

were carried on in a variety of habitats where there is a wide range of variation in water levels. Interpretation of the results provided ideas which were tested on managed marshes with considerable success. It is noteworthy that in some areas the range of tolerance for breeding black ducks and ring-necks was found to be within a six-inch variation in water level. Because of the great variety in natural situations which waterfowl managers may try to improve, they will not be able to apply Mendall's findings directly but they will find in this book a most telling demonstration of the principles of habitat management.

Some of the data which this book contains were gathered during a 20-year period, and intensive field work was carried on for the 12 years between 1943 and 1955. It should not detract from the credit due the author to suggest that his work well points up the need for time and continuity in wildlife research.

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Nature Photography at Night

By TAPPAN GREGORY. Denver, Colorado, Denver Museum of Natural History, 1957. 62 p., illus. (Museum Pictorial No. 14)

Two other issues of these pictorials have dealt with nature photography: M.P. No. 1, "Nature Photography with Miniature Cameras," and M.P. No. 5, "Nature Photography with the High-Speed Flash." The third member of the series deals historically with the fascinating record of Mr. Gregory who pursued the hobby of night photography of wild life for more than fifty years and gained wider experience than any other photographer in that field. Mr. Gregory has traced the evolution of equipment from open charges of magnesium flash powder to magnetic synchronizers and flash bulbs. The first-hand record of interesting experiences in the field is illustrated with 41 of the author's best night flash pictures of wild life.

V. E. F. SOLMAN

The Ecology of Invasions by Animals and Plants

By CHARLES S. ELTON. London, Methuen, 1958. 181 p., illus. \$6.00 (30/-).

The director of the Bureau of Animal Population at Oxford has presented a stimulating discussion of a problem that has an urgent appeal to nearly all biologists. At the same time the presentation is in simple enough terms to be clear to the layman interested in conservation and agricultural production. Workers in such applied fields as plant quarantine, plant pathology, and forest, agricultural or medical entomology will find data on problems analogous to their own and will find the theoretical discussions stimulating. Workers in such disciplines as ecology, biogeography, population dynamics, evolution and conservation will find a rich assortment of data gathered from many sources, Canadian included.

Slightly over half the book is given over to a discussion of Wallace's Realms and their geological background, to the vast and increasingly serious number of plant and animal invasions into new territories, and the resulting problems in population dynamics. The changing food chains that result from such invasions are then discussed. In a chapter headed the "Reasons for Conservation" the author presents the view that only by deliberately complicating, rather than trying more and more to simplify, our communities of economic plants and animals can disastrous outbreaks and fluctuations be limited. His thesis, based on mathematical, experimental and observational data, is that the simpler the population structure the more violent are its fluctuations. Somewhat surprisingly voles and lemmings are not mentioned in this connection, but one can scarcely overlook the fantastically violent fluctuations in the populations of these animals in the arctic where prey, predator and plant species are few, in comparison with the much smaller fluctuations that occur in southern Canada where all

elements of the community are more varied. In a complex community, with many competing species of hosts and parasites, predators and prey, food plants and cover plants, we have something analagous to a strongly buffered fluid: the introduction of a foreign element produces no runaway change but only a minor readjustment in structure. In a tropical forest the structure is so complex that such scourges and rapid changes as we are even now experiencing in our much simpler temperate forests cannot occur.

The remedy proposed in the final chapter is that we abandon our attempts at a rigid monoculture (the author's term for great stands of single crops in as nearly sterile surroundings as can be achieved) and to turn our backs belatedly on the barbed-wire engineering type of (self-styled) agricultural efficiency expert. The sterile monoculture, if it were fully realized, would be even more poorly buffered than the arctic fox and lemming population of the high arctic. The author urges the retention and extension of the hedgerow system of farm fields that has served so well in many parts of England. This suggestion is not entirely original—much the same thought was expressed by H. J. Massingham in *The Wisdom of the Fields*; and I do not doubt that Cobbett, who admired a good hedgerow, would have expressed it too if anyone in his day had had the temerity to suggest barbed wire as an alternative. But probably no logical and adequately reasoned support for hedgerow farming has hitherto been presented. One of Massingham's countrymen remarked to him: "I likes eddicated people but the worst of it is they be so dommed ignorant." It is quite clear that Dr. Elton is exempt from this stricture; he has kept touch with the living world. Moreover he cites encouraging preliminary findings of increased production under the methods that he advocates.

I find great satisfaction in this presentation of reasoned support for cultural

methods instinctively developed. I have boyhood recollections of rich Devon farmlands where the fields were both hedged and banked. And I remember, as we drank his cider after an afternoon's rabbiting, an old farmer, whose family has prospered on that farm for uncounted generations, explaining to us that the roadside banks were broader and unhedged because before the days of metaled roads folks traveled on the bank tops during winter rains. This man was truly a part of a balanced community, not a foreign influence wrecking its economy for a quick return.

This stimulating and thought-provoking book can be recommended unreservedly. I have no criticisms of the latter part and only a few very minor ones of the earlier chapters. I wonder whether the uniformity of the Cretaceous fauna was as great as it appears. After a hundred million years our perspective is desperately shortened and animals that seem to have occurred simultaneously in different continents may actually have done so a million years apart. On page 42 the author ascribes the richness of the Oriental Realm to the mountain barriers to the north. These mountains certainly served to increase the distinctness of this realm; but the richness was probably due more to its being wholly tropical and to the stimulus of intermittent penetration of the sea barriers in the Malay Archipelago. Finally I regret that Dr. Elton did not supply balance for his story of invasions by documenting one or two that have occurred without human agency; the invasion of and explosive spread within the Americas by the Cattle Egret might have served.

I am at a loss to explain why a book that sells in England for thirty shillings should be listed in Canada at six dollars. I am informed by the office concerned that books in this class are subject to neither duty nor sales tax.

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