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LONGEVITY OF PIED CURRAWONGS AT TIMBERTOP, VICTORIA

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Between 1962 and 1976, 1 910 Pied Currawongs were banded at Timbertop in north-eastern Victoria. The number of individuals retrapped was 332 (17.4%). The longest elapsed time between banding and recovery was 14 years, and 1.7 per cent of birds were known to be alive over ten years after banding. The mean annual survival rate was estimated to be between 64.4 and 79.8 per cent (from three separate forumlae) and the mean for further expectation of life was between 2.5 and 4.5 years. These may represent underestimates of the actual survival rate because of the low probability of recapturing surviving marked birds. Although the bulk of the population was not resident year-round, there were few recoveries away from the banding location.

INTRODUCTION

Estimates of annual survival and life expectancy have been calculated for only three species of Australian passerines. An annual survival rate of 66 per cent was estimated for a sedentary population of Chestnut-crowned Babblers *Pomatostomus ruficeps* by Boehm (1974). Morris (1975), using a similar procedure, estimated the annual survival rate of a population of Yellow-tufted Honeyeaters *Lichenostomus melanops* to be 57 per cent. The survival rate of the Splendid Wren *Malurus splendens* was 61 per cent, however, the survival rate for males and females differed greatly being 71 per cent and 43 per cent respectively (Rowley 1981).

A banding programme continuing over a long time period is essential to collect the type of data needed for calculations of life expectancy. Such studies for any species of bird have been rare in Australia. This paper uses banding and retrap data to estimate annual mortality, survival and life expectancy for a moderately large (350 g) passerine, the Pied Currawong *Strepera graculina*. A banding study of this species at Timbertop (37°08'S., 146°20'E., altitude 700 m a.s.l.) in north-eastern Victoria began in 1962 and continued until 1976 (except for the years 1965 to 1969).

During winter, the Pied Currawong is a conspicuous and common species at Timbertop and around most settlements in the foothill and mountain forests of eastern Australia (Frith 1969). At Timbertop, the population density decreases markedly in spring, when winter flocks break up and pairs defend large breeding territories, a pattern reported for Pied Currawongs elsewhere in Australia (Walsh 1965; Strong 1966; Readshaw 1968a, 1968b; Wimbush 1969; Recher 1976). Similarly, dispersal during the year may be extensive and unpredictable (Strong 1966; Readshaw 1968b; Robertson 1969; and Wimbush 1969). During the course of our study at Timbertop, almost all banding and retrapping was done in the non-breeding period, and consequently no birds younger than approximately 6 months would have been banded.

The total number of individuals banded over the 15-year period was 1 910. Of these, 320 (16.8%) were retrapped or recovered within 20 km of the banding place and 12 (0.6%) recovered more than 20 km away.

METHODS

Birds were caught in box traps of the same type used by Strong (1966), which had been baited with food scraps. Trapping took place mostly

during the winter months of June, July and August, when the density of Pied Currawongs was highest. These three months accounted for 74.2 per cent of all currawongs banded. Only 4.6 per cent of individuals were banded* in the six months from November to April. No nestlings were banded.

Three methods of analysis were used to estimate survival rates from the banding and retrap data. Calculations were restricted to only those individuals retrapped at least once.

Boehm (1974) stated (for Method 1), "The method used is based on the assumption that all losses from the marked population are by maturity alone, but emigration, band loss, and net or trap shyness may account for part of the disappearance of banded birds". These assumptions would also apply for the other methods.

Band loss for Pied Currawongs was probably minor (bands on ten-year retrapped birds were not unduly thin), but both trap shyness and non-residency may be more serious (see Discussion). The intermittent trapping effort may also undermine the estimates. Method 3 is better than Method 2 in that it is less influenced by the small sample sizes inevitably involved in the long intervals.

METHOD 1

This was the method used by Boehm (1974) and Morris (1975), which was based on Lack (1954). For every year (i) on a x-year study, the number (a) of banded birds present and the number (b) still present one year later, are calculated. The mean percentage annual survival is then estimated as:

$$100 \left(\sum_{i=1}^{x} b \Big/ \sum_{i=1}^{x} a \right)$$

*Bands used were provided by the Australian Bird-banding Scheme (ABBS), Division of Wildlife and Rangelands Research, CSIRO, Canberra.

METHOD 2

This was used to calculate the percentage annual survival using the ratio of percentage of individuals known to be alive (%KTBA) in successive yearly intervals after banding. An estimate of average annual percentage survival is then:

$$\frac{100}{x\text{-}1} \times \frac{\%\text{KTBA (yr 2)}}{\%\text{KTBA (yr 1)}} + \frac{\%\text{KTBA (yr 3)}}{\%\text{KTBA (yr 2)}} + \ldots + \frac{\%\text{KTBA (yr x)}}{\%\text{KTBA (yr x-1)}}$$

METHOD 3

As the actual number of individuals is known to be alive (KTBA) 10 years and longer after banding is relatively small, the ratios of successive %KTBA for these intervals may be less reliable estimates of annual survival. This can be circumvented by emphasizing the ratios for the period closer to banding as expressed by the following formula:

$$100 \times \frac{\%\text{KTBA (yr 2)} + \%\text{KTBA (yr 3)} + \ldots + \%\text{KTBA (yr x)}}{\%\text{KTBA (yr 1)} + \%\text{KTBA (yr 2)} + \ldots + \%\text{KBTA (yr x-1)}}$$

Two further parameters can be calculated from the annual percentage survival (S). These are the percentage annual mortality (M), which is simply 100-S, and the expectancy of further life (E), which is (200-M)/2M (Fry 1980).

RESULTS

A summary of the banding and retrap data is given in Table 1. The time elapsed between banding and recovery was used to calculate the number of individuals known to be alive (KTBA) for each of the time intervals: at least one year after banding; two years after banding; and so on, up to 14 years after banding (Tables 2 and 3). By applying these data to the three formulae given in the methods section, the estimated mean annual survival rate (S) was 64.4 per cent, 79.8 per cent and 75.3 per cent, respectively. These rates suggest a mean expectancy of further life after banding of 2.5, 4.5 and 3.6 years, respectively.

The maximum period elapsed between banding and recovery was 14 years and eight days, and 1.7 per cent of individuals were known to be alive at least ten years after banding.

TABLE 1

Yearly banding totals and the number of birds known to be alive in subsequent years.

Banding Date	Number Banded	1YR	2YR	3YR	4YR	5YR	6YR	7YR	8YR	9YR	10YR	11YR	12YR	13YR	14YR
1962	223	38	14	8	8	7	7	7	7	6	5	5	3	2	1
1963	157	14	5	4	3	3	3	3	3	3	2				
1964	34	1													
1965-69	0														
1970	205	37	31	30	8	8	3								
1971	224	21	20	8	8	4									
1972	200	28	11	10	2										
1973	372	37	35	8											
1974	125	6	1												
1975	300	17													
1976	70														
TOTAL	1 910	199	117	68	29	22	13	10	10	9	7	5	3	2	1

To calculate annual survival for each year of banding we tallied (for every elapsed yearly interval) the number of individuals known to be alive and the total number banded. For example, the % known to be alive after 1 year

$$= \frac{100\ (38+14+1+37+21+28+37+6+17)}{(223+157+34+205+224+200+372+125+300)}$$

and the % known to be alive after 6 years

$$= \frac{100\ (7+3+0+3)}{(223+157+34+205)}$$

These calculations are detailed in Table 2.

TABLE 2

Calculation of survival rates according to Method 1. Survival of birds banded according to year.

Year Banded	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	Total
1962	38	14	8	8	7	7	7	7	6	5	5	3	2	1	
1963		14	5	4	3	3	3	3	3	3	2	0	0	0	
1964			1	0	0	0	0	0	0	0	0	0	0	0	
1970									37	31	30	8	8	3	
1971										21	20	8	8	4	
1972											28	11	10	2	
1973												37	35	8	
1974													6	1	
1975														17	
To calculate annual survival:															
Number of banded birds present (=a)	38	28	14	12	10	10	10	10	46	60	85	67	69		459
Number of these birds still present 1 year later (=b)	14	13	12	10	10	10	10	9	39	57	30	63	19		296

$$=> \Sigma b \,/\, \Sigma a = 0.664$$

Note that only those birds recovered at least once are considered.

TABLE 3

Calculation of the percentage of individuals known to be alive (%KTBA) for each of the yearly time intervals.

Interval (years)	KTBA	Total individuals possible in age group	%KBTA
1	199	1 840	10.82
2	117	1 540	7.60
3	68	1 415	4.80
4	29	1 043	2.78
5	22	843	2.62
6	13	619	2.10
7	10	414	2.42
8	10	414	2.42
9	9	414	2.18
10	7	414	1.69
11	5	414	1.21
12	3	414	0.73
13	2	380	0.53
14	1	223	0.45

KBTA = Known to be alive.

Recoveries more than 20 km from the banding place were few (Table 4) and fell into no apparent pattern beyond a tendency to be in a north-western direction. This is probably a sampling bias, reflecting the low density of human populations in all directions around Timbertop except to the north-west, where some population centres occur.

TABLE 4

Recoveries over 20 km from Timbertop.

Month banded	Distance (km)	Recovery Details: Direction	Month retrapped	Year banded	Year retrapped
May	60	SSE	Sept.	1962	1964
July	71	NNW	Aug.	1973	1975
,,	65	NNW	June	1973	1974
,,	51	NNW	June	1971	1973
,,	50	NNW	July	1971	1972
Aug.	70	NNW	Mar.	1971	1973
,,	29	SW	June	1963	1966
Sept.	125	NW	Mar.	1972	1975
,,	71	NNW	May	1972	1973
Oct.	54	NNW	July	1975	1976
,,	50	NW	May	1975	1976
,,	40	N	Aug.	1972	1974

DISCUSSION

Fry (1980) compared survival rates among landbirds of tropical, south temperate and north temperate areas. His data, although fragmentary, suggested that annual survival rates in southern Africa and Australia approached more closely those typically reported for birds in tropical areas (ca. 80%) (Snow 1962; Fogden 1972; Bell 1982) than for those reported for north temperate areas (ca. 50%). Woinarski (1985) considered this further for insectivorous birds in forested regions of south-eastern Australia, and suggested that relatively high annual survival for such species was typical. The survival rate, of between 66 per cent and 80 per cent, found at Timbertop for Pied Currawongs provides further support for a relatively low annual adult mortality being typical for Australian passerines.

In comparison to the survival rate of 66 per cent reported by Boehm (1974) for Chestnut-crowned Babblers, the survival rate reported here for Pied Currawongs (64-80%) may be misleadingly low. The babblers studied by Boehm were extremely sedentary and could be retrapped repeatedly with relative ease. Therefore the survival rate reported for the babblers may be more accurate than the rate reported here for the Pied Currawong. Additionally, our study had a highly-variable degree of trapping effort between different years. Over 80 per cent of the Pied Currawongs banded at Timbertop were not handled again. Although this may have resulted from substantial mortality, it may also have been the result of trap-shyness, insufficient trapping effort, large population size or a high proportion of transient birds. Vellenga (1966) and Strong (1966) both found that Pied Currawongs that had been caught, subsequently avoided traps.

As the local population of Pied Currawongs around Timbertop during most winters would probably exceed 1 000 individuals (e.g. Readshaw 1968a, 1968b), the probability of recapturing marked birds that were present would be relatively low, especially in those years in which little trapping was done. The probability would be further reduced if individual birds did not return every year or if they were present during only part of the winter trapping season. Readshaw (1968b) found that Pied Currawongs are highly mobile and that they may wander somewhat

irregularly. As a consequence, banded birds that were alive would remain unrecorded in many instances. For example, in our study 17 individual Pied Currawongs were recaptured at least five banding years after their initial capture. Of these, only four were retrapped in any intervening years, and no individuals were retrapped in more than two years. Separately or together these factors should decrease our estimates of survival, suggesting that the actual annual survival may be even higher than that estimated.

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