HOW MANY BROODS DOES THE STARLING RAISE?

By LAWRENCE E. HICKS

THE spread and increase of the Starling (*Sturnus v. vulgaris*) has been phenomenal. It is now the most numerous bird in winter or summer in much of the eastern United States. Whenever a species multiplies rapidly, the layman, rather naturally, explains the phenomenon by stating that the creature produces several large broods of young each season. Unfortunately many ornithologists seem to have fallen into this time-worn and dangerous rut to explain population increases in bird-life, without attempting to discover whatever the facts may be. Populations and their levels provide some of the most intricately complex problems of biological science. The evidence shows that a species laying only a single clutch of one or two eggs may maintain or greatly increase its numbers, yet a species laying three clutches of six or eight eggs each, or two clutches of fifteen or twenty eggs each, still may not increase, or may even actually dwindle in numbers.

Many publications have included statements on the number of broods raised by the Starling each year. Yet I have been unable to find a single reference as to the evidence upon which such statements were based. Obviously not all of the information listed can be correct. Apparently most of the information as to the number of broods was recopied from earlier papers, taken from questionable European sources or based on limited local observations, which can be decidedly misleading.

Forbush[1] says that the Starling produces "One or two brood yearly, sometimes three." Roberts[2] reports, "Two or three broods are raised in a season." Howell[3] records, "In the Middle States, two broods are raised, beginning about the middle of April." Chapman[4] writes, "A second brood may be raised." Cooke[5] adds, "The Starling is very prolific, raising two and sometimes three broods of three to six young each year." Kalmbach[6] mentions, "Two broods are raised each year by many pairs and rarely a third is hatched. The first brood leaves the nest about June 1 and the second late in July."

From the authorities cited one would expect the Starling to raise two broods each year regularly with third broods at least occasionally available for study. The writer has been making for several years a study of all phases of the Starling's existence, including somewhat limited studies of breeding Starlings in all sections of

[1]Forbush, E. H. Birds of Massachusetts, 1929, ii, 405.
[2]Roberts, T. S. Birds of Minnesota, 1932, p. 169.
[3]Howell, Arthur H. Birds of Florida, 1932, p. 374.
[4]Chapman, F. M. Birds of Eastern North America, 1932, p. 429.
[5]Cooke, May Thacher. The Spread of the European Starling in North America (to 1928). U. S. D. A. Cir. 40, 1928, p 4.
[6]Kalmbach, E. R. The European Starling in the United States. U.S.D.A. Farmers' Bull, 1571, 1928, p. 6.

Ohio. To date there is no good evidence that a single pair under observation, having once fledged young, has nested again the same season. Many ornithologists have been questioned on this point, but all have admitted that their ideas about the number of Starling broods came from publications rather than from field evidence.

This should not be construed that Ohio Starlings do not raise two broods—merely that to date the evidence that they do so is lacking. If Starlings regularly raise two or more broods each year, as commonly supposed, certainly some evidence of the extra broods would now be available. However, we should not minimize the difficulties of getting a direct answer to a problem which at first may seem easy to solve. It is necessary positively to connect a mated pair which have raised one brood of young, with a second reproduction venture. This is difficult to do. In these attempts continued negative results are somewhat less than gratifying and are necessarily inconclusive.

In this discussion several points may be listed:

1. Adult Starlings are difficult to capture and band at the nest cavity, and if captured may desert or be too wary to renest in the same cavity. Of the few adults banded by the writer during the breeding season, all raised but one brood, at least within the range of operations.

2. Several methods were devised to mark breeding Starlings without interfering with their normal activities, but with only partial success in one case. One season at Fredericktown, Ohio, fifteen adults were "painted" at the nest cavities in telephone-poles. This was accomplished by tacking a burlap pad above the opening in such a way that it lightly brushed the backs of the adults upon entrance. When the adults were accustomed to this, thick orange paint was smeared on the back side of the burlap pad. With luck a good smear was placed on the back of each bird which was quite conspicuous in the field. Of the fifteen birds so marked, at least nine were traced in the vicinity for several weeks, and these did not make second nesting attempts. Two of the nest cavities were occupied by late breeding adult pairs, but these were by unmarked birds which took possession as soon as the first young had left. Thus two broods in one cavity do not necessarily indicate two broods by the same pair.

3. Adult Starlings feed their young for a considerable period after they leave the nest (in one case studied for more than two weeks!). A second nesting would also be delayed for a certain "rest period." Hence, when a pair begins nesting in a cavity which less than a week before housed a brood of young, it seems nearly certain that two pairs of adults, not one, are involved. A member of one pair under observation had a few albino feathers. A member of another pair had a twisted bill. Yet the pairs which raised late broods in the cavities earlier used by the first pairs, lacked these identification marks.

4. A large collection of field notes on Starling nesting-dates

indicate that the important breeding season is relatively short—much too short for the species to produce two broods commonly. Most of the later nestings are believed to be by birds of retarded sexual development, such as immatures of the preceding season, or are reattempts after one nesting failure.

5. Several hundred recoveries have been received from the thirty-three thousand Starlings banded in central Ohio in winter. These wintering birds breed from northeastern Ohio to New York State, Toronto, Montreal, and Quebec. Many are reported shot at the nesting-site. A study of these records indicates that the breeding season is far too short for the birds which winter at Columbus to produce regularly more than one brood on their breeding-grounds to the northeast.

6. Starlings, however, like most other passerine birds can and do regularly make a second nesting attempt where the first is ill-fated. In at least three cases marked adults made second attempts after the writer had taken the first clutch of eggs. A second attempt, however, is considerably different from raising a second brood after having cared for young of the first brood both before and after leaving the nest.

7. In central Ohio the last wintering birds leave about April 1st. Most Ohio breeding pairs have complete sets of eggs from April 20th to May 10th. Most of the eggs hatch from May 2d to May 22d, and the young leave the nest chiefly from May 18th to June 7th. Thus successful parents are still feeding young of the first brood out of the nest from May 28th to June 17th. By June 1st to June 5th flocks of hundreds of immatures appear, some still being trailed by adults bringing food. After June 20th it becomes difficult to find adults at nest locations. As the young out of the nest are deserted, the adults collect in small groups or flocks. Immatures, the first week or longer out of the nest, are easily detected by their tail-length. These stub-tails are absent long before the earliest date at which second broods could be produced. During the years 1930-34 it is possible that in the mid-West many potential second broods have been suppressed owing to the extensive drouth effects.

8. Detailed studies have been made of several thousand immature Starlings collected from July to October. The age-range of these birds would definitely indicate that the usual reproduction in the Starling is one brood, not two. In August and September the progressive change of each feather group from the juvenile to the adult colored feathers, gives a conspicuous index to the age of each bird. Birds of second or third broods should be in conspicuous contrast to those of earlier broods. However, the whole population can be assigned to one rather narrow age-range class.

9. In the light of the above discussion it would seem desirable to reinvestigate the number of Starling broods actually produced. The answer may not be the same for all of the present breeding range of the species. On the basis of facts now established and in the

absence of conflicting evidence, it seems reasonably safe to conclude that during the last five years at least 95 per cent of the breeding Starlings of central Ohio have produced one brood *only*.

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NOTES ON THE SURVIVAL, WINTER DISTRIBUTION, AND MIGRATION SPEED OF EASTERN MOURNING DOVES[1]

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CAPE COD, with its woods of scrub pine and oak and its open fields, has long been a favorite breeding area of the Mourning Dove (*Zenaidura macroura carolinensis*). Although not nesting in large numbers in the immediate vicinity of the Austin Station, many birds have been trapped and banded each year. Late in the summer the Doves exhibit a marked tendency to congregate before migrating in localities of abundant feed. Such an area was created at the Station this past summer (1934) by sowing an acre of buckwheat. In late August and early September it was not unusual to flush seventy-five to one hundred doves from the buckwheat or to take twenty from a single house trap. As a result the number of bandings, 315, was nearly double that of any previous year.

From the 519 Mourning Doves banded in the four years 1930 through 1933 a total "return"[2] of 106, or 20.4 per cent, has been reported. Table 1 is based on these "returns" and is arranged to show the numbers killed each year subsequent to banding and the survival rate. The figures in columns S-1, S-2, S-3, etc. give the number of doves shot the first, second, third, etc., shooting seasons subsequent to banding. Thus it is evident that, during the first hunting season immediately following the time of banding 26, or 5.01 per cent, of the Doves were shot, and during subsequent seasons only 7, or 1.34 per cent. The total known kill, then, is 6.35 per cent.

TABLE 1.

Year	*Number*	*S-1*	*S-2*	*S-3*	*S-4*	*S-5*	*Y-1*	*Y-2*	*Y-3*	*Y-4*
1930	74	3	0	0	0	0	11	6	5	3
1931	110	4	3	2	0	..	32	14	5	..
1932	175	11	0	1	..	..	21	7	..	..
1933	160	8	1	..	..	..	17	..	..	..
	519	26	4	3	0	0	81	27	10	3

Columns Y-1, Y-2, Y-3, and Y-4 give the number of birds known to be alive one, two, three, and four years after banding; *not* the

[1]Contribution No. 20 from the Austin Ornithological Research Station.

[2]Includes both recoveries and Station recaptures.