Book Reviews

Sociobiology and Ecology of Hoofed Mammals

The Behaviour of Ungulates and Its Relation to Management. Papers from a symposium, Calgary, Alberta, Nov. 1971. V. GEIST and F. WALTHER, Eds. International Union for Conservation of Nature and Natural Resources, Morges, Switzerland, 1974. Two volumes. 942 pp., illus. Paper, $15. IUCN Publications, new series, No. 24.

The ungulates, or hoofed mammals, include such diverse types as pigs, antelopes, deer, hippopotami, sheep, camels, horses, and rhinoceroses. In a phrase, they can be characterized as large vegetarians whose limbs are specialized for running to escape big cats and other carnivores. The hooves serve in most instances as devices for placing the feet on points, which permits a sprinter's pace when running in the open. Elephants are often loosely classified as ungulates; more precisely they can be called subungulates, in reference to the fact that they originated as a discrete group but from the same stock as the ungulates early in the history of modern mammals.

The hoofed mammals hold a special interest for students of social behavior. The approximately 190 species, constituting one of the larger mammalian assemblages, display among themselves a wide array of social organizations. Many forms, such as the moose, are "semisolitary": adults live alone except to pair and occasionally to form loose feeding aggregations, while the young remain closely associated with their mothers until they are nearly or fully grown. Other species, such as the horses, the pigs, and many of the antelopes, have grafted a new form of organization onto this basic mother-offspring unit. Two or more such units are allied for long intervals, during which time the members recognize one another as individuals and may or may not exclude strangers. The elephants have carried the trend to its extreme, with closed kinship groups persisting over three or more generations of time. Elephant cows assist one another in times of danger, the young are nursed indiscriminately by whichever members happen to be lactating, and a single old matriarch leads the group in travel and in defense formations. The elephants represent an evolutionary pinnacle equivalent to the African wild dog among the carnivores and the chimpanzee among the nonhuman primates. In other words, they are among the most advanced of the mammals other than man.

Students of ungulate behavior, including several of the authors of the work under review (J. F. Eisenberg, R. D. Estes, P. J. Jarman, and Valerius Geist), have been more successful than most vertebrate zoologists in correlating social organization with the ecology of the species. Their research has helped to substantiate the now widely accepted proposition that the details of organization are idiosyncratic adaptations on the part of species to special features in the habitat. As a rule, herds have increased in size and their organization has grown more complex as species have shifted their preference from closed forests to more open habitats such as savannas and meadows. The principal reason is considered to be the greater threat posed by predators in the open habitats. Membership in herds—the more tightly organized the better—provides a communal sentinel system and, in a few of the larger species, the opportunity to counterattack en masse. Larger size also predisposes ungulates toward higher sociality because the animals are able to consume greater quantities of grass and a wider range of other kinds of plants, permitting populations to secure more energy and hence to attain higher densities.

Because of the economic and ecological importance of ungulates, close attention has been paid to the application of the newly acquired knowledge to game management. Here, too, the mammalogists have been fortunate. They have formulated many recommendations which appear to me to be both sensible and humane. R. M. Laws, for example, notes that protected elephant populations tend to increase rapidly to the point of destroying their own environment, and they must be thinned by hunting. But removal of individuals should not be random; the loss of the matriarch results in the disruption of the family groups and the potential further destabilization of local populations. When culling is necessary, entire groups should be removed until the needed lower density is reached. A different situation exists with the elephants of Ceylon, which remain a threatened population. Fred Kurt discovered that growing populations of feral water buffaloes are polluting the waterholes on which the elephants depend. They, not the elephants, need to be thinned at this time. The intricate relation of man to many of the species must be part of the basic studies. Dromedaries are a remarkable species that compete with neither domestic nor wild ungulate species. For some 3000 years they have lived in close symbiosis with the nomadic peoples of North Africa and the Near East. Hilde Gauthier-Pilters documents how delicate this relationship is, and why it is important not to impose too much political or economic change on the nomads if the symbiosis is to be preserved.

The Behaviour of Ungulates and Its Relation to Management constitutes the first real synthesis of the social behavior and ecology of ungulates as a whole. Only in the past ten years have field studies of these animals begun to multiply, and progress has been rapid. The two volumes edited by Geist and Walther are therefore more valuable than most such reviews. The average quality of the articles is also higher. It is apparent that in the majority of instances the authors submitted their key contributions, or at least careful summaries of their most important work. The result is a rich compendium of facts and generalizations. We learn from R. N. Owen-Smith that the rare white rhinoceros, in contrast to the black rhinoceros, has relatively cohesive social groups and strong territorial behavior. L. K. Sowls shows that peccaries are markedly more social than their relatives the swine and constitute one of the few vertebrate spe-

cies in which females are dominant over males. W. L. Franklin extends the earlier work of C. B. Koford on the vicuña, confirming that this camel-like species is the most strictly territorial of all mammal species and is organized into year-round harems totally dominated in all activities by the resident male. A series of articles by several authors on the pronghorn antelope and reindeer elevate these unique north temperate species into the ranks of the best studied of all animal species. Many other examples of excellent special studies can be cited.

Several new syntheses also deserve particular mention: mother-offspring relations by P. C. Lent; courtship and combat behavior by F. R. Walther, nicely illustrated by the author's professional-grade drawings; the sociobiology of the Suidae by Hans Frädrich; the sociobiology and behavior of the antelopes and other bovids of Africa, which constitute one-third of the entire world ungulate fauna, by R. D. Estes; and the first attempt to formulate the ecological correlates in terms of some principles of population biology, by Valerius Geist. While the future of some of the most interesting ungulate species remains threatened by the continued destruction of their habitats, there is an occasional cause for optimism. R. C. Bigalke reports that 19 of the 44 species of South Africa have adapted sufficiently to farmed land to maintain reasonably large, stable populations. H. Mendelssohn describes the increasingly strict measures taken by the Israeli government to protect the two gazelle species still found within its borders. Other authors, including H. K. Buechner, P. A. Johnstone, and John Vincent, describe a few successful attempts to stabilize wild ungulate populations in African reserves and game ranches.

In their general introduction the editors disarmingly list the weaknesses of the book, most notably a relatively thin coverage of deer and other cervids and of ecology and physiology generally. They compensate by providing a short but useful bibliography in these areas. In addition there are two defects in organization. The index is limited to the names of the ungulate species and the contributing authors, making searches for general topics through the 56 chapters unnecessarily laborious. Also, each author's bibliography is presented after his own chapter, whereas a unified bibliography at the end of the two volumes would have been more useful. But these are not major flaws. The editors and authors have made an important and lasting contribution to sociobiology and ecology, and they have brought the ungulates to the center of the stage alongside the primates and carnivores.

EDWARD O. WILSON
Museum of Comparative Zoology Laboratories, Harvard University, Cambridge, Massachusetts

Comparative Endocrinology

The Pituitary Gland. A Comparative Account. R. L. HOLMES and J. N. BALL. Cambridge University Press, New York, 1974. x, 398 pp., illus. $28.50. Biological Structure and Function, vol. 4.

This is the first book devoted entirely to a comparative treatment of pituitary gland structure and function in all vertebrates. Such treatments have been slow in coming not because of a lack of interest in the subject but because of a dearth of basic information. The great body of published work that has been accumulating on the hypophysis in various classes of vertebrates is still meager in view of the fact that the division includes more than 60,000 species and that it is dangerous to extrapolate from one group to another not only within a class, but even among members of the same genus. Holmes and Ball approach the subject by presenting detailed descriptions of representative species, but they also present examples of deviations from a basic plan within a group and stress the number of variations that the gland has undergone during the course of evolution.

The book begins with a brief general outline of the structure and function of the pituitary gland. This is followed by several chapters on specific aspects of the mammalian gland and then by a series of chapters on the other vertebrates. Since we know most about the gland in mammals this is a good sequence to follow. Each chapter is well organized, beginning with an introduction to the taxonomic and phylogenetic position of the class under consideration and then treating in sequence gross morphology, histology and cytology, the cell types present, the evidence concerning their function, the structure and function of the hypothalamus and neurohypophysis, and the mechanisms of control of secretion from that region of the gland. The book ends with a chapter entitled "Some general considerations"—a somewhat disappointing termination for an otherwise good book because of the selection of topics discussed and the cursory nature of the discussion.

One of the strengths of the book is that structure is never divorced from function. The physiology of the gland is dealt with in terms of anatomy, histology, and cytology. The authors are to be especially commended for discussing in considerable detail the development of staining techniques and the problems involved in their use and in the interpretation of the results. These important matters too often are discussed only superficially.

A comparative textbook should incorporate all the available information on the structure and function of the system being studied and discuss the evolutionary significance of the observations. These things have been essentially accomplished by Holmes and Ball. It is not an easy task to compile and catalog information from different groups of animals when common tools and language of investigation and discussion are not available. This book does not alleviate this formidable problem, but calling attention to it is a step in the right direction.

The Pituitary Gland: A Comparative Account should receive widespread acceptance as a textbook for introductory courses in comparative endocrinology and as a general reference. By making the reader aware of the unique features of the gland in the various classes of vertebrates it can, as a comparative book should, suggest new ideas and new approaches to old problems.

MARTIN P. SCHREIBMAN
Department of Biology, Brooklyn College, Brooklyn, New York

Telomerization Reactions

Free Radical Telomerization. CHARLES M. STARKS. Academic Press, New York, 1974. xii, 268 pp., illus. $23.

Since the 1940's, when the nature of free radical telomerization reactions was first recognized, these reactions have been the subject of many investigations. Much of the useful information concerning them, however, is found in the patent literature and in foreign (particularly Russian) journals. Starks has made a unique contribution in assembling the literature