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THREE YEARS OF EASTERN BLUEBIRD BANDING AND STUDY

By T. E. MUSSELMAN

In the January-February, 1934, issue of *Bird-Lore*, pages 9-13, I described an experiment carried on with Bluebirds (*Sialia s. sialis*). Aware of the scarcity of this beautiful bird and wishing to encourage its increase by supplying appropriate nesting-sites, I built twenty-two simple boxes, which I placed about three feet high on odd posts along the country roads near Quincy, Illinois. (See accompanying map.) The following summary represents the 1933 activities in these few boxes:¹

First nesting—April 1 to May 30, 1933

Total boxes, 22; occupied by Bluebirds,	18, or	81.8 per cent
3 nests had 4 eggs each	=	12
13 nests had 5 eggs each	=	65
2 nests had 6 eggs each	=	12
1 box was vacant		
1 box attracted House Wrens		
1 box, 4 eggs destroyed	=	4
1 box sheltered a Red-headed Woodpecker		
Total eggs, 93; total birds matured,	88, or	94.6 per cent
Average eggs per nest		4.89
Average birds per nest		4.631

SUMMARY

Infertile eggs	1, or	1.1 per cent
Eggs destroyed by Sparrows	4, or	4.3
Birds matured	88, or	94.6

100.

Second nesting—June 15 to July 15, 1933

Total boxes, 22; occupied by Bluebirds,	15, or	68.1 per cent
2 nests had 3 eggs each	=	6
7 nests had 4 eggs each	=	28
6 nests had 5 eggs each	=	30
2 boxes harbored English Sparrows		
1 box had Red-headed Woodpeckers		
4 boxes were vacant		
Total eggs, 64; total birds matured,	35, or	54.7 per cent
Average eggs per nest		4.26
Average birds per nest		2.33

SUMMARY

Infertile eggs	7, or	11 per cent
Eggs deserted	22, or	34.3
Birds matured	35, or	54.7

100.

¹These records appeared in *Bird-Lore*, *ibid.*, pp. 11-12.

In 1934 the box-complement was increased to 50 boxes.

The totals for 1934 are somewhat similar to 1933, yet the terrific drouth during the second period, with twenty-six days of temperature above 100 degrees, literally cooked the eggs in the nest-boxes, with a resulting low average in birds and high averages in desertions, but correspondingly peculiar egg-complements.

First nesting—April 10 to May 30, 1934

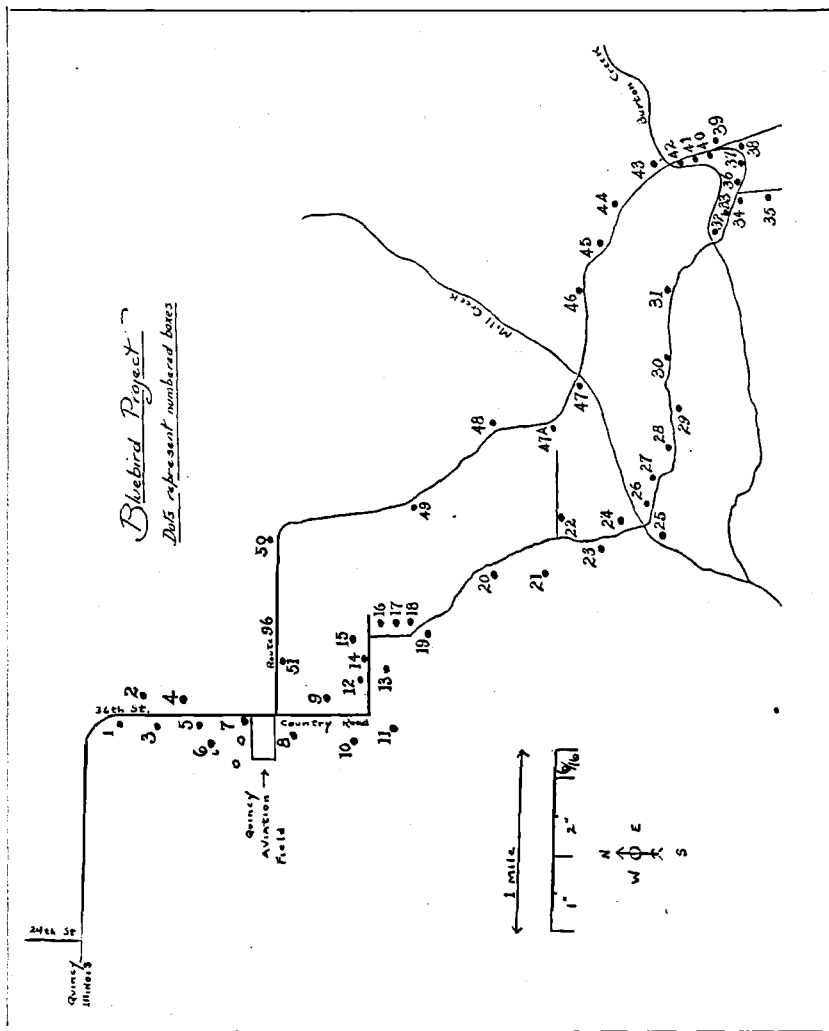
Total boxes, 50; occupied by Bluebirds,	39, or	78 per cent
1 nest had 4 eggs	=	4
29 nests had 5 eggs	=	145
8 nests had 6 eggs	=	48
1 box was vacant		
5 contained wasps		
2 boxes had Chickadees		
1 box had a Tufted Titmouse		
1 box had a House Wren		
1 box had an English Sparrow		
1 nest of 5 Bluebird eggs was destroyed	=	5
Total eggs, 202; total birds matured	173, or	85.6 per cent
Average eggs in occupied nests		5.18
Average birds per nest		4.43
	SUMMARY	
Infertile eggs	14, or	6.93 per cent
Baby birds died	2, or	.99
Eggs destroyed	13, or	6.44
Birds matured	173, or	85.64
		100.

Second nesting—June 15 to July 15, 1934

Total boxes, 50; occupied by Bluebirds,	31, or	62 per cent
6 nests had 3 eggs each	=	18
13 nests had 4 eggs each	=	52
11 nests had 5 eggs each	=	55
No boxes had 6 eggs		
1 box had 9 eggs	=	9
Total eggs, 134; total birds matured,	51, or	38.06 per cent
Average eggs in occupied nests		4.32
Average birds per nest		2.13
	SUMMARY	
Infertile eggs	31, or	23.13 per cent
Dead birds	3, or	2.24
Eggs destroyed	5, or	3.73
Eggs deserted	44, or	32.84
Birds matured	51, or	38.06
		100.

During 1935 the experiment was enlarged, 102 boxes being distributed along forty-three miles of country road.

All equipment was in place early in February. Egg-laying commenced early in April. However, the heavy snow and freeze of



MAP SHOWING DISTRIBUTION OF BLUEBIRD HOUSES ABOUT QUINCY, ILLINOIS, AS OF 1934

April 13th affected thirty-three nests, which were deserted, with a corresponding destruction of sixty-seven eggs.

The following data were formulated on nesting after the April 13th date:

First nesting—April 13 to May 30, 1935

Total boxes, 102; occupied by Bluebirds,	88, or	86.2 per cent
1 nest had 2 eggs	=	2
6 nests had 3 eggs	=	18
20 nests had 4 eggs	=	80
49 nests had 5 eggs	=	245
12 nests had 6 eggs	=	72
3 boxes were stolen		
6 boxes were vacant		
3 boxes attracted House Wrens		
1 box had an English Sparrow		
1 box contained wasps		
Total eggs, 417; total birds matured,	261, or	62.59 per cent
Average eggs per nest		4.74
Average birds per nest		2.96

SUMMARY

Infertile eggs	21, or	5.04 per cent
Eggs deserted	41, or	9.83
Eggs disappeared	50, or	11.99
Birds found dead	28, or	6.71
Eggs pierced by wrens	16, or	3.84
Birds matured	261, or	62.59
		<hr/>
		100.

Second nesting—June 1 to July 15, 1935

Total boxes, 99; occupied by Bluebirds,	77, or	77 per cent
8 nests had 2 eggs	=	16
11 nests had 3 eggs	=	33
28 nests had 4 eggs	=	112
28 nests had 5 eggs	=	140
2 nests had 6 eggs	=	12
18 boxes had no tenants		
3 boxes had House Wrens		
1 box had English Sparrows		
Total eggs, 313; total birds matured,	231, or	73.80 per cent
Average eggs per nest		4.07
Average birds per nest		3.00

SUMMARY

Infertile eggs	31, or	9.90 per cent
Eggs deserted	10, or	3.19
Eggs disappeared	15, or	4.79
Dead birds	3, or	.96
Pierced by wrens	23, or	7.35
Matured birds	231, or	73.81
		<hr/>
		100.

Distribution of Bluebird Boxes Near Quincy, Illinois for the Year 1935 .

Comparison of first nesting periods

	1933	1934	1935
Eggs per nest.....	4.89	5.18	4.74
Birds per nest.....	4.63	4.43	2.96
Infertile.....	1.00	7.00	5.03
Desertions or destroyed.....	4.00	5.00	32.37
Percentage matured.....	94.6	85.64	62.59

In spite of the drouth which caused material damage in the second nesting in 1934, the totals were similar, but the rains, snow, and freeze of 1935, produced poor results in the first nesting, with birds more constant during the second nesting than usual.

Comparison of Second Nesting Periods

	1933	1934	1935
Eggs per nest.....	4.26	4.32	4.07
Birds per nest.....	2.33	2.13	3.19
Infertile.....	11.00	23.13	9.90
Desertions.....	34.00	32.83	16.29
Percentage matured.....	54.70	38.06	73.51

SUMMARY

In 1933 albinism occurred when a female in box 14 laid four white eggs, all apparently infertile. In 1934 the same mother (band 128074) moved over a hill to box 27, where she completed a set of five white eggs by May 5th. On May 18th, I banded two young birds, Nos. 178140 and 178141. Three accompanying white eggs were infertile. On June 18th there was a second complement of four white eggs. These were partially incubated, then were destroyed, and I fear the mother was killed on the nest.

In 1935 I was able to reach definite knowledge of the percentage of white eggs laid by Bluebirds. Of the 730 eggs recorded, 40 were albinistic in nature, or a total of 5.48 per cent. Fifty per cent of these white eggs hatched and the young were banded, and I am hoping that some of the young birds may return to this vicinity next year which will allow me to determine whether the trait of laying albinistic eggs is inherited.

CHART FOR 1935

Total albinistic eggs	Total birds	Infertile	Deserted	Dead birds	Pierced by Wrens
40	20	1	8	4	7

In 1934, Box 3A at Big Lake lost its top, and I found four Cowbird eggs and three Bluebird eggs in the nest. On but one other occasion that year did I find a Cowbird egg in a nest where the nest-box was intact, necessitating entrance through the hole in the side. In 1935, Cowbird eggs were found on two occasions.

In capturing the mothers for banding I often covered the entrance hole with my hand. The birds were so accustomed to enter and retreat through this side hole that they would push at the obstructing hand but failed to appreciate that they could escape through the top.² Eventually, however, they flew out through the strange upper opening after being banded. Two brooding mothers out of three could be replaced on the eggs, where they remained without flushing. Never have I had a Bluebird desert her eggs after capture and banding. On one occasion I covered the entrance of a box and inserted my hand to catch the female, only to find a coiled black snake which had devoured four eggs or baby birds and I am wondering if many of the other cases of egg-disappearance in 1935 were not due to this insidious foe.

In 1934 the area around which my boxes extended was probably not greater than four square miles (see accompanying map). This area supported forty-five pairs of Bluebirds nesting in artificial boxes and also three native nests in the interior and one additional nest-site on the border of this area. I may not have located all natural nests, but I know the area and believe that no additional Bluebirds nested there. The area could have supported triple the number of nest-boxes. In answer to the inquiry, "Does your project suggest a gregarious character of nesting?" I answer, "No." In no case did two birds nest closer than a quarter of a mile.

I have emphasized in the *Bird-Lore* articles referred to that my boxes are placed three feet from the ground and on posts away from human habitation. If the box is placed on the pasture side of a post away from the wires, cows use the box to scratch their backs, so I try to attach them to the wire-side of the post. This protects them from cattle and likewise makes it impossible for cats to molest them.

In three years, except for freezing or the piercing of young birds by wrens, but one bird has been killed at the nest, and this one died from the attack of a hawk. The nests are too low and too far removed from barns to attract either English Sparrows or Starlings. Tree Swallows are spring migrants only. Our common swallow is the Bank Swallow. Eighty miles east on the Illinois River the Tree Swallow constitutes a threat to the successful termination of such an experiment. The boy problem is practically nil. Only one box has been molested. Cows broke two boxes from their posts. Repairs quickly put the damaged boxes into use again. Boy Scout propaganda, conservation taught in public schools, and newspaper publicity through my nature column in the Quincy *Herald Whig* have developed an interest that is nearly State-wide. Farmers pride themselves on the possession of one of these boxes, and should

²Sometimes a cow or a mischievous boy would be responsible for removing occasional box covers.

a top be removed, they return the cover to place, then call me by telephone to give details of what has happened.

Bluebirds demand a low nest-site, and, as there are few of these available, they take readily to my boxes. Higher in the trees are numerous holes, but these harbor Titmice, Chickadees, Woodpeckers, mice, and flying squirrels. Consequently the advisability of supplying nesting-sites can readily be seen.

The 1934 drouth created many strange complications. In box 30 I believe two different females laid eggs during the second nesting period. Four eggs were deposited by one female. Later a crude secondary nest of dead grass was constructed above the first, and three additional eggs were laid in the upper compartment. The new nest was so flimsy that both complements were visible. No doubt owing to the scarcity of available nesting-sites, a second female deprived the first of her nest, or perhaps the first mother was killed. Unfortunately these females were not banded, so I could not identify them positively. In box 20 there were nine eggs in a single nest; however, I believe this complement represented the eggs of two different females, both laying in the same nest at the same time, as the eggs varied in color, five being darker blue and four a paler color. Similarly the two colors represented correspondingly different types of eggs. During the first nesting period I often found clutches of six eggs, never more. During the second period I have seldom found a normal nest of more than five eggs. In 1936 I hope to band every available female, in which case I may come to a solution of the rather complicated marital relationships which occasionally manifest themselves.

The 1935 season was one of the most difficult to analyze that I have had. I enlarged my experiment until I had boxes extending over a circuit of forty-three miles. I was particularly careful in the placement of the boxes, all of them being nailed on fence-posts on the immediate roadside, as I found that they were just as effective there, as farther back in the fields and this placement facilitated the record-making of this large number of units. I found that all boxes placed on posts within a few feet of wood-lots or wooded ravines were sure to be inhabited and generally successfully so. Three successive boxes placed on posts in the open prairie did not attract the birds and not even a straw was carried to them.

It is ill advised to place the boxes in the heavy woods or on posts that terminate hedge fences as the woods attract Chickadees, Titmice, and Wrens as well as rodents, while those in the immediate proximity of hedges or bushes are particularly susceptible to the attack of black snakes.

All my boxes were cleaned, painted, and in place by the 15th of February, 1935. During the month of March the big flight of Bluebirds arrived and pairs of birds selected their nests. Eggs were laid in many of the boxes early in April. Unfortunately, a snow with an

accompanying freeze occurred April 13th which was one of the most disastrous experiences that I have had to face. With the exception of one or two mothers which were able to withstand the rigors of the cold snap and which stayed on the nests continually, all nests were involved, either in frozen eggs, disappearance of eggs, or the freezing or starving of the banded birds, which in several instances were found in the nest.

Previous to 1935 during my work with Bluebirds I have not noted the disappearance of any eggs, but as I went from box to box, the entire complement of eggs had very often disappeared. Whether this was due to the fact that mice and chipmunks had found this an easy means of securing food during the snow-storm and had carried away the eggs, or whether they were used as food by Starlings I cannot say, but there was a continuous disappearance of eggs during the entire season which was contrary to my experiences in former years. In normal years the Bluebird has its eggs incubated by the time the House Wren appears, and in former years I had few cases of pierced eggs.

The freeze of April 13th advanced the nesting period about three weeks, with the result that there were full complements of eggs in many of the nest-boxes shortly after the arrival of the Wrens on April 18th. This resulted in a larger number of pierced eggs than usual. These little birds destroy Bluebird's eggs even though the shape of the box does not suit their own nesting habits.

During the first nesting period in 1935, I banded eighteen mothers. During the second nesting I found that none of these birds were in my nests, which leads me to believe that the mother Bluebirds probably travel a number of miles between the first and second nesting and probably fly in small irregular bands with the broods of young birds. The second nesting is carried on by stray mothers which have formerly nested elsewhere.

In nearly a dozen cases, late in the summer, complete nests were constructed but were deserted by the parent birds before the eggs were laid. Three nests were built over old nests containing complements of eggs. The young birds matured in the upper nest although normally when I found a nest in which the eggs had been frozen, I removed all traces of the old nest and eggs.

The lumber with which I make my boxes is furnished me by the Quincy Casket Company and is cut with an electric band saw. Six cuts make a box and it is a simple matter to make from fifteen to twenty-five in an evening's time after the boards have been cut. There is always danger of splitting the back board when erecting the box, so I suggest that four nail-size auger-holes be bored through the back, which decreases the liability of the boards' splitting when the boxes are nailed to the oak and hickory fence-posts.

Anybody wishing a working model of this Bluebird box may have the same by writing me and supplying a stamp to cover return

postage. For biology teachers such a Bluebird project creates great interest, and an outline for an entire project will be forwarded with the above working outline.

For the 1936 season I have enlisted a number of scientists and bird-banders, which include Mr. and Mrs. William Gerdes, who have helped me for the past two years in handling the projects above described; also two Quincy High School seniors who live in neighboring towns will have charge of units of twelve and fifteen boxes. Three other boys living in Liberty, Columbus, and Marblehead, Illinois, will handle units of boxes which run as laterals through their towns. I suggest that other banders and conservationists carry on similar experiments.

There is a lot of work connected with an experiment of this sort, but it is worth the trouble. For the first time in twenty years, Bluebirds are a common sight along the country roads of Adams County, and I believe that any other enthusiast can duplicate this experiment.

Quincy, Illinois.

SURVIVAL AS INDICATED BY RETURNS TO SUMMERVILLE, SOUTH CAROLINA

BY WILLIAM P. WHARTON

THE results of continued banding work at my station at Summerville, South Carolina, during the winters of 1931-1934, inclusive, are here given in summary form as they relate to true returns-W of White-throated and Eastern Chipping Sparrows and Red-eyed Towhees handled in numbers.¹ This is done by means of tables and graphs. Tables I, II, and III show by species the numbers banded each year, the returns from these which were taken in each subsequent year, and the numbers of such returns surviving each year as indicated by subsequent returns. The percentages of each year's returns are given following the number taken in such year, and the percentages of survival following the figures showing the number known to be alive in the same year. The three graphs are based on the survival data of the tables, and show by means of columns of varying lengths the average relative shrinkage in survival following the first year of returning. Detailed tables of individual returns, such as have been given in full in previous articles, are here omitted because of their bulk.

Comparing the three species, it is noteworthy that the Chipping Sparrow continues to show, as it did in tables given in my previous

¹See "*Bird-Banding*" for July, 1931, page 116, for data previously published on this subject.