Another aspect of the coloration of adult females is, at least qualitatively, different from that of first winter birds. This is the occurrence of yellowish and occasionally orange in the plumage. It is less common than redness. The percentages in order of increasing number of molts are: 24, 40, 25, 50, and 0. The over-all percentage is 31. The average number of areas per bird is 1 2/3. Only four areas are so far recorded, with percentage frequencies, as follows: throat 47, rump 26, crown 21, and face 10. These percentages are necessarily rather approximate since a total of only 19 areas is involved. Either reddish, yellowish, or both is exhibited by 29 birds and of these only four show both reddish and yellowish.

For the moment we will take both yellow and red carotenoid colors together and note that they occur in about 67 percent of presumed adult females and, further, that the percentage is about 90 in birds with three ascertained molts and 100 in those with more than three molts.

While it is obvious that the difference between yellow and red requires investigation, it is almost certain that the facts will be forthcoming only from experimental work. At least two situations are possible; first, that red and yellow represent two different concentrations of the same pigment or pigments, and second, that the two colors arise from chemically different pigments. Chemical analysis will be required to distinguish these alternatives.

At present I can only conclude that females vary with age in two main directions. A rather high proportion tends to assume male characters. A much smaller fraction develops yellow carotenoid coloring at least as scattered feathers. Finally, a very few birds show an over-all yellowing that seems distinct from any variation known in males (Blake 1955, p. 99, 107).

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Museum of Comparative Zoology, Cambridge, Mass.

NOTES ON JUVENAL PURPLE FINCHES

By CHARLES H. BLAKE

It will have been apparent from my previous papers that the banding station of Mr. and Mrs. Parker C. Reed in Lexington, Mass., is noteworthy for the number of Eastern Purple Finches *(Carpodacus p. purpureus)* banded there. What follows are the first results from a study of 343 birds which could be safely diagnosed as birds of the year during the summer of 1954. The bandings cover the period from 17 July to 24 October. The one juvenal banded on the last date was taken each week through 13 November. It is perhaps quite as remarkable that young birds should have been present for four months as that a few individuals remained for two months or more.

It is obvious that a great debt is owed the Reeds for the time and effort that has gone into the accumulation of this data. I can only hope that my analyses prove worthy of the material.

GAPE COLOR

This large sample has made possible a more detailed study of gape color than I could do earlier. (Compare Blake 1954 b). The chronological results are given in Table I, stated as percentages, except the last column which gives a rank number counting red as 1 and dull yellow as 6.

TABLE I. *Chronological summary of juvenal gape color.*

	No. observations	Red	Red-orange	Orange	Orange-yellow	Yellow	Dull yellow	Aver. gape color
July	35	3		31	11	31	23	4.4
Aug.	316	1	5	13	9	54	18	4.6
Sept.	294		1	5	10	75	9	4.8
Oct.	80		1	4	14	32	49	5.2
Nov.	3						+	6.0
Apr.	3					+		5.0
May	7					+	+	5.1
June	6					+		5.0
July	5		+			+		3.8

The table allows us to conclude only that the gape color becomes progressively more yellow through the late summer and fall. Differences from the generality of brown birds (Blake loc. cit., Table I) do not seem significant but the juvenals are clearly yellower than any known males during July to November. In the following spring and early summer they closely resemble known males.

Other comparisons appear more informative. One of these is with stage of molt (see below). There is a hint from Table II that the gape is reddest at the inception of molt and about the same color as in July and August. This is partly because molt begins in late July or in August in most of these birds. It is quite possible that the color is redder before and yellower after the molt stages here tabulated. Information on the gape color before attainment of independence is an obvious desideratum.

TABLE II. *Gape color related to stage of molt (percentages).*

	No. of observations	Red	Red-orange	Orange	Orange-yellow	Yellow	Dull yellow	Aver. color
2 weeks before molt	14	7		14	7	50	21	4.5
1 week before molt	39		5	13	8	57	15	4.5
Stage 1	91	1	5	10	7	65	23	4.6
Stage 2	65		2	12	9	66	11	4.7
Stage 3	49		4	10	16	59	10	4.6
1 week after stage 3	42			10	12	71	7	4.8

TABLE III. *Comparison of gape color in pink and non-pink birds.*

	No. observations	Red	Red-orange	Orange	Orange-yellow	Yellow	Dull yellow	Aver. color
Non-pink	90		2	11	8	64	14	4.8
Pink	64	3	12	20	19	42	3	3.9

I have already called attention (Blake 1954 a, b, 1955) to the fact that some individuals become ruddy or pinkish at the postjuvenal molt and that such are males as far as known. This plumage type cannot be identified until the bird is quite well along in postjuvenal molt (stage 3 or later). I compare in Table III the data for pink and non-pink birds without regard to date or molt stage. The difference in average color is probably real. We may also tabulate average color for a given stage of molt, as is done in Table IV. It is clear that the pinkish birds are consistently redder than the non-pink ones.

TABLE IV. *Relation between stage of molt and gape color in pink and non-pink birds.*

	Pink birds		Non-pink birds	
Stage of molt	No.	Aver. color	No.	Aver. color
Just before molt	4	3.5	9	4.5
Stage 1	9	3.9	18	4.4
Stage 2	13	4.1	20	4.7
Stage 3	21	3.5	23	5.0
Just after stage 3	17	4.0	20	5.0

For a few birds it was possible to tabulate gape color in relation to the week in which it was reddest. This was done only in cases in which redness increased and then decreased. This tabulation ignores the possibility, suggested by Tables II and IV that the gape color may be reddest before the birds actually come to the traps. If this be so then Table IV relates only to a second reddening. A further indication of an early occurrence of considerable amounts of available carotenoids is given by the presence of pink edges to the quill feathers in some individuals. The information on change of color shown in Table V is unsatisfactory in at least two respects. First, no data are available for the week before maximum redness. I estimate the average at this time to be 3.5. Second, the table ignores the birds which do not show a detectable maximum. The inclusion of such birds would greatly decrease the amplitude in the average column.

TABLE V. *Gape color related to maximum redness.*

Time	No.	Aver. color
3 weeks before	3	4.7
2 weeks before	5	4.0
1 week before	—	—
Week of maximum redness	8	2.4
1 week later	7	4.0
2 weeks later	4	4.5

TABLE VI. *Comparison of under tail covert streaking.*

	Aver. no. of streaks	Percentage of birds showing streaks
Juvenal	5.0	87
First winter	0.7	27

UNDER TAIL COVERTS

Dark streaking of the under tail coverts has been referred to at least twice (Ridgway 1901, Blake 1955), but on different bases. Ridgway mentioned streaking of the longer coverts while my data are based on counts of streaks on all covert feathers. There is no doubt that streaks are more frequent on the short, anterior feathers than elsewhere. Two samples have been drawn from the population. The first is 22 birds in which it seemed reasonable to conclude that the notes gave the number of streaks for the first winter plumage as well as for the juvenal plumage. The two plumages are evidently different as shown in Table VI.

A second sample of 100 birds in juvenal plumage shows 85 percent with streaks and 6.2 streaks per bird on the average.

WING LENGTH

The wing length (chord) of practically all individuals was taken routinely each week. The results are shown in Table VII for the whole series and for three subsamples. For comparison I add a sample of presumed mature females and one of immature, pinkish males. The latter is taken from Blake (1954 a) and is independent of the present juvenal sample.

It is clear that first winter birds do not differ from immature males nor from adult females. This does not mean that individual females do not increase their wing length at the first postnuptial molt or at later molts but any such change can only be shown by correlation for which no data are yet available.

A more important result of these measurements is the opportunity to examine their accuracy. Thirty-two birds yielded series of five or more independent wing measurements. The range within each series varies from zero to three millimeters but is not greater than one millimeter in 26 (= 81 percent) series. The mean range is 1.1 millimeters. Thus the measurements tend to reflect the accuracy with which the scale is read and are not subject, on the whole, to variation due to placement or flattening of the wing.

TABLE VII. *Number, mean, standard deviation, and range of wing lengths (mm.).*

Sample	No.	Mean	Standard deviation	Range
Up to 12 Sept. '54	209	79.7	1.7	76-83
12-19 Sept.	106	80.0	2.1	75-85
21 Sept. and later	28	78.9	2.1	75-83
Total juvenals, '54	343	79.7	1.9	75-85
Adult females	21	80.1	1.5	77-83
Immature males	31	79.8	2.2	76-85

The average of the deviations of individual measurements from their mean, taken separately for each bird, varies from 0.0 to 0.9 mm., and the over-all average of these averages is 0.40 mm. Since this over-all average is less than half the average range, we see that the discrepant measurements are a minority of the measurements in the usual series.

The standard deviation of each series was also calculated. It varies from 0.0 to 1.1 mm. By averaging the corresponding variances we find a mean standard deviation of 0.54 mm. From this mean standard deviation we conclude that 67 percent of the measurements on a single bird will lie within a span of 1.08 mm., or, for practical purposes, within the accuracy of the scale reading, which was to the nearest millimeter.

A final point of interest is that the sample gives no evidence of any growth of the primaries after the birds began to come to the traps nor any evidence of shortening due to wear during their summer and autumn stay.

RUDDY OR PINKISH BIRDS

I have already pointed out that some males are more or less pinkish in first winter plumage. Two different aspects of this redness may be studied in the present series of birds.

First, the margins of the outer vanes of the wing and tail quills may be pinkish instead of olive. Out of the 343 birds, 3.5 percent are so recorded. In nearly half of these birds some quills have olive or buffy edges. One or two outer tail feathers were plucked from a considerable number of birds. Ten such individuals repeated with the replacement quills sufficiently grown to reveal the margin color. One of these birds displayed pinkish. Considering the sample sizes I see no reason to suppose that 10 percent is significantly larger than 3.5 percent. Of the birds with pinkish quill margins only two also showed some pinkish or ruddy tint in the body plumage. It is not really surprising that the number should be so small. In the first place the quills are fully developed before the onset of postjuvenal molt. Carotenoids available at the time of quill growth may not be available later or vice versa. The time difference is probably a minimum of three weeks and often more. A consideration of Table VIII will show that the proportion of pinkish quill margins displayed by ruddy and non-ruddy birds can not be taken as different from the proportion in the whole population. So far as we can go at present, pinkish quill margins and pinkish or ruddy tints elsewhere in the plumage are acquired independently.

Our second point is the presence of ruddy or pinkish tints in parts of the plumage other than wing or tail quills. Such coloring

TABLE VIII. *Percentages of ruddy or pinkish color.*

Character	Whole series	Ruddy	Non-ruddy
Pinkish quill margins	3.5	6.	3.
Same and/or ruddy	12.5		
Ruddy body color	9.6		

TABLE IX. *Number of cases of reddening of the cited areas.*

Rump	24
Crown	11
Back	10
Throat	10
Greater secondary coverts	7
Breast	7
Face and/or ears	6
Lesser wing coverts	4
Upper tail coverts	3
Humerals	1
Middle secondary coverts	1

varies in intensity from a very faint tinting to color approaching that of the adult male. Its area may be very restricted or may extend to practically all the regions which are red or rosy in the fully colored male. The occurrence of such reddened areas is shown in Table IX. The average bird has 2½ ruddy areas. On the whole the reddest areas in the adult male are most frequently ruddy or pinkish in first winter birds. In this series only one bird showed reddening of all the red areas of the adult male.

It is probable that additional birds developed redness after they passed out of the available population. These would be birds that were not seen in stage 3 of the postjuvenal molt or later. In general it is not until about stage 3 that enough first winter feathers are developed in appropriate places to judge whether the bird will show reddening.

Since this red color is largely confined to the margins of the feathers bearing it, it may be abraded away after a few months. We handled in early May 1955 a bird which was recorded the previous fall as showing a trace of ruddy in the rump; this had already been lost. The completion of molt in the same bird had brought to view ruddy areas not visible the previous fall when it was last seen just after stage 3 of molt.

As far as is now known these birds are males. If this be true of all of them, then they still are only about 23 percent of the males in the population of first winter birds.

Another estimate may be made from the fraction of birds handled in or after stage 3 of molt that showed reddening. The figure is 26 percent or about half the probable males in this population. The difference in estimates is reasonable in view of the discussion above.

THE BANDED POPULATION

The period of study extended from the week of 14 July to the week of 9 November, 1954. For the major part of this period usable results on population turnover and other matters may be obtained. All the figures have been placed on a weekly basis and referred to the first day of the week. For methods see Blake (1953). The figures for the population as a whole are shown in Table X.

We must allow for the fact that this table is distorted at both ends but in somewhat different ways. The only ascertained juvenals, banded before 7 August were those recaptured the week of 4 August

or later. In the later part of the table any birds already in first winter plumage at banding would be missing. The effect is to omit from both ends of the table birds whose stay was short.

The population shows two peaks, one early in August and the other nearly six weeks later, the middle of September. Both of these peaks seem mainly to come from a large influx of new birds. It will be seen later that there is evidence for the appearance of a new population on 12 September and later.

A special study was made of those individuals whose stay was three weeks or longer. This length of stay was chosen rather arbitrarily. The mean stay of the 306 birds banded during the weeks of 4 August to 29 September was 1.1 weeks. The main items of information on long stay birds are gathered in Table XI.

This table is also distorted at the beginning for the same reason as noted for Table X. We see that the population, banded and present, shows a single peak a week later than the first peak of the whole population. The mean stay of these long stay birds is 4.2 weeks or nearly four times as long as the stay of the average bird.

RETURNS

Although only a small part of the subsequent history of these birds is available now (August 1955), that small part is not without interest. Returns began on 10 April 1955 with one bird and 14 have so far shown up. All of these birds were banded between 17 July and 14 August. Proportionately this is 4.1 percent of the whole banded population or 12.0 percent of the birds banded through 14 August.

When we look at the individual histories we find that 11 of these returns were long stay birds, that is 23 percent of the birds have supplied 79 percent of the returns. In contrast to the figures given above, 14.1 percent of the long stay birds have returned or 22.5 percent of those banded through 14 August. On the other hand, the short stay birds showed a return rate of 1.1 percent, or considering only those banded through 14 August, a rate of 4.4 percent.

The conclusions that may now be drawn are that, first, long stay birds tended to form some sort of attachment to the banding station which led them to visit it again, even if briefly. Second, the birds banded earlier in the season were probably raised nearer the station than the later birds and returned to its general vicinity to breed.

One bird, 55-02491, reappeared on 1 May 1955 and was not taken again until 7 August. With three exceptions returned birds were trapped only on a single week end each. The birds that repeated stayed 9, 11, and 13 weeks respectively.

Only one bird was recovered away from Lexington. This was the last one banded and was present from 24 October to 13 November and was trapped by Mr. Charles J. Paine in Weston, Mass., on 10 December. Practically all Purple Finches left Lexington by mid-November.

While there is no evidence of loss of wing length during the summer and fall, a just measurable amount of abrasion was found during the spring. Counting by months from the date of banding, little or no

TABLE X. *Population, turnover, and mean stay.*

Week	Banded birds present	New bandings	Arrival ratio, %	Departure ratio, %	Turnover ratio	Turnover time, weeks	Mean stay of new birds, weeks
14 July	9	9	100	0	50	2.0	4.9
21 "	30	21	70	0	35	2.9	3.3
28 "	30	0	0	0	0	—	—
4 Aug.	97	67	69	30	49	2.0	2.0
11 "	91	24	26	42	34	2.9	1.7
18 "	83	28	34	37	35	2.9	1.0
25 "	72	20	27	35	31	3.2	0.8
1 Sept.	83	37	45	49	47	2.1	0.4
8 "	84	51	61	60	60	1.7	1.0
15 "	90	57	63	54	58	1.7	0.8
22 "	52	11	21	46	33	3.0	0.8
29 "	37	11	30	40	35	2.9	1.4
6 Oct.	26	2	8	62	35	2.9	0.0
13 "	10	0	0	50	25	4.0	0.0
20 "	6	1	17	50	33	3.0	4.0
27 "	3	0	0	33	16	6.1	0.0
2 Nov.	2	0	0	50	25	4.0	0.0
9 "	1	0	0	100	50	2.0	0.0

TABLE XI. *Data on long stay birds*

Week of banding	*Length of stay, weeks* 3	4	5	6	7	8	9	10	*Population* Banded & present	Per cent of total population present	Per cent of all long stay birds	*Bandings* Total bandings	Per cent of all weeks bandings	Per cent of all long stay birds	*Departures* Departures	Per cent of all weeks departures	Per cent of all long stay birds
14 July	1	3	3	1		1			9	100	9	9	100	11			
21 "	8	1		1	1			1	21	70	27	12	57	15			
28 "									21	70	27	0	—	0			
4 Aug.	5	9	1	4	1	2			43	44	55	22	33	28	1	3	1
11 "	4	2		1					49	53	63	7	29	9	9	24	9
18 "	4								44	53	57	4	14	5	4	13	5
25 "	1				1				42	58	54	2	10	3	8	32	10
1 Sept.	1								35	42	45	1	3	1	14	34	18
8 "	1	5	2						29	35	37	8	16	10	8	16	10
15 "	5	1	1						28	31	36	7	12	9	5	10	6
22 "	1	1							25	48	32	2	18	3	3	12	4
29 "	1	1	1						25	68	32	3	27	4	4	27	5
6 Oct.									21	81	27	0	0	0	11	69	14
13 "									10	100	13	0	0	0	5	100	6
20 "	1								6	100	8	1	100	1	3	100	4
27 "									3	100	4				1	100	1
2 Nov.									2	100	2				1	100	1
9 "									1	100	1				1	100	1
Totals	33	23	8	7	3	3	0	1									

loss occurs for eight months, about half a millimeter in 9 or 10 months, and about two-thirds of a millimeter in 11 months. We suggest a pattern of abrasion in which no measurable loss occurs until the primaries are about 9 months old. It then proceeds at an increasing rate until the feathers are dropped when they are some 12 to 13 months old.

POSTJUVENAL MOLT

I cannot yet give a complete account of the postjuvenal molt, but the earlier stages, which have already been referred to, are fairly readily defined. These stages are, of course, arbitrary divisions of a continuous process and are separated from each other in time by about a week.

Stage 1—Molt in one or more of the following areas: breast, lesser wing coverts, shoulders; and no other areas. This stage occurs within a week of the inception of molt.

Stage 2—Molt continuing in the regions listed for stage 1 and, in addition, in back or rump, or, frequently, crown and rump; rarely in other areas.

Stage 3—Molt in breast, crown, and rump, frequently in throat, shoulders back, tail coverts, and, less commonly, in other areas.

No clear evidence of the duration of postjuvenal molt was obtained but I suspect it will be found to be between eight and 10 weeks.

One special point should be noted. In 22 birds it was possible to determine the relation between the molt of the middle and greater secondary coverts. In 86 percent of the birds the beginning of molt in the greater coverts preceded that in the middle coverts.

At this point it is proper to advert to the birds banded on 12 and 18 September. It was apparent on handling the newly banded birds on 12 September that they were not as far along in molt as the repeating previously banded birds. For 30 repeating birds and 49 new banded birds an estimate was made of the stage of molt expressed simply as weeks before or after inception of molt. The results appear in Table XII. The average situation is 3½ weeks after for the repeaters and 1½ weeks after for the new birds.

The week of inception of molt was estimated for 138 birds banded before 12 September and for 81 birds banded on 12 and 18 September and expressed in percentages as shown in Table XIII. The average date for the birds banded before 12 September is about 17 August

TABLE XII. *Weeks of molt as of 12 September.*

Weeks	Birds previously banded	Birds banded on 12 Sept.
0		8
1	3	19
2	5	13
3	5	6
4	8	3
5	6	
6	2	
7	1	

TABLE XIII. *Inception of molt.*

Week of	Per cent of whole series	Per cent of birds banded before 12 Sept.	Per cent of birds banded 12, 18 Sept.
14 July	½	1	
21 "	½	1	
28 "	7	11	
4 Aug.	12	19	
11 "	10	17	
18 "	13	24	
25 "	12	15	6
1 Sept.	19	12	32
8 "	15	1	40
15 "	8		21
22 "	½		1

and for the later series about 10 September, a difference of 3½ weeks.

It may be objected that any arbitrary division of the whole series would yield a table resembling Table XIII. It is quite true that a certain resemblance would be expected. If we make a similar comparison of birds banded before 18 August and those banded from 18 August up to but not including 12 September, we find the difference in average inception of molt to be two weeks. The overlap of the two sets of birds is about five weeks instead of the three weeks shown in Table XIII.

What all this appears to mean is that the juvenals are, in general, pretty much of an age when first trapped, so later arrivals begin molt later in time. To this general statement there seem to have been two exceptions: (1) the earliest birds banded arrived from nearby as relatively younger birds than the later arrivals and (2) the September birds discussed above arrived from some area different from the source of most of the population, moved rapidly, and so first appeared also as relatively young birds.

SUMMARY

In discussing the juvenal Purple Finches banded at Lexington, Mass., in the summer and fall of 1954, we have shown gape color to become gradually yellower.

The juvenal plumage has more thickly streaked under tail coverts in a much larger fraction of the birds than does the first winter plumage.

Wing length is the same as in brown birds generally or in adult females. Wear is not appreciable until the primaries are about 9 months old.

Some 3½ percent of the birds show pinkish edges to the quill vanes in the first winter plumage and about 11½ percent show some pink in this plumage. This tinting is independently acquired in the quill feathers and in the contour feathers.

The banded population showed definite peaks. The maximum turnover was in the first half of September. The birds which stayed three weeks or longer showed one, relatively early peak of numbers present. These long stay birds produced the great bulk of the returns.

All returns in the spring and summer of 1955 came from birds banded not later than 14 August.

Three early stages of postjuvenal molt are described. Differences in time of molt in parts of the population are discussed.

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Museum of Comparative Zoology, Cambridge, Mass.

GENERAL NOTES

Observations on a Wintering Flicker.—A male Flicker *(Colaptes auratus)* that I first saw December 30, 1953, at my feeding shelf in Baltimore, and color-banded there 9 days later, was present in a rather wide area about my home through April 10, 1954. His disappearance coincided with an influx of the species on the night of April 10-11; that was the main arrival of the year in the neighborhood, where the Flicker is normally a summer resident; the very first new bird had been present March 7-18 and I had seen 2 or 3 passing singles after that. On July 15-16 the color-banded male was back on his wintering ground, feeding two partly independent juveniles. Again October 12-14 he reappeared; on October 14 a female was with him during the few minutes he was seen. He did not return in 1955.

Winter range. During his winter stay I found this bird chiefly—that is, frequently—within an area half a mile long and a fifth of a mile wide; occasionally the width of his range was extended to a third of a mile. There were times when I could not find him and he may have been outside those boundaries. There was a large wood at one end of the area and a very small one near the other end; a good part of the intervening and surrounding residential territory was fairly well wooded.

Although my complete record of the bird suggests that he nested somewhere in my region, I am confident that he did not do so within the range just described, for I searched there—and also well beyond, on all sides—many times during the summer, and scanned for bands the great majority of all Flickers encountered, without finding him. Also, the part of the range in which he made his July and October reappearances was occupied during the summer by an unbanded male.

First singing, drumming. As far as I could observe, the wintering male came into song on February 22, and began to drum on February 25; the migrant male that was present March 7-18 sang on some days from March 10 on. My records for 15 previous years show no Flicker song before March 10 except once on February 27 by an isolated passing bird, and once on March 5 by an early arrival. My previous earliest date for drumming was March 18.

Hole-digging. On February 25 I found the Flicker digging a hole 43 feet up in the dead top of a tree; the hole at that time ran in horizontally about 1½ inches. On several more days through April 1 I saw him work there; by that time he had begun to dig downward. That was the last digging I saw him do.

Both during that period and later, this hole was a tremendous attraction to other woodpeckers—permanent residents, migrants and summer residents alike. On February 25 a color-banded resident female Downy Woodpecker *(Dendrocopos pubescens)* went within a few feet of it while the Flicker was digging, and her unbanded mate examined it during an absence of the Flicker.