Book Reviews

Experimental Population Ecology

Physiological Mammalogy. William V. Mayer and Richard G. Van Gelder, Eds. vol. 1, *Mammalian Populations.* John B. Calhoun and J. J. Christian. Academic Press, New York, 1963. xii + 381 pp. Illus. $12.

The first section of this book, which is John B. Calhoun's, "The Social Use of Space," contains an elaborately structured theory of the evolutionary development of the intraspecific and interspecific division of living space. This well-written thesis is based on the primary general assumptions that evolution has favored the minimizing of aggressive encounters and the development of a uniform resource utilization. Portions of Calhoun's interesting, intuitively based attempt at a mathematical formulation of social dynamics appears to have considerable heuristic merit, and it will probably stimulate other attempts to formally describe the evolution of social structure. However, its potential to subserve this catalytic function has likely been impaired by overly zealous and stringent anecdotal defense of a conceptual structure that is admittedly founded on secondary assumptions and observations highly susceptible to equivocal interpretation.

Many will justly take exception to the poorly fortified suggestions (i) that living space is divided inter- and intraspecifically, not by competition but primarily through "home range inhibition" by the emission of noxious vocal spacing signals; (ii) that a group size of 12 individuals is the behavioral and physiological optimum for most mammals, including man; (iii) that the supragregarious habit of herding species originated from social drives secondarily acquired while feeding together upon spatially restricted food resources; and (iv) that the "*sole* function of culture is to provide a mold which enables interactions to transpire in a larger group such that their physiological consequences to the average individual closely approximate those that would result were the individuals still living in a closed social group of about 12 individuals." The most important contributions are Calhoun's ingenious experimental demonstrations of environmentally induced pathological togetherness, withdrawal behavior, and the existence of a nonegaletarian optimum-sized population density for white Norway rats.

The second part of *Mammalian Populations*, John J. Christian's "Endocrine Adaptive Mechanisms and the Physiologic Regulation of Population Growth," represents a creditable and truly mammoth job of providing multidisciplinary evidence for the operation of density-dependent socioendocrine mechanisms in mammalian populations. Part 1 is a hasty, and necessarily incomplete and somewhat biased survey of the function of the major endocrines. Part 2 summarizes 10 years of Christian's own work and other supporting experiments which indicate that pituitary-adrenalcortical activity increases and that reproductive ability and resistance to disease decrease as group size increases in chronically maintained unisexual aggregations and in freely growing populations of mice in the laboratory, and in natural populations of various species of wild mammals. This work is open to the minor criticisms that its treatment of both endocrine mechanisms and population phenomena are less recent than the date of publication would lead one to anticipate; that many of the references are not primary references, and a number of them, including the author's, are uncritically and sometimes erroneously quoted; and that more careful editing and organization would have enhanced readability. Conflicting theories of population regulation and most published data which fail to support, or which conflict with, the author's hypothesis are not discussed and evaluated; also omitted is a large body of pharmacological evidence of a supportive nature. Inclusion of available evidence for primary central nervous control of pituitary-adrenalcortical and reproductive function could have profitably bolstered the suggestion that the physiological changes ensuant to changes in group size and population density are ostensibly sociopsychological in origin. Basic points in the author's argument which deserve further conceptual consideration or experimental and documentary elucidation include the permissive role and tissue use of adrenal steroids, the concept of optima, the physiological effect of very high population densities as opposed to the effect of high densities, the effects of inanition upon adrenal-cortical function, and the extra-adrenal endocrine control of reproductive processes.

Mammalian Populations will not, as the editors projected, serve as a compendium on the physiology of normally nonlaboratory animals, nor will it be explicitly useful as a guide to the selection of nonclassical animals for experimental use. It will serve primarily as a useful summary of the principal experiments and as argumentative supports for the major theses of the two foremost pioneers in modern experimental population ecology. Their contributions leave little doubt that changes in the social environment concomitant to changes in population density have a very profound direct effect upon the behavior and physiology of individuals, and the major significance of this volume lies in the fact that it contains substantial evidence to support this assertion.

Lest uncritical readers of broader social interests derive unwarranted justification for complacency from the evidence that populations possess built-in feedback controls on their own growth, it is well to note that the processes considered "adaptive" in the sense that they help assure the population's continued existence are most often inimical to the health and comfort of the individual.

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