A STUDY OF THE NESTING OF MOURNING DOVES.

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4. THE PARENTS.

THE routine of nest life may be summed up as follows; the male gathers the materials for the female who fashions the nest; the male incubates and broods during the day while the female does the same during the night, early morning and late afternoon; and both parents regurgitate "pigeon-milk" for the young. Two striking differences between the nest behavior of Mourning Doves and most passerine birds is the almost constant brooding of the young till near the end of the nest life and the lack of any sanitary care of the nest.

Mourning Doves are very shy about going to their nests when they are watched; I have never seen them do this unless I was out of sight in a building or so far away as not to disturb them.

Yet they will apparently endure much visiting of their nest without deserting. In 1921 about half the 76 Doves that we frightened from their nests remained at their posts until some one started to climb the tree; about a third were sufficiently timid to fly off when we merely walked under the tree; while a sixth were so bold that they staid on their nest until nearly or quite touched by the investigator.

The "broken wing" ruse. Sometimes Mourning Doves exhibit the "broken wing ruse" when frightened from their nests. If much distressed they throw themselves on the ground near the intruder and flutter about as if seriously injured. More often this instinct shows itself as follows: the bird flies some distance, perhaps 10 to 30 yards, flutters a little on the ground, stops and waves its wings, then walks along waving its wings, making little flights into the air and then again walking along flapping its wings; in these cases, the pretence of injury has degenerated into a mere form. Again, the bird will fly near the ground as if intending to

* Concluded from Vol. XXXIX, p. 474.

make a demonstration, but instead it flies up again and alights on a tree. Other Doves merely fly to another tree without showing any trace of this "broken wing" instinct.

In 1919 I kept few notes on this phenomenon; in 1920 I recorded the nests at which it occured but not always at which visit, but in 1921 I became interested and kept full records, making special visits to particular nests for data. Our impression had been that it was largely an individual characteristic, that a few Doves always showed it when frightened from the nest and that most Doves never exhibited it. What stimulated us to more thorough investigation of this problem was reading Dr. J. Grinnell's[63] statement that "Probably as with other birds this ruse comes into use chiefly towards the end of the incubation." What we tried to find out was what proportion of the Doves showed this instinct, whether it was influenced by the stage of the nesting cycle, and finally, if one bird of a pair showed it, whether the other did too.

Our results follow for the 13 nests in 1919 and 1920 where this ruse was shown.

1919. In one case the female demonstrated when one young bird was newly hatched. The other nest A was visited 11 times from the date when the first egg was laid; there was no demonstration until the young bird was nine or ten days old at which time the female feigned injury; three days later both parents demonstrated with great vigor.

1920. Three nests contained eggs, in two cases these were fresh. Two of these birds were joined by their mates. Two nests could not be examined but must have contained eggs or small young. Two nests had medium-sized young. In one case the young had left their nest and were resting on the ground. In nest 23 both parents demonstrated separately both with eggs and young. In Nest 119, on August 25, the female merely flew away from the eggs; on September 8 the male demonstrated with large young and was joined by his mate. In Nest 2 there was no demonstration with eggs, but there was with young at three visits. The results from these two years are not extended enough to warrant conclusions.

The 22 nests in 1921 where this ruse was exhibited may be classified in four divisions.

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[63] Loc. cit., p. 597.

Four nests visited when containing eggs only.

Nest 16: female demonstrated with fresh eggs.

Nest 50: female demonstrated with eggs May 9 and 14.

Nest 87: male demonstrated on May 29 with fresh eggs, but on June 1 female *did not.*

Nest 96: female demonstrated with fresh eggs.

Five nests visited when containing young only.

Nest 14: male demonstrated April 23, with middle-sized young; female demonstrated April 26 and 30 with large young.

Nest 43: both parents demonstrated with large young which were frightened from the nest.

Nest 44: both parents demonstrated with large young.

Nest 54: male demonstrated May 29 with small young; female demonstrated on June 1 and was joined by her mate.

Nest 117: female demonstrated with middle-sized young.

Two nests where ruse was shown with both eggs and young.

Nest 34: female demonstrated May 9 with eggs; May 12 she did so with tiny young; May 14, male flew near the ground but did not alight and go through the performance; May 15, male demonstrated and later in the day the female also; May 20, male flew low but did not alight and feign injury. In this case the male's conduct is unusual, as the instinct was less strong at the last visit.

Nest 48: female demonstrated May 9 with eggs; May 14, male flew low but did not actually demonstrate with eggs; May 15 and 20, male's conduct was the same with young; May 23, female demonstrated and May 24, male did so. Here the behavior of the male would place him in the next category.

Eleven nests where this ruse was not shown with eggs but was with young.

Nest 1: March 23 and 24, with eggs and April 5 with tiny young, female merely flew away; April 8 she flew low as if intending to demonstrate but did not do so; April 13 with eight and nine day old young she did demonstrate and again on April 15.

Nest 5: April 5, with eggs, female flew near the ground but did not actually demonstrate; April 26 with middle sized young she did demonstrate.

Nest 11: April 23, 26 and 28 with eggs there was no demonstration by the female; May 4 with newly hatched young she did demonstrate.

Nest 20: April 30, May 4, 9 and 11 with eggs, and May 14 with tiny young, there was no demonstration by the female; May 18 with four and five day young she demonstrated and again the next day; May 20 the male did so.

Nest 24: April 30 with one egg, female merely flew away; May 9, with two eggs she flew low as if intending to demonstrate, but did not do so; May 15, with tiny young, she did demonstrate; May 24, male did so with large young.

Nest 25: May 4 and 12 with eggs, May 14, 15 and 17 with tiny young, there was no demonstration by either parent; May 21, female demonstrated with five and seven day young; May 22, she repeated the performance and was joined by her mate; May 23. she did so again, and May 24 and 25, the male demonstrated.

Nest 27: April 30 and May 9, there was no demonstration by female with eggs; May 15, male demonstrated with a young bird about five days old; but May 17, he merely flew away. This is another exception like Nest 34.

Nest 31: visited three times with eggs, no demonstration by female; with large young, male demonstrated

Nest 32: May 4 with eggs and May 12 with small young, there was no demonstration by female; May 16, with middle sized young, male demonstrated.

Nest 38: May 4, with eggs there was no demonstration by female; May 25 with large young, male demonstrated.

Nest 53: May 15, with eggs there was no demonstration by female; May 29, with small young, male flew low but did not actually go through the performance; May 30, female demonstrated.

Thus this ruse was shown as follows in 1921: At four nests with eggs (not visited subsequently); at two nests both with eggs and young; at five nests with young (not visited previously); and at eleven nests, not with eggs, but with young.

It will be seen that a few Doves showed this instinct throughout

the nesting cycle. As the birds that showed it with eggs would probably have also shown it with young (we never found an exception to this), we have six of the total 22 that doubtless fall in this category, and as one or two of the five pairs visited with young only, would probably have shown it with eggs, we get a possible seven or eight in this class, or about one third of the pairs that demonstrated in 1921.

With the majority of our Mourning Doves this instinct increased as the nesting cycle advanced; of 17 pairs visited in three years, with both eggs and young, 14 exhibited it when they had young but not when they had eggs. We have not found a single instance of the contrary, where a bird showed it with eggs and not with young. This increasing concern over the welfare of the brood is shown especially well in Nests 1, 20 and 25 which were visited often enough to show that it was not until the young were half grown that this instinct appeared in the parents. If we consider the individual birds rather than the pairs, we find that in nine cases (Nests 1, 5, 11, 20, 24, 25, 53, A in 1919 and 119 in 1920) the females did not demonstrate early in the nest cycle but did so late and in two cases (Nest 25 and 48) the male showed the same increasing zeal. There were just two exceptions, in Nests 27 and 34 at the last visits the males failed to demonstrate after they had done so previously with young.

Dr. A. Wetmore[64] found much the same thing true with the White-winged Dove in Arizona: "When females were flushed from the nests containing fresh eggs usually they flew directly away with a loud *clap, clap,* of their wings. When incubating or brooding young the procedure was often different. Then they dropped to the ground and fluttered rapidly away continually falling forward as though injured, while moving the partly spread wings tremulously." Dr. Wm. Ralph[65] describes the behavior of the Ground Dove as follows: "When one is driven from a nest containing eggs it will drop to the ground as if shot, and will then flutter around as if wounded, to try to draw the persons disturbing it away from the nest, but, whether it succeeds or not, it will soon fly off. When a nest contains young, however, the bird will

[64] Condor, XXII, 1920, p. 143.
[65] Cited by Bendire, Loc. cit. 1892, pp. 148–9.

become almost frantic with anxiety, and will tumble around until it appears to be nearly exhausted."

As to the numbers that showed this reaction, in 1920 we frightened Doves from 50 nests; one parent from eleven of these nests or 22 per cent showed this "broken wing" instinct; three of these birds were joined by their mates in this demonstration. In 1921 one or both parents of 22 out of 76 nests from which Doves were frightened, or 29 per cent feigned injury. From these figures it would appear that only one-fifth to one-third of our Mourning Doves here showed this reaction. But when we consider that this ruse is most common when the young are from half to nearly grown, we must inquire in how many cases with middle-sized or half-grown young this instinct was shown and how often it was not. In 1920 in six such cases it did appear, in fourteen it did not; in 1921 in eighteen it did appear and in twelve it did not. (I believe that in 1920 we might have missed some cases, because sometimes a bird flies some distance before alighting and going through the "broken wing" performance, and since we were not looking out for it particularly we may not always have observed it.) Our figures show that from 30 to 60 per cent exhibited this instinct near the end of the nest cycle.

About the middle of May 1921 it occured to us to find out whether, when one parent showed this ruse, the other would too.

Our records show more data for the females because most of our trips were taken in the late afternoon when they were on the nests.

In fourteen nests during the three years both parents demonstrated.

In ten nests the female demonstrated, the male not being tested at all.

In four nests the male demonstrated, the female not being tested at the same stage of the nesting cycle.

In one nest (No. 53) the female demonstrated, while the male merely flew near the ground.

In one nest (No. 87) the male demonstrated with fresh eggs, while the female did not.

Our results seem to show that if one parent shows the "broken wing" instinct, the other probably will. We have only two

negative cases where parents were tested at the same stage, and in these the other parent might have shown this instinct later. In Nests 34 and 48 the females showed this instinct earlier and more strongly than their mates. In eight cases a parent was joined by its mate in the demonstration, twice with eggs and six times with young. Here again we see greater concern over the young than the eggs.

What is the explanation of this similar action from both birds of a pair, is it imitation, mere chance, or a matter of birds of like tendencies mating? Imitation might account for half the cases where both parents demonstrated: that is, the five instances where the birds were seen to demonstrate only together, and Nests A and 25 where the females first exhibited this ruse alone and upon later occasions were joined by their mates, in the latter case the male doing it still later by himself. But the six cases where the birds demonstrated only separately (when the mate was not seen by us) and also in Nest 54 where the male demonstrated one day and on another the female took the initiative and was joined by him, are more difficult to explain. They seem too numerous to be attributed to mere chance.

Our conclusions are (including observations on 43 nests in 1922) that here in Norman about one-third of the Mourning Doves never show the broken wing instinct. About one-sixth show it throughout the nesting cycle, beginning with fresh eggs, while about one-half show it with middle sized or nearly grown young; thus, typically it increases with the advance of the nesting cycle.

If one of a pair shows this instinct, the other usually does.

7. THE BREEDING SEASON.

Late and Early Nesting in General. The nesting season of the Mourning Dove is reported in general as continuing until September; the same thing is repeated for particular localities from Michigan, Indiana, Ohio, Arkansas, Oklahoma, Louisiana and Texas. As for definite instances I have been able to find reports of seven cases of September nestings in Iowa, two from South Dakota, one from Colorado, "several" from Ohio, one each from

New York, Pennsylvania, Kansas, New Mexico and Arizona, five from California, three from Oklahoma, and ten from Texas.

Nests later than September must be considered exceptional, for although Mr. Wm. S. Taylor[66] says of Texas that in October "nests are often found," I have seen only four definite instances of very late nestings: one from California[67]—2 eggs, December 5, 1911—and three from Texas, reported by Mr. H. P. Attwater in a letter as follows: in Bexar County, October 9, 1900, two young just hatched; in Aransas county, November 27, 1890, two fresh eggs, and in Bexar County, December 20, 1899, two eggs.

Mourning Doves usually begin nesting in April throughout most of their range but Capt. Bendire[68] says: "The nesting season begins about the middle of March in Florida and other Southern States." I have found only two January records, one from Texas[69]—January 26, 1895, and the other from California[70]—January 18, 1920. Three February nests from Texas and five from California have been reported. Except for California there are few reports of March nestings; one each from Louisiana, Mississippi, Tennessee and Texas, two from Arizona and three from Indiana. There are eleven cases from California, two of squabs and the rest of eggs.

8. The Breeding Season at Norman.

Mourning Doves arrive here in March and leave in late September and early October, although a few are seen all fall and winter; we have records of their occurence for every month in the year. In September they gather to some extent into flocks; on September 17, 1920, I saw 24 together, on October 2, 28 and on October 16 at least 30.

It is a little difficult to be sure in the spring whether a bird is a migrant or one that has wintered with us, but as the latter are usually found near creeks or feeding places for stock, we consider birds that appear on the campus as probably migrants. The

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[66] Loc. cit., p. 6.
[67] Howell, A. B., Condor, XIV, 1912, pp. 73–74.
[68] Loc. cit., 1892, p. 140.
[69] Attwater, H. P. In a letter.
[70] Fortiner, J. C. Condor, XXIII, 1921, p. 168.

earliest seen in 1920 was March 11 and in 1921, March 1. In 1920 they became abundant the last of March; in 1921 apparently they were delayed by the cold weather in late March and did not become common until April.

The first "coo "was heard in 1920 on March 11, and in 1921 March 6. The height of cooing occurs from the last of March or early April till the middle or latter part of May. In July 1920 very little cooing was heard, and in August almost none. In September we heard only one full "coo" of four notes; that was on September 8. On September 1 and 2, "coos" of only three notes each were heard and on the 8, one of two notes and two or three of only one.

Early and late nesting. At Norman the Dove's nesting season lasts from six to seven months, from late March through September and sometimes into October. This is a longer season than any other bird here; the English Sparrow starts earlier but stops earlier; the earliest young of this species we have found were about a week old March 20, 1920, and the latest were about the same age on August 22, 1920. In 1920 we know of two Dove nests that were built in March; in one the eggs were probably not laid until April and as to the other we do not know, it contained two eggs when found April 3, but was deserted a few days later. In 1921 there was one nest containing a full set of eggs March 22. By the end of April in 1920, 37 nests had been found by us on the campus, and 51 more were seen during May. In 1921 due to the cold weather in early April, the Doves were later in getting started so that we located only 27 nests by April 30; in the next month we found 88; this increase over 1920 was probably due to more time spent on searches and more of the campus being covered.

As to late nestings Table VII gives the number of nests found by us in Norman in September and October from 1919 to 1921.

TABLE VII.

September and October Nests of Mourning Doves Found in Norman. The date is the latest at which each nest was seen to be occupied.

1919

Sept. 1: 2 young leave nest.	Sept. 4: 2 young.
Sept. 4: 2 eggs.	Sept. 4: 2 large young.
Sept. 4: 2 eggs.	Sept. 4: parent incubating.
Sept. 4: 2 young.	Sept. 11: parent incubating.

TABLE VII. (*Continued*).

1919	1920
Sept. 16: 1 young.	Sept. 5: 2 young.
Sept. 16: 2 large young.	Sept. 8: 2 young ready to fly.
Sept. 16: 2 young leave nest.	Sept. 8: parent incubating.
Sept. 16: 2 fresh eggs.	Sept. 8: parent incubating.
Sept. 16: 2 large young.	Sept. 8: 2 young recently out of nest.
Sept. 16: 2 young ready to fly.	Sept. 8: 1 young ready to fly.
Sept. 17: 2 large young.	Sept. 12: 1 young.
Sept. 18: 1 large young.	Sept. 12: 2 young.
Sept. 18: 1 large young.	Sept. 12: 1 young ready to fly.
Sept. 18: 2 large young.	Sept. 12: 2 young.
Sept. 18: 2 large young, 1 flies.	Sept. 12: 2 young.
Sept. 19: 1 young ready to fly.	Sept. 12: 2 young.
Sept. 22: 1 large young.	Sept. 12: 2 young recently out of nest.
Sept. 23: 1 young ready to fly.	Sept. 17: 2 young leave nest.
Sept. 23: 2 young leave nest.	
Sept. 28: 2 large young.	1921
Sept. 28: 1 young ready to fly.	
Oct. 1: 1 young 12 or 13 days old.	Sept. 10: 2 young ready to fly.
Oct. 1: 2 young 12 and 13 days old.	Sept. 16: 1 young ready to fly.
Oct. 1: 2 young 8 or 9 days old.	Sept. 18: 2 young being fed by parents.
	Sept. 20: 2 young ready to fly.
	Sept. 22: 2 young being fed by parents.
	Sept. 22: 2 young being fed by parents.
	Sept. 26: 2 young being fed by parents.
	Sept. 27: 2 young leave nest.

In 1919 we found 34 occupied nests in August, 28 in September and three in October, 42 different nests in all. Four of these contained eggs as late as September 18 and one must have had eggs as late as September 22. Three broods of young Doves left the nest during the first week in October.

In 1920 the Doves did not nest so late. We found 31 nests in August and 14 in September. The last young birds flew September 17.

In 1921 we spent the summer away from Norman, not returning until September 9, so we undoubtedly missed some of the nestings that ended early in the month. We found four occupied nests and four broods of young still being fed by their parents (from the 18th to the 26th), making eight in all. The broods from the two latest nests left as follows: one soon after September 20 and the last September 27.

The finding of so many September nests, once we began to search for them, leads us to believe that such late nesting is more common throughout the breeding range of this species than has generally been reported.

Number nesting in different months. Since it would have been a gigantic task adequately to search the 120 acres of the campus or even half of it for Dove nests throughout six months, we specialized on one area of about seven acres in extent. This consists of two groves; one, which we called S, is square and contains about five acres; it is planted with about 160 elms and locusts rather far apart. The other is triangular and hence designated T; it contains about two acres and the 136 trees, which are all elms, are crowded together.

Table VIII shows the number of nests found in this area each month from August to October 1919, from April to September 1920 and from March through May, and also September 1921.

TABLE VIII.

NUMBER OF NESTS EACH MONTH IN S AND T.

	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total*
1919 T.	..	..	..	..	..	3	3	1	4
S.	..	..	..	..	..	14	10	1	19
Whole.	..	..	..	..	..	17	13	2	23
1920 T.	0	7	16	6	0	0	0	0	28
S.	0	3	8	13	15	10	3	0	35
Whole.	0	10	24	19	15	10	3	0	63
1921 T.	1	7	23	..	..	..	0	..	27
S.	0	3	18	..	..	..	4	..	22
Whole.	1	10	41	..	..	..	4	..	49

In 1920 there is an increase in the number of nests from April to May and then a gradual decline each month till fall. May appears

* Some nests were occupied during parts of two months and were counted under each. These double countings had to be adjusted in arriving at the actual totals.

to be the height of the nesting season. This is shown also in Table IX which gives the numbers of different nests found at various dates in the area in 1920.

TABLE IX.

NUMBER OF DIFFERENT NESTS AT VARIOUS DATES IN S AND T IN 1920.

Date	Apr. 18	May 13	June 22	July 31	Aug. 13	Sept. 8
T	3	15	1	0	0	0
S	2	5	10	6	7	2
Whole	5	20	11	6	7	2

In 1921, the largest numbers of different nests found in the area were as follows: May 9, 15 nests (10 in T and 5 in S); May 15, 19 nests (11 in T and 8 in S); May 29, 17 nests (11 in T and 6 in S). Mr. J. C. Fortiner[71] on an acre in California found Mourning Dove nests increasing from one in January, two in February and ten in May to sixteen in June; then decreasing with seven in July and five in August to one in September. Dr. J. Grinnell[72] says, "Thirty-two of the sixty-six nestings recorded in California were observed between May 20 and June 18, which period probably represents the height of the breeding season."

On May 15, 1921, we hunted over most of the north 60 acres of the campus and located 48 occupied Dove nests. Probably there were about 60 pairs nesting in this area. The most thickly populated place so far as Dove nests are concerned that we have ever found, was the two acre grove T, on May 13, 1920, at which time it contained fifteen occupied nests.

Seasonal differences in S and T. A seasonal difference in the use of S and T is shown in Tables VIII and IX. T, where the trees are all elms and crowded together, is the most popular place on the campus for Dove nests, in April and May, but it is hardly used at all from July on. S, which is planted equally with elms and locusts rather far apart, is little patronized in April but becomes increasingly favored, so by July (1920) all the Dove nests in the area had shifted to it. Here again there appears to be adaptation

[71] Loc. cit.
[72] Grinnell, Bryant and Storer. Loc. cit., p. 594.

for the purpose of protection, the Doves preferring the wooded environment in early Spring and the more open space during summer and fall.

That the Doves were justified in their preference for T in the Spring is shown in Table X.

TABLE X.

SUCCESSES AND FAILURES IN S. AND T. DURING APRIL AND MAY

	T				S			
	Number		Per Cent		Number		Per Cent	
	Successes	Failures	Successes	Failures	Successes	Failures	Successes	Failures
1920	2	9	17.2	81.8	0	5	0	100.0
1921	8	10	47.8	52.2	2	7	22.2	77.8
	10	19	34.5	65.5	2	12	14.2	85.8

It is evident that T was a safer place in which to nest than S in April and May both in 1920 and 1921, since a third of the nests whose fate was known succeeded in T and only one-seventh in S.

In August and September 1919 the proportion of known successes and failures in both groves were equal, for in T there were two successes and one failure, and in S seven successes and four failures; thus two-thirds of the nests succeeded in each place. In other years we have no data for T for these months as no Doves were found nesting there.

9. THE HUNTING SEASON.

According to the Game Laws for 1921[73] Mourning Doves are protected entirely in 25 States and allowed to be shot in 23. In these latter the season opens September 1 in fifteen States, September 16 in one, October 16 in five and November 20 in two. To protect the birds fully through the breeding season, they should not of course be shot in early September, but as they start their migration at this time in many States, hunters object that they would get no shooting under this plan. At any rate it seems as if Texas, where the birds winter, should be put among the States with the open season beginning October 16. Messers Quillin and

[73] Farmers' Bulletin, 1235, U. S. Dept. Agr. 1921.

Holleman[74] say, in regard to Bexar County: "This species is rapidly decreasing, owing to the hunting season on Doves opening on September 1, at which time thousands of young are still in the nests, where they starve when the parents are shot by so-called sportsmen. It is expected the opening date will be changed to November 1, at the next meeting of the Legislature." This, however, was evidently not done.

The situation in Oklahoma is as follows: until 1913 there was an open season from August 15 to May 1; after that the Doves were protected entirely for four years during which time they greatly increased. In 1917 all protection so far as the State law goes was taken from them. By Federal law the open season extends from September 1 to December 15. Of course the State should pass a law conforming to this, so that the State game wardens would be responsible for enforcing it.

10. NATURAL ENEMIES.

That the Mourning Doves' powers of swift flight render the adults comparatively immune from the attacks of the Raptores seems to be the general opinion. Dr. A. K. Fisher[75] found remains of Mourning Doves in only nine out of 2,690 stomachs of Hawks and Owls taken from all over the country. Dr. Grinnell[76] says, "On the whole Doves are probably much more immune from natural enemies than are Quail or Grouse," and Mr. A. Leopold's[77] experience in New Mexico agrees with this.

As to the enemies of the eggs and nestlings, Mr. Robert Ridgway[78] tells that on his place in southern Illinois, Blue Jays killed "even half-grown young of the Mourning Doves and destroyed the eggs in fully ninety per cent of the first nests built." Mr. Wm. Gates [79] considers snakes and large wharf rats the worst enemies of these birds in Cameron, Louisiana.

On the University grounds at Norman, Doves seem to have few natural enemies People interfere little as no shooting is allowed

[74] Condor, XX, 1918, pp. 39–40.
[75] Hawks and Owls of the U. S., 1893.
[76] Grinnell, J. Bryant, H. G., and Storer, T. I. Loc. cit., 1918, p. 599.
[77] Condor, XXII. 1921, p. 20.
[78] Bird-Lore, XVII, 1915, p. 100.
[79] Bull. 14. Gulf Biol. Sta. Cameron, La. 1909, pp. 15–17.

and the workmen keep an eye out for boys who appear malicious. Blue Jays are not common, only three or four pairs nesting on the campus each season. Bronzed Grackles build there in large numbers, especially in T, but we have never seen any evidence of their disturbing the Doves; sometimes, indeed both species nest in the same tree. On August 25, 1920, a Cooper's Hawk caused all the Doves in sight to flee but we did not see it capture any. We have never seen a snake on the campus nor a rat outside of the buildings. June 1, 1920 we found an Opossum asleep in a Grackle's nest in T and we thought he might have been responsible for some of the many empty Dove nests in the vicinity.

Cats are probably the worst enemies of our Doves; the landscape gardener says they come over from neighboring houses and execute great slaughter among the nesting birds. An instructor reports that one cat living next the campus "brought home a Dove every day all summer."

In the spring of 1920 storms were among the most potent factors in the destruction of Dove nests: on April 22 we knew of nineteen occupied nests, on the 24th and 25th there were heavy, cold rains, and on the 27th, fourteen of these nests had been destroyed or deserted. In the spring of 1921, however, there were no such disastrous storms.

Numbers of successes and failures. In nearly half of the nests recorded—141 out of 306—the outcome was known. The numbers that were known to have succeeded or failed in the three years are shown in Table XI.

TABLE XI.

SUCCESSES AND FAILURES OF DOVE NESTS.

	Numbers		Per Cent	
	Successes	Failures	Successes	Failures
August and September, 1919	15	7	68.2	31.8
April to September, 1920	18	41	30.5	69.5
April, May and September, 1921	28	32	46.7	53.3
	61	80	43.2	56.8

In August and September 1919, two-thirds of the nests whose fate was known succeeded, throughout the year of 1920 three-tenths were found to have done so, while in the spring and fall of

1921 nearly half brought young to maturity. The sum of the three years gives us 61 successes and 80 failures, or 43 per cent of the former.

In half of the failures, the nests were found empty, in three-eighths they had been destroyed and in only eight were deserted eggs in the nests. Five of these last instances occurred in August and September 1919; two possible explanations suggest themselves: the nesting instinct may have waned at this late date before the young were hatched—Miss Sherman[80] gives an instance of this; or some of the parents may have been shot.

In 51 of the 80 failures, the nests were known to have contained eggs, in 26, the stage of the nesting cycle was unknown, while in only three nests were young known to have come to their ends. Possible reasons for this unequal proportion may have been: first, most of our observations were taken at the beginning of the nesting season when the nests, of course, contained eggs; second, the disastrous storms in April 1920 occurred when all but two of the nests had eggs; third, eggs are more easily blown out than young; and finally, if a nest proved itself capable of holding eggs and a parent, it probably would be able to hold at least one young bird to maturity.

What relationship do different factors hold to the successes and failures of these nests; for instance is there a correlation with the kind of trees chosen, the height of the nests from the ground, the use of the nests of other birds, the position of the nests on branches or in crotches, the location in a thickly planted grove of elms or a thinly planted one of locusts and elms, or finally with the season?

In the first two cases there seems to be no special correlation. The nests succeeded and failed in about the same proportion in all kinds of trees. As to the height from the ground, in 1920 the average height of 14 successful nests was 9.4 feet and of 40 unsuccessful nests, 13.1 feet; in 1921 the average height of 25 successful nests was 13.8 feet and of 32 unsuccessful ones 13.2. The low average height of the successful nests in 1920 probably does not mean that a lower nest was safer than a higher, but merely that there were too few of these nests to get a reliable average;

[80] Auk, XXX, 1913. p. 412.

in the other three results where from 25 to 40 nests were involved, the average height of successes and failures in both years proved to be the same as the average of all the nests found.

The use of other birds' nests proved highly successful in 1921, but no advantage accrued to the Doves that used them in 1920. Nests in crotches were nearly twice as successful as those on branches. Nests in the thickly planted elm grove T met less than half as many disasters as those in the sparsely planted elm and locust grove S in two springs, but successes and failures were equal in both places in August and September, 1919.

As to the relation with the season, Table XII shows that many more failures were found in the early nests than in the late ones.

TABLE XII

SUCCESSES AND FAILURES OF DOVE NESTS IN RELATION TO THE TIME OF YEAR.

	April		May		June		July		Aug.		Sept.		Oct.	
	S	F	S	F	S	F	S	F	S	F	S	F	S	F
1919									4	2	8	5	3	0
1920	1	17	6	17	1	6	0	0	4	1	6		0	0
1921	1	5	19	27							8	0	0	0
	—	—	—	—	–	–	–	–	–	–	—	–	–	–
	2	22	25	44	1	6	0	0	8	3	22	5	3	0

There are probably several factors that account for this: one is the weather—the greater likelihood of severe storms in April; another is that probably more natural enemies are abroad early in the season than late, partly because they have their own offspring to feed, and partly because they do not expect nests so late; and finally, many April and May nests are first attempts of birds hatched the year before; it is possible that these are frailer than others and that the birds increase in skill as the season advances.

Number raised in the nest. The number of young Doves raised in all the successful nests is shown in Table XIII.

TABLE XIII.

NUMBER OF YOUNG DOVES RAISED IN A NEST.

Year	2 young	1 young	3 young	Average in Each Nest
1919	9	6	0	1.6
1920	12	6	0	1.7
1921	18	9	1	1.7
	39	21	1	1.7

The similarity in the proportions found each year is very striking —one third of the nests raised only half their proper quota. Interestingly enough these figures are corroborated by the work of Mr. Gates[81] in Louisiana, for of the thirty-one successful nests recorded by him twenty raised two birds and eleven only one, so they averaged 1.7 to the nest.

In only two instances, both in 1921, were infertile eggs found in nests. In most of the cases where only one bird was raised, the probability is that the other squab fell out on account of the frailty of the nest, for if some enemy had been responsible, would not both have been taken?

Number of broods. The nesting cycle of Mourning Doves according to Mr. Frank Burns[82] lasts from 30 to 32 days. In nine cases with Dr. Whitman's[83] captive birds of this species, the time elapsing between the laying of the first egg of one brood, successfully raising this brood and laying the first egg of the next brood varied from 27 to 35 days, the average being 31 days.

The very long nesting season indicates that many broods are at least attempted. Dr. Whitman's experience is instructive here; he had six pairs of these birds, one pair of which raised young for four years, the others being reported for only one year each; thus there are records for 9 seasons. The number of broods attempted varied from 2 to 7, averaging 4.4; the number of successes varied from 1 to 3, averaging 2.2; and the number of months spent in breeding varied from 2 to 5, averaging 4.1.

A breeding season of three months gives time for three successful

[81] Loc. cit.

[82] Loc. cit., p. 91.

[83] Inheritance, Fertility, and the Dominance of Sex and Color in Hybrids of Wild Species of Pigeons, II, pp. 117–118.

broods. Apparently all of our Doves here do not nest as long as this or there would be as many nesting in June as in May which does not seem to be the case. Practically all the Doves here are nesting by May 1, for no more cooing is then heard after nine in the morning showing that the males are on the nests. Some pairs perhaps breed for two months, through April and May, or through May and June; others probably breed three months, and some must nest for a longer period, either continuously or with intermissions, or how shall we account for the August and September broods?

Mr. Leopold[84] found from three years hunting of these birds in New Mexico that "after the main squab crop has issued forth, the young birds are just as numerous, or slightly more so, than the adults. *The yearly increase is therefore 100%.*" We can calculate from the figures found in our study how many broods the Doves have to attempt in order to double their numbers by fall. If 40 per cent of the nests succeed and each successful nest averages 1.7 birds, then each pair has to average three attempts in order to double yearly: $40\% \times 3 = 1.2$ successful nests. $1.2 \times 1.7 = 2$ birds raised.

If they do not double yearly the number of failures is probably greater than 60 per cent. If they more than double, the number of successes is greater than 40 per cent, or more than three broods are attempted, or, in places where they nest upon the ground, one-sixth of the nestlings would have no chance of falling out.

Thus from these various sources, the short nesting cycle and long period of breeding, the behavior of Dr. Whitman's captive Doves, and finally the abundance of these birds despite frail nests and a clutch of two eggs, it seems probable that Mourning Doves average at least three broods a year.

11. CONCLUSIONS.

In some cases the 1921 figures are almost the same as those of 1920 but in others there is a wide difference. Perhaps a word of explanation as to my methods should be given. I went at this problem with no theories, simply recording results; in the fall of

[84] Loc. cit., p. 19.

1920 upon classifying my data I did evolve a few tentative generalizations. The next year I again went to work recording facts about nests but not working up my material until the fall. The corroboration of certain data has been surprising to me, but, on the other hand, several of my theories deduced from results of 1920 have had to be modified.

The facts stand thus: in an unchanged environment we found that when dealing with such large numbers of nests, these birds acted in much the same way in two succeeding years. The disturbing factor was the weather: the low temperatures in early April 1921 which killed the locust buds and delayed the birds in starting to nest, and especially the storms in late April 1920 which destroyed the majority of the early nests. Most of the factors that have proved to be uniform are those depending on the environment independently of the weather.

The instances of greatest uniformity in the two years relate to the position of the nests: the average height at which the nests were built; the numbers of nests in crotches and on branches throughout the season; the different proportion of these positions in April; the percentage of nests built on others and the proportion of such nests found in April. All these depend upon the opportunities offered the Doves for building and these have remained practically unchanged.

The majority of the nests that were placed on branches were built later than April and hence the weather conditions were fairly uniform in 1920 and 1921; we find their percentage of successes and failures almost alike in both years.

The proportions that have proved to be markedly different in the two seasons can be largely traced to weather conditions; the choice of fewer locusts as nesting sites in 1921 and the variation in the successes and failures of the nests built in crotches and of those on other nests, both of which classes were, for the most part, built in April.

Another stable proportion is the number of Doves raised in a nest; this doubtless depends to some extent on the environment, although the same proportion was found in Louisiana, but it is probably largely due to the innate inability of the Mourning Dove to build an adequate nest.

Mourning Doves are birds of very wide distribution, being known to breed in every State in the Union. Although they are shot in large numbers throughout the southern part of their range, they seem to hold their own and in a great many places are reported as common or abundant. Mourning Doves have several disadvantages in the struggle for existence: first, they lack intelligence; second, their clutch consists of only two eggs; and third, they build such frail nests that heavy storms destroy them or half of their brood may be crowded out. They seem to have compensated for these disadvantages in three ways: first, their powers of swift flight help them to escape enemies; second, their adaptability enables them to live in a wide range of environment and finally their very long season of nesting counterbalances the few eggs and poor nests.

SUMMARY.

1. The height from the ground of 122 nests in 1920 averaged 13.3 feet and of 118 nests in 1921, 14 feet.

2. Both years two-thirds of the nests were placed on horizontal branches and only one-third in crotches, yet in April the numbers in both positions were about equal. Twenty-seven to 30 per cent of the nests on branches succeeded, while 40 to 68 per cent of those in crotches were known to have done so.

3. Both years 15 per cent of the nests were built on top of other nests and in both years two-thirds of such nests occurred in April. In 1920, only one-sixth of these succeeded due to April storms; but in 1921, two-thirds succeeded, all of them raising their full quota of squabs.

4. In 1917 we found a nest containing two squabs and an egg. In 1921 we traced the history of two nests with three eggs from the beginning to the time the young left the nest; all the eggs hatched and five of the birds were raised to maturity.

5. The average age of leaving the nest of 16 birds was 13.4 days.

6. Some Doves, at least 30 per cent, never exhibited the "broken wing" ruse; a few showed it throughout the nesting cycle, but most exhibited it only when the young were half or nearly grown.

7. The nesting season lasts in Norman from late March to late September or early October.

8. In September 1919 we found 28 occupied Dove nests, four containing eggs as late as September 18, and one September 22; the last young Doves left the nest during the first week of October. In 1920 we found 14 nests in September, the last birds leaving September 17. In 1921 we saw eight broods in September, the last leaving the nest September 27.

9. Sixty-one nests were known to have succeeded and 80 to have failed. The majority of early nests were failures and the majority of late nests were successes.

10. Thirty-nine nests raised two young, twenty-one raised one young and one raised three; an average of 1.7 young for each nest.

Norman, Oklahoma.

A REVIEW OF THE GENUS CYANOCOMPSA.

BY W. E. CLYDE TODD.

A STUDY of the series of specimens (193 in all) of the Fringilline genus *Cyanocompsa* in the collection of the Carnegie Museum, in connection with pertinent material from other sources, shows that certain changes in the systematic arrangement of the forms composing the group are desirable. It is the object of the present paper to bring these proposed changes to the notice of other ornithologists, with a view to clearing up the confusion in which the members of this genus seem to have become involved. While it has been thought best to restrict the synonymy to a citation of the first reference for each name, it is hoped that the statements defining the respective ranges of the several forms, and the remarks in connection therewith, may suffice to properly allocate all the published records. Measurements, where given, are in millimeters, and unless otherwise stated are the average of a series of specimens. The names of colors are from Mr. Ridgway's 'Color Standards and Color Nomenclature.' Acknowledgments are due to the authorities of the American Museum of Natural History, the Museum of Comparative Zoology, the U. S. National Museum, and the Bureau of Biological Survey for their courtesy in the loan of specimens.