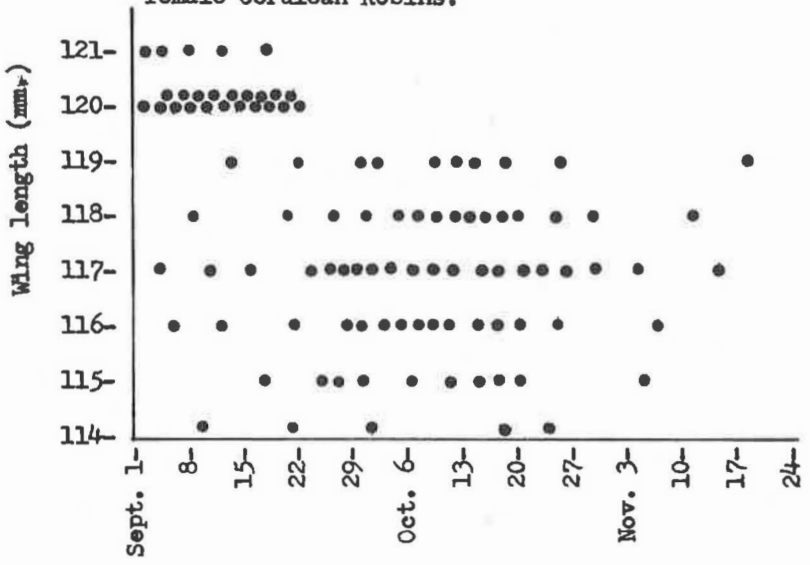
Figure 3. Scatter diagram of wing lengths and dates of capture of 100 female Cerulean Robins.



THE PINE SISKIN WING STRIPE AND ITS RELATION TO AGE AND SEX

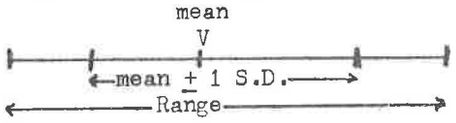
By Robert P. Yunick

The Pine Siskin (Spinus pinus) invasion of 1964 was my first encounter with this species in the hand. Early in the encounter, the differences in the amount of intensity of yellow in the wing stripe sent me to the literature to determine what significance, if any, these criteria contributed toward determining age and sex. Texts like Forbush (sexes alike or similar, female smaller than male), Roberts (yellow on wings and tail of female is restricted) and Chapman (no comment on age and sex difference) provided insufficient information, so I sought the answer from inspection of the skin collection at the American Museum of Natural History (AMNH) in New York in June 1964. Because I was not able to examine the wing stripe of the specimens without risking undue damage to the skins, I was not able to compare wing stripe characteristics and wing chord data of these specimens of known sex with similar data gathered from birds I had banded during the previous winter. However, a comparison of data I did have gave an indication of an indirect relationship between wing stripe characteristics and age and sex.

In 1966, my traps were again visited by these tame mites of the north woods and more data were gathered. The data were still not conclusive, so another invasion was awaited.

Since 1966 siskins have continued to invade the area in their erratic fashion, but they have not appeared at my feeder in number. Elinor McEntee's summation of her observations of this species(EBBA News 33: 100-101) prompted me to review my 1964 and 1966 banding data and the museum measurements, and compare these to her data. My purpose for doing this and presenting these results here is not to pretend to provide a final answer to the question, for I admit I do not have one, rather to provide additional data, stimulate some discussion of the matter and perhaps interest some student, or a bander with access to a breeding population of Pine Siskins, to examine the problem and provide the answer for banders as to whether the wing stripe has significance as an aging and sexing criterion.

As did Mrs. McEntee, I measured wing chords and kept track of the intensity and extent of yellow in the wing; and segregated birds into four groups according to broad and narrow wing stripe and bright and dull yellow. In 1964 I banded 134 siskins in my yard between February 1 and April 19. Of these 134, I classified 129 wing stripes and measured 118 wing chords. In 1966, I banded 63, classified 61 and measured 61. I calculated the means and standard deviations for the four groups and have presented these in Figure Ia along with a similar analysis of Mrs. McEntee's data using her "Group A, B, C and D" designations with slight modification (Her "A", extensive bright yellow, is my broad bright yellow; "B", limited bright yellow, is narrow bright yellow; "C", extensive pale yellow, is broad pale yellow; "D", limited pale yellow, is narrow pale yellow). The following is the method of presenting the data in Figure I:



Included in Fig. Ib are wing chord data from 284 specimens measured at AMNH. These data were segregated at the time of collection into sex(male or female), age (Adult or immature) and time of collection (month of the year). In addition, Mrs. McEntee's and my own data are gathered into four other categories for two additional comparisons: namely, 1) the wing chords of all birds with broad stripes (bright and pale) have been compared to those of birds with narrow stripes (bright and pale) (Figures Ic and Id); and 2) the wing chords of all birds with bright yellow (broad and narrow) have been compared to those of birds with dull yellow (broad and narrow) (Figures Ic and Id).

Comparison of Wing Chord Length vs. Wing Stripe Color and Width

Both Mrs. McEntee's and my own data show the same trend in change of wing chord length between the four classified wing stripe groups (Fig. Ia). My measurements are consistently longer than Mrs. McEntee's and probably reflect the difference in each of our methods of measuring the wing chord. These differences range from 0.4 to 1.3 mm., on the average. Beside noting that the wing chord increases from Group D to A, it is significant that there is such a large degree of overlap in these data.

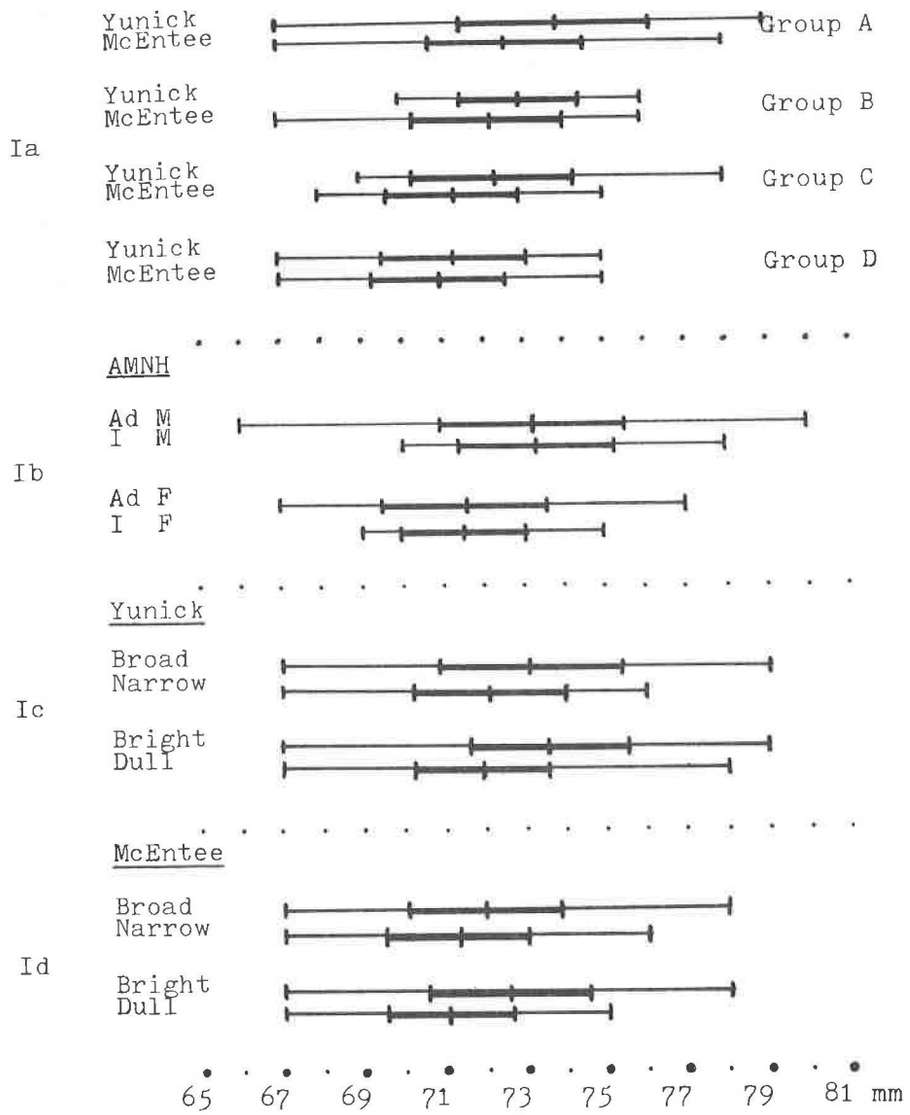
In figures Ic and Id where the banding data are collected into groups of broad vs. narrow and bright vs. dull, the intention was to determine how these data relate to those on birds of known age and sex. In this comparison, my data (Fig. Ic) are again consistently longer (0.9 to 1.2 mm.) than Mrs. McEntee's (Fig. Id), and again the trends are identical. The wing chords of birds with broad wing stripes are about 1 mm. longer than those of birds with narrow wing stripes, whereas the wing chords of birds with bright yellow stripes are about 1.5 mm. longer than those with dull yellow wing stripes. The discussion of these results in comparison with birds of known age and sex is given later.

Comparison of Museum Data on Birds of Known Age and Sex

These data, presented in Figure Ib, indicate the following significant things. The wing chord lengths of all four age-sex groups show substantial overlap. Wing chords of males are longer than wing chords of females. Within each sex there is essentially no difference between the mean values of hatch year (HY and immature are used interchangeably) and after hatch year wing chord lengths (AHY and adult are used interchangeably).

Not shown in the figure is a comparison wherein wing chord lengths of AHY males collected in the period January to May were compared to those of AHY M's collected in the period June to December. The same comparison were made for AHY F's. This was done to determine whether there was any reason to limit the comparison of HY data and AHY data to the same time period, i.e. June-December, on the basis that after December 31, HY's become AHY's and may bias the January-May data.

There was no significant difference between AHY M's during January-May (68 birds averaging 73.1 mm.) and June-December (98 birds averaging 73.3 mm.) nor AHY F's during January-May (57 birds averaging 71.4 mm.) and June-December



Pine Siskin Wing Chord
Figure I

(70 birds averaging 71.7 mm.). Therefore, the data in Fig. Ib represent 12- month composites.

Comparison of Museum Data with Banding Data

Since males' wing chords are longer than females', it would seem appropriate to call Group A male and Group D female. Assigning groups B and C is not as clearly defined, If brightness of the wing stripe takes precedent as a sex-determining characteristic (bright is male, dull is female), one would expect stripe width to donate age. In such a case it is most likely that a narrow stripe denotes a first winter bird, or since we are considering birds past January 1, a second year (SY) bird. The birds with broad stripes would be ASY. Thus group A,would be ASY-M, group B would be SY-M, group C would be ASY-F and group D would be SY-F.

However, one possibility must be considered. If stripe width, and not color intensity, takes precedent as a sex determining characteristic per Roberts, (broad is male, narrow is female), and color intensity denotes age, it would follow that Group A is ASY-M, group B is ASY-F, group C is SY-M and Group D is SY-F.

The data appear to support the first alternative, i.e. stripe brightness is a sex determining characteristic, for the following reason. The museum data show no appreciable difference in wing chord means of AHY vs. HY males, or AHY vs. HY females. The closest analogy results from the grouping of group A with B and group C with D. Therefore, group A and B would denote the male population (bright yellow wing stripe) by virtue of the close proximity of the mean wing chord measurement of these two groups; and similarly, group C and D would denote the female population (dull yellow wing stripe).

The alternate possibility of a broad wing stripe (group A and C) denoting the male population and a narrow wing stripe (group B and D) denoting the female population is less acceptable due to the greater difference in the mean wing chord values of A vs. C and B vs D.

It is interesting that the museum data should show a discrete difference between the two sexes and a marked similarity of the two age groups within either sex, whereas the banding data show a uniform, sequential icrease from group D to A. Mrs. McEntee's data show more of a resemblance to the museum data than do my own data.

I believe that the reason for the sequential increase in wing chord length is due to an inadequacy of the eye, or the manner in which the data were collected. Wing stripe was judged by visual inspection. During the 1964 invasion, repeat captures were few and it was not possible to check the accuracy of these determinations. However, in 1966 many repeat cap-

tures were made and it became apparent that some birds judged to have a broad wing stripe on one capture were judged to have a narrow wing stripe, or vice versa, on the second capture. At that point I began to measure stripe widths after first judging whether the stripe was "broad" or "narrow" by inspection. Measurements were made, with dividers, of the distance between the base of the stripe and the edge of the greater covert covering the stripe at the point of meeting of the primaries and secondaries. The results are given below in Table I.

Table I

Measurement of "Broad" and "Narrow" Wing Stripes

Stripe width, mm.	No. birds judged to be "Broad"	"Narrow"
0		1
1		3
2		5
3	2	6
4	3	
5	4	
6	4	
7	3	
8	1	
9	1	
10	1	
11		
12		
13	1	

These results show some overlap, or error in judgement, because birds with three-mm. wide stripes in this limited series were judged to be both "broad" and "narrow". In no case was there any conflict in judging a bright or pale wing stripe on recapture.

When the opportunity arises, more data will be gathered and at that time all wing stripe widths will be measured. With sufficient data, a representative plot of wing chord length vs. measured wing stripe width may be instructive.

So far, the data presented are consistent with Forbush's statement on the size of the female and Mrs. McEntee's conclusions, but contradict Roberts' statement about the yellow being restricted in the female, The data that follow on sex ratio contradict these data and support Roberts.

Comparison of Sex Ratio

The sex ratios of the AMNH birds were determined and compared to some of Mrs. McEntee's and my own data. This was done on the assumption that the museum data are random and reflect the population in general. The museum data are given in Table II, and the banding data are given in Table III.

Table II

	AMNH - Sex ratio	
Age	Male, percent	Female, percent
Adult	56.7	43.3
Immature	54.5	45.5

Table II shows that males outnumbered females by about 55/45 and the two age classes show very similar distributions with the immature population only very slightly richer in females than the adult population.

Table III

	Wing stripe ratio from banding data	
Comparison	Yunick's data, percent	McEntee's data, percent
Bright	46.6	47.8
vs.		
Dull	53.4	52.2
Broad	56.8	55.4
vs.		
Narrow	43.2	44.6

In Table III, a similar approximately 55/45 distribution is found when the number of birds with broad wing stripes is compared to the number with narrow wing stripes. This suggests, contrary to the previous data, though in agreement with Roberts, that stripe width may denote sex (males are broad, females are narrow), and intensity may denote age (bright is ASY, dull is SY).

From this it is apparent that a more intensive study is needed to ascertain the utility of the wing stripe characteristics as aging-sexing criteria.

Conclusions

An attempt to relate wing chord length and wing stripe characteristics of the Pine Siskin to an aging-sexing scheme gave contradictory results. A comparison of wing chord lengths of birds with bright or dull, broad or narrow wing stripes with the wing chord lengths of birds of known sex at the American Museum of Natural History indicated that wing stripe width may be an aging criterion and stripe brightness may be a sexing criterion.

A comparison of the sex ratio of the museum specimens with the distribution of wing stripe types indicated that stripe width may be a sexing criterion and stripe brightness may be an aging criterion. Examination of a breeding population would help to resolve this matter.

Acknowledgement

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BOOKS for BANDERS

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SINCE SILENT SPRING by Frank Graham, Jr. (Field Editor of Audubon Magazine) Houghton-Mifflin Co. 1970. 333 pages. $6.95.

Eight years ago Rachel Carson's "Silent Spring" was published. It aroused bitter antagonism and drastic criticism from many; while confirming the opinions of thoughtful, and alerting others to threatening dangers. Recently published is this book of Graham's.

The author reviews the effect the Carson book had, both initially and more recently. Then he surveys the situation regarding insecticides and pollution during the past eight years. Bird Banders are presumably and intelligently aware of the situation in general, but many of us can well afford further education in particulars. In considering the book, there is a temptation to quote page after page because of the importance packed into every paragraph. In selecting details for mention,