A comparison with results from banded Great Blue Herons (*Ardea herodias herodias*) can be made as May Thacher Cooke has published recoveries of this race from Middle America (*Auk*, 1946: 254). Of the fifteen listed, all banded as juvenals, six were from Cuba. Three, banded in Wisconsin and Michigan, were recovered in the western-most province of Cuba. Two, banded in Maine, were reported from east central and east Cuba. One, banded in Maryland, was recovered in west central Cuba (El Stabo, Matanzas) but apparently east of our plotted recoveries. A Michigan bird was reported from Jamaica and the other eight, all banded in the upper Mid-West, follow the pattern of our birds south to Gatun, Panamá. From time to time in *Bird-Banding* Miss Cooke has published recovery records of herons. Eight other records of this species from México are of birds banded at localities from Nebraska to California. Three Little Blue Herons banded at Charleston, S. C., were reported from the Bahamas, Jamaica, and Venezuela, respectively, while one from Cape May wandered to Tobago, British West Indies. A Louisiana Heron from Charleston was shot at Caibarien, central Cuba. A Snowy Egret from Texas moved to Costa Rica while one from Utah migrated to Sinaloa. On the other hand, the numerous recovery records of the Black-crowned Night Heron are scattered indiscriminately.

We are indebted to Professor R. L. Caylor of Cleveland, Mississippi, for the use of his unpublished Cuban and Colombian recovery records of two Little Blue Herons banded at Glen Allan, Mississippi.

Acknowledgements have been previously made but it is our desire to dedicate this brief exposition to four of our many willing assistants on the heron banding trips. Coincidentally these were the four who accompanied Mrs. Coffey and the writer on our last trip (1941) to Glen Allan. To the memory of these four leading Eagle Scouts and members of the Tennessee Ornithological Society who have given their lives for their country,—Austin W. Burdick, Jr., Fred W. Fiedler, Jr., Joe T. Mason, Jr., and Ben C. Welch, Jr.

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LONGEVITY OF THE OVEN-BIRD*

BY HARRY W. HANN

While studying the Oven-bird (*Seiurus aurocapillus* Linnaeus) on a forty-acre tract near Ann Arbor, Michigan, during the years 1933-1942, the author accumulated data on the length of life of thirty-eight individuals of that species (Hann, 1937, 1940, 1941).

*Contribution from the Department of Zoology, University of Michigan.

Though this is a small number for statistical treatment, it seems best to present the data, in view of the difficulty in obtaining such material.

Adult birds were banded at the nest with metal and colored bands soon after the young hatched, and the young were banded with metal bands while nestlings. The adult males returned regularly to the territory of their former nesting, and the adult females to the approximate former territory. Only one banded young bird returned to nest within the area studied. It is assumed in calculating the longevity that the adult birds returned to their former nesting territory and were found there if present. This assumption is believed to be quite accurate for the males, but may be open to question with some of the females, since they are less apt to return to the exact territory of their former nesting, and also are more difficult to find. In considering longevity here one can calculate only a minimum length of life from individual records, since the birds, with one exception, were of unknown age when banded. Unbanded birds which appeared in the area at the beginning of each season after the first when full records were kept were presumably yearling birds in most cases, though some may have been older birds which found their former territory unsuitable for nesting.

The data concerning the longevity of the Oven-bird in the area are given in Table 1, and again in rearranged form in Table 2. Table 1 shows the presence of adult birds during the different seasons. Table 2 shows the annual age groups of the birds from the time they were banded until they failed to return, or, in other words, it shows the number of seasons each bird was known to have been present. The individuals marked x were new birds in the territory during 1934 and 1935, and were known not to have been there during the previous seasons. Number 32M (y) was hatched in the area in the spring of 1934, and was the only adult bird whose exact age was known.

In the first horizontal line of figures at the bottom of Table 2, the numbers indicate how many birds reached the different ages; that is, out of 38 birds, 17 were present as banded birds only one year; eight were present two years; and so on. In line 2 the annual survival number is given; that is, out of 38 birds, 21 returned to the area the second year; 13, the third year; and so on down to one, which was present during its seventh season as an adult bird, and hence was at least seven years old.

The *mean minimum life span* may be found directly from Table 2 by multiplying the number of birds in the age groups by the ages attained, adding the products, and dividing by the total number of birds. The mean minimum life span of the 38 birds was thus $\frac{17 \times 1+8 \times 2+7 \times 3+4 \times 4+1 \times 5+1 \times 7}{38}$, or 2.2 (2.16) years. The

mean minimum life span of the 23 males, obtained in the same manner, was 2.3 years; and the 15 females, 1.9 years.

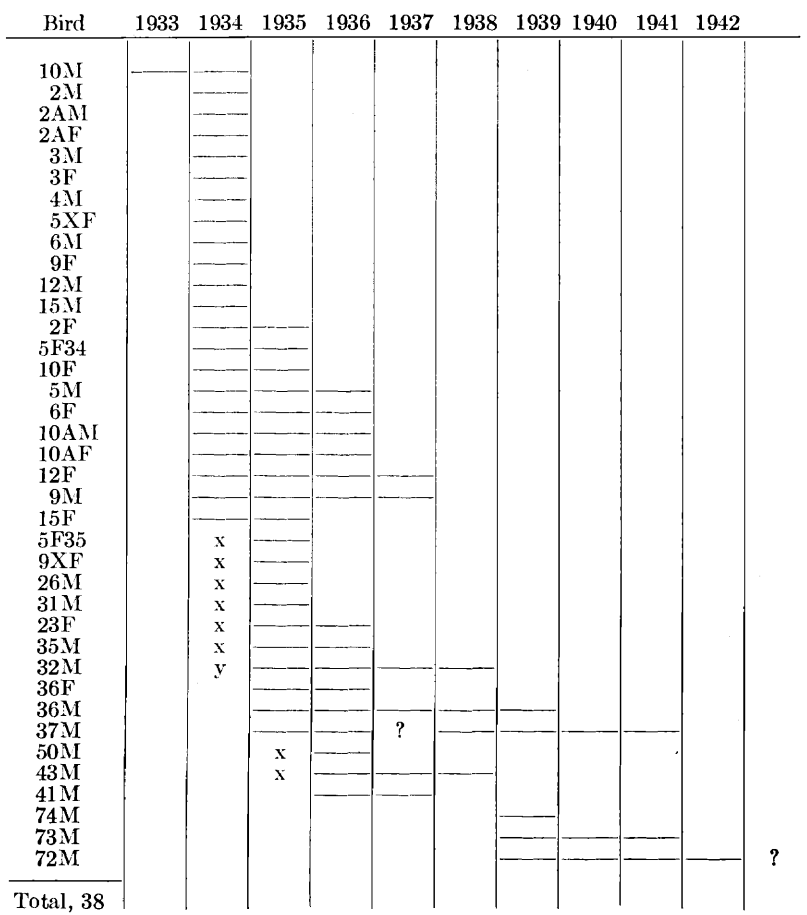

Table I, showing the presence of adult Oven-birds in the study area by calendar years. *M* after the number of the bird indicates *male*, and *F*, *female*. A continuous line shows that the bird was present during the breeding season of that year, or those years. An *x* preceding the line indicates that the bird was known not to have been in the territory during that year, and hence probably was a yearling bird at the beginning of the next season when it first appeared. Male 32M (y) was hatched in a distant part of the woods on June 7, 1934, and was banded at the nest. Male 37*M* was not seen during 1937, but there is a possibility that it may have been present. Male 72M may have been present after 1942, but no observations were made after that season.

Bird		1 yr.	2 yr.	3 yr.	4 yr.	5 yr.	6 yr.	7 yr.
2M		———						
2AM		———						
2AF		———						
3M		———						
3F		———						
4M		———						
5XF		———						
6M		———						
9F		———						
12M		———						
15M		———						
5F35	x	———						
9XF	x	———						
26M	x	———						
31M	x	———						
50M	x	———						
74M		———						
10M		———	———					
2F		———	———					
5F34		———	———					
10F		———	———					
23F	x	———	———					
35M	x	———	———					
36F		———	———					
41M		———	———					
5M		———	———	———				
6F		———	———	———				
10AM		———	———	———				
10AF		———	———	———				
12F		———	———	———				
43M	x	———	———	———				
73M		———	———	———				
9M		———	———	———	———			
15F		———	———	———	———			
32M	y	———	———	———	———			
72M		———	———	———	———			
36M		———	———	———	———	———		
37M		———	———	———	———	———	———	———
1. Number reaching group age only		17	8	7	4	1	0	1
2. Annual survival number		38	21	13	6	2	1	1

Table 2, showing the annual age groups from the time each bird was banded. Figures at the bottom of the table in line 1 show the number of birds which reached only the age indicated in the column after being banded, and figures in line 2 indicate the annual survival numbers, whether the birds lived to be older or not.

The difference shown in the life span of the sexes may be due at least in part to a greater difficulty in locating the females in the woods. It was not due to a loss of females during the nesting season, for only one female was known to have been killed at the nest; she

was at least three years old, so that her record did not reduce the average.

The percentage of survival and mortality for a single year can be calculated from the data in line 2 at the bottom of Table 2, and also the mean longevity can be obtained from this result. Thus the survival rate for the first year following banding was $\frac{21}{38}$, or 55.3 per cent, and the mortality rate, $\frac{17}{38}$, or 44.7 per cent. The mean longevity of a stable population may be calculated by using the formula $Y=\frac{1,}{M}$ where Y is the mean longevity in years, and M is the percentage of mortality each year (see p. 10). Since the mortality of the Oven-bird between the first and second years of banding was 44.7 per cent, the resulting longevity would be 2.2 (2.24) years. This checks favorably with the mean of 2.2 (2.16) years found previously by averaging the *minimum ages* of the 38 individuals.

One can see by inspection that the actual survival numbers, 38, 21, 13, 6, 2, 1, 1, (Table 2, line 2) decrease at a rather uniform rate, meaning that the survival rate, or its complement, the mortality rate, is about the same for all ages. The approximate annual mortality rate represented here can be obtained by applying the method used by Farner (1945, pp. 62, 63), where "the adult mortality rate is obtained by dividing the total number of deaths by the composite strength of the sample." Accordingly *the mean mortality rate of adult Oven-birds of all ages* is $\frac{38}{38+21+13+6+2+1+1,}$ or 46.3 per cent. Hence the survival rate is 100-46.3, or 53.7 per cent. This is but another way of working from the mean age of all the birds as on page 2, and the figure for the mean natural longevity by use of the formula $Y=\frac{1}{M}$ is the same, 2.2 (2.16) years. The survival rate of the adult Oven-birds then, whether calculated from the mean of all known minimum ages, or from the mortality rate of all birds during the first year after banding, is, in round numbers, 54 per cent—55 per cent, and the mean longevity, 2.2 years. If the survival rate is the same for all ages of adults, as the small amount of data indicates, the age at which any particular adult was banded would make no difference, since the life expectancy of all would be the same.

Since only a single bird was known to have died in the area, it must be assumed that practically all birds died between breeding seasons, hence lived an average of about one-half year longer than the 2.2 years, or 2.7 years.

LITERATURE AND DISCUSSION

Two sources of information for computing the longevity of birds have been utilized in recent years; one, the data obtained by banding birds in a given area through a period of years, and the other, information from the central files of banding associations.

Burkitt (1926), using his own banding data, calculated that the average natural longevity of the European Robin was 2.8 years. He used the formula $n = \frac{2-r}{y}$ in computing the longevity in a supposedly stable population, letting n be the number of years in longevity, r, the proportion of unmated birds, and y, the number of young per pair which reached the breeding stage. Workers since (Nice, 1937; Farner, 1945; Marshall, 1947) have omitted the r value, since the number of nonbreeding birds is usually small or unknown, and changed the formula to $Y = \frac{1}{M}$, where Y is the number of years in the natural longevity, and M is the number of young reaching the breeding age annually, or the annual mortality of breeding birds of all ages.

Nice (1937), during a life history study, banded Song Sparrows for a period of years at Columbus, Ohio, and concluded that the average natural longevity of adult males under normal conditions was about 2.5 years, and the annual survival rate about 60 per cent. She took the mean age of the banded males as a basis for her calculations and also checked the results with the modified Burkitt's formula.

Lack (1943, a, b, c,) computed the periods of life expectancy and longevity for several species of birds using data from the banding files of the British Bird Marking Scheme and the Aberdeen scheme. He concluded (1943c, p. 137) that the span of longevity for the European Robin as calculated by Burkitt was too high, and that about 1.3 years was more nearly correct. He also arrived at relatively low figures for some of the other species.

Farner (1945), working with data from the banding files of the Fish and Wildlife Service, calculated that the survival rate of adult American Robins was 47 per cent, and the resulting longevity, 1.9 years. Returns from individual birds recovered dead, however, indicated that the average longevity was 1.7 years.

Marshall (1947), also working from data of the Fish and Wildlife Service, found that only 40 per cent of the banded Herring Gulls survived the first year after banding, 25 per cent the second year, and 1 per cent the tenth year. The Herring Gull's maximum natural longevity was 17 years, but Herring Gulls in capitivity have been known to live as long as 49 years.

Data on the Herring Gull and also on the other species mentioned, including the Oven-bird, indicate that birds do not ordinarily live out their potential life span, but are subject to a fairly constant percentage of loss each year. Marshall (p.197) concludes that "there is little or no decrease in the expectation of further life as the Herring Gull advances in age; i. e. a bird eight years old has as much expectation of further life as at any previous time since the first year."

Male Oven-bird number 37M, which reached an age of at least seven years, apparently is the oldest known Oven-bird. The oldest one previously recorded was banded by Raymond J. Middleton, Norristown, Pa., July 31, 1937, and retaken June 10, 1942, hence was at least six years old (Gill, 1945). Four other warblers, a Yellow Warbler (Gill, 1944), a Pine Warbler (Cooke, 1937), a Maryland Yellowthroat (Gill, 1946), and a Myrtle Warbler (Gill, 1947) have been known to reach the age of seven years. The fact that four other species of warblers have reached the age of seven years may indicate that the longevity in these species and perhaps in other warblers is similar to that of the Oven-bird.

Summary and Conclusions

1. Longevity of banded Oven-birds was observed during a ten year study of the species on a forty-acre tract near Ann Arbor, Michigan.

2. Out of 38 adult birds banded at their nests, 21 returned the second year; 13, the third; 6, the fourth; 2, the fifth; 1, the sixth; and 1, the seventh. Though these numbers are small for very reliable statistical value, the results are given because of the difficulty in securing more complete data.

3. The mean minimum life span of adult birds up to the last breeding season was 2.2 years. Counting one-half year longer as the mean time birds lived which failed to return the following year, the minimum life span was 2.7 years. The mean minimum life span of the males found in a similar manner was 2.8 years, and of the females, 2.4 years, but the difficulty in finding the females in the woods probably accounts for at least a part of this difference.

4. The mortality between the first and second years of banding was approximately 45 percent, and the corresponding survival, 55 per cent. The mortality of birds of all ages obtained by "dividing the total number of deaths by the composite strength of the sample" was 46 per cent, and the survival, 54 per cent.

5. The data indicate that survival in the Oven-bird is approximately the same for all ages, thus supporting the conclusions of other recent authors, that birds do not ordinarily live out their potential life span, but are subject to a fairly constant percentage of loss each year.

6. The oldest Oven-bird recorded during the study was a male which reached the age of at least seven years, one year more than the oldest known previous record. Its age equals that of each of four other warblers, a Yellow Warbler, Myrtle Warbler, Pine Warbler, and a Maryland Yellowthroat, which may indicate that the longevity in these species and perhaps in other warblers is similar to that of the Oven-bird.

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OBSERVATIONS ON THE ORCHARD ORIOLE IN LOWER MISSISSIPPI DELTA

BY JOHN V. DENNIS

This study was conducted entirely within the boundaries of the Delta National Wildlife Refuge in Louisiana. The refuge is located between the Mississippi River and the Gulf of Mexico, some seventy to eighty miles below New Orleans. The refuge marshlands are divided by innumerable waterways known as passes and bayous. These are distributaries of the Mississippi, which, since the Civil War, have deposited over eighty square miles of marshland in this portion of the delta, or almost all of the present refuge.

Lying on the east bank of the Mississippi two miles above Pilottown, is the refuge headquarters area, comprising approximately