

AN EXAMINATION OF CERTAIN AGING AND SEXING
CRITERIA FOR THE CEDAR WAXWING
(*BOMBYCILLA CEDRORUM*)

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INTRODUCTION

The bander who searches the usual reference works such as Forbush (1929), Roberts (1955) and Chapman (1966) for information on the aging and sexing characteristics of the Cedar Waxwing (*Bombycilla cedrorum*) finds a less than satisfactory scheme for the treatment of this bird in the hand. More recently, Wood (1969) in his bander's guide to sexing and aging presents a scheme based on chin coloration and wax appendages which at first appeared to contradict, in part, my own experience with the species, and which prompted an analysis of my own data and an examination of a series of museum skins to confirm the use of wax appendages as an aging aid. In the course of this review, the differences in chin-throat coloration and how these related to sexing were assayed.

COLLECTION OF DATA

The banding data were gathered from 358 Cedar Waxwings handled during the period of August through October for the years 1966 through 1969 as part of the operation of a weekend-manned "Operation Recovery" station at Vischer Ferry Game Management Area in southern Saratoga County. The station is located at coordinates 424-0734, about ten miles east of Schenectady, New York. The species nests in the area and during the above-noted period is commonly flocked in groups of up to 100-200 feeding on the berries of various trees and shrubs. All captures were made by mist net as follows:

- 1966 - 9 AHY captured August 19-27 (data collected on only two of these birds), and 39 HY captured August 27-October 23 with a peak of 29 on September 26.
- 1967 - 7 AHY captured August 26-September 30, and 53 HY captured September 23-30 with a peak of 38 on September 23.
- 1968 - 7 AHY captured August 9-31, and 46 HY captured August 31-October 13 with a peak of 23 on September 7.
- 1969 - 16 AHY captured August 9-October 18 with a peak of 8 on October 18, and 188 HY captured August 23-October 18 with a peak of 141 on September 27.

In all cases HY's (hatching year birds) were identified by their streaked plumage and AHY's (after-hatching year birds) by their unstreaked plumage. Where possible, AHY's were sexed by brood patch or cloacal protuberance.

TABLE I. OCCURRENCE OF WAXY APPENDAGES IN CEDAR WAXWINGS AT VISCHER FERRY, AUGUST - OCTOBER

Plumage of Bird	Number of Birds Having the Following Count of Waxy Appendages on One Wing									Total	
	None	1	2	3	4	5	6	7	8		9
Streaked (HY)	309	5	2	3	3	2	1	1	1	1	326
Percent	94.9	1.5	0.6	0.9	0.9	0.6	0.3	0.3	0.3	0.3	100.0
Unstreaked (AHY)	13	1			2	3	3	3	5	2	32
Percent	40.6	3.1			6.3	9.4	9.4	9.4	15.5	6.3	100.0

TABLE II. OCCURRENCE OF WAXY APPENDAGES IN CEDAR WAXWINGS AT AMNH

Plumage and Sex of Bird	Number of Birds Having the Following Count of Waxy Appendages on One Wing									Total	
	None	1	2	3	4	5	6	7	8		9
Streaked Male	23			1		1					25
Streaked Female	21	2									23
Streaked Unknown	3										4
Total Streaked	47	2		1		2					52
Percent	90.5	3.8		1.9		3.8					100.0
Unstreaked Male	77	5	3	4	2	2	5	29	16	6	149
Percent	51.7	3.4	2.0	2.7	1.3	1.3	3.4	19.5	10.7	4.0	100.0
Unstreaked Female	63	4	1	1	1	2	5	23	6		106
Percent	59.5	3.8	0.9	0.9	0.9	1.9	4.7	21.7	5.7		100.0
Unstreaked Unknown	9				1		2	4	3	1	20
Total Unstreaked	149	9	4	5	4	4	12	56	25	7	275
Percent	54.1	3.3	1.5	1.8	1.5	1.5	4.3	20.4	9.1	2.5	100.0

TABLE III. OCCURRENCE OF WAXY APPENDAGES BY DATE OF COLLECTION AT AMNH

Month of Collection	Number of Birds Having the Following Count of Waxy Appendages on One Wing									Total	
	None	1	2	3	4	5	6	7	8		9
January	8	1						5	2	1	17
February	18	1				2	4	4	1		26
March	23		1		3	2	17	3	6		53
April	10	2		1		4	3	3	3	1	37
May	18	1			1		3	3	4		21
June	16	1	1		1		5	6	1	1	27
July	8		1	1			6	1		1	26
August	6	2		1		1		1	1		12
September										1	1
October	3		1			1		1			6
November	8		1			1	9	1	1		20
December	141	7	4	5	4	4	10	56	19	5	255

TABLE V. COMPARISON OF CHIN-THROAT COLOR TO WAXY APPENDAGE DISTRIBUTION BY SEX OF UNSTREAKED WAXWINGS AT AMNH

Coloration and Sex of Bird	Number of Birds Having the Following Count of Waxy Appendages on One Wing									Total	
	None	1	2	3	4	5	6	7	8		9
Black-Male	64	3	2	3	1	2	4	20	15	6	120
Brown-black-Male	13		1	1			1	7	1		24
Brown-Male	1	1			1		2	1			5
Black-Female	11		1				1	1			14
Brown-black-Female	43	3		1	1		4	17	5		74
Brown-Female	9					2	1	5	1		18

The data on wax appendages and chin-throat coloration of the museum skins were obtained at American Museum of Natural History in New York City, where 327 skins were examined. These included 52 birds in streaked plumage and 275 non-streaked birds, all contained in the first six trays of the museum's collection. The 52 birds in streaked plumage had collection dates ranging from August 10 to October 28. The 275 non-streaked birds had collection dates ranging throughout the year.

Data on the wax appendages for both the Vischer Ferry birds and the AMNH skins were taken by recording the number of secondaries and tertiaries of one wing that were so adorned. If the counts of the two wings differed, the higher count was recorded. The occurrence of waxy appendages at the tip of the tail band was recorded also, as was the color of the tail band. In all cases, any trace of red wax at the tip of a feather was determined to constitute an appendage.

Data on chin-throat coloration were grouped into three categories as follows:

"Black" - The chin and throat were extensively colored with a rich, velvety black.

"Brown-black" - Either the black was restricted to only part of the chin with the throat a blend of cinammon-brown-black, or the entire chin and throat were a cinammon-brown-black, lacking the intensity of a "black"-throated bird.

"Brown" - The chin and throat were colored with the same cinammon-brown as the upper breast. There was no black present.

The data are summarized in Tables I through V.

DISCUSSION OF DATA

A. *Occurrence of Waxy Appendages in HY Birds* — The data gathered from hatching year birds in juvenal plumage at Vischer Ferry indicate that approximately 95 percent of this age group lack waxy appendages. Among those that do have these appendages, the appendages are fewer in number than those found on birds in unstreaked plumage, as indicated in both Tables I and II. The appendages are also much reduced in size compared to those of birds in unstreaked plumage. The data on the more limited series of HY birds in streaked plumage at AMNH agree fairly well with the Vischer Ferry data in that about 91 percent of those birds lacked appendages. In addition, the museum data indicate that among those streaked birds of known sex, the portion of males lacking appendages (92.0 percent) was comparable to that in females (91.4 percent). The occurrence of waxy appendages offers no indication of a means of sexing HY birds.

B. *Use of Waxy Appendages as an Aging Criterion for HY and SY Birds* — Forbush (1929) indicates that there is a complete post-natal molt followed by a partial postjuvinal molt in September-

October of the body plumage and wing coverts. Subsequently, there is one complete molt per year in September-October. Thus, the condition of the flight feathers, including the occurrence of waxy appendages observed on HY birds in August-October, persists through to the following September or October. If at this first postnuptial molt all or nearly all second year birds acquire appendages, and this fact cannot be unequivocally ascertained from the data at hand, the use of a lack of waxy appendages for aging birds in November-December as HY, and January-August as SY is reliable to the extent of about 95 percent.

In order to ascertain the acquisition of appendages at the first postnuptial molt one would have to examine returns of birds banded as HY's. Unfortunately, to date, not one of the nearly 400 waxwings banded as part of this study, and other banding activities, has been recaptured as a return.

C. *Occurrence of Waxy Appendages in AHY Birds* — Data in Table II for birds in unstreaked plumage somewhat parallel the more limited data for unstreaked birds at Vischer Ferry in Table I. Nine is the maximum number of waxy appendages noted. Arvey (1951) has reported eight as the maximum number. The distribution of appendages is somewhat similar in both cases. However, the museum data allow a comparison of appendage distribution by sex. As in the case of HY birds, appendage distribution in birds of all ages, past the juvenal plumage, cannot be used as a sexing criterion. There appear to be two trends apparent in the distribution of waxy appendages: 1) Slightly more females than males have no appendages, and 2) Slightly more males than females have maximum counts of waxy appendages (eight and nine appendages). Otherwise, the distribution is quite comparable in the two sexes. In examining a limited series of skins at the University of Kansas Museum of Natural History, Arvey (1951) found 17 birds out of 53 with wax. Of these 17, six were male, seven were female and four were of unknown sex.

It is not known whether a bird acquires a full complement of waxy appendages in one molt, or in successive molts. Again, an examination of return captures could ascertain this and could conceivably serve as a valuable tool in better describing age distribution within a population of this species.

Without indicating the age or sex of all the birds considered, Myers and Myers (1967) found that among 303 birds banded during the winter of 1965-66, 60 percent lacked wax, 10 percent had traces of wax on only two or three secondaries, and 30 percent had wax. Arvey (1951) found 32 percent with wax among the Kansas series. In this study, 54 percent of the AMNH birds lacked wax.

D. *Occurrence of Waxy Appendages During The Molt Year* — Table III presents a comparison of the month of collection vs. the waxy appendage count of 255 waxwings in unstreaked plumage at AMNH (the labels on 20 birds gave no date of collection). Males, females and "unknowns" are included. The purpose of this comparison was to ascertain whether appendage distribution was

constant throughout the molt year.

On the monthly basis, the data are somewhat sparse and a clearly defined comparison is not possible. However, by treating the data on a quarterly basis, a trend becomes apparent. Below are given the quarterly totals and the numbers of birds possessing one-six appendages, and those with seven-nine appendages, and the percentage of the total population that each of these represents.

Quarter	Total	No. with		No. with	
		1-6 appendages	%	7-9 appendages	%
Oct.-Dec.	26	4	15.4	11	42.2
Jan.-March	96	11	11.5	36	37.5
April-June	85	11	12.9	23	27.1
July-Sept.	48	8	16.4	10	20.8

Among the birds with one-six appendages, the appendage distribution remains essentially constant between 11.5 and 16.4 percent of the total population, regardless of the time after molt. However, among the birds possessing seven-nine appendages, where appendage loss, if it occurs, would be maximized, there is a definite decline in number starting with the first quarter after molt (Oct.-Dec.) through to the quarter immediately prior to and including molt (July-Sept.).

This decline in the number of birds possessing maximum appendage count could be attributable to: 1) appendage wear or breakage, 2) feather loss due to molt and other causes, 3) mortality. Wear and breakage alone do not adequately explain the decline in the population of these birds of maximum appendage count, for if wear and breakage alone were operative, one would expect an increase in the proportion of the population having one-six appendages. This population is essentially constant. However, mortality could, in part, account for this decline.

E. *Use of Chin-throat Coloration as a Sexing Criterion* — Among birds in juvenal plumage at AMNH, all chins and throats were a tan color, and therefore no differentiation was possible.

Table IV, however, presents the results of examining the colors of the chins and throats of the birds past juvenal plumage. Two conclusions were reached from these data. Among the birds of known sex with rich, velvety black chins and throats, those classified as "Black", 89.5 percent were male.

Among those birds classified as "Brown-black" and "Brown", 76.0 percent were female. The value of the chin-throat coloration as a sexing criterion is questionable because of the low reliability attached thereto.

F. *Comparison of Chin-throat Coloration with Waxy Appendage Distribution* — Table V gives a further breakdown of Table IV by showing the occurrence of waxy appendages as a function of chin-throat coloration. Among the males, those with "Black" throats

TABLE IV. COMPARISON OF CHIN-THROAT COLOR WITH SEX OF UNSTREAKED CEDAR WAXWINGS AT AMNH

Sex	Number of Birds Classified into the Following Chin-throat Categories			Total
	"Black"	"Brown-black"	"Brown"	
Male	120	24	5	149
Female	14	74	18	106
Unknown	10	9	1	20
Total	144	107	24	275

lacked waxy appendages about 53 percent of the time, comparable to 54 percent of the time among those with "Brown-black" throats. The distribution of appendages among the two groups appears comparable also.

Among the females, as the throat coloration changes from "Brown to "Brown-black" to "Black", the percentage of birds lacking appendages goes from 50 to 58 to about 79. The significance of this trend is not apparent, and due to somewhat limited data may not even be real.

G. *Other Plumage Variations* — Examination of the plumage of the 358 birds handled at Vischer Ferry revealed that 354 of these had the usual yellow tail band. One HY bird with no waxy appendages in the wing had a red tail band, and three HY birds had orange tail bands. The latter were caught on September 7, 1968 as part of a catch of 23 HY waxwings that day. Their simultaneous occurrence raises the question of their origin from a single brood.

Only one example of a bird with waxy appendages on the tail was found within the series of the 358 banded birds treated in this paper. The HY bird in Table I having seven waxy secondaries and tertiaries had two waxy appendages on its tail. Prior to this study, one after-hatching-year bird captured in 1965 had waxy appendages on the tail, but no further information on the bird was recorded at the time.

Among the specimens at AMNH, all had yellow tail bands and three of the 327 had waxy appendages on the tail. One bird of unknown sex, having eight waxy appendages on the wing, had five on the tail. Another bird, a male with two waxy appendages on the wing, had five appendages on the tail also. A third bird was most regally attired. It had eight appendages on the secondaries and tertiaries, eight on the tail and three on the primaries for a total of 30 appendages. In addition, the primaries had yellow spots near the tips. The sex of the bird was not marked on the label.

The occurrence of these variations is not clearly attributable to any one age class or sex. Myers and Myers (1967) found only two

birds with waxy rectrices out of a total of 537 that they banded. Both of these birds had nine waxy secondaries, and were the only two of the 537 to have more than seven waxy secondaries. Arvey (1951) claims that wax seldom occurs on the rectrices unless the secondaries have the maximum number of waxy tips. In general, this is the case, except for the one bird noted above with two appendages on the wing and five on the tail.

In all instances at Vischer Ferry and AMNH, the birds examined had red waxy appendages. Farley (1924) cites two examples of birds possessing yellow appendages. No details are given about number.

CONCLUSIONS

1. An examination of the occurrence of waxy appendages in the juvenal plumage of 326 Cedar Waxwings banded at Vischer Ferry, New York during August to October indicates that about 95 percent of the population lacks these appendages. In cases where 95-percent reliability is acceptable, the lack of these appendages may be used to denote HY birds in November and December, and SY birds in January to August, as pointed out by Wood (1969) and Chapman (1966). Examination of a lesser series of 52 birds at AMNH indicated about 91-percent reliability.

2. Among a limited AMNH series of birds in juvenal plumage, males and females display comparable distribution of waxy appendages on the wing. Based on a more extensive series of birds in postjuvenal plumage, slightly more females than males (about 60 vs. 52 percent) have no wax, and slightly more males than females (about 15 vs. 5 percent) have eight or nine appendages on the wing. Otherwise the distribution is comparable in both sexes, and wax distribution is not useful as a sexing criterion, as per Roberts (1955).

3. Despite the indication by Forbush (1929) that the adult plumages of the two sexes are alike, or by Chapman (1966) that adults have black chins, the examination of chin-throat coloration of 275 unstreaked specimens at AMNH indicates that black chin-throat coloration is about 91-percent reliable in segregating males, as pointed out by Wood (1969). However, based on the same series of skins, Wood's criterion of using brownish throat coloration as a means of segregating females is about 76-percent reliable.

4. Among waxwings in postjuvenal plumage, the percentage possessing seven-nine appendages declines steadily from a maximum of about 42 percent in the immediate post-molt period (Oct.-Dec.) to about 21 percent in the immediate pre-molt period (July-Sept.). At the same time, the percentage of birds possessing one-six appendages remains essentially constant at about 12-16 percent. The data seem to rule out appendage loss as an explanation for this decline. Alternately, mortality may account for this decline.

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LITERATURE CITED

- ARVEY, M. D. 1951. Phylogeny of the Waxwings and Allied Birds. *Univ. Kansas Pubs., Mus. Nat. Hist.* **3**: 473-530.
- CHAPMAN, F. M. 1966. *Handbook of Birds of Eastern North America*. Dover Publications, Inc., New York. 581 pp.
- FARLEY, J. A. 1924. Abnormal Cedar Waxwing. *Auk* **41**: 160.
- FORBUSH, E. H. 1929. *Birds of Mass. and Other New England States*. Norwood Press. Norwood, Mass. Vol. III, 465 pp.
- MYERS, M. L. & J. 1967. Quantitative Notes on the Variation of Wax on Cedar Waxwings (*Bombycilla Cedrorum*). *Kansas Orn. Soc. Bull.* **18**: 1.
- ROBERTS, T. S. 1955. *Manual for the Identification of the Birds of Minn. and Neighboring States*. The Univ. of Minn. Press. Minneapolis, Minn. 738 pp.
- WOOD, M. 1969. *A Bird-Bander's Guide to Determination of Age and Sex of Selected Species*. The Penn. State Univ., University Park, Pa. 181 pp.

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