

# ANNUAL ADULT SURVIVAL RATES OF BLACKBIRDS AND STARLINGS

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The purposes of this study were (1) to determine annual adult survival rates from banding data for each sex of the Brown-headed Cowbird (*Molothrus ater*), Common Grackle (*Quiscalus quiscula*), Red-winged Blackbird (*Agelaius phoeniceus*), and Starling (*Sturnus vulgaris*), and (2) to compare survival rates calculated from band returns with survival rates calculated from band recoveries.

Others have studied annual adult survival of the starling. Kluijver (1935) found the rate to be 50 percent in Holland, and Lack and Schifferli (1948) found it to be 48 percent in Great Britain and 37 percent in Switzerland. Kessel (1957) estimated an annual survival of 42.5 percent for starlings more than 6 months of age in the Northeast (United States). From non-banding data, she concluded that at Ithaca, New York, male starlings have a higher survival rate than females. Also from non-banding data, Davis (1959) claimed *mortality* rates of 56 percent (44% survival) for the male and 70 percent (30% survival) for the female. Coulson (1960) studied survival of banded starlings using some 7,000 recovered in Great Britain. He wrote: "The sex-ratio of the starling changes over a short period at the end of the birds' first year to give a marked predominance of males. This can only be explained by a male mortality of 39 percent and a female mortality of 70 percent in the first year of life from 1 August. This differential mortality probably arises through more first-year females than males breeding in their first year."

## METHOD

Listings of all interceptions for the four species processed through August 31, 1965, were obtained from the Bird Banding Laboratory. (The term "interception" is used in this paper to designate a banded bird retaken in any way, alive or dead.) From these listings, all records satisfying all of the following conditions were tabulated: (1) the bird was sexed, and aged as adult when banded; (2) all banding and interception information was complete, and the times of banding and interception were given to the day (e.g., if the only interception time given was May 1945, the record would be omitted); (3) the bird was banded prior to January 1, 1960 (to assure a substantial period of at least 5-2/3 years for a banded bird to be intercepted); (4) the interception was made at least 6 months after the bird was banded (to assure that only birds 6 months of age or more were used for the calculations); and (5) the interception method was specified and the bird was designated by the bander as a normal wild bird not kept in captivity or used experimentally.

Survival rates (Tables 1 and 2) were first calculated from 6,179 final return records (birds trapped and released in the same 10-

TABLE 1. ANNUAL SURVIVAL RATES OF COWBIRDS AND GRACKLES CALCULATED FROM RETURNS\*

No. years after birds were banded	Brown-headed Cowbird						Common Grackle					
	male			female			male			female		
	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)
½	1486			804			964			852		
1½	526	35.4	36.4	253	31.5	31.0	424	44.0	45.0	359	42.1	44.0
2½	205	39.0		76	30.0		193	45.5		170	47.3	
3½	77	37.6		25	32.9		88	45.6		84	49.4	
4½	30	39.0		5	20.0		49	55.7		34	40.5	
5½	7	23.3		2	40.0		20	40.8		15	44.1	
6½	4	57.1					8	40.0		3	20.0	
7½	1	25.0			3	37.5	3	100.0				
8½					2	66.7	1	33.3				

\*Birds taken alive in the same 10-minute latitude and longitude block where banded.

minute latitude and longitude block as where banded). These records were numerous for each species (2,290 cowbirds, 1,816 grackles, 1,353 redwings, and 720 starlings).

A second set of survival calculations (Tables 3 and 4) was made from 1,211 recovery records of birds taken dead at least 20 minutes of latitude or longitude from the 10-minute block where banded. Only records of birds taken at least 20 minutes of latitude or longitude from the 10-minute block where banded were used to insure that, unlike the return data, most of these recoveries were not made or influenced by the original bander. The largest number was shot, while the others were killed by automobile, trapping accidents, cat, etc. Unlike the returns, the recoveries were seldom made by the original bander since most were made many miles from the original banding site. It is thought that fairly precise survival rates were obtained from recovery data when the sample sizes were adequate.

TABLE 2. ANNUAL SURVIVAL RATES OF REDWINGS AND STARLINGS CALCULATED FROM RETURNS\*

No. years after birds were banded	Red-winged Blackbird						Starling					
	male			female			male			female		
	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)
½	953			400			411			309		
1½	390	40.9	}42.1	163	40.7	}43.3	164	39.9	}36.4	96	31.1	}32.2
2½	179	45.9		76	46.6		48	23.2		36	37.5	
3½	83	46.4		37	48.7		17	35.4		8	22.2	
4½	27	32.5		13	35.1		4	23.2		5	62.5	
5½	10	37.0		6	46.1					1	20.0	
6½	3	30.0		4	66.7							
7½	1	33.3		3	75.0							
8½				1	33.3							
9½				1	100.0							
10½				1	100.0							

\*Birds taken alive in the same 10-minute latitude and longitude block where banded.

## RESULTS AND DISCUSSION

Survival rates calculated from returns (Tables 1 and 2) for each species and sex were lower in each case than the rates calculated from recoveries (Tables 3 and 4). This was as expected since many trapping and banding stations are discontinued after a few years of operation resulting in many birds being assumed dead before they actually are. For example, a bird nesting in a bander's home area might be caught 3 years in a row; but, if the bander then should discontinue trapping in this location, the bird probably would not be caught again even though it lived 6 more years and continued to nest in the same local area. The return record on that bird would indicate that it survived only 3 years after being banded when it actually survived at least 9 years. Survival rates determined from recovery records would not have contained this bias since subsequent interceptions of the banded birds were not dependent on the original bander. The rates calculated from recoveries were thought to be accurate when the sample

TABLE 3. ANNUAL SURVIVAL RATES OF COWBIRDS AND GRACKLES CALCULATED FROM RECOVERIES\*

No. years after birds were banded	Brown-headed Cowbird						Common Grackle					
	male			female			male			female		
	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)
½	195			85			450			284		
1½	88	45.1	48.5	37	43.5	40.4	225	50.0	49.9	151	53.2	53.5
2½	43	48.9		13	35.1		115	51.1		80	52.9	
3½	27	62.8		4	30.8		56	48.7		43	53.7	
4½	12	44.4		2	50.0		22	39.3		22	51.2	
5½	6	50.0		1	50.0		10	45.4		10	45.4	
6½	5	83.3					6	60.0		6	60.0	
7½	1	20.0			4	66.7	2	33.3				
8½	1	100.0			4	100.0	2	100.0				
9½					2	50.0	2	100.0				
10½					1	50.0	1	50.0				
11½					1	100.0	1	100.0				
12½					1	100.0	1	100.0				
13½							1	100.0				
14½							1	100.0				
15½							1	100.0				
16½							1	100.0				

\*Birds taken dead at least 20 minutes of latitude and longitude from the 10-minute blocks where banded.

sizes were adequate. However, the number of recovery records for the starling and redwing were small while the number of return records for each species and sex were large. Thus for comparison of survival rates among the species and between sexes, the rates obtained from returns probably are better even though all give somewhat lower survival rates than actually occur in nature.

The return data indicate that grackles and redwings have similar

TABLE 4. ANNUAL SURVIVAL RATES OF REDWINGS AND STARLINGS CALCULATED FROM RECOVERIES\*

No. years after birds were banded	Red-winged Blackbird						Starling					
	male			female			male			female		
	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)	No. birds alive	Survival rate (%)	Weighted rate (%)
½	71			31			54			41		
1½	30	42.2	42.6	17	54.8	59.1	26	48.1	53.8	18	42.9	38.5
2½	14	46.7		10	58.8		16	61.5		6	33.3	
3½	5	35.7		8	80.0		10	62.5		1	16.7	
4½	2	40.0		4	50.0		5	50.0				
5½	1	50.0										

\*Birds taken dead at least 20 minutes of latitude and longitude from the 10-minute blocks where banded.

adult survival rates (1.8 percentage points difference). When considered together, these rates are higher (9.6 percentage points higher) than the combined rates of cowbirds and starlings, which also are very close to each other (.6 percentage points difference). Return data also give a slightly higher annual survival rate for the male cowbird (5.4 percentage points higher), starling (4.2 percentage points higher), and grackle (1 percentage point higher) than for the female, but a slightly lower rate for the male redwing than the female (1.2 percentage points lower).

Data from recoveries (Tables 3 and 4), as for returns, indicate grackles and redwings have similar adult survival rates (0.8 percentage points difference) that considered together are higher (6.0 percentage points higher) than the combined rates for cowbirds and starlings, which also are very close to each other (1.7 percentage points difference).

Annual adult grackle and cowbird survival rates calculated from returns were an average of 9.0 percentage points lower than those calculated from recoveries (grackles and cowbirds were the two species with large sample sizes for both type records). If it is assumed that the rates calculated from returns for the starling and redwing also were approximately 9.0 percentage points too low, then their estimated survival rates can be determined by adding 9.0 percentage points to the survival rates obtained from the return data. These adjusted estimates of starling and redwing

survival, based in each case on over 300 returns, probably are better than those based in each case on under 75 recoveries. The adjusted starling adult annual survival rates would be 45.4 percent for the male and 41.2 percent for the female or 43.3 percent overall. For the redwing they would be 51.1 percent for the male and 52.3 percent for the female or 51.7 percent overall.

The 43.3 percent survival rate determined in this study for the starling is close to the 42.5 percent rate estimated from banding data by Kessel (1957) and is somewhat higher than the 37 percent rate estimated from non-banding data by Davis (1959). A higher male than female survival for the starling in the United States also was indicated by Kessel (1957) and Davis (1959).

For the redwing, the 51.7 percent adjusted survival rate, calculated from returns, compares closely with a 53.4 percent unadjusted survival rate calculated from returns in an earlier study by Fankhauser (1967). The earlier rates were not adjusted because special procedures were used in that study to eliminate biased return records. This was done primarily by using only return records obtained from a station that annually trapped and banded fairly constant numbers of redwings for more than 15 successive years. Thus, the use of return records from this single station eliminated the biases, previously described, caused by the frequent termination of banding stations.

Estimates of the annual adult survival rates for grackles and cowbirds calculated from recoveries probably are fairly accurate because of adequate sample sizes, and no obvious biases. These rates for the grackles are 49.9 percent for the male and 53.5 percent for the female. For the cowbird the rates are 48.5 percent for the male and 40.4 percent for the female. No previous studies on survival rates of the grackle and cowbird were found.

Bias less obvious than that discussed for return records may exist in the data used for survival calculations within this paper. For example, it may be that the return data is biased somewhat if the adult birds become progressively either more or less easily trapped as they became older. Similarly, records from recoveries may have given biased results if the adult birds became progressively either more or less easily recovered, for example by shooting, as they became older. Doubtlessly, still other causes for bias could be reasoned. However, it is hoped that if such biases do exist they are small and do not greatly influence survival rates determined by this type of study.

#### SUMMARY

Annual adult survival rates for the male and female of four bird species were determined from two sets of band interception records—from 6,179 returns of birds taken alive in the 10-minute latitude and longitude block where banded, and from 1,211 recoveries of birds taken dead 20 minutes or more of latitude or longitude from the 10-minute block where banded. The rates calculated from the returns were lower in each case than the rates calculated from the recoveries. The best annual adult survival rates for each species

and sex were estimated to be as follows:

- Brown-headed Cowbird—44.4 percent (48.5 male, 40.4 female).  
These rates are from recovery records for 195 males and 85 females.
- Common Grackle —51.6 percent (49.9 male, 53.5 female).  
These rates are from recovery records for 450 males and 284 females.
- Red-winged Blackbird —51.7 percent (51.1 male, 52.3 female).  
These are adjusted rates from return records for 953 males and 400 females.
- Starling —43.3 percent (45.4 male, 41.2 female).  
These are adjusted rates from return records for 411 males and 309 females.

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