

SURVIVAL OF SOME COMMON PASSERINES IN A PENNSYLVANIA WOODLOT

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INTRODUCTION

Banding returns during a six-year study of the bird populations in a central Pennsylvania woodlot allow estimation of the average annual survival of some common passerine species. Bird populations in the woodlot were stationary with the exception of an increase in the number of robins. During the study irrigation with sewage effluent was introduced into a small part of the study area, but no effect of the irrigation could be detected in the bird populations (Savidge and Davis, 1971).

The study area consisted of an approximately 64 ha woodlot with heterogeneous vegetation 2 km north of State College on Pennsylvania State University property (Davis and Savidge, 1971). Banding was started in the area in 1962. From 1963 to 1967 the banding was done on a permanent 8 x 8 grid of 64 mist nets (9 m x 2 m) placed 91.4 m apart from early spring through fall. The capture rate was higher in the later years of the study because of a change in the netting schedule between 1964 and 1965 to improve netting efficiency. The capture rate was lower in 1964 than in 1963 although the netting schedules were comparable in these years.

METHODS

An estimate of the average annual probability of survival was calculated as the proportion of birds known alive in each year (banded the previous year or earlier) that were also known alive the following year (Table 1). Only birds captured in two or more years are included in the calculations which are based on recaptures in the years following banding in order to exclude transients. The estimates are therefore presumed to reflect the survival of the resident breeding populations. The contribution of each year's numbers to the overall estimate is weighted by the number of birds known to be alive at the beginning of the interval. Because not all the birds known to be alive were captured each year, a correction for birds alive but not captured in 1967 (the last year) is calculated (Table 2) from the weighted probability of capture in 1965 and 1966.

For another study blood samples (0.2 ml) were taken from many of the birds for serological and cytological examination, but this sampling had no measurable effect on the subsequent recapture rate of these species (Franks, 1967). Birds accidentally killed in the taking of blood samples are excluded in the analysis for subsequent years.

RESULTS AND DISCUSSION

Both uncorrected and corrected estimates of the survival (Table 3) for five of the seven species in the study are at the upper range of the survival previously reported for passerines (Farner, 1955). This high survival may reflect the nature of the sample. The birds in this study were presumably the breeding segment of the population. The

TABLE 1.
Number of birds known to be alive in years subsequent to banding.

Species	Year banded	1963	1964	1965	1966	1967
American Robin (<i>Turdus migratorius</i>)	1963		7	7	4(1) ¹	1
	1964			5	4	1
	1965				6	3
Wood Thrush (<i>Hylocichla mustelina</i>)	1962	9	6	4	2	1
	1963		19	13(4) ¹	5	3
	1964			6	5	2
	1965				13	8
Gray Catbird (<i>Dumetella carolinensis</i>)	1962	3	2	2(1) ¹	0	0
	1963		8	5(1) ¹	2(1) ¹	1
	1964			2	0	0
	1965				6	5
Rufous-sided Towhee (<i>Pipilo erythrophthalmus</i>)	1962	3	3	2	1	0
	1963		14	8(2)	5(1) ¹	2
	1964			7	2	0
	1965				3	2
Scarlet Tanager (<i>Piranga olivacea</i>)	1962	4	3	3	2	0
	1963		5	5(1) ¹	3	0
	1964			5	2	1
	1965				5	3
Red-eyed Vireo (<i>Vireo olivaceus</i>)	1962	3	1(1) ¹	0	0	0
	1963		9	8	5	1
	1964			5	4	2
	1965				10	1
Ovenbird (<i>Seiurus aurocapillus</i>)	1962	10	6	4(1) ¹	3	0
	1963		4	2	2	0
	1964			5	1	1
	1965				2	1

¹Numbers in parentheses indicate birds killed as a result of training new workers in the technique of taking blood samples. This value is subtracted from the number known alive to determine the number alive at the beginning of the next interval so the calculated estimate of mortality does not include this source of "artificial" mortality.

corrected annual survival of Ovenbirds in this study (0.54) is the same as Hann's (1948) reported survival of breeding Ovenbirds. Roberts (1971), however, reported an annual survival of 0.845 for breeding Ovenbirds.

The corrected survival of robins (0.67) in this study is higher than that reported by Farner (1945, 1949). Farner's estimate (0.47-0.48) probably includes both breeding and nonbreeding birds since his estimate is based on birds banded as juveniles and recovered after

TABLE 2.
Probability of capture of a bird "known to be alive".

Species	1965		1966		Weighted ¹ proportion captured
	Known alive	Proportion captured	Known alive	Proportion captured	
Wood Thrush	24	0.96	27	0.93	0.94
American Robin	12	0.75	15	0.80	0.78
Gray Catbird	9	0.89	10	0.70	0.79
Rufous-sided Towhee	17	0.76	11	0.91	0.82
Scarlet Tanager	13	0.85	13	0.69	0.77
Red-eyed Vireo	13	0.54	19	0.89	0.75
Ovenbird	12	0.67	9	1.00	0.81

¹Average of 1965 and 1966 proportion captured weighted by number known alive each year.

adult survival values occur (1 November). The discrepancy between our estimate and Farner's suggests a difference in the survival between breeding and nonbreeding segments of the population. Evidence for variation in survival among different segments of a population of Field Sparrow (*Spizella pusilla*) was reported by Fretwell (1968). Another possible explanation for the discrepancy between Farner's estimate of robin survival and our estimate is that the robin population increased during our study so that our estimate reflects survival in an expanding population whereas Farner's (based on banding records over a large area) reflects survival in a more stable population.

Populations of the other species were stationary during this study so that this possibility does not explain our high estimates of sur-

TABLE 3.
Annual probability of survival.

Species	Number of observations	Survival (p) ¹ (uncorrected)	1967 ² correction	Survival (p) (corrected)
Wood Thrush	78	0.63	0.8	0.64
American Robin	32	0.62	1.4	0.67
Gray Catbird	27	0.63	1.6	0.69
Rufous-sided Towhee	45	0.56	0.9	0.58
Scarlet Tanager	36	0.61	1.2	0.64
Red-eyed Vireo	44	0.50	1.3	0.53
Ovenbird	38	0.53	0.5	0.54

¹Annual probability of survival is calculated as the proportions of birds known alive in each year (banded the previous year or earlier) that were also known alive the following year.

²The 1967 correction is an estimate of the birds alive in 1967 from 1966 that were not captured in 1967 based on the probability of capture from Table 2. Estimate added to 1967 "known to be alive" to estimate corrected survival.

vival for the Wood Thrush, Gray Catbird, Rufous-sided Towhee, and Scarlet Tanager.

Since Frank's (1967) analysis of the recapture rates of birds in the early part of this study revealed no difference between bled and unbled birds, no mortality resulting from the taking of blood samples in this study is known to occur with the exception of the occasional bird killed in the actual bleeding process (see Table 1). We therefore feel justified in considering our estimates of survival based on these "experimental" birds to be representative of the population.

SUMMARY

An average annual survival (p) was estimated for seven species of common passerines in a Pennsylvania woodlot. The estimates of the annual survival of American Robins, Wood Thrushes, Gray Catbirds, Rufous-sided Towhee, and Scarlet Tanager are at the upper range of the survival estimates previously reported for passerines whereas the estimates of the annual survival of Ovenbirds and Red-eyed Vireos are intermediate.

ACKNOWLEDGMENT

This study was supported in part by Public Health Service Training Grant No. GM 00736.

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Received 10 May 1973, accepted 7 November 1973.