the reader might expect to find an expression of Agassiz's views on the origin of species, but this is not the case. The meat of the book begins with chapter 6, "Gradation Among Animals"; here Agassiz develops his views against the transmutation of species. He denies that there is a transition through time from one taxonomic group to another, and he explains the apparent succession of organisms found in different geologic strata as a series of successive creations.

David E. Kidd
University of New Mexico
Albuquerque