

Chart 2

Early Arrival and Late Departure Dates for Migrating Warblers in the Tennessee Valley Area of Alabama As Established by Banding Operations at Brownsboro.

ES = Early Spring
LS = Late Spring
EF = Early Fall
LF = Late Fall

Nashville Warbler---ES, 4-14-62; EF, 9-20-62; LF, 10-15-61.
Orange-Crowned Warbler---ES, 4-19-61; EF, 10-7-63; LF, 11-3-62.
Cape May Warbler---LS, 5-10-61.
Black-throated Blue Warbler---LS, 5-9-61; LF, 10-17-59.
Myrtle Warbler---EF, 10-9-63.
Magnolia Warbler---EF, 8-28-62.
Chestnut-sided Warbler---LF, 10-17-63.
Bay-breasted Warbler---EF, 9-20-63; LF, 10-26-63.
Prairie Warbler---LF, 10-9-63.
Ovenbird---ES, 4-12-63.
Kentucky Warbler---LF, 9-25-60.
Connecticut Warbler---LS, 5-20-62; Only Fall Record for State, 9-24-63.
Mourning Warbler---ES, 5-18-63; EF, 9-6-62.
Yellow-throat---LF, 10-18-60.
Wilson's Warbler---LF, 10-9-63.
Canada Warbler---ES, 4-23-62.
American Redstart---LF, 10-13-61.

Those dates underlined are also State Records.

In conclusion it can be said of this continuing study, that the present results begin to indicate more accurately the yearly occurrence of migrating warblers and the times of their arrival and departure. Also, the study points out that there is much work to be done in expanding ornithological knowledge in the North Alabama area, and perhaps most of the rest of Alabama, as well.

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Mortality of the Little Blue Heron

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The mortality of the Little Blue Heron, *Florida caerulea*, as portrayed in this report is based on the analysis of the records of recoveries of nestlings banded by the writer and others in Alabama, Mississippi, Oklahoma, South Carolina, North Carolina, Texas, Florida, New Jersey, Louisiana and Delaware.

The banding done in Alabama discussed in this paper was done by the writer and his wife with the assistance of a number of students; biologists of the Alabama Department of Conservation, especially J. E. Keeler and Robert W. Skinner; and Maurice F. Baker of the Alabama Cooperative Wildlife Research Unit. Banding in Mississippi was mainly done by Ben B. Coffey, Jr. In Oklahoma, V. A. Travis and B. W. Beall did the banding. Less constant groups of banders worked in the other states. Listings of the recoveries were made available by Allen J. Duvall, Bird Banding Laboratory, U.S.F. & W.S., Patuxent Research Center, Laurel, Md. The research was partly supported by a grant-in-aid from Auburn University.

The grouping of the 282 recoveries by states, where banding was done, and by age classes, is given in Table 1. The greatest age shown was 12-13 years and less than one percent of the birds attained this age. The greatest mortality was during the first year when 74 percent of the banded young died. This actually represents a much lower rate than that which occurs among all first year Little Blue Herons because by the time they reach the banding age of two to five weeks, a 10 to 25 per cent mortality of nestlings has already occurred. Therefore, nestlings banded are a select group. In Table 2 are listed the select group of recoveries known by the writer to have resulted from 1856 bandings of nestlings from three colonies in Alabama. Table 3 lists mortality data comparing the select Alabama data with those combined from all states.

No data have been found in the literature regarding longevity in the Little Blue Heron. Therefore the two birds banded by Coffey (366-57277, banded 5-23-37 and recovered 4-19-50; and 376-45635, banded 6-1-41 and recovered 2-__-54) sufficiently establish a longevity of almost 13 years. This is a very conservative estimate because one bird was reported as "shot" and the other as "found injured", indicating that these were not physiological terminations of life. Therefore, the birds may naturally live much longer.

Palmer, 1962, refers only to survival in the Great Blue Heron, *Ardea herodias*, given in Owen, 1959, and that for the Grey Heron, *Ardea cinerea*, by Lack, 1949, and Olsson, 1958. Kahl, 1963, reporting on mortality of the Common Egret, *Casmerodius albus*, cites the oldest individuals as 16 years, and the oldest reported in the literature for some other herons as: Great Blue Heron 20-21 years, Common Heron 15-16, 11.2 and 18 years, and Black-crowned Night Heron, *Nycticorax nycticorax*, 12-13 years.

Longevity in the Alabama group (Table 2) is recorded only up to 6 years, which is to be expected with the small sample size and the relatively recent banding dates.

Table 1. Totals of Recoveries of Banded Little Blue Herons in Age Classes, by States (1926-1962).

Age Classes	States: According to Recovery Totals													Totals	
	Miss.	Alla.	Okla.	S. C.	Tex.	N. C.	Tenn.	Fla.	N. J.	La.	Del.	No.	Per Cent		
0-1	90	30	30	14	15	12	6	6	4	1	1	209	74.1		
1-2	12	3	3	0	1	3	1	0	1	1	0	15	8.9		
2-3	7	3	1	2	0	0	0	0	0	0	0	13	4.6		
3-4	5	4	0	0	1	0	0	0	0	0	0	10	3.5		
4-5	6	2	0	1	0	0	0	0	0	0	0	9	3.2		
5-6	3	3	0	2	0	1	0	0	0	0	0	9	3.2		
6-7	2	0	0	2	0	0	0	0	0	0	0	4	1.4		
7-8	0	0	0	0	0	0	0	0	0	0	0	0	0		
8-9	0	0	0	0	0	0	0	0	0	0	0	0	0		
9-10	1	0	0	0	0	0	0	0	0	0	0	1	0.3		
10-11	0	0	0	0	0	0	0	0	0	0	0	0	0		
11-12	0	0	0	0	0	0	0	0	0	0	0	0	0		
12-13	2	0	0	0	0	0	0	0	0	0	0	2	0.7		
Totals	128	45	34	21	17	16	7	6	5	2	1	282	99.9		

Table 2. Numbers and Percentages (of the total recovered from 1856 Little Blue Herons banded by the writer in Alabama (1953-1962) in Age Classes at Death.

	Age Classes in Years					Totals
	0-1	1-2	2-3	3-4	4-5	
Number	20	2	3	4	2	34
Percentages	58.8	5.9	8.8	11.7	5.9	99.9

The mortality in the first year (Table 3) is 58.8 percent for the Alabama group and 74.1 percent for the combined group. This again undoubtedly reflects the small size of both samples. There are many reasons for high mortality in the first year. Banding returns in general report the bird as "shot" if returned from outside the states, and "found dead" if returned from within the United States. This simply reflects the veracity of the report. The reporting individual is curious about the band and he cannot be prosecuted for finding a dead heron. The young white birds are easy targets and a great number must get shot, as the recoveries indicate. They are less conspicuous as gray adults and are more wary, thus fewer are shot.

By using the method of analysis of Lack, 1949, the average annual mortality after the first year may be calculated by the formula:

$$M = \frac{D_2 + D_3 + D_4 + \dots + D_n}{D_2 + 2D_3 + 3D_4 + \dots + (n-1)D_n}$$

where M = the average annual

mortality and D = the number of recovered birds the second, third--- to nth years.

Expectation of further life may be calculated from: $e = \frac{2-M}{2M}$

Even though the survival rate of 41.2 percent for the Alabama group is much greater than the 25.9 percent for the combined group, the average annual mortality after the first year is 33.3 percent for either group and the expectation of life at the beginning of the second year is 2.5 years for both groups. Thus the similarities between the two groups are best seen after the first year.

Table 3. Comparison of Mortality of the Little Blue Heron in Alabama and all States Combined.

	Ala.	Combined
Number of recoveries	34	282
Mortality in first year	58.8%	74.1%
Average annual mortality after the first year	33.3%	33.3%
Expectation of life after leaving the nest	1.2 yrs.	0.85 yrs.
Expectation of life at the beginning of the second year	2.5 yrs.	2.5 yrs.

Compared with the mortality rate in older herons of other species, the Little Blue Heron with 33 percent is higher than the Great Blue Heron (29 percent, Owen, 1959), the Common Heron (31 percent, Lack, 1949, and 28 percent, Olsson, 1959), the Common Egret (26 percent, Kahl, 1963), and the Black-crowned Night Heron (31 percent, Hickey, 1952). The life expectancy at the beginning of the second year reflects this greater mortality rate, being 2.5 years as compared with an average of 2.94 years for the other herons just mentioned.

Summary

These mortality studies of the Little Blue Heron were made from banding returns from nestlings banded in Alabama, by the writer, and from a number of other states where they have been banded by different workers.

The combined group showed a first year mortality of 74.1 per cent while the Alabama data show a 58.8 per cent mortality. The expected life after leaving the nest was 0.85 years for the combined group and 1.2 years for the Alabama birds.

After the first year, the average annual mortality rate was 33.3 per cent for both groups and the expectation for further life at the beginning of the second year was 2.5 years for both groups.

Compared with the Great Blue Heron, Common Heron, Common Egret, and Black-crowned Night Heron, the Little Blue Herons had a higher rate of mortality and a shorter life expectancy.

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INSECTICIDES AS A FACTOR IN BLUEBIRD NESTING SUCCESS

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The recent decline in the Eastern Bluebird, Sialia sialis, population and the alleged reasons for the decline are well known. Facts about the extent and rate of decline are largely unpublished or unknown.

Four major reasons have been offered for the decline:

- (1) Lack of nesting cavities caused by man's improved farming practices.
- (2) Mortality incurred by agricultural chemicals, especially insecticides: mortality due either to direct contact with the chemicals or indirectly by ingestion of insects affected by the chemicals.
- (3) Sterility caused by the chemicals.
- (4) Mortality caused by unusually severe or prolonged periods of cold weather on wintering grounds.

Lack of facts, and curiosity, prompted the authors to begin a study of the comparative use of man-made nesting boxes in areas free of insecticides and areas having moderate to heavy use of the materials.

Twenty nesting boxes of 5/4" rough redwood were constructed during the winter of 1962-63. Dimensions of the boxes include 5" x 5" floor space, 8" deep front exposure and 10" rear. A 1 1/2" entrance hole was centered in the front exposure 5" above the floor. A hinged roof allowed inspection of the interior. Adequate roof overhang, drainage and ventilation were provided. Small strips were attached to the interior below the entrance holes to allow the exit of swallows in the event of their use of the boxes.

The twenty boxes were divided into two groups of ten each. One group of ten boxes was erected on Wheeler National Wildlife Refuge near Decatur in Morgan County, Alabama. No insecticides or agricultural chemicals other than chemical fertilizers have been used in this area during recent years. The remaining ten boxes were placed on a private farm in Limestone County, Alabama, about seven miles north of the refuge boxes. This farm has a moderate to heavy annual use of agricultural insecticides and fertilizers. Here heptachlor granules were applied to alfalfa in October of 1962. Methyl parathion, endrin, cystox, toxophene, DDT, and sevin were applied to cotton in late spring and during the summer of 1963 by both ground equipment and aircraft. All of these chemicals are widely used in the Tennessee Valley.

There was no unusual departures from what is considered normal weather in this vicinity during the time the nest boxes were under observation. In the late fall and winter of 1962-63 there were several severe cold periods with temperatures falling to near 0° F. and slightly below.

All twenty boxes were erected on March 20-21, 1963. Each was faced in a southeasterly direction and placed about 4 1/2 feet above the