

tail, 77–81 mm.) and are considered the northern race, *O. a. naevius*. Though Screech Owls do not, as a rule, migrate to any great extent, they do wander at times so that it is imperative that nesting birds be obtained from various parts of the state in order to determine the true status of *O. a. asio* and *O. a. naevius*.

“Appalachian Ruffed Grouse, *Bonasa umbellus monticola* Todd”

In December, 1940, a series of 35 Ruffed Grouse specimens, composed of 18 males, 2 (?) males and 15 females collected mainly in October, November, and December, was taken to the Carnegie Museum at Pittsburgh, Pennsylvania, and compared with the type series of “*monticola*.” The specimens from the mountains of Virginia compared favorably with the type and other specimens from West Virginia. Compared with the series of *B. u. umbellus* from Pennsylvania at the Carnegie Museum, the Virginia birds as a group were consistently darker on the upper parts, with heavier barring and more pronounced buffy wash on the under parts. No specimens of *B. u. togata* were available for comparison.

Upton, Massachusetts

CLUTCH-SIZE IN INTRODUCED BIRDS

BY R. E. MOREAU

DURING the last few years I have been collating records, both published and unpublished, of the clutch-sizes of African birds (a) within 5° of the equator and (b) south of 25° S., with the primary object of ascertaining the prevalence, or degree, of difference in clutch-size with latitude throughout an entire avifauna. Although most of the data are not stated in a form that makes a strict statistical investigation possible, the analysis, which I hope will be published elsewhere, shows that the equatorial clutch-size is the larger in less than four per cent of species, while the South African clutch-size is the larger in 38 per cent of the species. But most of the differences amount to less than one egg whereas, compared with those of closely allied British birds, the South African clutch-sizes for the most part run much more than one egg smaller.

Hypotheses readily present themselves to account for the fact that British birds have bigger clutches than closely comparable birds in South Africa. It is much more difficult to think of a reason why South African birds should have bigger clutches than birds of the same species close to the equator. It occurred to me that we might perhaps get a useful slant on this problem if we could find out whether the

clutch-sizes of wild birds transported and established in new countries and new climates had altered.

I quickly found that critical information on the subject was very deficient indeed. Four British species are naturalized in very circumscribed areas in South Africa but apparently only the English Sparrow (*Passer domesticus*) and the Starling (*Sturnus vulgaris*) are at all numerous and only for the latter have I been able to obtain any records. Betham (1929) found the clutch of the Starling in South Africa to be normally five. In Britain it is "5-7, sometimes 8-9, 4 minimum" (Jourdain in Witherby *et al.*, 1938). Without more, and independent, information from South Africa no stress can be laid on this difference.

British species bulk very large in the avifaunas of Australia and New Zealand, but I have not succeeded in obtaining any local data of value for the present discussion. Dr. W. R. B. Oliver, the author of 'Birds of New Zealand,' has kindly informed me that the clutch-sizes therein quoted for British species are derived from British sources.

I turned more hopefully to the possibility of finding for the English Sparrow and the Starling in America not only critical data but perhaps also a discussion of their clutch-size in relation to locality or latitude. Since I have extremely little American literature available at Amani, in Tanganyika Territory, where I am resident, I applied to Mrs. M. M. Nice and Mr. F. C. Lincoln, who most kindly interested themselves in the question and went to considerable trouble on my behalf. In the result, considering the economic importance of these two species, surprisingly little information has been forthcoming, but the results are somewhat unexpected and suggest that more attention might profitably be devoted to the question.

Passer domesticus.—

The British clutch is given as "3-5, occasionally 6 or even 7" (Jourdain in Witherby *et al.*, 1938), from which it can be deduced that the average lies between 4 and 5. The clutch-size in North America has been generalized as "3 to 6" (Grosvenor & Wetmore, n.d.) and 3-7, usually 5-6 (Kalmbach, 1940).

For Ontario, Canada, Dr. Harrison F. Lewis, Chief Federal Migratory Bird Officer, Ontario and Quebec, has provided me with particulars of 23 clutches in the Royal Ontario Museum of Zoology. They average 4.65, and he notes that the true local average may be rather lower since there may be a tendency for collectors for a museum to prefer the bigger sets.

The following statements were transmitted to me by Mrs. M. M. Nice:—

- (a) North Carolina: 3-7, average at least 5. "Sixes are common but fives are to be more often met with than any other number in my experience" (Alexander Sprunt, Jr., Montreal).
- (b) Northeastern Florida: average 4.75. "Hundreds of nests examined" (S. A. Grimes, Jacksonville).
- (c) Florida: 3-7, average 5-6 (Donald T. Nicholson, Orlando).

From the foregoing it seems that the average clutch in North America, from Ontario to Florida, is within .5 of 5.0. It is if anything, slightly bigger than the clutch of the same species in England, and the indications are that it is no smaller in Florida than in Ontario.¹

Sturnus vulgaris.—

The British clutch has already been cited as "5-7, sometimes 8-9, 4 minimum," which indicates an average of at least 6. The North American clutch has been generalized as 3-6 by Cooke (1928); as "four or five" by Grosvenor & Wetmore (n. d.).

For the neighborhood of Ottawa, Mr. T. S. Hennessy of the Canadian National Parks Bureau, who has specialized on the banding of nestling Starlings, has, through Dr. Lewis, provided the data from 117 nests "believed to have contained a full complement of eggs or young when examined." The average is 4.19. Nine clutches in the Royal Ontario Museum of Zoology average 5 eggs each.²

From North Carolina, Mr. Sprunt writes: "Starlings almost invariably have 3 eggs. Sometimes 4 are found, but as yet the bird is not an abundant breeder with us."

DISCUSSION

The foregoing data, which it is very desirable to have supplemented, appear to show an interesting difference in response to their new environment by two species that have both made a notable success of 'muscling into' a rich continental avifauna. The English Sparrow which, with some assistance from man, has in ninety years spread from New York to Alaska and Mexico, seems to have, on the whole, at least retained and perhaps slightly increased its clutch-size in the process. Kalmbach (1940) notes, however, that, while it is here and there in the West still increasing its range and its numbers, east of the Alleghenies it seems to be on the decrease. It would be of great interest to know whether the clutch-size at the 'growing points' of

¹ Since this was written, I have seen the paper by R. L. Weaver in *Auk*, 60: 62-74, 1943. His average for 38 clutches at Ithaca, N. Y., is 4.73 eggs, a figure in close agreement with the foregoing, especially the Ontario average.

² Since these notes have been compiled, Dr. Lewis has transmitted Mr. Hennessy's results for 1942—an average of 4.15 in 26 nests.

the species' North American range is any different from that in areas where it is in retrogression.

The Starling, which has, on the whole, expanded much more irregularly than the English Sparrow, seems to have consolidated its advances while at the same time it has actually tended to reduce its clutch-size. It is conceivable that this may be connected with a more highly developed habit of migration—and vagrancy—than the English Sparrow's. There is also a suggestion that the Starling has a smaller clutch in the south of its North American range than in the north; whereas for the English Sparrow the indications are against any difference.

Incidentally, it may be worth stressing that the United States and Canada offer a splendid field for a study of the geographical variation of clutch-size. There is certainly a tendency for clutch-size to increase with latitude in Africa. Grote (1939) has produced evidence of increase from west to east—from equable to extreme 'continental' climate—in Europe. Differences may manifest themselves in even so small an area as England and South Scotland (Boyd, 1936). Differences of great interest may disclose themselves on the North American continent, as already foreshadowed by Skutch (1940).

SUMMARY

English Sparrows (*Passer domesticus*) in the U. S. A. and Canada average clutches no smaller than in Britain and no smaller in the south of their American range than in the north. Starlings (*Sturnus vulgaris*) have clutches appreciably smaller in North America than in Britain and perhaps smaller in the south of their range than in the north. Many more data are needed.

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Amani

Tanganyika Territory

THE PASSENGER PIGEON
AS OBSERVED BY THE REV. COTTON MATHER

BY FREDERIC T. LEWIS

THE early records of "countless multitudes"—"millions of millions"—of Passenger Pigeons in New England have been gathered by Edward H. Forbush and published in his 'Game Birds, Wild Fowl and Shore Birds' (Massachusetts State Board of Agriculture: 433-472, 1912), and again in his 'Birds of Massachusetts' (2: 54-82, 1927). From his wide reading Mr. Forbush cites, among others, the comments of Governor Dudley, of Governor John Winthrop, and Roger Williams (1643); but the more scientific observations by Cotton Mather have apparently been overlooked. They are found in a curious book—'The Christian Philosopher: a Collection of the Best Discoveries in Nature, with Religious Improvements. By Cotton Mather, D.D., and Fellow of the Royal Society. London; Printed for Eman. Matthews, at the Bible in Pater-Noster-Row. MDCCXXI.' That octavo of viii and 304 pages is well described by its author as a "rhapsody," designed to show "how innumerable are the *Appearances* of Nature which are above the Powers of *Mechanism*." Two very popular books served as his models—one by "the industrious Mr. Ray" [RAY, JOHN. 'The wisdom of God manifested in the works of the creation.' First ed., 1691 (London); 12th ed., 1759 (London); and others later]; the other by "the inquisitive Mr. Derham" [DERHAM, WILLIAM. 'Physico-theology: or, A demonstration of the being and attributes of God, from His works of creation.' First ed., 1713; 13th ed., 1768 (London); and several later]. "*Fratrum dulce par*" writes Dr. Mather, in acknowledging his great indebtedness to their works, "and I give thanks to Heaven for them."

True to form, 'The Christian Philosopher' deals with the whole realm of nature, and abounds in quotations from all the authorities.