

Conservation Problem

The World's Cats. Vol. 1, Ecology and Conservation. Proceedings of a symposium, Laguna Hills, Calif., Mar. 1971. RANDALL L. EATON, Ed. World Wildlife Safari, Winston, Ore., 1973. x, 350 pp., illus. Paper, \$10.

This volume records the proceedings of a symposium held with the aims, first, of assessing our knowledge of the ecology and status of as many felid species as possible and, second, of considering what sort of conservation measures are required to preserve endangered species and which of these appear to be feasible in the immediate future. The major part of the book is devoted to papers dealing with the ecology of various species from North America, Asia, and Africa, followed by sections dealing with management in captivity of cheetah and snow leopard and finally a discussion of conservation proposals.

The main points that emerge from the studies presented are not only how little is known about most of the Felidae but also how difficult it is, in the majority of cases, to find out more. A number of the contributions are summaries of existing knowledge, or lack of it. Of more general interest are the papers which report new observations. These include studies of the lynx in Alaska by P. M. Berrie, the bobcat in the Savannah River Plant, South Carolina, by E. Provost *et al.*, the Ceylon leopard by N. Muckenhirn and J. F. Eisenberg, and the Kalahari lion by F. Eloff. The last two are particularly interesting from the viewpoint of comparison with the studies made by Schaller on the same species in the more typical habitat of the Serengeti. Of wide general interest, too, is Joslin's study of the residual population of the Asiatic lion in the Gir forest. This is, in effect, a study of human ecology and the impact of man and his domestic animals on a wild carnivore population. The conservation problem presented is essentially a sociological one, involving within the reserve the problems of overstocking with cattle, encroaching cultivation, and the incursions of hide collectors who despoil the lions of their kills.

As far as conservation goes, there was very general agreement on two points. First, for most of the species concerned, survival depends on the survival of their natural habitats. In the face of increasing exploitation of land by man, the only way to ensure this is

by the creation of adequate reserves. Second, as long as trade in skins remains a lucrative pursuit it will be impossible for the less developed countries, no matter how conservation-minded their governments may be, to prevent illegal killing of those species whose pelts are most valued. Poaching is becoming more organized and increasingly difficult to control, and although customs regulations are easy to make they are extremely difficult to enforce. The representatives from Asia, Africa, and South America were united in their opinion that without a ban on the import of skins by the developed countries they had little hope of instituting effective control measures. It is therefore highly satisfactory to note the considerable advances that have been made in this direction since the conference was held.

The editing of the volume leaves much to be desired. Misprints, including incorrect spellings of scientific names, are far too common, and a number of the contributions include grammatical errors and misuses of words which obscure meaning. It is also an irritation to find distances and areas given in English units in one paper and in metric units in another.

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Biological Transformations

Thermodynamic Aspects of Developmental Biology. A. I. ZOTIN. Translated from the Russian. Karger, Basel, 1972 (U.S. distributor, Albert Phiebig, White Plains, N.Y.). viii, 160 pp., illus. \$18.50. Monographs in Developmental Biology, vol. 5.

Current Soviet investigations into the metabolic aspects of carcinogenesis, aging, embryogenesis, oogenesis, and regeneration are featured here by Zotin in a review which purportedly illustrates the diverse biological applications of nonequilibrium thermodynamics. Zotin clearly disagrees with his colleague K. S. Trintscher, who earlier concluded that some biological transformations lie beyond the scope of nonequilibrium thermodynamic laws. Unfortunately, Zotin's analysis of this fundamental question is, in my judgment, unsound.

In 1946 Prigogine and Wiame proposed to avoid near-equilibrium approximations in biology by utilizing a general nonequilibrium variational prin-

ciple. Applied to an arbitrary open system, the principle requires that the rate of entropy increase due to internal irreversible processes must be at a mathematically defined local minimum whenever the system is at steady state. If this principle is combined with special near-steady-state approximations, it predicts that the total energy dissipation rate of a system will always decrease as the system approaches steady state.

Trintscher, finding in the literature that the rate of heat production by eggs increases during early embryogenesis, concluded that the Prigogine-Wiame theory is not applicable to living systems. Zotin subsequently renormalized the calorimetric data to show that the specific rate of heat production per unit dry weight of embryo is actually a monotonic decreasing function of time, thereby convincing himself that the Prigogine-Wiame theory is confirmed. Throughout his monograph Zotin argues that the Prigogine-Wiame theory, and subsequent extensions permitting more general near-steady-state approximations, should be used to unify the study of biological transformations.

Zotin's renormalization procedure is vulnerable to criticism because it clearly biases the calculations in favor of obtaining decreasing specific dissipation rates; the renormalization corrects for the decreasing mass of yolk in an egg, but does not correct for the increasing mass of newly synthesized structural material in the embryo. More important, in a regulated biological system, such as a mitochondrion, the internal couplings of a subset of component processes are modulated by other component processes, giving rise to nonlinear relations which cannot be described by near-steady-state approximations. In such cases the specific energy dissipation rate is free to increase and decrease according to the programming of the regulatory mechanisms, rendering the Prigogine-Wiame theory and subsequent generalizations inapplicable.

Zotin employs the phrase "constitutive deviation from the steady state" to account for the increasing specific dissipation rates which appear during the initial stages of carcinogenesis, oogenesis, and regeneration; sometimes he optimistically refers to these processes as examples of "natural rejuvenation." At best these phrases imply only that near-steady-state approximations have failed. Consequently, I see little hope of success for the special thermody-