

ceeds to trace the various stages of evolution in the order of their probable occurrence, illustrating the conditions found in a large number of species by admirable figures. And it may be said that only one who has done similar work can fully appreciate the time and labor that this study must have entailed. At the end we are presented with a table giving a systematic arrangement of the divisions of the parrots defined by the characters offered by the lingual muscles and hyoid. By these the parrots are divided into three families, Loriidæ, Nestoridæ and Psittacidæ; and here the work of Mr. Mudge may be looked upon as confirming the views of those who have established the first two families on other characters. The Psittacidæ are subdivided into two 'Groups,' one of which contains only the Psittaculinæ and Pyrrhulinæ while the second consists of seven subfamilies comprising the vast majority of parrots. To a certain extent the geographical boundaries of the subfamilies agree with the anatomical limits, but we find *Caica* bracketed with *Pyrrhulopsis*, and *Platyercus* with *Bolborhynchus*, and the geographic unity is by no means conspicuous, as it is in the divisions of Gray's 'Hand List.'

It may, perhaps, be a mere personal prejudice, but the Australian region is so well marked ornithologically that it seems a little suspicious to see Australian and South American parrots placed in the same subfamily. Still every ornithologist is aware that no two schemes for the subdivision of the parrots agree in their minor details and that of Dr. Mudge is consistent in using the same class of characters throughout.

It would have been interesting to have compared the present arrangement with the results of Prof. Thompson's study of the cranial characters of parrots but, unfortunately, Thompson failed to put his results into definite shape and we are in the dark as to just what his ideas may be.

Some might perhaps urge against Prof. Mudge's classification that *Stringops* is not awarded a sufficiently high rank, being placed with other Australian species in the Cacatuinæ, but if *Stringops*, though specialized in some points is, on the whole, merely a cockatoo of generalized structure this association is what might have been expected on theoretical grounds.

Finally, it may be suggested, without in the least wishing to depreciate the most excellent work of Prof. Mudge, that it remains to be seen if an examination of the lingual muscles of any other division of birds will yield as good results as has been afforded in the present instance. The parrots, in structure and habits, are a remarkably homogeneous group of birds and it would seem that the differential evolution of their tongue muscles might be more uniform than in any other group, and consequently more available for purposes of classification.—F. A. L.

**Winkenwerder on the Migration of Birds.**—In the present paper<sup>1</sup> of

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<sup>1</sup>The Migration of Birds, with Special Reference to Nocturnal Flight. By H. A. Winkenwerder. Bull. Wisconsin Nat. Hist. Soc., Vol. II, No. 4, Oct., 1902, pp. 177-263, with diagrams and other illustrations.

nearly one hundred pages the author makes an important contribution to the literature of the subject, through, especially, his record of observations on the nocturnal movements of birds as observed by himself and others through telescopes. This detailed record, with the accompanying diagrams, forms an 'Appendix' of some 50 pages. The main discussion is divided into four chapters: (1) Historical Review; (2) The Causes of Migration; (3) Migratory Routes; (4) The Manner of Migration. The first two chapters seem rather perfunctory and unsatisfactory; the second, on the causes of migration, closes with the following statement of the author's conclusions: "Birds are set in migratory motions by a complex combination of changes in temperature, humidity and living nature. The cause for migration, however, is the failure of food in two wide-spread areas—the north and the south—at opposite seasons of the year" (p. 196). He also says (p. 191): "It has been maintained for years that the question of food will never explain the vernal migrations, however well it serves that purpose in autumn. . . . The assumption that the question of food will not explain the vernal migration has probably been due to our ignorance of the physical conditions of the south." He then cites a remark of Weismann's to the effect that "ponds, rivers and creeks become dry, insects disappear and even vegetation fails in many regions of the south in summer," and quotes "Mr. C. R. Ricker" (*lege*, C. B. Riker<sup>1</sup>) on the effect of the dry season on vegetation, etc., at Santarem, Brazil (Mr. Winkenwerder, however, does not state the locality of Mr. Riker's observations), and adds: "Do not cases of this kind give us rather striking evidence that the food supply of the south is limited?" To Mr. Winkenwerder the matter is very simple. He says: "We have thus two areas in the geographical distribution of birds that are deficient in food at opposite seasons of the year, and we can see readily enough the cause for migration, both in the spring and in the fall!"

Under 'Migratory Routes' the author describes the methods and discusses the evidence afforded by the extensive series of observations on the nocturnal movements of birds as seen through telescopes at Madison and Beloit, Wisc., Lake Forest, Ill., and Detroit, Mich., during May, 1900, and also in April, May, September and October, 1898-1901, at Madison. The theory of migratory routes is considered as established, and also the theory that they are determined by the topographic features of the areas traversed.

Under the head of 'The Manner of Migration' are considered 'Numbers associated in Migration,' 'The Altitude attained in Migration,' and the 'Associations of Individuals and Species.' Nine thousand birds per

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<sup>1</sup> Mr. Riker's name is constantly misspelled "Ricker" throughout the paper, Coues appears as "Coves", other names of authors are also misspelled, and Mr. Brewster's paper on bird migration is cited repeatedly as "Bull. Nutt. Orn. Club, No. 1," though sometimes correctly as Mem. Nutt. Orn. Club, No. 1.

hour, it has been calculated, were seen by Dr. G. O. Libby, in 1897, passing across the field of the telescope at the Washburn Observatory, during the whole period of observation. Telescopic observations seem to show that "by far the greater number do not attain an altitude much over one half mile from the earth's surface," and that former estimates of the altitudes at which birds migrate have been "far too high." As other observers have shown, many species are found in close association in migration, and also that the individuals may move singly, or in straggling bands, or in compact flocks.

As already intimated, the chief value of the present paper consists in the record of a considerable mass of new telescopic observations on the nocturnal flights of migrating birds.—J. A. A.

**North American Water-Fowl.**—Another bird volume of the 'American Sportsman's Library' series,<sup>1</sup> recently issued, treats of the 'Water-Fowl Family.'<sup>2</sup> It forms a volume of about 600 pages, under the joint authorship of L. C. Sanford, Dr. L. B. Bishop, and T. S. Van Dyke, with numerous illustrations by Fuertes, Bull, Frost, and others, the greater part of the bird illustrations being by Fuertes. The first fourteen chapters (pp. 1-502), devoted to 'Duck-shooting,' 'Goose-shooting,' 'The Swans,' 'Rail-shooting,' and 'Shore-bird Shooting,' are by Mr. Sandford, while the three chapters (pp. 503-564) treating of 'The Water-Fowl of the Pacific Coast,' are by Mr. Van Dyke. Then follows 'Diagnoses of Families and Genera' (pp. 565-579), by Dr. Bishop, and a very full and satisfactory index. Mr. Sanford has had a wide experience in the pursuit of North American 'Wild-Fowl,' and writes from an intimate personal acquaintance with the birds whose habits he so well describes. Some sixty pages are first given to the general subject of Duck-shooting, describing the different methods prevailing at various localities and under diverse conditions, including some remarks on 'The Decrease of Wild-Fowl' (pp. 63-70); then the Ducks are taken up in systematic sequence, species by species, followed by a similar treatment of the Geese, Rails, and Shore-Birds. All of the species and subspecies enumerate as North American in the A. O. U. Check-List, the waifs and strays from other countries, are included. Under each species is first given, in small type, a very full description of the birds, including sexual and seasonal variations of the plumage, in most cases including the downy young, and the eggs

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<sup>1</sup> For a notice of the 'Upland Game Birds' see *Auk*, XIX, 1902, p. 306.

<sup>2</sup> The Water-Fowl | Family | By | L. C. Sanford | L. B. Bishop | and T. S. Van Dyke | New York | The Macmillan Company | London: Macmillan and Co., Ltd. | 1903 | All rights reserved—Crown 8vo, pp. ix + 598, 1 photograph and 19 half-tone plates from drawings by L. A. Fuertes, A. B. Frost and C. L. Bull. American Sportsman's Library Series, edited by Caspar Whitney.