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A STUDY OF THE NESTING OF MOURNING DOVES.

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Plate XVIII.

THE campus of the University of Oklahoma is a particularly favorable place for the study of the nesting of the Western Mourning Dove (*Zenaidura macroura marginella*), for great numbers of this bird breed here. In August and September 1919, we found 37 nests, during the season of 1920 we located 124 nests, and in April, May and September 1921, 122. This study deals not with intensive observation of individual birds, but with statistics on these nests, the numbers of which were large enough to enable us to make averages and draw some general conclusions.

Norman is situated almost in the center of Oklahoma, its elevation is 1170 feet, and the yearly rainfall varies from 30 to 35 inches. The country is level prairie, now largely under cultivation, and almost the only indigenous trees grow along the creek beds. Both the town and the campus of the University have been liberally planted with trees, mostly elms and locusts, few of which are older than

*I wish to acknowledge my indebtedness to my husband, Dr. L. B. Nice, who went on many searches for Dove nests and to my daughter, Constance, who, with her unquenchable zeal for climbing the trees, was of indispensable assistance to me.

25 years, and most are younger. The Mourning Doves evidently prefer the grove environment of the campus to the same kind and sizes of trees on the streets of the town, for, although we have been on the lookout for nests of these birds wherever we have been, in 1919, 89 per cent of all nests seen were on the University grounds, and in both 1920 and 1921, 92 per cent were in this situation.

In order to avoid confusion among so many nests, I gradually evolved an elaborate system of records depending on a map of the campus, 10.5 × 14 inches in size, and a large notebook. I divided the campus into 26 divisions, each being designated by a letter; then on the map I marked the location of each nest by a number, using a new map each month and sometimes oftener. The notebook was divided into squares with columns for the number of the nest, its location on the campus, the kind of tree, height from the ground, position in a crotch or on a branch, and any peculiarity of the nest or parents. The rest of the columns were headed by the dates and hours of visit, and under each date it was noted whether the parent was brooding, the contents of the nest, if examined, behavior of the parents, size and position of the young, etc., or the fact of the destruction of the nest.

1. THE NEST.

Building the Nest. Nest building as a rule takes place in the early morning. The male Mourning Dove gathers the materials and carries them to his mate who arranges them. He takes one piece at a time, and if he happens to drop it, he does not stop but continues his journey to the tree and then starts over again. Dr. Chas. Whitman[1] says: "All pigeons, so far as I know, carry but *one straw* at a time; the sparrow, on the other hand, loads itself up with as many pieces as it can hold in its mouth, and thus saves trips to the nest. * * * In this simple difference of method we see a wide difference in intelligence." This laborious practice of one straw at a time is probably one reason why Doves' nests are such poor affairs.

[1] Behavior of Pigeons III, 1919, p. 22.

Material. The nests of Mourning Doves are notoriously frail structures, being simple platforms of dead grass, weeds, etc., and a few twigs. In three or four instances only, have the nests here in Norman been so scanty that the eggs could be seen through the bottom.

I examined the materials in three typical nests that had been deserted. Nest 7, found deserted April 23, 1921, with one punctured egg in it, was situated in a crotch of an elm 12 feet from the ground. The materials consisted of 6 twigs from 1 to 6 inches long and 148 pieces of dried grass, 4 of which were from 15 to 18 inches long, 33 from 8 to 6 inches, 27 about 6 inches and 84 were smaller.

Nest 33, on May 4, contained two eggs, while on May 9 it was empty. It was in a crotch of an elm on a very old Robin's nest, 12 feet from the ground. The materials were 3 twigs, 1 to 2 inches long, 10 weed stems, 4 to 10 inches long, and 145 pieces of dried grass, 3 of which were about 12 inches long, 28 varied from 6 to 10 inches, 34 were about 4 inches long and 80 were smaller.

Nest 41 was in process of construction May 9; contained two small young May 26, but was empty the next day. It was situated on the branch of an elm 10 feet from the ground. It was more substantial than the others and was made of 3 twigs about 8 inches long, 1 tiny twig, 40 pieces of dried grass stems and grass roots, 20 wild geranium stems, 40 pepper-grass stems and 31 little pieces of weed and grass—135 pieces in all.

Many of the smallest pieces were doubtless fragments of the original materials gathered, although the first two nests had not been used for long. If we assume that these smallest pieces represent two or three times as many pieces as were carried to the nest, we would have from 87 to 115 pieces carried to the first two nests, that were placed in crotches and from 115 to 120 to the last nest that was in a more exposed situation.

Trees Chosen. In 1919, we found 22 Dove nests in elms, 10 in locusts, 4 in osage orange, one in a box elder and one in a walnut; in 1920 there were 68 Dove nests in elms, 25 in locusts, 14 in osage orange, 4 in apples, 3 each in cedars and box elders, 2 in walnuts and one in a maple. In 1921 there were 79 in elms, 10 in locusts, 16 in osage orange, 3 each in maples and walnuts, 2 each in elder

and Russian mulberry, and one each in an apple and pine. The Doves seem to have nested about equally in all kinds of trees in proportion to their number except that silver maples (*Acer saccharinum*) of which there are many on the campus, are evidently not liked. Cottonwoods are avoided entirely so far as our experience goes. In 1921 the Doves utilized elms more and locusts less than the year before, which was probably due to a late frost that killed the locust buds and delayed their leafing out for nearly a month. (In 1920 the first nest in a locust was found April 18, but in 1921 none was seen until May 3, at which time these trees were in fairly full leaf.)

Height of Nests. Only twice in Norman have we found Dove nests on the ground. One of these was located in a corn field in June 1917, while the other, which was on the campus, contained eggs June 8, 1919.

The following table gives the numbers and percentages of nests found on the campus in 1920 and 1921 at different heights.

TABLE I.

HEIGHT OF MOURNING DOVE NESTS FROM THE GROUND.

	1920		1921	
Height in feet	Number of Nests	Per Cent	Number of Nests	Per Cent
3–6	12	9.9	0	0
8–10	31	25.4	36	30.4
12–20	72	59.0	80	68.0
25–30	7	5.7	2	1.6
	122	100.0	118	100.0

In both years about a third of the nests were placed at 10 feet or lower, and about two-thirds from 12 to 20 feet. In 1920 there was more variation than in 1921, more very low and very high nests. The average of the two years is nearly the same, 13.3 feet for 1920 and 14 feet for 1921.

Position of the Nests. Horizontal branches are more in favor with Mourning Doves for placing their nests than are the crotches of trees. The numbers that chose each position in 1920 and 1921 are shown in Table II.

TABLE II.

POSITION OF MOURNING DOVE NESTS.

	Branch		Crotch	
Year	Numbers	Per Cent.	Numbers	Per Cent
1920	71	65.1	38	34.9
1921	75	63.6	43	36.4

In both years about two-thirds of the nests were found on branches and one third in crotches. Yet in early spring a different relationship is shown; in April 1921 there were nearly as many crotch nests as branch nests—12 in the former and 15 of the latter, while the year before in April there were even more in crotches—15 nests—with only 12 on branches.

This would look as if the Doves sought protection in crotches when the leaves were small. Perhaps a shortage of suitable crotches may have something to do with the matter. Undoubtedly there are not enough to go around in the height of the nesting season; but in July, August and September 1920, when few Doves were nesting, only one-fifth of the 30 nests found were in crotches and in September 1921, all four nests seen were on branches. This choice of sites in late summer and fall lends support to the theory that desire for protection is the reason that crotches are preferred in April.

That the Doves are not wise in their preference for horizontal branches rather than crotches is shown in Table III.

TABLE III.

SUCCESSES* AND FAILURES IN RELATION TO POSITION.

	Branch Nests				Crotch Nests			
	Number		Per Cent.		Number		Per Cent.	
	Successes	Failures	Successes	Failures	Successes	Failures	Successes	Failures
1920	6	16	27.3	72.7	8	12	40.0	60.0
1921	11	26	29.7	70.3	13	6	68.4	31.6
Total	17	42	28.8	71.2	21	18	53.8	46.2

* We knew the outcome of nearly half the nests found. We counted as "Successes" those nests that contained young large enough to fly when last inspected.

On an average the crotch nests are almost twice as successful as those on branches, for slightly more than a fourth of the latter succeeded, while a little more than half of the former did. It is interesting how the Doves persist in preferring the less safe position.

The Use of Other Nests. Mourning Doves sometimes save themselves trouble by utilizing the nests of other birds. (In all but one of our cases, which was a new Robin's nest containing one Robin's egg, the doves had added more or less material of their own.) In 1920, twelve used old Brown Thrashers' or Mockingbirds' nests, three Robins', two English Sparrows', one a Bronzed Grackle's and two old Doves' nests; in 1921, there were eight old Thrashers' nests used, five old Robins', three new Robin's and two old Doves'. Table IV shows the numbers of these nests and the percentage they form of all the nests found in 1920 and 1921; the numbers of these nests that were built in April and finally the successes and failures of these nests so far as they were known.

TABLE IV.

MOURNING DOVE NESTS BUILT ON OTHERS.

Year	Number of Nests	Per cent of total nests	Number in April	Successes	Failures
1920	20	15.4	13	2	10
1921	18	15.1	12	8	4

There is a surprising uniformity in the two years in the number of nests built on top of others—fifteen per cent each year. In 1920 thirteen of these nests were found in April, one in May, four in June, and two in September, while in 1921 twelve were found in April, three in May and three in September (we were not here during the summer).

Thus two-thirds of these nests occurred in April in both years. Here again would seem to be evidence of adaptation for greater protection in early spring.* In 1921 it worked out this way for two-thirds of the nests built on others were known to have succeeded while only one-third of the others did.

* It is possible that last year's Doves like to utilize these nests of other birds for their first attempts at nest building but with increasing experience grow more independent later in the season.

But in 1920 the results are just the opposite for then only one-sixth of the nests placed on others were known to have succeeded, while the same proportion as in 1921—one-third of the others did. An explanation of this lies in the fact of most of the nests on top of others being built in April, for the fatalities in that month were far greater than later in the season, due apparently to storms. These nests were neither better nor worse off than the others.

The chief advantage of building on another nest lies in a larger, stronger place for holding the young. Apparently there was no advantage when it came to weathering a long cold rain. Of the two successful nests on top of others in 1920, one raised one bird and the other raised two, and in 1921 all eight raised their full quota, which was even *three* in one case, and of the sixteen other successful nests nine raised only one bird apiece. (However three of these half broods were not due to frailty of the nests, two eggs being infertile, and one egg being knocked to the ground by the parent as he was frightened off the nest—the only case of such injury that occurred with us.)

Thus in 1920 no advantage accrued to the Doves that built their nests on top of others, but in 1921 these nests were decidedly more successful, both as to percentages of nests succeeding and to numbers of young raised.

Sometimes a Dove's nest is used again the same season; we have noted five instances of this. In 1919 a nest on August 16 contained one young bird and on August 26 two eggs. In 1920, one brood was observed to be in possession of a nest from April 22 to May 17, and on June 5 it was again occupied; the other nest was in use May 13 and 19, but was empty May 31, on June 16 a parent was again incubating. In 1921 one nest was used throughout April and was empty May 4, on May 25 a parent was incubating. In the other, one young bird left the nest May 3 or 4, and on the 29th a parent was in possession. The natural assumption is that the nest is used again by the pair of birds that built it, but we do not know whether this is true. Dr. Whitman[2] found a decided tendency among all his pigeons to select a new site for each nest.

[2] Loc. cit. III, p. 21.

It may be that other Doves utilize these old nests of their kind just as they do those of other birds.

Occasionally Doves make surprising choices of nests to build on: squirrel's nests are reported by two observers[3] [4] but one of the most unexpected is the use of a Baltimore Oriole's nest which was found in Kansas by Mr. A. J. Kirn.

This habit of using nests of other birds occasionally results in Doves incubating eggs of other species. Mr. F. Graham[5] reports of two Mourning Dove's eggs and three Boat-tailed Grackle's in a Grackle nest; Mr. J. R. Pemberton[6] tells of a Dove incubating two Brown Thrasher eggs as well as her own two in a Thrasher nest; while Mr. J. L. Davison[7] found a partly built Robin nest that had been finished by a Yellow-billed Cuckoo, and which contained one Robin egg, two Cuckoo eggs and two Mourning Dove eggs, the two latter birds being on the nest. What a pity this unique family was not left to develop!

Because of the Dove's method of feeding young it seems impossible that any young passerine bird that happened to hatch in a Dove nest could survive. Cowbird's eggs have been reported in Mourning Dove nests by two authors[8] [9]. We were hoping to watch developments in two nests with alien eggs this spring. The first case was a Robin's nest found April 15, with one Robin's egg in it; on April 23 a Dove was in possession and the nest contained two Dove eggs and one Robin's. On April 26 the situation was unchanged, but on the 28th, to our disappointment, the Robin's egg lay broken on the ground. The Dove's eggs hatched May 4, and the birds left May 19.

The other instance was an experiment we made by placing a Cowbird's egg, taken from a Cardinal's nest, in a Dove's nest that contained one egg on April 26. On April 30 the nest contained two Dove eggs and the Cowbird egg, but on May 4 and 5, only one Dove egg beside the Cowbird egg, and on the 9th, the nest was

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[3] Stoner, E. A. Oologist, XXXII. 1915. p. 76.

[4] Kirn A. J. In a letter. Texas, April, 1920.

[5] Oölogist, XXXII. 1915, p. 211.

[6] Condor, XXIII. 1921, p. 133.

[7] Auk, IV. 1887, p. 264.

[8] Coues, E., Auk. I. 1884, p. 293.

[9] Bendire, C., Smithsonian Rep. 1893. pp. 587–624.

empty. We hope to carry out this experiment with a Cowbird egg another year. In these two cases it looks as if the Doves did not wish to have more than two eggs in the nest as in each case one disappeared and in the case of the Robin's nest it was impossible for it to roll out. However, in two other nests found in 1921 three Dove eggs were incubated and hatched.

2. THE EGGS.

Incubation period. Dr. Witman[10] found that the time of laying of the first egg of captive Mourning Doves occurred between 4 and 6 P. M., while in six cases the second egg was laid early in the morning of the second day after from 6.30 to 9.00 A. M. The incubation period was found by him by observation on eleven sets[11] of eggs to be 14½ to 15½ days for the first egg and 14 1/8 and 14 7/8 for the second. Dr. Whitman[12] noted that in the case of all his pigeons the young birds usually hatched early in the morning or between 10 A. M. and noon. "If the egg does not hatch by 3 P. M. one can be fairly certain that nothing will be done until next morning. It may be fully time for the bird to hatch, but for some reason the hatching is not completed, and the bird *goes to sleep*, apparently rests, and then wakes up very early with the rest of the birds in the morning and concludes the hatch."

As a rule one or the other parent is continuously on the nest from the time the first egg is laid until the young are fairly well grown. Dr. Wallace Craig[13] says, "Male and female take regular turns in sitting on the eggs or young: the female sits from evening till morning, the male from morning till evening, the exchanges taking place usually about 8.30 A. M. and 4.30 P. M." As Mourning Doves will not come to their nests if they see a person any where near, I have witnessed this exchange only when I was concealed from view. On May 11, 1921, a female was relieved by her mate at 8.17 A. M., and on September 22, a male left the nest upon the return of the female at 4.25 P. M.

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[10] Loc. cit. III. p. 45.
[11] Loc. cit. III. p. 42.
[12] Loc. cit. III. p. 50.
[13] Auk, XXVIII. 1911. p. 406.

The Number of Eggs. The number of eggs in a set is almost always two, but one, three and four eggs in a nest have been reported.

Dr. Whitman's[14] Mourning Doves in two cases laid only one egg. Mr. J. G. Tyler[15] found a heavily incubated egg of this species in an old nest of a Mockingbird, "the unusual depth of the nest seeming" to preclude the possibility of an egg having rolled out. Capt. Bendire[16] and Prof. Wm. S. Taylor[17] say that "sometimes only one" is laid, while Mr. W. F. Henninger[18] says this "frequently happens."

Sets of four eggs have been reported a number of times. In five such cases[19-23] no details are given. The four found in a Yellow-billed Cuckoo's nest by Messrs L. B. and L. I. Evans[24] were all equally incubated. Mr. A. F. Ganier[25] stated that "only one pair of birds was in evidence" at his nest with "four perfectly fresh eggs." Dr. Lynds Jones[26] reported that his set of four "was pretty clearly occupied by two females amd one male." In a letter he says: "The eggs were paired both as to size and shape, and degree of incubation. Two of them (which were alike in shape and size) were well advanced in incubation, while the other two were slightly addled."

I have found reports of over 40 cases of three eggs in a nest; most of the finders give no details as to appearance or stage of incubation of the eggs. Eleven[27-37] report single cases only. Two

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[14] Loc. cit. III. p. 43.
[15] Pac. Coast Avifauna 9, 1915. p. 37.
[16] Life Histories of North American Birds, I, 1892, p. 142.
[17] The Mourning Dove. Bull. Univ. Texas, No. 57, 1916. p. 6.
[18] Wilson Bulletin, IX, 1902. p. 138.
[19] Barnes, R. M. Oölogist, XXX. 1913, p. 148.
[20] Duprey, H. F. Oölogist, XXX. 1913. p. 148.
[21] Gainer, A. F. In a letter; set found by friend at Nashville.
[22] Harris H. Birds of Kansas City Region, 1919, p. 258. Also in a letter.
[23] Shepardson, D. I. Oölogist, XXVI, 1909. p. 153.
[24] Oölogist XXXI. 1914. p. 80. Also in a letter.
[25] The Hummer. Aug. 1899.
[26] Wilson Bulletin XXXI, 1909, p 190.
[27] Barnes, R. M. Loc. cit.
[28] Beard, T. R. In a letter.
[29] Densmore, R. Oölogist, XXX. p. 16.
[30] Evermann, B. W. Auk, V. 1885; p. 351; also Proc. Ind. Acad. Sci. 1920, p. 37.
[31] Graham, F. Oölogist, XXXII. 1915, p. 211.
[32] Graves, E. W. Oölogist, XXVI, p. 56.
[33] Grinnell, J., Bryant, H. C. and Storer, T. I. Game birds of California. 1918, p. 595.
[34] Harris, H. Loc.cit. Also in a letter.

such sets are illustrated.[38-39] Three men[40-42] have found two instances of these sets, Mr. H. C. Little[43] reports "several," Mr. H. P. Attwater writes that on "two or three occasions" he has come across such sets and Mr. L. B. Evans writes that a neighbor has found two or three. Mr. Wm. S. Taylor states in a letter that he has found three such sets, while the Evans brothers have found as many as six sets in Kansas, all of these occurring in May.

Of the men who do describe their sets, only one[44] says the size and shape of the eggs were about the same. In six sets[45-48] differences in size are mentioned; in four, one egg was smaller than the others, in one it was larger, and in the other, two were smaller and one the usual size. Mr. J. G. Tyler[48] describes the third egg as "somewhat smaller, more pointed, and of a shade so unlike the others that there appeared to be a difference in shell texture."

In three cases there was a marked difference in the stage of incubation of the eggs, Mr. F. Stephens[49] reporting that in "two incubation had commenced, the third was fresh," Mr. A. S. Pearse[50] finding that two "were hardly incubated while the other was perfectly fresh" and Mr. J. W. Jacobs[51] stating that "two of the eggs were pipped" while "the third was perfectly fresh and to all appearances fertile."

We have found three nests[52] that contained more than the normal set. The first was seen May 25, 1917, when it contained two small squabs and one egg; unfortunately as we were not particularly interested in Mourning Doves at that time, we did not revisit this nest. The other two cases were found in the spring

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[35] Simmons, G. F. Auk, XXXII. 1915, p. 322.
[36] Stoner, E. A. Oölogist, XXXII. 1915, p. 76.
[37] Westbrook, D. C. Oölogist, XXX. 1913, p. 51.
[38] Hundley, C. O. 4th, Rep. Forest, Game & Fish Warden, W. Va. 1916, p. 120.
[39] Ritenbergh, J. Oölogist, XXIV. 1907, p. 9.
[40] Doolittle, E. A. Auk, XXXVI. 1919, p. 281.
[41] Hartrauft, C. W. Oölogist, XXV. p. 85–7.
[42] Jones, L. Loc. cit. Also in a letter.
[43] Oölogist, II, 1885, p. 39.
[44] Semmes, T., Jr. Oölogist, XXIV. 1907, p. 8.
[45] Evans, L. B. 3 sets; in a letter.
[46] B., W. D. L. Oölogist, VI, 1889, p. 193.
[47] Hutchinson, W. C. Oölogist, VI. 1889, p. 176.
[48] Tyler, J. G. Loc. cit. p. 36.
[49] Cited by Bendire. Loc. cit. 1892, p. 142.
[50] Wilson Bulletin, IV. 1897, p. 63.
[51] Wilson Bulletin. IV. 1897, p. 71.
[52] Nice, M. M. Condor, XXIII. 1921, pp. 145–7.

of 1921; in one, Nest 20, one egg was slightly smaller than the other two, but the three hatched just one day apart. In the other, Nest 29, the third egg looked somewhat yellowish, and it hatched five and six days after the other two. So in two of our cases there was a difference in appearance of the eggs, and in two a difference in the age.

The question arises as to whether Mourning Doves lay three and four eggs in a clutch. I think we are on safe ground in assuming that when four eggs are found in one nest they are the product of two females. Whether such cases always or usually mean polygamy we have no means of knowing at present.

As to the matter of three eggs, I asked the opinion of two men who have made a special study of the life history of pigeons, Dr. Wallace Craig and Dr. Oscar Riddle.

Dr. Craig wrote: "The question is partly a physiological one, as to whether it would be possible for a female Dove to lay three eggs in one set. As to the question of behavior, I suppose it possible that a female might lay in another's nest. Or I suppose it possible that two females might form a homosexual union, as they sometimes do in captivity."

Dr. Riddle answered my question as follows: "I very much doubt that Mourning Doves ever lay three eggs in a clutch. It seems to me probable that where three Mourning Dove eggs are found in one nest they have one of the two following origins.

"(1) The same female has laid eggs or an egg, and while incubating has again laid in the same nest. (We have a very few ring-doves who do this.)

"(2) The eggs are laid by two different Mourning Doves. If the latter happens, one conjecture would be that the same male had mated temporarily or otherwise with the two females. We have observed considerable lapses of fidelity of male doves to their mates."

Still another possibility in some cases might be the adoption of a deserted Dove's nest which contained an egg.

Before leaving the consideration of three eggs in a nest, let us turn to the cases where three young have been found. Besides our two instances, I can find four others[53-55] only one of which[55]

[53] Fisher, A. K. No. Amer. Fauna, No. 7, 1893, p. 33.

is in any way described: in this case the three young were "all of one size." Most of the finders of three eggs in a nest seem to have collected these unusual sets or not to have revisited them. Prof. Wm. S. Taylor, however, did return to those he found and in a letter he says that in each of the three cases "when I visited the nest after the birds had hatched out I found two birds, and no trace of the third egg. Each of these nests was built on the flat surface of a rail in a rail fence, the bird using a flat depression in the rail for its nest. All of these nests were in Kentucky."

In the cases we found in 1921, we were able to trace the history of the nests from the egg stage to the time the young left and at neither nest was there ever more than one pair of birds in evidence. The first of these three eggs sets (Nest 20) was found in a new Rob-n's nest on April 30; the eggs hatched May 13, 14, and 15. The birds developed rapidly so far as feather development went, but on May 19, upon weighing them, we found that the two younger were smaller than others of their age; the five-day-old weighing 21.8 grams, and the four-day-old 17 grams, the average of two other five-day-old birds being 36 grams, and of two four-day-olds 30.5 grams. It would thus appear as if the three were not getting quite enough food, yet, although we did not disturb them after May 21, they left the nest at the average age for Doves here, when 13, 13 and 12 days old respectively.

The other nest (No. 29) was a fairly substantial one in a crotch of an elm; on May 3, it contained two eggs and on May 9, three. These eggs hatched May 16, 17 and 22, on the last of which dates the birds weighed respectively 40.3 grams, 37.8 grams and 4.4 grams. The belated squab could not compete for food with its large nest-mates. The next day it had only gained four-tenths of a gram, and the day after it was dead. The others left the nest when 12 and 13 days old.

These two nests are of particular interest in that their history and outcome were different. The raising of three birds to maturity in Nest 20 was dependent on two favoring circumstances, the roominess and depth of the new Robin's nest used, and the fact

[54] Semmes, T. Jr., Loc. cit. Two cases.

[55] Wharram, S. K. Oölogist, XXXII, p. 134.

that the birds differed only a day in age. In Nest 29, the hatching of the last bird five and six days after its nest mates made its survival impossible, as the others were eight and nine times its size, and it would be hopeless for it to expect enough food. Moreover if the three had hatched only a day apart the nest could not have held them when they were half grown. So here we have two possible explanations of the rarity of three young Mourning Doves being found in one nest: first, the ordinary Dove nest is incapable of holding three young birds to maturity, and secondly, the third bird may hatch so late that it cannot compete for nourishment with its large nest mates.

3. THE YOUNG.

Growth. There is almost always a difference in size in a pair of Mourning Dove squabs, due to their usually hatching one or two days apart. In our experience, in six nests the young hatched on succeeding days, in two nests two days apart and in another on the same day. With Dr. Whitman's[56] captive Mourning Doves one set hatched two days apart, two sets on the same day and nine on succeeding days.

In May 1921, we weighed the nestlings in one nest from the day they hatched to the age of eight and nine days, we weighed two other young for four successive days and have single weights of five other squabs of whose age we are certain. Table V. gives the weights of six young Mourning Doves. (Unfortunately these birds were not always weighed at the same time each day.)

TABLE V.

DAILY WEIGHTS IN GRAMS OF YOUNG MOURNING DOVES.

When Hatched	1 day	2 days	3 days	4 days	5 days	6 days	7 days	8 days	9 days	10 days	11 days
29 a	8.1	10.2	15.3	22.2	28.8	34.3	40.3	44.1	52.2	55.8	
29 b	6.2	11.5	19.0	23.5	32.2	37.8	44.4	52.1	56.3		
25 a									62.3	69.8	71.0	77.6
25 b							45.0	49.7	53.0	55.0		
48									57.7			
20 a							41.0	43.0				
Aver.	7.2	10.8	17.2	22.8	30.5	36.1	42.7	47.2	56.3	60.2	71.0	77.6
Daily Gain		3.6	6.7	5.6	7.7	5.6	6.6	4.5	9.1	3.9	10.8	6.6

[56] Loc. cit. III, p. 51.

We never weighed a young bird before it had been fed, except, perhaps in the case of the third squab in Nest 29, which weighed 4.4 grams. An infertile egg weighed 5.2 grams.

The rapid growth of these birds is apparent; 29b increasing its weight nine times by the eighth day, while the average of all the birds increased eleven times by the eleventh day.

There was considerable individual difference in the birds; 29b growing faster than 29a, so that when the former was seven days old it weighed slightly more than its eight day nest mate. On the other hand 25a was decidedly ahead of its nest mate even at the same ages. Here there was a two days difference in age and the older one apparently got more than its share of food. No. 48 was alone in the nest but did not weigh quite so much as 25a at the age of eight days. No. 20a was the oldest in a nest of three; and is slightly below average weight, but there is no marked difference as with the younger birds. No. 20b weighed only 21.8 and 26 grams at five and six days, and 20c weighed 17 grams at four days.

I kept a few notes on the most striking phases of feather development.

First hatched: covered with white down, blind.

One day old: appearance the same, but squab is larger.

Two days old: pin feathers of wings appear; eyes open a little.

Three days old: eyes open wider.

Four days old: pin feathers of tail appear.

Five days old: in two birds wing feathers have begun to unsheath, but in two birds they have not.

Six days old: wing feathers unsheathed in all four birds; tail feathers begin to unsheath in two.

Seven days old: tail feathers more or less unsheathed in all the birds.

Eight days old: pin feathers of head unsheath.

Feeding. Young Mourning Doves are fed "pigeon milk," which is regurgitated by both parents, the young putting their bills inside that of the parent. When they are small the parent feeds both at the same time, pumping the food up by a bowing motion. How long young Doves are fed after they leave the nest I do not know. A young bird we had in captivity[57] still begged franti-

[57] Nice, M. M. Proc. Okla. Acad. Sci. I. 1921, pp. 57–65.

cally from an older Dove at the age of four weeks; after this I never saw him do it. Perhaps he would have persisted longer if he had been rewarded with food instead of cruel pecks.

Position in Nest. Mr. F. C. Willard[58] says of young Mourning Doves in Arizona that they "always face in the same direction." Miss Althea Sherman[59] showed that this was not true in Iowa, the earliest date at which she reports young Doves as facing in opposite directions occurring when the oldest was six days old. Our experience has been that the more usual position is for squabs to face in the same direction, but that near the end of nest life they often face in opposite directions.

At first the young face the tail of the parent; the oldest birds in which we noted this position were eight and nine days old. Later they are more apt to face in the same direction as the parent.

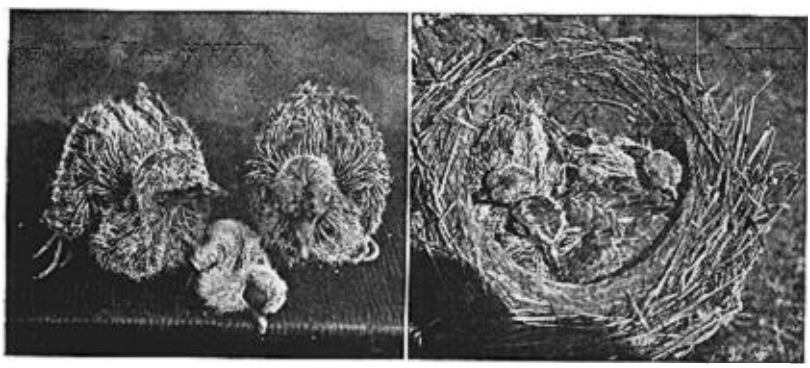
Length of time the young are brooded. Mourning Doves usually brood their young almost constantly up to the age of about ten days; after this the squabs are apt to be left alone more or less.* In 26 cases parents were seen brooding with large young and where the age was known it varied from ten to thirteen days. In five of these cases the young flew out when disturbed. Two broods were replaced, one of which was noted unbrooded in the nest two days later, but in the other three cases the birds left for good and were thus brooded till the very end of the nest life. (With such large birds, the parent usually sits beside them.) In nine of the 26 cases, the parents did not brood constantly till the very end of the nest life, and seven other broods of large young were seen with no parent on the nest.

A few cases in which the ages of the young are known will be given. Nest 25: young brooded when 10 and 12 days old; but parent not seen when young were 11 and 13 days old; young left the nest next day. Nest 29: young brooded when 10 and 11 days, but parent not seen when young were 11 and 12 days old; young left the next day. Nest 1: young brooded till 10 and 11 days old

[58] Condor, XIV. 1912, p. 59.

[59] Condor, XIV. 1912. p. 153.

* Practically all our data are based on single visits, so if we recorded a nest unbrooded or brooded at one time, it would not necessarily be true of the whole day.



1 and 2. Portions of the Mourning Dove Grove February, 1921.
3. Three young Doves from one nest, six, one and seven days old.
4. Three young Doves in old Robin's nest, eight, seven and six days old.

at least, but parents not seen when young were 13, 14 and 15 days old. Nest 118: young brooded till 4.25 P. M. by male when 8 and 9 days old; female waited in the tree one-half hour before she came to the nest; no parent seen when nest was visited, when the young were 12 to 14 days old.

The earliest age at which we have found young left unbrooded was four and five days. On September 23, 1919, in nest A the male was on the nest at 4 P. M. No parent was there at 5 P. M. although the female was near, but at 7.30 P. M. she was on. On September 27 the young were not brooded at 7.15 P. M., but at 7.45 the female was on. Another brood—V—of young that hatched on the same days as brood A, was found with no parent on or near at 5 P. M. September 23, although the female was brooding at 7.30 P. M. These two nests were exceptional as we have never found any other nestlings unbrooded for even a short while under the age of ten days, except Nest 118, for half an hour when the young were eight and nine days old. The weather was not warm; the maximum and minimum on September 23 being 73° and 53° and on the 27, 85° and 65°. And although the parents of one nest—V—showed themselves later to be indifferent to the fate of their young, those of the other proved themselves especially devoted.

Length of time the young stay in the nest. Mr. E. W. Gifford,[60] with captive Mourning Doves in California, found that two young birds in different broods left the nest at the end of twelve days. Mr. Frank L. Burns[61] gives the period of nestling life of this species, as ten to twelve days; basing his statement on his own experience in Pennsylvania and on that of Mr. C. H. Rogers in New Jersey. In contrast to these short periods, Miss Sherman[62] described a brood that did not leave till 17 and 18 days old. In answer to my question about these birds she wrote, "I have no theory why this brood staid in the nest longer than the average *here* which is at least fifteen days."

We know the ages at which 16 young Mourning Doves left the nest of their own accord in 1921.

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[60] Condor XI, 1909, p. 85.

[61] Wilson Bulletin, XXXIII, 1921, p. 96.

[62] Loc. cit.

TABLE VI.

AGE AT WHICH MOURNING DOVES LEFT THE NEST.

Nest	Date of Leaving	Number in Brood	Age in Days
1	Apr. 19 & 20	2	15
11	May 19	2	15
34	May 23 & 25	2	13
20	May 26 & 27	3	13, 13 & 12
48	May 27	1	12
25	May 28	2	12 & 14
29	May 29	2	12 & 13
118	Sept. 27	2	13 & 14

Four birds left at 15 days, two at 14, six at 13 and four at 12, making an average of 13.4 days. The average age of the 12 birds leaving after May 23, is just 13 days. The young in the two earliest nests staid longer than those later—15 days—whereas no later birds staid longer than 14 days.

Young Mourning Doves are easily frightened out prematurely. The earliest age at which we have found this to occur was eight days—the squab in Nest 48. It was replaced and left of its own accord four days later. In Nest 25 the older bird was frightened off the nest when 11 days old but was put back and did not leave permanently until it was 14 days old.

Norman, Oklahoma.

(*To be concluded*)

AN ARIZONA FEEDING TABLE.

BY FLORENCE MERRIAM BAILEY.

A FLOCK of Gambel's Sparrows with their handsome black-and-white striped crowns, spending the winter of 1920–21 like ourselves among the mesquites at the foot of the Santa Rita Mountains in southern Arizona, made a bird table seem important; for if they were kept around our tent during the winter, what other interesting migrants might they not tempt to stop in passing during the spring. They were quick to respond to our hospitality, and for five months, during which they were fed daily, made our