Book Reviews

Birds

Avian Biology. Vol. 1. DONALD S. FARNER and JAMES R. KING, Eds. Kenneth C. Parkes, taxonomic editor. Academic Press, New York, 1971. xx, 386 pp., illus. $30.

No other animal group enjoys the massive and diversified following of birds: on the one hand there is an army of amateur field workers, on the other biologists who work on birds because they are the best group in which to investigate certain fundamental biological problems. It is not surprising, accordingly, that birds have contributed to a disproportionate degree to knowledge in a number of areas: geographic variation and speciation, biogeography, population dynamics, systematic concepts, the study of instinct, and the biology of reproduction, especially the role of the photoperiod as a controller of this cyclical phenomenon.

In view of this the present volume, which provides reviews of the current state of knowledge on 11 different topics by leaders in these fields, will create wide interest. The work is the conceptual descendant of A. J. Marshall's *Biology and Comparative Physiology of Birds*, and the series is dedicated to this distinguished avian physiologist. There are chapters as follows: classification (Storer), the fossil record (Brodkorb), systematics and speciation (Selander), adaptive radiation (Storer), avian communities (MacArthur), sea-bird ecology (Ashmole), desert adaptations (Serventy), breeding seasons (Immelmann), population dynamics (von Haartman), adaptive aspects of reproduction (Cody), and behavioral ecology (Orians). About six of the chapters are outstanding for completeness of coverage and the comprehensive bibliography; two or three are updated versions of chapters in Marshall; only a couple (because they deal with only some phases of a subject) are a little disappointing.

In the space of a few hundred words it is obviously impossible to review the advances in knowledge in all these fields. Of greatest interest will be the chapters dealing with ecological adaptations—on factors governing breeding, the special adaptations of marine and desert birds, factors governing clutch size, and so on. Immelmann provides an up-to-date account of the first of these. The photoperiod, so ably demonstrated by Rowan and Bissonnette to be the major initiator of periodic phenomena in higher latitudes, now gets little attention from researchers. What controls breeding in the tropics, where the photoperiod is relatively constant, proves to be just as open a question as it was when John R. Baker first drew attention to the problem. Certain generalities can, however, now be made: lowland forest birds inhabiting areas of heavy annual precipitation tend to concentrate their breeding into the drier months; birds inhabiting areas with two wet and two dry seasons may, according to the species, breed twice a year or nest during the short rains but not the long rains. The erratic nature of breeding in desert birds is now well documented. Many Australian desert species have developed the remarkable capacity to respond to rain within a few days, but this capacity (for some unknown reason) is largely lacking in southern African desert species. It is interesting to note that, despite a generation of experimental research into the photoperiod as an initiator of breeding, physiologists (unlike the birds) have not responded to the possibilities of rainfall. The "physiological pathways" whereby this affects the bird remain unstudied. The role of "endogenous periodicity," or internal rhythm, as an initiator of periodic phenomena in birds remains controversial; its occurrence has, however, now been conclusively demonstrated in one species (by Serventy and Marshall), the transequatorial sea-bird migrant, *Puffinus tenuirostris*. Last, we are no further ahead in our understanding of an equally tantalizing aspect of reproduction, what *stops* the process, than we were twenty years ago.

Serventy's chapter on deserts is an excellent review of specializations and adaptations for life in the world's most extreme habitat. Breeding may be denied for long periods, and population crashes occur periodically. Birds have two alternative ways of handling the unpredictable desert environment: vacate the area when conditions start to decline (a nomadic way of life is one of the major adaptations of Australian desert birds), or slug it out in situ. Some species do the former, others the latter. One of the greatest needs of resident (nonnomadic) species is a capacity to build up numbers rapidly when good conditions finally return. The Australian zebra finch has become something of an expert at this. Young birds develop spermatozoa at the age of 60 days. In the laboratory, males 6½ weeks old and females 9½ weeks old have begun nesting and birds 11 to 12 weeks old have been successful in raising broods. And laboratory pairs of zebra finches have raised up to 23 successive broods of young.

ALLEN KEAST
Department of Biology, Queen's University, Kingston, Ontario

Origins of Husbandry

Geography of Domestication. ERICH ISAAC. Prentice-Hall, Englewood Cliffs, N.J., 1971. x, 132 pp., illus. Cloth, $6.95; paper, $2.95. Foundations of Cultural Geography.

Domestication is a popular scientific subject, and, as is typical of fads, each explication becomes a distinct genre. *Geography of Domestication* is no exception. Its basic arguments are that domestication occurred first in the Near East, that religious beliefs and practices were prime motivating forces in the domestication of plants and animals, and that diffusion brought the idea of domestication and its by-products to Europe, Africa, Asia, and perhaps to the New World. These conclusions are somewhat startling, quite controversial, and stimulating.

Isaac assumes that domestication originated in the Old World; thus he accords the Western Hemisphere scant attention. Within the Old World he attempts to demonstrate by selecting archeological, historical, and ethnographic evidence that no matter which traits are chosen—myths, harnessing methods, megaliths, fortifications, irrigation, terracing, or the plants and animals themselves—the Near East, not Southeast Asia, is where domestication

began. However, he fails to mention, even by way of refutation, Gorman's evidence for plant domestication in Thailand before 7000 B.C. (*Science* **163**, 672 [1969]).

The origin and movement of the major Old World plants and animals are summarized, and aperçus of minor domesticates are presented. Isaac argues that, after domestication started in a rather broadly defined Near Eastern hearth, population movements introduced these to other regions, where contacts led to secondary domestication of local biota. Some of the secondary domesticates are conceptualized as "bridging domesticates," plants that helped to transfer domesticates, poorly adapted to one area, to places where they could flourish. "Substitute domestication" is the replacement of an introduced domesticate by a more recently developed native plant. Regrettably, Isaac's model does not account for the domestication of many plants and animals. It does not explain the domestication of most of Africa's indigenous plants or elucidate why China is, in his terms, a center solely of secondary domestication. Furthermore, convincing archeological data support the proposition that domestication in the New World was independent of an Old World stimulus.

In reviewing theoretical ideas concerning the origins of domestication, Isaac offers valuable critiques of Sauer, Vavilov, and others. But his revival and extension of Eduard Hahn's belief that religion was the primary basis of domestication, a theme making this book unique, sheds new light on this basic question. Isaac postulates that certain plants and animals with crescent- or lunar-shaped horns were domesticated to fullfill a continuous need for ritual offerings. on the basis of an analysis of myths with a slain god motif, he proposes that another "revolution" occurred, with primacy in the Near Eastern Neolithic, which changed man's religious philosophy toward the animate world. He evokes this argument to reject an ecological or economic interpretation of domestication.

Isaac naively criticizes archeology while ignoring the fact that recent work actually supports and strengthens some of his basic hypotheses. Less reliance on outdated secondary sources and a better comprehension of the contributions of anthropological archeologists and paleoethnobotanists would have prevented the use of inaccurate evidence. For example, Tell Mureybat in Syria and Ali Kosh in Iran are far more important for understanding the beginnings of domestication than are the Natufian sites, which Isaac mistakenly dates too early and which have no evidence of domestication. In addition, the alleged fortification around Jericho is Neolithic and not Natufian. Contrary to Isaac, terracing actually occurred earlier elsewhere in Asia. And finally, the presence of gazelle and antelope bones in later Near Eastern sites does not mean these animals were domesticated.

Domestication is a very complex subject, with educated guessing a rule of the game. The criticisms notwithstanding, Isaac has compiled a succinct and readable book. It is unfortunate that serious misinterpretations and omissions, recognizable to the scholar, were missed by the series editor and reviewers, for their presence does not commend this otherwise interesting book to beginning students or to laymen.

RICHARD I. FORD
Museum of Anthropology,
University of Michigan, Ann Arbor

Ovines in the Wild

Mountain Sheep. A Study in Behavior and Evolution. VALERIUS GEIST. University of Chicago Press, Chicago, 1971. xvi, 384 pp. + plates. $14.50. Wildlife Behavior and Ecology.

Mountain sheep are found on all northern continents and are characterized by considerable diversity, especially in horn shape. This book documents a highly detailed behavioral study of the bighorn sheep, *Ovis canadensis,* in several regions of British Columbia and Alberta. It also includes data from the author's studies of Dall's sheep, Stone's sheep, moose, and mountain goat. Geist's investigation places him among the ranks of those biologists who believe that the best way to understand the behavior and ecology of large mammals is to go and live with them for all seasons of the year. To the names Fraser Darling, Murie, Schaller, Carpenter, and Goodall must now be added Geist. However, this book is much more than an account of field studies. On the basis of his behavior studies, Geist advances a theory of sheep evolution which suggests "that evolutionary changes can be adaptations not to the physical habitat but to changes in the social environment." He fairly acknowledges his intellectual debt to J. F. Eisenberg, who suggested in 1966 that the type of society demonstrated by each species of mammal is closely related to and a function of its separate ecology.

Geist suggests that, early in their evolution, sheep developed a new defense against horn blows in combat. Instead of relying on a thick hide and an inhibition against entering combat, sheep "caught and neutralised" horn blows with the head. The structure of the head and horns altered and males could thus fight without injuring each other. Selection against fighting was reduced. Selection for sociality arose (i) because mountain sheep live on small patches of stable grassland which are generally all occupied, so that selection will act against dispersing juveniles and juveniles will tend to inherit home ranges from adults, and (ii) because of the development of "neotenization," whereby juvenile characters are retained in adults. As a result, young rams (although sexually mature) have a long period of postpubertal physical maturation, and in the first year of life closely resemble adult females. Bighorn sheep are thus a behaviorist's "dream species," for it is possible to exactly predict a male's hierarchical position by the size of his horns. Space does not permit a complete description of Geist's theory of sheep evolution, except to mention that he relates increased horn size to the distance a race has moved into previously glaciated terrain. By comparing horn development and aggressive behavior patterns, Geist explains the evolution and present distribution of the six known species of wild sheep and their many races.

The book is not without minor faults. Several references are made to a paper by Watson *et al.,* 1956, but it is not listed in the bibliography. Geist makes no mention of A. F. Fraser's 1968 book *Reproductive Behaviour in Ungulates.* Bad stippling of figure 44 makes it impossible to separate certain hypothesized sheep movements. It is occasionally difficult to determine in the text exactly which species the author is referring to. And Geist gives little information on his method of individual identification of animals, which is crucial in a behavioral study.

The book is very well illustrated by clear drawings and first-class photographs. There is a wealth of tabular and graphical data. To wildlife biolo-