plain on these issues after reviewing the evidence available. Although he concludes that whales are not intelligent in any special sense, he believes this is no reason to excuse the sorry way in which man has treated the whales. The history of whaling and the future for whales which he describes do not lead him to an over-optimistic conclusion. But this book by its clarity of presentation and usefulness as a major source for all the most important references on its subject could well influence that outcome by its level-headed approach.

RAY GAMBELL

The Desert Bighorn, edited by **G. Monson** and **L. Sumner.** Arizona UP, Tucson, $14.95.

Although the description on the cover of this book implies that it is directed towards the game hunter it is in fact a collection of serious studies on the desert bighorn by 15 naturalists and biologists, and one archaeologist. Perhaps it will not hold the attention of the reader with the charm of Valerius Geist writing of his own fieldwork on the same wild sheep, *Ovis canadensis*. It does, however, contain much valuable information on behaviour, relationships with man and other pedators, habitat preferences, physiology, and population dynamics.

The book is dedicated to Charles Hansen, who was killed in an aeroplane accident in 1973. He had helped to plan the contents from the early 1960s as a product of the Desert Bighorn Council, and nine of the 22 chapters were written either jointly or entirely by him. It is therefore not as up-to-date, especially the bibliography, as might be expected of a book published in 1980; nevertheless it should prove essential reading for anyone interested in the history of wild sheep in North America and their conservation today. The archaeological evidence for the hunting of bighorn sheep in the past is discussed by Campbell Grant, while the justification for its continuance today is presented by W.E. Kelly. Controlled hunting may not reduce the numbers of sheep directly, but a more insidious problem is the harmful effect of altering the ram-ewe proportions that is the result of modern hunting for trophy heads, as predicted by Geist and others. If, as Monson estimates, there is a total population of around 20,000 desert bighorn in the USA (1978 figures), this question should receive very careful monitoring.

JULIET CLUTTON-BROCK

Animal Suffering; the science of animal welfare, by **Marian Stamp Dawkins.** Chapman, £3.95.

Pain and suffering are positively an advantage to animals in teaching them what to avoid if they are to survive. Animals in cages, however, may not escape from such adverse experiences. What is more, we may not know what is adverse when we see it. It now seems, for instance, that separating a sheep from its herd (e.g. for shearing) is far more traumatic for it than marching the sheep plus friends into a slaughterhouse. Dr Dawkins, then, is here concerned with how to recognise mental suffering.

The fundamental problem is that, all too often, we measure animal discomfort by uninformed analogy with ourselves. Yet, as Dawkins points out, the essential differences between ourselves and other species make analogy hazardous; we would not choose to live the inverted, insectivorous life of a bat or the peptic existence of a tapeworm (to quote one of her extreme examples). So she has analysed the ways of evaluating animal suffering, and the best clues turn out to be behaviour, apparent physical health, the animal's preference, and, if it can be measured without causing suffering, physiological change.

It is a complex issue, pocked with emotionalism, misinterpretation, anthropomorphism and inadequate research, but Dawkins beats them all out and points out the pitfalls. Sometimes she beats too hard. Thus, for example, productivity as a sign of well-being is written off because to some people this means productivity of a farm rather than a single