

# How Long do Purple Martins Live?

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## Introduction

**M**any Purple Martin landlords have asked (or have been asked) the question: How long do Purple Martins live? Answers vary, but they are often presented vaguely as a range of years couched with words like “about” and “probably.” J. D. Ray, writing in *The Purple Martin and its Management in Texas* states that “Purple Martins typically live to be about 5 to 7 years of age.” C. J. Slabaugh’s (1994) book, *Purple Martins – 400 Questions and Answers* states that “The average life span of a Purple Martin is 7-8 years.” The Purple Martin Conservation Association (PMCA), usually a source of good information, has

published two estimates of how long Purple Martins live: “Most martins probably live only 2-5 years” (<http://www.purplemartin.org/forumarchives/interest.htm>) and “Most martins live to be 3 to 7 years old.” (Hill, 2002). And, in what must be the most vague answer of all, R. B. Layton (1969), in his book *The Purple Martin*, concluded that “the span of life of the Purple Martin is between 0 and 13 years, nine months, at least, and even beyond perhaps.”

These estimates are understandably vague given past difficulties with accumulating data on known-age birds and analyzing them appropriately. Lacking data and



Hatching Year photo by Martin Scott/Birding World; all other photos by James R. Hill, III/PMCA

**Nestling**

**Hatching Year**

**Subadult Male**

knowledge of appropriate methodology, we have all been limited to making educated guesses of how long Purple Martins live. The situation is changing, however. Today, thanks to PMCA's long-term banding program and the availability of a suite of powerful analytical models developed by population ecologists and statisticians over the last 30 years, we can now refine our estimates of how long Purple Martins live.

## Methods

Before going further, let us define what we mean when we ask how long Purple Martins live. First, we do not mean how long did the oldest known martin live? (See sidebar.) Maximum observed life spans, while very interesting, are anomalies and are not good indicators of how long most birds live. To use a human analogy, it is interesting to note that, according to the Guinness Book of World Records, the oldest known person lived to be 122 ([http://www.guinnessworldrecords.com/content\\_pages/record.asp?recordid=48373&Reg=1](http://www.guinnessworldrecords.com/content_pages/record.asp?recordid=48373&Reg=1)). However, this number is not particularly useful to, say, an insurance company actuary who needs to know how long people live on average. Likewise, we are interested in how long Purple Martins live on average, which in the parlance of population ecologists is termed "mean life span."

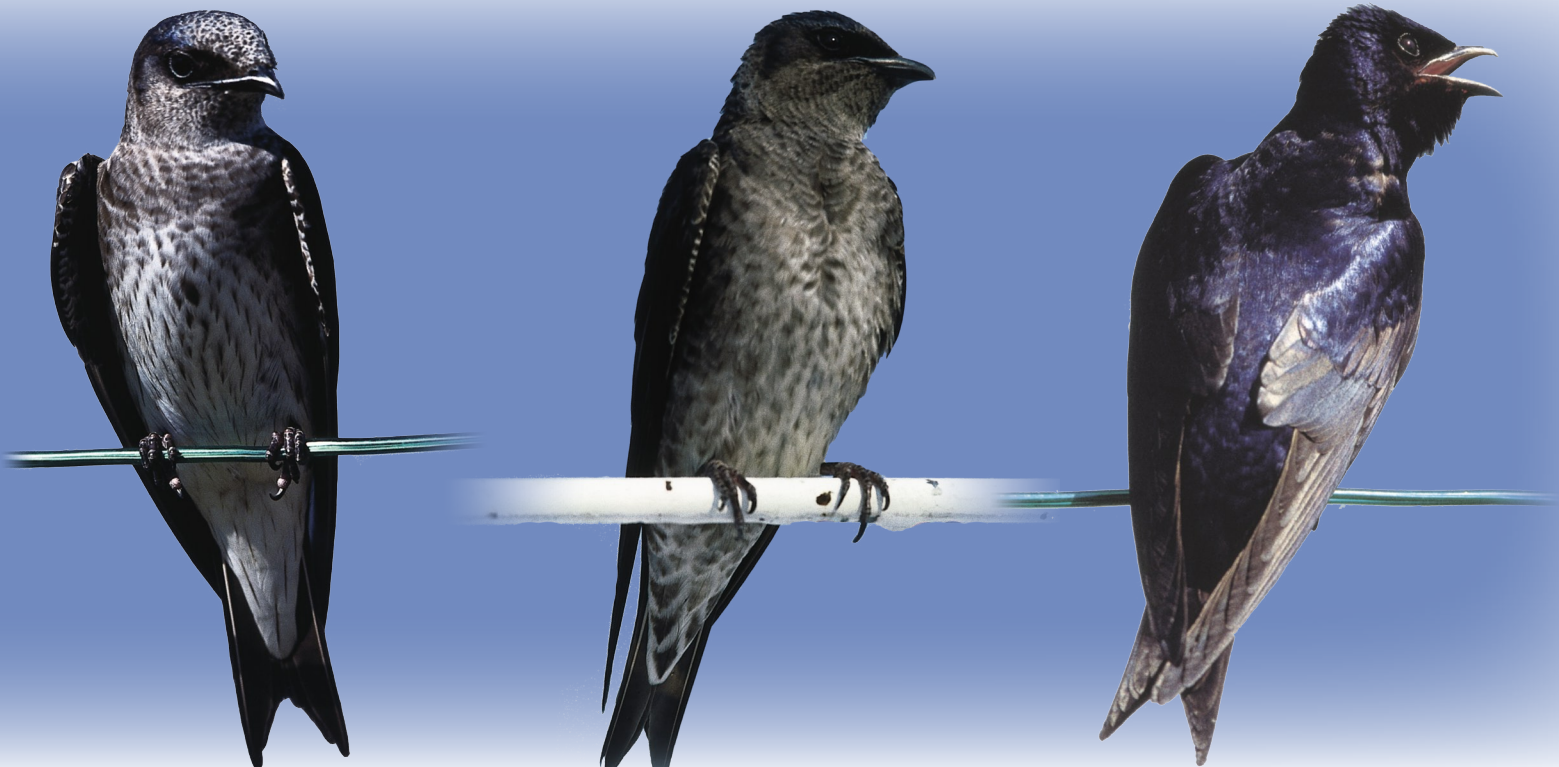
Mean life span (MLS) can be calculated from estimates of age-specific survival rates. Survival rate is defined as the probability that a bird alive at time T is still alive at time T+1. For birds, T is usually expressed in years. Thus, if,

of 1,000 birds alive in year 1, 500 survive to year 2, the survival rate (S) is 0.50 (500/1000) or 50%. Entering a survival rate (S) of 0.50 into Brownie, et al.'s (1985) simple formula  $MLS = -1/\ln(S)$ , with  $\ln$  being the natural log, yields a MLS of 1.4. So, in this simple hypothetical case, the birds lived on average 1.4 years.

Turning to the PMCA case, since 1995, PMCA has banded 12,000 Purple Martins. Most were banded as nestlings, and each received a uniquely coded color-band that allowed the bird to be identified as a known age individual from a distance. Most were banded at our Edinboro, PA research colonies, and at Andy Troyer's Conneautville, PA colony. Using spotting scopes to read bands on birds perched in colonies and near the Presque Isle martin roost, PMCA and its partners have amassed 18,000 sightings of known age martins. We used PROGRAM MARK (White and Burnham 1999) (<http://www.WarnerCNR.ColoState.EDU/~gwhite/mark/mark.htm>) (don't try this at home!) to estimate age-specific survival rates from these data. For simplicity, we estimated mean (average) annual survival rates across our years of banding, 1995-2004. We then entered these mean annual survival rates into a formula for calculating MLS.

## Results

In our most elementary hypothetical case above, we had a one-age class population of birds with an annual survival rate of 50%, and the birds lived on average 1.4 years. The real case with the PMCA's Purple Martin banding data



**Subadult Female**

**Adult Female**

**Adult Male**

**Table 1. Mean annual survival of Purple Martins in NW PA by age class over the period 1995-2004**

| Age Class               | Age                | % Surviving | Survival Rate | Standard Error |
|-------------------------|--------------------|-------------|---------------|----------------|
| Hatching Year (HY)      | Fledgling to age 1 | 27%         | 0.27          | 0.01           |
| Second Year (SY)        | Age 1 to age 2     | 61%         | 0.61          | 0.03           |
| After Second Year (ASY) | Age 2 and beyond   | 49%         | 0.49          | 0.02           |

is considerably more complex, and we think, more interesting, because we got some unexpected results: PROGRAM MARK yielded mean annual survival estimates for three age classes in PMCA's study population: Hatching Year (HY), Second Year (SY) and After Second Year (ASY) birds (Table 1.)

These survival estimates indicate that 27% of our banded birds survived from fledging to age 1. Of those that made it to age 1, becoming SY birds, 61% survived to age 2, becoming ASY birds. Of those, 49% survived to age 3, 49% to age 4, etc. The standard errors of our survival estimates, a measure of statistical precision, are low, indicating good precision.

Brownie, et al. (1985) do not give a MLS formula for three age classes, but Colorado State University scientist Dr. Gary White has expanded their formulas to accommodate three age classes. We used White's unpublished formula to estimate MLS from our three age-class estimates of survival.

The results: Between 1995 and 2004, Purple Martins banded in PMCA research colonies lived an average of only one (1.0) year after being banded as fledglings.

### Discussion:

We expected to find measurable differences in survival between two age classes of martins, young and adult. Differences in survival between young and adult birds have been demonstrated with many species of birds, and it has long been thought that young martins in their first year of life do not survive as well as older birds. Canadian Wildlife Service scientist Charles Francis (1995) confirmed this when he estimated survival rates for Purple Martins and other species. Using program SURVIV, a program similar to PROGRAM MARK with respect to the underlying statistical models, Francis analyzed band recovery data from Purple

Martins across North American killed or found dead over the years. He estimated mean annual survival rates for two age classes, first year birds (fledging to age 1) and adults (age 1 and beyond), to be 32% and 61%, respectively.

We were surprised, however, to find measurably different, i.e., statistically different, survival estimates for three age classes in our study population (HY 27%, SY 61%, ASY 49%). One is more likely to observe this in larger, longer-lived birds. We were also surprised to find that our ASY birds apparently have a lower survivorship than our SY birds, 49% vs. 61%. Usually, when one is able to detect differences in survival rates among three age classes, the rates increase with each age class. Perhaps we were able to detect different survival estimates for three age classes because of the strength of our data. Generally, the greater the quantity and quality of data going into PROGRAM MARK, the better the results coming out. The PMCA has accumulated a lot of good banding data that lend themselves to the kinds of analyses capable of PROGRAM MARK.

But why would SY birds apparently survive better than ASY birds in our population? Here again, we speculate. Perhaps because ASY birds are more likely to mate and raise a brood than SY birds, the behavioral and physiological demands on them are greater, resulting in reduced survival. Also, older martins migrate north earlier than younger martins, so they are more likely to encounter adverse weather conditions in our area. We hope to shed more light on these hypotheses by further examining banding data and Project Martinwatch data from our research sites.

What about our estimated mean life span of 1.0 year for the PMCA banded Purple Martins? Is this bad news? No, it is just fresh news and a more realistic estimate of how long Purple Martins actually live. Although our estimate sounds low, and certainly is low compared to previous ones, including our own, we are confident that it is

## Oldest Purple Martin?

How long did the oldest known Purple Martin live? Thirteen years and nine months, according to the U.S. Bird Banding Laboratory at Laurel, Maryland (Clapp, et al. 1983). The Lab is generally acknowledged to be the unofficial arbiter of such records, because they manage the banding database and are in the best position to verify reports of banded birds. According to their records, the oldest known Purple Martin was banded as a nestling with band number B261331 on July 1, 1933 at Dallas City, Texas. The bander was L. Hunter. Purple Martin B261331 was later reported as a male found dead under a martin house during the spring of 1947, at Dallas City, Texas. The reporter was G. C. Arthur. No doubt, over the ages, some Purple Martins have lived longer than 13 years, 9 months, but this is the documented record. What are the odds that a Purple Martin would live to be nearly 14 years old? Using survival rates of PMCA banded birds, we estimate that only 1 in about 30,000 martins would live to be 14. A landlord has a better chance of living to be 100!

## Banding: Tools of the Trade



banded sub-adult male

USFWS aluminum bands



spatula used to spread the bands open



banding pliers



plastic colored leg bands

See [http://purplemartin.org/update/BandingPM11\(3\).pdf](http://purplemartin.org/update/BandingPM11(3).pdf) for information on banding Purple Martins.

ity of powerful, modern analytical methods, we expect to be able to answer more sophisticated questions in the future. We already think, for example, that survival rates in our study population vary somewhat between years, and the variation appears to be consistent across age classes, suggesting common mortality factors. Also, we hope to couple our survival estimates with productivity estimates from our Project Martinwatch data to assess whether our research population is changing. Some will surely think that our population must be declining if the mean life span of our birds is only 1.0 year, but we won't know until we do more analyses. Eventually, as banding data from other study populations in the US and Canada accumulate, we hope to compare our results with others', and we will be

reasonable for three reasons:

1. It is more scientific than previous educated guesses, because we derived it from an analysis of many banding data using modern statistical models.
2. It is consistent with estimates for small birds in general.
3. It compares well with an independent estimate of 1.2 years derived when we used Francis' (1995) estimates of Purple Martin survival in White's MLS formula.

### Future Analyses of the PMCA's Banding Data

For this analysis, we kept things relatively simple, because we simply wanted a better answer to the general question of how long do Purple Martins live. Given the size and quality of PMCA's banding database and the availabil-

sure to share results of future analyses with our readers.

Meanwhile, what can one say when asked how long do Purple Martins live? Because our result (1.0 year) is specific to our research colonies, we are hesitant to extrapolate it to martins in general. We predict, however, that as more banding data from other studies accumulate and are analyzed, other estimates of mean (average) life span after fledging will likely fall in the range of 1.0 to 2.0 years. Thus, one should be safe in saying that, on average, Purple Martins live only one to two years after fledging. That is substantially less than previously thought, but is more realistic in light of contemporary knowledge of bird populations.

### References

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## How Long Do Birds Live?

How long does a bird live? British ornithologist Dr. Mike Housome has developed convincing, easy to follow, explanations of the life span of birds, how life span is calculated, and how bird populations carry on despite most individual birds having apparently short life spans. See [http://www.countrysideinfo.co.uk/bird\\_lifespan.htm](http://www.countrysideinfo.co.uk/bird_lifespan.htm)

If you are among the many people who find it hard to believe that small birds do not live long on average, you may find Dr. Housome's explanations to be helpful and reassuring.