

and permanent entities, are traced. This should be enough to dispel any notion of the unity of the caribou herd. It is not always easy, in fact, to decide whether one or two herds are being dealt with. In familiar areas the reviewer finds that herds he thought he knew have been "lumped" with others. There are some very interesting observations of the behaviour of caribou, including some in contact with wolves. A verified case of bovine tuberculosis is an addition to the pathological record, and the granular tapeworm was also found encysted.

No one investigation or series of investigations is likely to provide all the answers necessary for caribou management. Surely a resource so important should be kept under constant study. It is certain, for example, that even in early days there were great variations in the numbers of caribou. In some years they may very well have been far too numerous for their own good, and in other years there may have been just as few as there are now. However, destructive factors have been carefully studied by Banfield, and are capable of producing the present scarcity, even though there may not be absolute certainty that other influences are not at work. Human utilization, the controllable factor, will have to be reduced until the animals increase. As some of the users are shown to need 100 animals per year, and others less in proportion as they have other resources, it will not be easy to establish an equitable basis for the reduction.

C. H. D. CLARKE

MIGRATION OF BIRDS

By FREDERICK C. LINCOLN, illustrated by BOB HINES. *Washington: United States Department of the Interior, 1950. Circular No. 16 of the Fish and Wildlife Service. 9 x 6 inches; iii + 102 pages; maps and line drawings. \$0.30.*

Although the fact is nowhere mentioned, this latest in a series of United States Government publications on bird migration is merely a slightly "warmed-over" version of 'The migration of North American birds' by the same author,

published as Circular No. 363, United States Department of Agriculture, 1935.

Except for the insertion of certain references to three or four of the more recent developments in migration study, the addition of two appendices, and the expansion of the bibliography, the text of the "new" version is almost word-for-word the same as the 1935 circular. Where minor changes were made, they often led to curious results. For example, the following quotation is from the 1935 version: "During the World War broad areas in the air were under constant close surveillance, and among the airplane pilots and observers many took more than a casual interest in birds. Of the several hundred records resulting from their observations only 36 were of birds flying above 5,000 feet and only 7 above 8,500 feet." These sentences appear *verbatim* in the 1950 version, except that "War" now becomes "Wars" and, for some reason, the word "close" is deleted. The statistics remain unchanged.

Mr. Lincoln is at his best in his delineation and discussion of the flyways of North America. Some of his descriptions have been modified to include information gained in the past fifteen years, and they are interestingly written. However, the section on "Arctic routes" reappears unchanged and indicates in two paragraphs that, in sum, they are tributary to either the Atlantic or Pacific coast routes.

He is probably at his worst in dealing with the influence of weather on migration. The section under that heading appears unchanged in 1950, despite the following points: (1) the validity of his opening sentence: "The state of the weather at any point has little if anything to do with the time of arrival of migratory birds" must be seriously questioned; (2) the association between the advance of migrants and isothermal advances is probably not as close as was once thought; (3) the concept that strong tail winds "interfere with their balance and disarrange their feathers" might well have been omitted, even in 1935.

Since recent European studies of migration are not given consideration, and since the text again deals almost

entirely with North American migrants, the change in title is scarcely a happy one.

The figures have been "brightened up" by the addition of a portrait of the bird in question. This certainly makes for emphasis and decoration, but there is a resultant tendency for some of the figures to become more crowded and less lucid than they were when Wells Cooke first presented them around the turn of the century.

While no one would quarrel with the principle of keeping the salient facts of bird migration before the public, the methods employed in this instance seem scarcely above reproach. The new title, decorative cover, modernized figures, large print and 200 per cent increase in price all imply a thoroughly revised and up-to-date treatment of this subject, something which this circular certainly is not.

At the time of going to press we have received a photographic reduction of this work with hard covers, published by Doubleday at \$1.25.

W. W. H. GUNN

CYTOLOGICAL AND EMBRYOLOGICAL STUDIES IN THE AMPHI-APOMICTIC *ARABIS HOLBOELLII* COMPLEX

By TYGE BÖCHER. *Det Kongelige Danske Videnskabernes Selskab. Biologiske Skrifter. Vol. 6, No. 7 (1951) pp. 1-59. Dan. Kr. 9.00.*

Holbøll's rock-cress, *Arabis Holboellii* Hornem., is a highly polymorphic American-Greenlandic species which has long presented many problems to taxonomists. The present discontinuous distribution suggests that the species is a survivor of North American glaciation.

It is now most abundant in western North America (Alaska-California) but it is also found about the Great Lakes, on the Gulf of St. Lawrence, and the coasts of Greenland. Western North America is the present centre of variation of the species and, in the author's opinion, is the probable centre of origin. The basic haploid chromosome number is 7; diploid races occur in both America and Greenland, triploid races in Greenland only, and tetraploid and hexaploid races in America only.

In the present study collections of the varieties *typica* and *retrofracta* from Greenland and from Alaska respectively were examined cytologically. Meiotic behaviour and pollen development were studied in detail, and observations on embryology and seed sterility were also made. Diploid and triploid plants of the var. *typica* and diploids of var. *retrofracta* were found. In some diploids the pollen meiosis was regular, in others an apomeiotic development resulted in the formation of pollen with the unreduced chromosome number. Usually the triploids were apomeiotic. Frequently the embryo-sac also followed an apomeiotic development; in such cases the unreduced pollen germinated but fertilization did not follow. It is of interest to note that *Arabis Holboellii* is the only species of the Cruciferae for which apomixis has been reported.

Böcher's work is a contribution to an understanding of the complex taxonomic problems of this species. Further cyt-taxonomic study, particularly of the American forms, would be very desirable and would probably be highly rewarding to our understanding of such evolutionary problems.

R. J. MOORE