

date work, within the reach of most, was greatly needed, and with Mr. Iredale has undertaken to supply the desideratum—hence this first volume of the four which are to complete the work.

In the neat and handy volume under notice the authors deal with 188 species and their numerous racial forms, comprised in the orders Casuarii, Sphenisci, Procellariæ, Fregati, Pelecani, Lari (including the Limicolæ), Ralli (including the Colymbidae and Podicipidæ), Galli, and Columbæ. These orders and their component sub-orders, families, and genera, together with their diagnostic characters, are fully described. Under species the necessary synonymy, plumages from nestling to adult, nests and eggs, distribution and sub-species—including the range and diagnostic definitions of nearly 700 racial forms—are given. As a further help to identification, a series of illustrations is furnished in the form of ten coloured plates depicting more especially hitherto unfigured species, immature birds, and nestlings in down; while thirty-six plates in monochrome contain some 300 figures devoted to the elucidation of the characters upon which the various species treated of in the volume are based. These plates and drawings have been prepared by Lilian Medland and are excellent, but in some of the coloured plates the reproductions, though good and very useful, have not done full justice to the artistic merits of the originals.

We may not always be in sympathy with the views of the authors on the vexed question of nomenclature, and on the recognition of racial forms which are sometimes based upon too trivial characters; nor are we aware that the curlew sandpiper breeds in "Arctic Europe." These, however, are small matters, and it is a pleasure to recommend the book as one which, being the product of consummate personal knowledge, admirably fulfils its purpose, is excellent in all respects, and will doubtless be much appreciated by ornithologists.

W. E. C.

Climatic Factors in Agriculture.

Agricultural Meteorology: The Effect of Weather on Crops. By J. Warren Smith. (The Rural Text-book Series.) Pp. xxiv + 304 + 8 plates. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1920.) 13s. net.

IT has been said—and the statement is very generally true—that in most soils the crop yield is more affected by the weather than by manuring and cultivation. For this reason it is necessary to repeat most field trials for a number of years in order that the variations due to climate may be averaged out; and if at the same time meteorological records are taken it is possible to

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trace out some of the relations between weather fluctuations and the variations in yield. The infinite variety in meteorological conditions and in the factors concerned in plant growth makes statistical examination of the results essential if trustworthy information is to be obtained. The great value of long-continued experiments in this connection is clearly pointed out in the book under notice, and a large number of exceedingly interesting correlations are given between the yields of various crops and the weather characteristics—rainfall and temperature—not only over the whole year, but also over limited portions of the growing season. As more data become available it will be possible to specify the most critical periods of plant growth, and the economic value of forecasts of crop yields will be considerably increased.

The effect of climate is not confined to the final yield of the plant; it operates throughout its whole life, not only directly, but also indirectly through the soil conditions, insect and other pests, and so on. The relations must be considered, therefore, from many aspects—ecological, physical, physiological, to mention only a few. The difficulty of presenting such diverse material in a continuous and logical manner is obvious, and the author is to be congratulated on the success he has achieved.

Most readers of the work will be greatly interested in the methods adopted by the U.S. Weather Bureau in preparing and issuing weather forecasts and warnings. Full advantage is taken of these warnings, not only by the growers of specialised crops, who employ various forms of heaters to prevent damage from frost, but also by the general farmer, especially in the important harvesting periods.

In one or two minor aspects the book might be improved. The explanation of the method of working out correlation coefficients could be shortened; the student should be expected to know the way to solve simultaneous equations. Further, the section on physiological indices should adequately include the work of F. F. Blackman and V. H. Blackman, and a discussion of the views of Matisse would not be out of place.

The suggested laboratory exercises at the end of each chapter are excellent. They are intended primarily for university students, but many of them contain stimulating suggestions which could profitably be followed up by experienced research workers.

Agricultural meteorology must inevitably attract more workers in the future. It is to be hoped that the literature of the subject will maintain the high standard set up in this book.

B. A. KEEN.