

Marie, Michigan, February 20, 1932, was shot at Newdale, Manitoba, November 21, 1932. This is my most westerly record to date. Two of my Grosbeaks were taken in northern Minnesota in 1929, one of them at Karlstad in the northwest corner of the State. Newdale is about thirty-five miles north of Brandon, Manitoba, and some two hundred miles northwest of Karlstad.—M. J. MAGEE.

## RECENT LITERATURE

**Game Management.**—By Aldo Leopold, Drawings by Allan Brooks. Charles Scribner's Sons, 597 Fifth Avenue, New York. London. 1933. 8 vo. pp. i-xxi + 1-148. Price \$5.00.

That Aldo Leopold is one of the clearest thinkers now studying the intricate problems of general conservation is evident on every page of this volume, which, besides being the most comprehensive and detailed work yet to appear on the subject, is obviously the product of an orderly, analytical, and open mind.

The author's thesis is, in brief, that "game can be restored by the *creative use* of the same tools which have destroyed it—axe, plow, cow, fire and gun." He defines game management as "the art of making land produce sustained annual crops of wild game for recreational use," and then in eighteen crowded chapters shows in detail and from almost every angle how it may be accomplished. While advocating artificial production of game, and the placing of the "art" on a frankly economic basis, he is careful to define sport, and to draw a middle course between the staged "pheasant drive" type of shooting in vogue in Europe and Great Britain, and the "free hunting" enjoyed by our grandfathers, now unfortunately a thing of the past. He marshals his facts from all the natural sciences, from biochemistry and zoology down to animal husbandry and agricultural economics, and he presents a lucid, convincing picture.

Throughout the book—Measurement of Game Populations, Game Refuges, Control of Cover, Control of Disease, Game Economics, and Esthetics are a few of the chapter-headings—the author's thorough grounding in modern biological principles is evident. Ecologists and students of geographical distribution will approve wholeheartedly his practical application of many of their tenets. The principles of ecological interrelationships and the laws of territoriality as expressed by recent thinkers form the groundwork on which his whole management plan is based. Though naturalists now take them for granted, ideas such as that there is a definite and measurable limit to the numbers of birds any given territory can support will probably be regarded by most sportsmen as astonishingly new. Another hypothesis which will undoubtedly be thought radical by the old guard predicates the improvement of environmental conditions as of far greater essential importance towards improving shooting than restocking with hand-raised birds.

The author recognizes the fact that game-birds are disappearing, despite legislative efforts in their behalf. He outlines the usual development of conservation methods as follows:

1. Restriction of hunting.
2. Predator-control.
3. Reservation of game lands (as parks, forests, refuges, etc.).
4. Artificial replenishment (restocking and game-farming).
5. Environmental controls (control of food, cover, special factors, and disease).

He shows how the first two methods, now widely in use alone, have failed to check the steady dwindling of the game-supply, and pleads strongly for the adoption of a sensible correlation of all five methods. But while he shows conclusively how his plan will work for upland non-migratory birds, he fails to suggest a similar workable plan to alleviate the far more critical situation in migratory game. The international scope of the natural economy of ducks, geese, and shore-birds, of course, precludes the confining of their life-histories within the limits of a 170-acre Iowa farm.

Bird-banding is recommended as a means of measuring game populations, and as a basis for all investigations where individual identification is necessary. While the scope of the book is such that but little space can be given to the actual technique of banding, the author refers to most of the essential publications where that information may be obtained. Data garnered through banding are used freely, and not a few important points are driven home by unassailable "return" figures.

All controversial questions are discussed with a fine tolerance for both sides of the question. In some of these, such as the chapter on predator-control, Mr. Leopold leans so far on the side of the biologist that he will undoubtedly make himself unpopular in most sporting circles, though he backs his arguments with incontrovertible evidence.

All too frequently technical writing is of faulty construction and boring in style. It is indeed a pleasure to find this so important book couched in very readable English. The reader is never distracted by flaws in the writing, nor tired by having to wade through the persiflage of verbosity and tautology which many writers on scientific subjects believe necessary to establish an atmosphere of learnedness.

The typography of the book is clean and pleasing. The many charts, maps, and graphs, as well as the black-and-white drawings by Major Allan Brooks, add much to the appearance, as well as the clarity and readability, of the volume. Though the birds on one of Major Brooks's full-page plates look more like Burrowing Owls than the Quail they are supposed to be, one of his vignettes, the tail-piece following the chapter on fluctuation and density of game populations, attains illustrative heights. It is a simple line drawing of a snowshoe rabbit sitting at the peak of its cyclic curve.

This book should be a standard reference work for game-management long after most of the titles in its bibliography are outdated and forgotten. The ornithologist will find it particularly valuable, not only as a compendium of useful information in fields somewhat outside his usual scope, but also as a constant stimulus to his imagination. The author's methodical tabulation of all sorts of data, such as cruising-radii, breeding-potentials, and fertility periods, show many surprising gaps in our knowledge which should provoke needed investigations.

The volume seems admirably fitted for use as a textbook. Indeed, the author suggests as a necessary adjunct to the advancement of game-management, that it be taught in universities, as agriculture and forestry are. Many students, myself among them, will regard his recent appointment to the chair of game-management in the University of Wisconsin as of far-reaching importance, if not the greatest impetus conservation has received since the days of William Dutcher.

We cannot but agree with him when he closes his arguments as follows: "Twenty centuries of progress have brought the average citizen a vote, a national anthem, a Ford, a bank-account, and a high opinion of himself, but not the capacity to live in high density without befouling and denuding his environment, nor a conviction that such a capacity, rather than such density, is the true test of whether he is civilized. The practice of game management may be one of the means of developing a culture which will meet this test."—O. L. A., Jr.

**Kluijver on the Biology of the Starling.**—The starling is a bird very much in the limelight both in Europe and this country, owing to its controversial economic status, its irregular migratory behavior, its phenomenal increase (in England as well as in this country) and finally to Bissonnette's experiments. Nevertheless, until now there has been no thorough study of its nesting behavior. This gap has been filled by an important contribution<sup>1</sup> both to the study of bird behavior and to economic ornithology from the Agricultural University at Wageningen, Holland. The author improved Bussman's terragraph<sup>2</sup> by forcing the birds to use one hole as entrance and another as exit, so that only entrances would be registered; this he did by means of wires hinged in front of the doors—one set that would swing inward, the other outward, on the same principle as trap nests for fowls. This apparatus he calls an "aphisigraph," or "arrival-recorder." He was able to install these changes on the day that the young hatched. The second year all four boxes thus equipped were adopted by Starlings at the beginning of the season, so that the author was able to get records on incubation as well as on feeding of the young.

In February and March the males come to the nest-boxes and sing for ten to thirty minutes, singing much more on sunny days than in cloudy weather. Females sing in the flock in the roosting-places, but never near the boxes. The females come to the boxes in late March or in April; banding showed that it usually takes several weeks before the pairs are definitely formed. The males start to build before the arrival of the females, but most of the building is done by the latter. The nests of the few unpaired males lack the feather lining and also contain many green leaves and flowers. Building continues until the young hatch.

The average date of the first eggs is correlated with the mean temperature of April. A bird hatched June 23, 1930, and banded in the nest returned to the colony and laid her first egg in 1931 on May 6th, and in 1932 on April 27th, the average dates for first eggs of all the birds being April 27, in 1931 and April 28th, in 1932.

During the day male and female share incubation in short shifts, usually not more than twenty minutes long, at most thirty and sometimes as short as five. The aphisigraph gave the following number of entries per day: 82, 77, 74, 72, 77, 67. The eggs are frequently left uncovered from two to ten minutes. The female incubates throughout the night. Although the male sings a great deal during egg-laying, he stops abruptly with the start of incubation. The eggs hatch very regularly in twelve days.

Only the female broods the young. The female usually does the major part of the feeding, in some cases, especially with late broods, the male doing little or nothing. Starlings are exceedingly zealous in feeding their young, as will be seen in the impressive figures in the accompanying table.

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<sup>1</sup> H. N. Kluijver. 1933. *Bijdrage tot de Biologie en de Ecologie van den Spreeuw (Sturnus vulgaris vulgaris L.) gedurende zijn Voortplantingstijd.* Veenman & Zonen. Wageningen. 145 pp., 3 pl.

<sup>2</sup> See *Bird-Banding*, Vol. IV, 1933, pp. 33-40.

Age in days	Number of Feedings in One Day				Average weight of feedings (in mg.)	Growth of Young Average of 5 birds in Box 22 (in grms)
	1930	1931	1932			
	Box 47 4 young	Box 48 6 young	Box 64 6 young	Box 63 6 young		
When hatched		118	118	118		6.8
1		156	151	175	144	
2		180	226	246	186	14.8
3	208	227	218	265	256	
4	247	235	283	298	336	30.8
5	251	306	316	303	439	
6	303	306	323		575	50.4
7	345	476	347		510	
8	300	525	355		641	65.0
9	388	430	331			
10	358	448	380		853	66.8
11	240	472	398		717	
12	401	483	432		828	69.4
13	395	485	450		791	
14	358	440	395		955	71.4
15	366	408	335		987	
16	421	366	430		880	69.6
17	378	393	427		805	
18	359		401		929	73.0
19	297		394			
20	187		185			
21	26					

The numbers of feedings per day increase till about the 8th day, when they stay more or less the same, decreasing a little at the end. However, in boxes 47 and 64 some of the young had left at the age of 19 days. The largest number of trips in one day was 525—the highest record the reviewer has ever found for any bird. The total number of feedings amounted to 6,895 at one nest and 7,668 at another. But since one to five objects were brought at each trip, approximately 15,900 pieces of food were brought to one nest in 1930, and some 27,300 to another in 1931. The average number of feedings per nest per hour during one day at three nests with four, six, and six young respectively was: 4-8 A.M. 30.5; 8-11, 26; 11-2, 21.3; 2-5, 17; 5-7, 18.

Another ingenious method of the author consisted in the placing of aluminum collars around the necks of some of the young and collecting the food from their throats for study. 17,933 objects were thus collected, belonging to 313 species, of which 267 species were insects. The average weight of the feedings was determined; beginning with 144 mg. on the first day it rose to 853 mg. on the tenth (see table). The weight of a feeding amounted to about one-eightieth the weight of the young, but in one case where the female did all the feeding some feedings equalled one-eighth the weight of the little bird. During the first few days the young were fed half their weight each day, but later six-sevenths their weight each day.

The feeding range of Colony A, consisting of 17 pairs, in 1930 was about 62 acres of pasture; in 1931, with 28 nests, it was about twice as large. Although Starlings have greatly increased on the station grounds in the past six years in response to the boxes put up for them, the number of other birds has not lessened.

An exhaustive study of the feeding-habits of the Starlings was made, particularly in regard to *Tipula larvæ*, or "leather-jackets," a crane-fly that does much injury to grasslands in Europe. At times this species formed 26 per cent of the food of the young.

It seems a pity that such a valuable study should not be published in German or English; the three-page summary in English at the end of the volume is helpful, but the main body of observations is available only to those who read Dutch.—M. M. NICE.

**Traveling with the Birds.** A Book on Bird Migration by Rudyard Kipling.—This quarto volume of sixty-three printed pages, twelve colored plates, and twenty-six line drawings has been prepared in the main for young readers, and well indeed does it treat the fascinating subject of bird migration. Adults, too, will not fail to appreciate its freedom from dogmatism and the author's stimulating manner of presenting the subject. Attention is called to the assistance bird-banding has rendered in determining something of the migration of the White-throated Sparrow, and also the importance this method of bird-study will have in the future in learning the details of migration routes generally.

To my mind the artist has come nearer to making his birds appear alive than any predecessor known to me. This ability is perhaps shown at its best in his portrayal of the Bobolink, Cardinal, Slate-colored Junco, Evening Grosbeak, Cliff Swallow, Golden Plover, Blue Jay, Redpoll, Cape May Warbler, and Black-throated Green Warbler. The method of reproduction employed has not been especially happy in all respects, in that the colors are sometimes of too great intensity, and in two cases at least has resulted in giving a wrong coloration, as shown by the bluish upper parts of the Redstart and the greenish sides and flanks of the Junco. The fact that most of his birds are painted approximately of life size, thus permitting a more detailed portrayal of the eye than would be feasible in smaller paintings, may possibly account for the lifelike appearance of the birds.—C. L.W.

**Der Vogelzug, Vol. 4, No. 3, July, 1933.**—Meise opens this number with a discussion of kinaesthetic memory and distant orientation of birds. He supports Grinnell's statement that no special sense of direction or "sixth sense" has to be invoked to account for birds finding their way during long journeys. His argument is as follows: perceptions of motion during flight may be received by the labyrinth of the inner ear, by muscular sensations, and by the primary sense organs. To these may be added optical images in some, but not in all, cases. These impressions are unconsciously embedded in the memory and combine themselves there into an absolute image of the road passed over, namely, the terminus, the direction, and the distance. The bird is in a position to retrace or to follow backwards these remembrances, but is not slavishly bound to the exact same path. Frequently there occur variations in the external factors and of the bird's bodily condition through unconscious regulation of its motions so that it may reach the same goal by a different path. This removes the assumption of a guiding stimulus emanating from the terminus of the journey, aiding the bird on its way. Meise assumes no special sense for the unconscious registering of the traversed road and for the equally unconscious recognition of previously registered stimuli during the return journey. He claims that the bird has a memory sense for a definite path to a definite place; this "place and path memory" is often hereditary as is shown by the first journeys of young birds.

It seems to the reviewer that Meise has not greatly simplified the whole problem. By assuming a series of unconscious or subconscious activities, he obviates the need of a definite sense of direction by substituting for it a type of activity wholly directed by subconscious impulses. However, he admits that heredity plays a role, as in the case of young birds making their first autumnal journeys alone. What, then is the difference between his use of "unconscious" and "instinct"? There is none. The distinction between instinct and the idea implied by the term "sense of direction" is not very broad but it is significant. However, it puts the problem of orientation beyond the pale of physiological investigation and is therefore

apt to prove more of a hindrance than an aid to deeper understanding. This is, however, no indictment of the reality of the distinction he draws.

Vilks and vonTransehe present a resume of banding work done on Starlings in Lettland.

Ohlendorf raises the question as to the manner in which the departure of young and old White Storks (*Ciconia c. ciconia*) is regulated with regard to time. He finds, from much banding work at Rossitten and collaborating stations, that the majority of young Storks leave in the latter half of August; the old birds from the middle of August to the first days of September.

The time elapsing between the two groups in any given spot is often very decided, but so far there are no data suggestive of any differential effect of external factors on young or old birds. With regard to the possibility of the young birds receiving guidance from the older ones, or not, data are still far from satisfactory.

Drost gives the 13th report of the Helgoland station, covering its varied activities during 1931 and 1932. In these two years 10,970 birds were banded at Helgoland; since the beginning, thirteen years ago, 45,659 birds of 143 species have been banded at Helgoland, while individual collaborators have swelled the total to 344,304 birds in all. The facilities and collections of the station's library, museum, and laboratory all increased during the two years under review.

Shorter notes include observations on the separation of the sexes of the Lark (*Alauda arvensis*) in spring; on the wanderings of the Kingfisher (*Alcedo a. ispida*) and notes on Danish banding work in Greenland.—H. F.