

returns from birds shot by hunters (two-season total of 0.9 per cent compared to Lincoln's 12 per cent first-season expectation for wild birds) does not indicate that very many have fully reverted to the wild state. It is significant to note that despite the immaturity of these birds at banding, three quarters were known to have attained December size.

One reasonable supposition is, if the records of the missing birds have not been terminated by death, that at least some of them have migrated only to establish themselves *en route* on refuges on which they have found things to their liking. The corn and open water of city parks, game-farm wintering pens, private as well as public refuges, great and small, all on occasion have proved attractive enough to draw and hold stragglers from the outside, many of which have been distinctly tame from the time that they have come in. The observed reaction of more or less tame Mallards to steady feeding and their ultimate degeneration into "barnyard puddle ducks" surely support Lincoln's suggestion that some may be "merely leading lives of indolence in the marshes." It is doubtful that these birds would be able to live sedentary lives in North Central States marshes without winter feeding by man.

The authors, however, consider most plausible Lincoln's alternative suggestion to the effect that the missing birds may no longer exist. One would think that the tameness of the birds which would tend to lead them to man-supplied corn in refuges would also tend to lead them within shotgun range to some extent. But we have to confront us always the exceedingly low rate of banding returns. Indeed, whatever else the data may or may not show, one is not to escape the obvious conclusion that few of the semidomesticated mallards are shot.

---

## THE WING MOLT IN PURPLE FINCHES

By M. J. MAGEE

EARLY in September I received a letter from Mrs. Margaret M. Nice, one of the Associate Editors of *Bird-Banding*. Mrs. Nice wrote that Mr. R. E. Moreau, East African Agricultural Research Station, Amani, Tanganyika Territory, Africa, was seeking information as to the length of time for the wing molt in individual birds, and she asked me to write him if I could give him any information. As for four years I have made a systematic study of the molt of the flight feathers (primaries, secondaries, and tertiaries) of the Purple Finch (*Carpodacus p. purpureus*), I was able to give him some details in the case of this particular species.

The great difficulty has been to trap the same bird near the end of its molt that you had in hand at the beginning of its molt. Most of the Purple Finches that are trapped near the beginning of their

molt move away before the molt is completed, so that the majority of these birds I get near the end of their molt have not been trapped before. However, I do get some.

Jonathan Dwight, Jr., in "The Sequence of Plumages and Moults of the Passerine Birds of New York" states that the innermost primary is usually the first to fall in passerine birds in general and that the innermost secondary falls at very nearly the same time as the outermost primary.<sup>1</sup>

My study of the Purple Finch shows, in most cases, that the outermost primary is fully grown some days before the innermost secondary is fully grown. Here are two examples, both birds adult males: September 14, 1931, second primary, seven-eighths grown; first primary, three-quarters grown; fourth secondary, three-quarters grown; fifth, quarter grown; sixth, fallen; October 23, 1932, first primary, three-quarters grown; fourth, secondary, nearly grown; fifth, quarter grown; and sixth, fallen.

As to the length of time for the molt of the primaries, Dwight states: "From the examination of specimens, it is impossible to determine the exact time required for a complete renewal of this most important row of flight-feathers. . . . I should estimate the time at about one month or probably a little longer. In extensive series of a few species, I find that the period between the earliest date of a specimen showing loss of the proximal primary and the earliest date of a specimen showing the distal primary fully grown varies between a month and six or eight weeks."

For the Purple Finch I estimate that the shortest time for the molt of the primaries is about seven weeks, the average lying between nine and ten weeks. My earliest date for a Purple Finch with ninth primary out is July 5th and the earliest date for a Purple Finch with first primary fully grown is September 9th.

Dwight also states that the adult Purple Finch begins to molt early in August. Many of my adult Purple Finches begin their molt earlier than this. From July 1st to 15th this year, 1935, I banded fifty-five Purple Finches, and molting had started on twenty-seven. From July 15th to the 31st, I banded forty-three Purple Finches, and of these, only three were not molting.

The wing of the Purple Finch has nine primaries, six secondaries, and three tertiaries. The outer primary is number one, the innermost, nine; the outer secondary is number one, the innermost, six. The tertiaries are molted after the beginning of the molt and are grown before the end of the molt, so it is not necessary to take them into consideration when determining the length of the molting period. The ninth primary is usually the first to fall out. In a number, the eighth and ninth fall out at the same time, but in some the

---

<sup>1</sup> *Annals New York Acad. Sci.*, XIII (1900), pp. 87-89.

eighth falls first. In some, the first primary and sixth secondary are about grown at the same time, but usually the sixth secondary is the last to be fully grown, so that if one can determine when the ninth primary falls (in some cases the eighth), and when the sixth secondary is fully grown, we can estimate the length of time required for the molt of the flight feathers.

In four years of observation on the molt of the flight feathers, I trapped over fourteen hundred molting adult Purple Finches (young-of-the-year do not molt their flight feathers until the following year).

Two difficulties that prevent an exact determination of the facts are: first, in fluttering around in the traps many birds lose some feathers that naturally would not have fallen out for a day or two; second, the eye is not quite accurate in measuring the amount of feather growth. When I estimate the growth of a feather as quarter, half, etc., of its entire length, the exact length may be a fraction more or a fraction less, which might make a difference of a day or two in estimating the length of time for a complete molt. However, in handling a large number of birds, these differences would not be serious.

During my four years of observation, the earliest and latest dates for the ninth primary to fall and the earliest and latest dates for the sixth secondary to be fully grown are as follows: ninth primary, fifth grown on July 8th. Allowing three days for the growth of the fifth, the earliest date of the ninth primary to fall was July 5th. The latest date for ninth primary to fall was August 21st. The sixth secondary was three-quarters grown on September 13th. Allowing three days for the growth of the last quarter, the earliest date for complete molt becomes September 16th. The latest date, November 2d, was for a bird trapped October 27th with sixth secondary half grown; add six days to complete molt, and we get the latest date, November 2d. If we consider the earliest dates, July 5th to September 16th, we have seventy-three days for the length of the molt. If we consider the latest dates, August 21st to November 2d, we again have seventy-three days. Seventy-three days is just one day more than my estimated average, which is ten weeks and two days.

The length of time for the ninth primary to grow is from eleven to sixteen days. I estimate the average at fourteen days. My records for the time of growth of the sixth secondary are not very many, but I estimate the time to be from ten to twelve days.

The Purple Finch making a complete molt of its flight feathers in the shortest time was a female at least four years old that year. The ninth primary fell July 31st and the sixth secondary was half grown on September 18th. Add six days to allow for growth of the sixth secondary, and the time for complete molt becomes seven weeks and six days. This female Purple Finch is of particular interest, as I have some data on the molt of her flight feathers for five successive years. The first year, on September 13th, the first primary was

two-thirds grown, the second secondary, seven-eighths grown. The second year, on October 10th, the first primary was three-quarters grown, and the sixth secondary had fallen. The third year, on July 18th, the ninth and eighth primaries had fallen; on September 26th, the sixth secondary was seven-eighths grown. The fourth year, on July 31st, the ninth and eighth primaries had fallen; on September 18th, the first primary was two-thirds grown, and the sixth secondary was half grown. The fifth year, on July 26th, the ninth and eighth primaries were just showing. For the third and fourth years, the time for the complete molt of the flight feathers can be estimated. For the third year, it was ten weeks and two days, which is just my estimate for the average length of time for the complete molt, and for the fourth year, which was my shortest record, the elapsed time was seven weeks and six days.

The Purple Finch requiring the longest time to make a complete molt of its flight feathers, was a male, molting into his first crimson plumage. The ninth primary was just showing on July 9th and the sixth secondary was three-quarters grown on October 11th. Add four days to allow for a quarter growth of the sixth secondary and time from ninth primary just showing back to time it fell out and the time for complete molt becomes fourteen weeks. Ten weeks and two days is the average length of time for the molt of the flight feathers on some twenty-five Purple Finches studied.

While at the annual meeting of the American Ornithologists' Union at Toronto in October, 1935, I was surprised to find that very little was known as to the length of time for the molt of the flight feathers of most species of birds. All persons with whom I talked, expressed surprise at the length of time of the molt of my adult Purple Finches. This subject offers an excellent field for banders to do some valuable work if they are so situated that they can handle many individual adult birds near the beginning and near the end of their molt. The only species available with me is the Purple Finch.

The following extracts are from a letter received from Mr. Moreau, December 4, 1935:

"In the literature there seems to be a complete lack of data on the subject of the duration of the individual's moult. Heinroth in his latest review of knowledge of moults does not mention the point at all. . . . It seems from your figures that there is wide individual variation, from which I infer that records from captive birds may be quite abnormal. . . . I was led to make my inquiry by the fact that on analysing the moult data from the birds collected in the evergreen forest here I found that about forty per cent of the population were in moult in each month from February to May, inclusive, with a smaller proportion in January and June, also. Treated statistically, my data indicated that the individual birds, on the average of all species, must take at least two months to get through their moult."

Sault Ste. Marie, Michigan, December 17, 1935.