Muskrats and Marsh Management. By **Paul Errington.** Harrisburg: Stackpole Company 1961. Price $5.00.

Muskrat Populations. By **Paul Errington.** Ames: Iowa State University Press 1963. Price $8.50.

These two books show the two sides of a remarkable man. Paul Errington, who died in November, 1962, before he was sixty, was of Scandinavian stock, brought up in poor circumstances in South Dakota. He began trapping in 1917 to help earn his living and he continued trapping, especially muskrats, to help him to get to college and through college. Paul got his education the hard way indeed, for along with poverty he had a round of polio which lamed him but perhaps left him with that strange degree of determination which is often characteristic of those who recover from this disease. I have had the privileged experience of going into the field with Paul Errington, and one thing I shall not forget is how he picked up his fairly heavy canoe, chucked it into the inverted *portage* position above his head and limped back the quarter mile to the car. But I remember much more vividly his interpretation of all we saw on marsh and creek, for Paul was a superb reader of " sign ". I was quite ignorant of the ways of muskrats and their special predator, the mink. Now I saw muskrat footprints of quiet going-about, then those showing fear, the claws momentarily biting deeper in the mud ; then the chase and the scuffle of the end. The mink is a ferocious animal who will kill his own kind ; we saw the sign of a smaller mink suddenly aware of being followed, his burst of speed measured by long leaps, the closing in of the bigger mink, the shortening leaps of the victim, then a short fight and blood on the mud. Paul watched his chosen animals with intensity and reached a state of knowledge and insight few others attain.

The romance of Paul Errington's life to my mind was his carrying forward of boyhood necessity of trapping muskrat—the bread and butter of all northern trapping—to the intellectual field. I have no doubt whatever that Paul knew wonder, that his appreciation of nature was of the order of Richard Jefferies's experience, and as self-originating. The first of these two books treats trapping and marsh management practically, but also examines the trapper and what moves him. There is not the slightest nonsense about it, but the reader will find it revealing. The second book is important and scholarly, written by the Paul who realised that the muskrat could show us how populations of animals waxed and waned and what were the factors which preserved the pendulum stroke more or less among animal populations in nature. Mathematicians have fashioned models of what happens in increase and decrease and have been able to postulate the whole of predation on a prey species like the muskrat. Paul Errington did not do it this way, but by spending over 30,000 hours in the field, finding out the densities of his muskrats through time, knowing families of them individually, watching the tolerant behaviour at high densities until stress began to show itself, with subsequent intolerant behaviour and lowering of densities. He saw the mobility of what he called " foot-loose " adolescents and how these animals were the main body of prey, but destined to die young, one way or another. The lodge owners, knowing their ground well, moving carefully and tending their territories, were rarely the prey. As Errington saw it, animal populations were largely self-regulatory. The European game preserver prowling around his domains killing all possible predators is wasting his time, as well as his country's heritage of wild life. This has been one of the biggest lessons to learn in all wildlife conservation. The thought of Paul Errington pervades the field of animal ecology and the dynamics of population. Suppose he had been high-falutin and had put aside the muskrat when he set

out to study Science-and-all-that: but no; he had the true scientific humility to study that with which he was most familiar.

If I have made this review rather an obituary notice than a deeper examination of Errington's research it is because Paul was a dear friend and lovable man whose philosophy was native and truthful. His contributions to science we can take for granted; he sought truth with a burning intensity. One last word: Errington held a research chair at Iowa State University for thirty years, relieved of formal lecturing and departmental management; we owe thanks to that institution for such enlightenment.

FRANK DARLING

Desert Animals. By **K. Schmidt-Nielsen.** Oxford University Press, 45*s*.

Man may be versatile, but he is no match for a hot, dry desert. Many animals, however, have become specialised for life in this hostile environment. Dr. Schmidt-Nielsen examines them in turn and analyses the various ways in which they have managed to solve this difficult problem. The more important and interesting desert species, such as the camel, donkey, sheep, rabbit, ground squirrel, pack rat and kangaroo rat, are each allocated a whole chapter. In addition there are chapters dealing with cattle, carnivores, rodents, marsupials, birds and reptiles. Members of the Fauna Preservation Society will be surprised to learn that the Arabian oryx receives no mention, probably because so little is known about it.

What are the basic solutions to existence under the desert sky? One is to be very small and to burrow underground during the heat of the day. Another is to be very large, so that cooling can be achieved by the loss of large amounts of water by evaporation. This water loss can be stepped up by sweating and panting, but there are obviously limits to the quantities of liquid that can be used up in an environment where there is no easily available drinking water. Of the bigger species, the camel is the best at coping with high temperatures. Contrary to popular opinion it does not store water, either in the hump or in the stomach, but relies on its ability to withstand remarkable degrees of dehydration and fluctuating body temperatures. It also has a carefully controlled system of water losses. There is evidence to show that a camel can tolerate a dehydration loss of over a quarter of its total body weight; half this loss would kill any other mammal.

Beautifully written, well produced and expertly presented, this will no doubt remain the standard work on the subject for many years to come. The summaries at the end of each chapter are extremely helpful; if only more books of this sort would follow this practice, how much easier it would be to check basic facts quickly.

DESMOND MORRIS

Animal Worlds. By **Marston Bates.** Nelson, 84*s*.

The high price, large quarto format and dazzling collection of photographs (nearly 250, of which 100 are in colour) suggest that this may be another 'glossy' production with a perfunctory text. Nothing could be further from the truth. The photographs are, admittedly, superbly reproduced, and illustrating animals and habitats from all parts of the world, so that many 'readers' will find the book worth the price for these alone. But Professor Bates has provided also a detailed and well-judged text in which the pleasure and enthusiasm of the naturalist are blended with the biologist's eye for discerning the patterns and processes in habitats and animal communities. The author, after a brief introductory background about ecological principles in which technical terms are kept to the minimum, proceeds to a survey of