Post-juvenal Primary Feather Molt of Wild Mourning Doves in Texas

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Abstract: Comparison of observed age at post-juvenal primary molt of wild mourning doves (*Zenaida macroura*) with predicted ages from 5 published aging studies revealed differences ($P < 0.1$) for all comparisons. Observed molt occurred at an older ($P < 0.0001$) age than predicted by the current standard for aging juvenile doves. A new model for aging mourning dove juveniles using molt data from primaries 1–9 is presented based on data collected from wild birds on the Texas A&M University Campus. The wide range in observed age at molt of primary 10 precluded its use in these analyses.

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Age data, combined with indices of breeding population size, reveal valuable information about trends in production, rearing success, peaks of breeding and mating, and many other population parameters (Petrides 1949). Juvenile mourning doves can be distinguished from adults by the presence of a buffy border around the tips of primary coverts (Moore and Pearson 1941) or by the degree of wear on unmolted primaries (Wight et al. 1967).

Several models for aging immature mourning doves by progression of post-juvenal primary feather molt have been developed (Jenkins 1955, Swank 1955, Allen 1963, Hanson and Kossack 1963, Haas and Amend 1976). Through the use of such models, the age structure and peak production periods of a mourning dove population can be estimated by examining a collection of wings. However, all of these models were either developed in part from data collected from captive birds (Jenkins 1955, Swank 1955, Hanson and Kossack 1963) or in part from data collected from

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recaptures of unknown-age wild birds (Allen 1963, Haas and Amend 1976). In this study, we compared ages of post-juvenal primary molt observed in known-age wild mourning doves to those predicted by the previously described models in the literature. Particular attention was focused on comparisons with Swank's (1955) technique as the standard because of its presentation in the Wildife Management Techniques Manual (Schemnitz 1980). We also propose a revised aging model based on data collected in this study and that collected from wild birds in Swank's (1955) study.

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Methods

Weekly nest searches were conducted on approximately 325 ha of the main campus of Texas A&M University (TAMU) at College Station, Texas, during 1981–82. Searches began in late January or early February and were continued until the end of the nesting season each year. The end of the nesting season was defined to be that time in which <5 new nests were found during weekly searches. This occurred during the week of 5 October 1981 and the week of 20 September 1982. The fate of all nests was followed weekly until the youngest nestling reached 9 days of age. Nestlings were aged using descriptions and photographs of known-age nestlings (Hanson and Kossack 1963). Once nestlings reached 9 days of age, they were flushed from the nest, banded with standard 3A aluminum butt-end bands obtained from the U.S. Fish and Wildlife Service Bird Banding Laboratory, and then returned to the nest (Morrow et al. 1987).

Data on progression of post-juvenal primary molt were collected from banded nestlings which were later recaptured in modified funnel traps located on the roofs of campus buildings (Morrow 1983). The age at molt for a particular primary was estimated for nestling recaptures by adjusting the age of the bird at recapture for the length of the primary being replaced, assuming a feather growth rate of 5.5 mm/day (the mean rate at which primaries grew in the sample of juvenile recaptures in this study).

Sign tests (Daniel 1978) were used to test for differences between observed molt ages and those predicted in the literature. Since Swank (1955) collected data on the TAMU campus, we combined data from wild juveniles in that study with our data. A proposed new model for aging juvenile mourning doves was developed by subjecting these combined data to simple linear regression (Steel and Torrie 1980). For the sign tests and the regression analysis, if birds were captured more than 1 time, only data from the first capture were used because of non-independent samples.

Results

During 1981–82, 1,749 known-age nestlings were banded. Seventy-three of these nestlings were subsequently recaptured; 60 were at some stage of post-juvenal primary molt. Mean age at initiation of post-juvenal primary molt was 30.1 days, and the average completion age was 157.8 days (Table 1). Considerable variability was observed in the age at molt of a particular primary with CV's ranging from 11%–23% of the mean. The largest variability observed was for primary 10, with a range of molt ages from 128–222 days (Table 1). Because of the large CV and the wide range of observed age at molt of primary 10, data for this primary were not included in subsequent analyses.

Comparisons of observed age at molt of birds in our study with those predicted in the literature indicated that molt progressed slower ($P < 0.0001$) than predicted by Swank (1955) (Table 2). Swank's predicted ages at molt deviated from our observed molt an average of 5.4 days (range 8–40 days), and in contrast, progressed faster ($P < 0.1$) in our study than predicted by Jenkins (1955), Allen (1963), Hanson and Kossack (1963), and Haas and Amend (1976) (Table 2).

The simple linear regression analysis on data from primaries 1–9 of wild juveniles from this study and wild birds from Swank (1955) resulted in the following regression model:

$$Y = 28.7 + 1.18X^2$$

Table 1. Mean observed post-juvenal primary molt age (days) for known-age mourning doves in central Texas.

Primary	$\bar{x}$ age	*N*	SD	CV (%)	Min.	Max.
1	30.1	21	5.5	18	22	45
2	35.5	18	4.3	12	29	47
3	39.9	9	4.9	12	34	47
4	50.4	7	8.0	16	42	64
5	61.2	9	10.5	17	49	82
6	74.0	5	15.8	21	59	101
7	87.0	5	9.2	11	79	102
8	107.5	2	19.1	18	94	121
9	123.0	6	18.9	15	109	157
10	157.8	6	36.6	23	128	222

Table 2. Deviations observed in comparisons between observed ages of post-juvenal molt of primaries 1–9, and those predicted by 5 published studies. Deviations >0 indicate slower than predicted molt.

	Deviations		
Study	Range	Min. absolute	$\bar{x}$
Swank (1955)	−8 – 40	0.0	5.4[a]
Jenkins (1955)	−32 – 18	0.4	−12.9[a]
Allen (1963)	−18 – 30	0.0	−2.2[a]
Hanson and Kossack (1963)	−24 – 24	0.2	−1.7[b]
Haas and Amend (1976)	−21 – 35	0.0	−7.5[a]

[a]Median deviation significantly ($P < 0.001$) different from 0.
[b]Median deviation significantly ($P < 0.1$) different from 0.

where Y = predicted age at molt and X = primary number. This model accounted for 93% of the variability in age at molt for our sample of birds. In general, molt of primary 1 is expected to occur at 29.8 ± 2.3 days, whereas the mean age for molt of primary 9 is expected at 124.1 ± 5.2 days. However, confidence intervals on individual predicted values are much wider, exceeding ± 2 weeks for all primaries (Table 3).

Discussion

Observed deviations resulting from a comparison of our data with previously published aging models indicated that molt progression in our sample of wild juveniles did not occur as predicted by any of these models. Although considerable variation was observed in our data, results of sign tests on the deviations from literature values indicated a skewed distribution, i.e., delayed molt when compared to Swank (1955) and faster than predicted for Jenkins (1955), Allen (1963), Hanson and Kossack (1963), and Haas and Amend (1976). If variability were the only factor contributing to these deviations, one would predict that the median of these deviations would have been 0. Therefore, our data indicated that none of the previously published models adequately predicted the age of post-juvenal primary molt of our sample of known-age wild juveniles. Part of the problem may be that all of the previously published studies made use of either captive birds or of unknown-age wild juveniles. Swank (1955) found that wild birds initiated molt before caged juveniles. Although Swank (1955) attempted to adjust data collected from caged birds to correct for this difference, our data indicated that this model over-corrected for the difference, resulting in a model which predicts molt of a particular primary at too young an age. The regression model based on our data combined with wild birds from Swank's study predicted molt to occur 4.9 days slower for primaries 1–9 than did Swank (1955). Importantly, results of our regression analyses point out the need

Table 3. Predicted post-juvenal molt ages (days) for mourning dove primaries 1–9 as estimated from regression analysis of data collected in central Texas from 66 known-age wild juveniles.

			95% CL	
Primary	Predicted age of molt (days)	*N*	$\bar{x}$	Individual
1	29.8	21	± 2.3	± 15.4
2	33.4	11	± 2.2	± 15.4
3	39.3	7	± 2.0	± 15.3
4	47.5	4	± 1.9	± 15.3
5	58.1	8	± 1.9	± 15.3
6	71.1	4	± 2.3	± 15.4
7	86.4	4	± 3.0	± 15.5
8	104.1	2	± 4.0	± 15.7
9	124.1	5	± 5.2	± 16.0

for a large sample when constructing hatching distributions from post-juvenal primary molt data, since confidence intervals on the predicted age of an individual bird were >30 days for all primaries, whereas confidence intervals for the mean of a large sample were ≤10.4 days.

We feel that the wide range at molt observed in this study for primary 10 precludes its usefulness for aging purposes. Swank (1955) and Thompson and Kabat (1950) working with northern bobwhite (*Colinus virginianus*) and Smith and Cain (1984) working with scaled quail (*Callipepla squamata*) reported increasing variation in the age at molt for higher primaries. Smith and Cain (1984) further stated that the accuracy of this technique with scaled quail was severely limited after 18 weeks of age due to the variability in the growth rate of primary 8 (the last primary molted during post-juvenal primary molt for quail).

Literature Cited

Allen, J. M. 1963. Primary feather molt rate of immature doves in Indiana. Cir. No. 4. Ind. Dep. Conserv. 5pp.

Daniel, W. W. 1978. Applied nonparametric statistics. Houghton Mifflin Co., Dallas, Texas. 510pp.

Haas, G. A. and S. R. Amend. 1976. Aging immature mourning doves by primary feather molt. J. Wildl. Manage. 40:575–578.

Hanson, H. C. and C. W. Kossack. 1963. The mourning dove in Illinois. Tech. Bul. No. 2. Ill. Dep. Conserv. 133pp.

Jenkins, J. H. 1955. A contribution to the physiological ecology of the mourning dove, *Zenaida macroura carolinensis* (Linnaeus): a study of age and seasonal changes in feathers, gonads, weight, and lipid deposition. Ph.D. Diss., Univ. Ga., Athens. 100pp.

Moore, G. C. and A. M. Pearson. 1941. The mourning dove in Alabama. Ala. Conserv. Dep. 36pp.

Morrow, M. E. 1983. Primary feather molt of juvenile mourning doves in Texas. M. S. Thesis, Texas A&M Univ., College Station. 45pp.

———, N. J. Silvy, and N. W. Atherton. 1987. A device for returning nestling birds to their nests. J. Wildl. Manage. 51:202–204.

Petrides, G. A. 1949. Viewpoints on the analysis of open season sex and age ratios. Trans. North Am. Wildl. Conf. 14:391–410.

Schemnitz, S. D., ed. 1980. Wildlife management techniques manual, 4th ed. The Wildl. Soc. Inc., Washington, D.C. 686pp.

Smith, D. S. and J. R. Cain. 1984. Criteria for age classification of juvenile scaled quail. J. Wildl. Manage. 48:187–191.

Steel, R. G. D. and J. H. Torrie. 1980. Principals and procedures of statistics. McGraw-Hill, Inc. New York, N.Y. 633pp.

Swank, W. G. 1955. Feather molt as an ageing technique for mourning doves. J. Wildl. Manage. 19:412–414.

Thompson, D. R. and C. Kabat. 1950. The wing molt of the bob-white. Wilson Bul. 62:20–31.

Wight, H. M., L. H. Blankenship, and R. E. Tomlinson. 1967. Aging mourning doves by outer primary wear. J. Wildl. Manage. 31:832–835.