Book Reviews

Quantitative Primate Studies

Baboon Ecology. African Field Research. STUART A. ALTMANN and JEANNE ALTMANN. University of Chicago Press, Chicago, 1971. viii, 220 pp., illus. $12.

Since Washburn's and DeVore's baboon studies of the early 1960's most field studies of primate behavior have been influenced by anthropological interests. The research questions have been based on the hypotheses that social behavior and organization are adaptations to ecological conditions; that therefore they covary with habitats; and that insight into the correlations between primate social systems and habitats will permit inferences from known habitats of early man to his unknown social life. The ecological orientation paralleled a similar new trend in ethology and was accepted by most zoologist monkey watchers.

The proposed aims required that the same primate populations be studied by both an ecologist and a student of behavior. As it has turned out, most field studies have been done by single workers who have been unable to cope with both tasks. The typical field report of the last decade focuses on the social interactions of the resting group. It then describes the habitat in qualitative terms, presents travel maps and a list of food species, and ends with speculations on the assumed local adaptiveness of the social system.

The Altmanns here set a new standard by devoting a full, heavily quantitative monograph to the ecology of a primate population. The monograph reports original fieldwork on the yellow baboons (*Papio cynocephalus*) of the Amboseli Reserve and extensively reviews ecological knowledge on the other baboon species. As quantitative treatment reveals the space-time patterns of feeding, drinking, and sleeping, some commonsense expectations are shaken by surprising facts. For example, the rate of alarm reactions is proportional to the time spent in a home range quadrat, not to the frequency with which the quadrat is entered. This suggests a steady rate of alarms rather than an alarming effect of a newly entered and therefore risky locality. In the descriptive sections the authors avoid declaring that an obviously adaptive group response is typical. It becomes clear that responses to apparently similar situations vary greatly and often inexplicably. In the same vein, the Altmanns treat migrating males not as a class but by presenting differing individual histories.

The authors' mathematical skills, acquired in their earlier work on communication processes, are here applied to the problems of home range use. Data are analyzed and reanalyzed in search of meaningful parameters and of ways to circumvent that pervading difficulty of fieldwork, biased samples. The reader looking merely for the usual type of descriptions may find that certain subjects are mathematically overtreated. He will soon realize, however, that the authors do more than just study baboons. With this book primate field research begins to test its own methods.

Speculations are set apart in the last 15 pages of the book. The major concept is the "utility" of a given section of the home range, which is composed of its resource value and its risk rate. "The perpetuation of the group depends upon its ability so to allocate the distribution of its activities among the parts of the home range that the net utility of the range to the animals is positive, or at least, non-negative" (p. 199).

Primate field research aims at an ecology of social systems. So far, we have had little more than a primate sociology. The Altmanns have now replaced the description of primate habitats by an analysis of interactions with the habitat. This ecology is "social" in such aspects as the avoidance of predators. As it concerns foraging, it is still predominantly an ecology of the individual. The third and most difficult step, it seems, will have to reveal the *social* strategies of resource exploitation.

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Sea Animals

Explorations in the Life of Fishes. N. B. MARSHALL. Harvard University Press, Cambridge, Mass., 1971. xiv, 204 pp., illus. $6.50. Harvard Books in Biology, No. 7.

This book's title is indeed descriptive of its content. Its author is one of the world's outstanding ichthyologists; he says he began the book when he gave a series of lectures at Harvard in the spring of 1963, but what he offers the reader are the experiences of a lifetime of research into the many and varied adaptations of the largest class of vertebrate animals. His fascination is with the animals of the deep sea, those vast reaches of the oceans "where sunlight is perpetually faint or lacking," where the pressure is high and food is scarce. The largest part of the book (chapters 3 and 4) deals with the ways in which fishes cope with these contingencies.

We are led into the problems of the deep sea, though, through a broad overview of the success of teleostean fishes that deals lightly with feeding adaptations and reproduction and then proceeds to considerations of hydrodynamic design including neuroanatomical and physiological specializations for cruising and high-speed swimming.

While deep sea fishes and their peculiar adaptations occupy about a third of the book, its nearly equally large final portion deals with convergent evolution. Examples from invertebrate phyla are given here, but fishes still provide the principal illustrative matter to explain how environmental forces shaped form and function, eventually to result in similar features among unrelated groups of animals. Surface feeders, for instance, whether the mosquito-fish *Gambusia* or flying fish, have small, upturned jaws and their pelvic fins originate anterior to the dorsal for reasons of skimming the surface with the snout. Certain fast-swimming sharks and tunas have silhouettes that can practically be superimposed, but more remarkable still, they both have retia mirabilia in their red muscles to enable them to operate several degrees above their ambient temperature. A number of advantages thus accrue to these large elasmobranch and teleost predators alike; to single out only two among many important metabolic reactions, nerve impulse transmission and digestion are speeded up.

At the very end of the book Mar-

shall speculates on the convergence of natural and man-made systems and makes some sketchy remarks about symbols and processes in nature and culture. One may throw out interesting asides about such matters in a lecture, as Marshall obviously did, but in print a three-page treatment of these matters is not adequate. Apart from this, he deals with his large and complex subject in a lively fashion; there are many terse descriptions, and the style is such that fairly complex details are conveyed with ease. The illustrations are well worth mentioning; they are mostly fine-lined drawings on the margins of the pages, an arrangement which makes for a particularly attractive book. *Explorations in the Life of Fishes* certainly should be in the libraries of skin-in and skin-out biologists alike.

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Mollusca

Terrestrial Slugs. N. W. RUNHAM and P. J. HUNTER. Hutchinson University Library, London, and Hillary House, New York, 1971. 184 pp., illus. Cloth, $6; paper, $2.50. Biological Sciences series.

Although mollusks are one of the largest groups among the invertebrates, there are few books on them that would interest and assist the reader with broad or general interests. This small volume on the widely distributed group called "slugs" should serve to stimulate interest in the use of slugs for teaching and research purposes. Well organized and informative, it brings together much salient information on these animals—information that has been somewhat buried in scattered papers and volumes not readily available to most persons. The text covers a wide range of topics, such as general features of the animals; their classification; foods and feeding habits; respiration; blood composition and circulation; excretion, reproduction, development, and growth; locomotion and mucus production; sensory and nervous anatomy with their functional relations. All of the morphological material is illustrated with good text figures. The ecology section includes a description of methods for sampling, discussions of the responses of the animals to humidity and temperature and of seasonal variation in aggregation and dispersal, and an analysis of what factors are important in their ecology.

A concluding chapter discusses "slugs as pests." Useful information, much of it dealing with the more recent literature, is reviewed. In England slugs are a serious garden pest, and they are not welcome in areas under cultivation in many other parts of the world. On the whole, this chapter is well written and contains pertinent material. Some helpful citations are missing, for example an excellent review of methods of snail control in A. R. Mead's *The Giant African Snail* (University of Chicago Press, 1961), but after all the book is not a manual on slug control and actually there are as yet no good methods, as the authors clearly indicate.

One of the noteworthy features of the book is the excellent series of well-integrated references. The 21 pages of citations will serve as a useful tool for anyone wanting to work in a wide field of interests in which slugs would serve for field and laboratory studies. It seems almost pedantic to point out that there are references that might have been added to assist those wanting additional information. A few that come to mind that could be helpful are as follows: The veronicellids, as is stated, are poorly known, but they are widespread in the tropics; some of a series of papers by Hans Hoffman could have been cited. The preservation of slugs is important and should at least have been mentioned; among others a paper by Hubricht (*Nautilus* **64**, 90 [1951]) would be helpful. The role of galactogen is discussed, and in this connection a reference to the work of E. M. Goudsmit and G. Ashwell (1965) would be timely. With regard to the parasite and predator relationships, the compilation of S. V. Wild and A. E. Lawson (*J. Conch.* **20**, 252 [1937]) on the enemies of land and freshwater mollusks of Britain would be a useful reference; also, an account of the more recent serious spread of rat lungworm (*Angiostrongylus cantonensis*), which also has slugs as hosts in many regions, was published in 1969 in a book by Alicata on parasites of man and animals in Hawaii.

Terrestrial Slugs will be helpful not only to those involved in classroom and laboratory programs; agencies concerned with control of slugs also will find a wealth of useful basic information in it.

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Crucial Numbers

Geography and a Crowding World. A Symposium on Population Pressures upon Physical and Social Resources in the Developing Lands, University Park, Pa., Sept. 1967. WILBUR ZELINSKY, LESZEK A. KOSINSKI, and R. MANSELL PROTHERO, Eds. Oxford University Press, New York, 1970. xvi, 602 pp., illus. $10.95.

Ironically, a three-year delay makes the publication of these conference proceedings more timely. The book outclasses this year's hundred bad books on the subject of a crowding world. It is coherent and broad-minded —better still, mind-stretching.

The conference topic, "population pressure upon resources," eluded the attempt at a single definition, but the participants did arrive at a consensus that it entails not one worldwide threshold of overpopulation, but three thresholds, each of them now critical somewhere. There is a lower threshold of insufficient population: "A certain degree of demographic pressure is necessary for man to seek to improve the utilization of his resources" (Tricart). There is an intermediate threshold above which one goes from extensive exploitation (long fallow) to intensive systems of cultivation which conserve or enhance environmental possibilities (soil fertility, streamflow processes, variability of species, and so on—see the contribution of Boserup or Mabogunje); and there is a more widely discussed upper threshold beyond which food crises recur, and at which urban assimilation capacities become critical (Beaujeu-Garnier, C. G. Clarke). As societies move along this path of development, they seem to go through an "optimum period" between the middle and upper thresholds, "in which one may have the impression of prosperity for one or two generations" (Pierre George).

The thresholds of population density or carrying capacity are not everywhere the same, and some geographical environments are more tolerant or more resilient than others. Many regions of "population pressure" are at the intermediate threshold, where a cultural and technical transformation must take place. "The passage from one equilibrium to another is precarious and always accompanied by serious tensions" (Tricart).

The conference was an attempt to restore a sense of priorities among geographers, by focusing on the interaction of fundamental human problems