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THE PURPLE FINCH INVASION OF NORTHEASTERN UNITED STATES AND THE MARITIME PROVINCES IN 1939.

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INTRODUCTION

IN the winter and spring of 1939, January to May, an unusual invasion of Purple Finches (*Carpodacus purpureus purpureus*) occurred throughout the northeastern United States and the Maritime Provinces. Many bird banders were able to band their first Purple Finches, while many others saw or became aware of Purple Finches for the first time in their lives. Hundreds, and in many places thousands, of the birds congregated and fed on weed seeds and buds, or on grain supplied at many feeding stations. Sunflower seed was preferred to most other foods, and thousands of pounds of it were consumed. In one small town, over one thousand pounds of the seed were sold in one week during the invasion.

In the seven years prior to 1939, an average of 4,700 Purple Finches were banded throughout the country. In 1939 there were 21,592 of the birds banded. If the number banded in 1938, 6,477, is subtracted from the 1939 total, the number banded as the result of the invasion was approximately 15,115. Each of six or seven banders was responsible for banding over one thousand of the birds. Several people banded almost two thousand.

THE HISTORY AND STATUS OF THE PURPLE FINCH IN THE NORTHEAST

Forbush (1929) gives the distribution of the Purple Finch in New England as follows:

"Common to uncommon resident up to heights of about 3,000 feet, rather irregular in winter and rare or wanting at that season in some northern parts of Maine, New Hampshire, and Vermont."

The more recent account by Bagg and Elliot (1937) gives under "Occurrence", the following:

"Technically a permanent resident, common in summer and sometimes abundant in migration, but highly irregular between early November and late March."

Minot in 1895 summarized its status by saying:

"Purple Finch—In New England, a common resident in summer, but only occasionally in winter."

This was supplemented, however, by William Brewster, who edited the second edition of Minot's book. Brewster added this footnote:

"A common summer resident, breeding nearly everywhere, but most numerously in the coniferous forests of northern New England. A few birds usually remain through the entire winter in southern New England and occasionally they occur at this season in extraordinary numbers throughout our entire territory. These fluctuations are apparently governed solely by the winter food supply and in no wise dependent on conditions of temperature or snowfall.—W. B."

Baird, Brewer, and Ridgway stated in 1875, that:

"It breeds from about the latitude 40 degrees to perhaps 60 degrees and in most parts between these parallels is rather a common bird in suitable localities. A few occasionally are found during the winter in Massachusetts but usually they pass the winter farther south. In the state of South Carolina they are especially abundant throughout the winter or from October until April.

"Dr. Coues states that the Purple Finch is a very abundant winter resident near Washington, arriving in October and remaining until May, being eminently gregarious. Stragglers were seen until nearly June, but the majority had departed as the leaves expanded.

"They make their first appearance in regular migration in Washington from the 10th to the 20th of May, occasionally a few are seen earlier."

The migration dates given by Dr. Chapman (1929) are of interest as they show some regularity in the spring and fall migrations throughout eastern United States. They are:

"Washington, common W.V., Sept. 12–May 26, largely a migrant. Ossining, rare P.R., common T.V. Cambridge, P.R. common from April to Oct., irregular, but sometimes abundant in winter. N. Ohio, common W.V., Sept. 1–May 20; Glenn Ellyn, fairly common T.V., March to April, Sept. to Oct., uncommon W.V."

Several returns of birds banded at Sault Ste. Marie, Michigan indicate a regularity in migration for one locality. A bird banded August 5, 1929 returned to the place of banding in 1930 on May 10; in 1931 on April 24; in 1932 on May 1; in 1933 on May 18; in 1934 on May 6, and in 1936 on May 2. Another bird banded July 28, 1922 also repeated for four years in late April or early May.

Some of the birds from New England and northern Michigan must travel into the deep south and even move considerably westward as the following returns will illustrate:

<i>Band</i>	<i>Date Banded</i>	<i>Place</i>	<i>Recovered</i>	<i>Date Recovered</i>
68905	Dec. 1, 1926	Middleboro, Mass.	Stuttgart, Ark.	Jan. 23, 1938
L62402	Aug. 31, 1934	Groton, Mass.	Warren, Ark.	Feb. 8, 1936
A128605	Feb. 14, 1929	W. Hartford, Conn.	Strawberry, Ark.	Jan. 28, 1938
37-2833	Dec. 30, 1936	Milton, Mass.	Grand Chateau, La.	Jan. 25, 1940
13570	June 25, 1922	Lakeville, Mass.	Warren, Ark.	Feb. 8, 1923
13571	June 25, 1922	Lakeville, Mass.	Warren, Ark.	Feb. 8, 1923
54393	Mar. 14, 1923	Wellesley, Mass.	Rockingham, N. C.	April 12, 1924
77230	Aug. 16, 1923	Peterboro, N. H.	Thornton, Tex.	Jan. 30, 1924
67227	Jan. 29, 1923	Norwalk, Conn.	Haynesville, La.	Feb. 1, 1924
L27215	May 5, 1939	Sault Ste. Marie, Mich.	Stuttgart, Ark.	Jan. 1, 1940
36-62261	May 13, 1936	"	Scottsboro, Ala.	Jan. 7, 1937
160792	May 29, 1925	"	Evansville, Tenn.	Jan. 22, 1927
160952	Jan. 30, 1925	"	Smackover, Ark.	Feb. 14, 1926
118680	Sept. 4, 1923	"	Sparta, Tenn.	May 1, 1924

One bird banded in the south in the fall of 1938 appeared in the invasion of 1939. No. 39-38912 was banded October 1, 1938 at Baton Rouge, La. and was retaken at Milton, Mass. April 17, 1939.

CAUSES OF INVASIONS

As indicated earlier, Brewster believed the fluctuations were governed solely by the winter food supply and were in no wise dependent on conditions of temperature or snowfall. Other authorities continue to express the point of view that such invasions are due mainly to food conditions.

Although the writer has found no significant data in the reports to explain the cause of this invasion, it is felt that before food is accepted as the primary cause of such invasions, more research is necessary. A careful analysis of all weather conditions in the north-east and middle-west is necessary for comparison with the time of the invasion. These conditions should then be compared with the circumstances of other similar invasions. Indeed it is a thesis problem in itself and will have to receive attention in another study which the writer contemplates. Perhaps, too, this may be one of the migration problems which defies solving and certainly it is one which invites continued research.

A few of the conclusions reached after studying the reports may be of interest, even though not too indicative. These birds should normally be farther south where food probably would be more abundant. Why should they leave these areas? This seems to be the same question raised when discussing regular migrations, especially in regard to the finches which leave northern states when seeds are most abundant, or start north when the seeds are relatively scarce.

However, Mr. M. J. Magee of Sault Ste. Marie, Michigan points out that there was a severe drought during the summer of 1938, preceding the invasion, and suggests that there was probably less food for the birds in the middle-west and south and that this may have driven the birds eastward and northward.

Some people feel that these birds congregated mainly from the northern regions of the winter range and were not birds which had gone very far south in the regular migration. Some evidence is at hand to support this, but the question still remains, as to whether the food conditions would be different enough to be the starting stimulus. Whether or not food was the starting stimulus, it seemed to have little to do with the spread and progress of the invasion. The first birds to arrive were moving rapidly and were not exhausting the food supply as they traveled. Areas traveled over in the beginning supported thousands of the birds for the duration of the period. Some of the first birds to arrive did not stop until they had spread to southeastern Pennsylvania and northern New Jersey.

Brewster's statement in regard to the weather and snowstorms

seems to be borne out by this feature of the invasion. In many parts of Maine, eastern New Hampshire and Massachusetts, the birds arrived in one of the biggest snowstorms which had hit the area for many years. Many observers and banders had not seen the birds prior to that time. It is understandable that some birds were probably in the area previously and were forced to the feeding stations by the three feet of snow that fell in some places. But it is peculiar that so many birds should put in their first appearance on March 12-13 when the storm arrived. Perhaps they were driven in front of the blizzard and could not escape it, but if weather has any major control over their movements, one would expect the birds to have gone into areas with less snow. This is primarily a local problem, however, and if one considers the effect of weather on the movements of these birds, an account would have to be taken of the general severity of the winter throughout the whole of the winter range.

Miss May Thatcher Cooke of the United States Biological Survey and others have expressed the opinion that such invasions must result from a certain tendency for the birds to become "bottled-up" because of numerous controlling factors, and then they are suddenly released and "spill over" into nearby regions.

For many years it has been known that Purple Finches possess this "wanderlust." They normally migrate southward for the winter and come northward again in the spring to nest. Their irregularity occurs mainly during the winter, but is not limited to the northern regions. The birds are known to make east and west migrations similar to those made by Evening Grosbeaks. According to Lincoln (1939) these migrations appear to have a certain regularity about them. Some of these birds were trapped in northern Michigan, taken at several points in New England, and then were retaken at the original places of banding.

Some observers have felt that the invasion resulted from a premature migration up the Connecticut and other parallel valleys, which was thwarted and thus the birds spread out into Maine, Vermont, Massachusetts and New Hampshire, and stayed in Connecticut, New Jersey, New York, and Pennsylvania until time to migrate northward normally. This would be a plausible explanation if the banding records and pluming observations supported it, but they do not. It also presupposes that the birds advanced through the southern areas unnoticed and then returned to these areas later in numbers and were trapped.

Mr. Charles H. Whittle of Hancock, N. H. observed in the spring of 1940 that the Purple Finches arrived May 1 at about the time the elms were in flower and that the birds fed almost exclusively upon them. He offers the possibility that this might have had some control over the 1939 invasion. The 1939 invasion started in late

February and extended through May and it seems highly improbable that any trees offering food to Purple Finches in the spring would be in bloom or would have changed from winter condition by March 1 in the northern states.

Intensive study of future invasions when conditions can be compared with those of the 1939 invasion may reveal the answer but it remains unsettled at this time with the amount of available information.

PURPLE FINCH INVASIONS

Only one other major invasion of New England by Purple Finches has been known to have occurred, although several minor ones are evident. Brewster referred to the other major invasion in his footnote in Minot's book of 1895, and he described it more fully in his "Birds of the Cambridge Region" (1906), where he says:

"At the latter season (winter) they occur somewhat irregularly and usually sparingly, but I have known them to be present in immense numbers and continuously, from December to March. This was the case during the winter of 1883-1884 when flocks containing upwards of fifty, or even as many as seventy-five to one hundred Purple Finches each, were repeatedly met with in Belmont and Waverly. On January 17 of that winter I saw fully two hundred along the roadsides while driving from Belmont to Cambridge."

In Brewster's Journals of 1883-1884, extracted by Mr. Ludlow Griscom, a letter from Manley Hardy of Brewer, Maine states:

"Only one previous record for this section. Surprised to find Purple Finches lingering through November. They began increasing about the middle of December and on the 22nd they were scattered everywhere in small numbers."

Another letter from Mr. Hardy of January 2, 1884, says:

"Present everywhere in increasing numbers."

From Providence, R. I., Brewster received a letter from Mr. Jenks, a taxidermist and natural history supply dealer who was a constant correspondent of his. He wrote on January 17, 1884:

"I have received no less than seventy specimens of the Purple Finch from the Rangeley Lakes region, Maine. This bird is now remarkably abundant about Providence, R. I."

Bagg and Elliot (1937) cite an earlier invasion but few data are available from which to judge the proportions. They quote from J. A. Allen (1864) as follows:

"This species seems, judging from the accounts of the older naturalists, to have greatly increased, in this and other eastern states, during the last twenty-five years. At Springfield it is chiefly a transient, rather common in April and September-October but never so abundant as at Cambridge where, in 1863, it was the most numerous bird (?) from March 25 to April 20."

Since 1884 the minor fluctuations which have occurred in the winter and breeding ranges are as follows:

Wendell P. Smith of Wells River, Vermont observed small fluctuations during the period January 31 to March 15, 1923 when he banded 48 birds, also February 23 to March 21, 1928 when he banded 52 Purple Finches. Ordinarily there would be very few if

any present at Wells River in this period. They appear only every 5 or 6 years. In 1939, Mr. Smith banded 101 of the birds.

Additional evidence supporting the 1928 invasion is found in Bagg and Elliot's book (1937). Numerous observers in western Massachusetts reported sizable flocks and Professor F. A. Saunders banded four hundred at Mount Holyoke College.

Mr. Glenn D. Chamberlain of Presque Isle, Maine also noticed this influx of 1928 when he banded 54 birds in early February, several more than in 1939. In both cases he banded all that came to the station and entered the traps.

Mr. B. S. Bowdish of Demarest, N. J. also had a rather successful year in 1923-4 when he banded 550 of the birds.

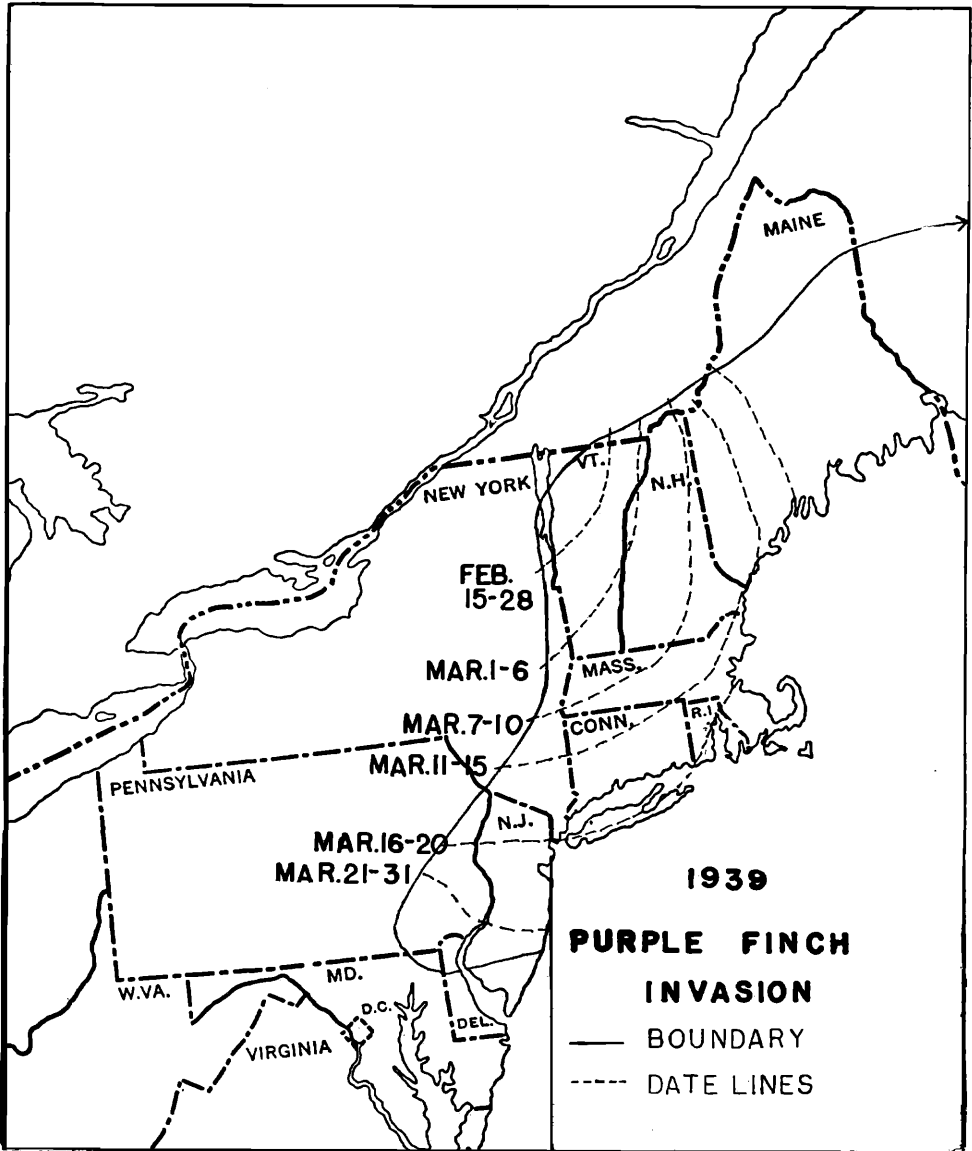
The yearly totals of the birds banded at the Wharton Banding Station at Groton, Mass., as reported by Mr. Edwin Mason, show no marked fluctuations since 1930 except the one in 1939. The totals of Purple Finches banded in these years were as follows: 1930—25, 1931—37, 1932—89, 1933—75, 1934—82, 1935—103, 1936—180, 1937—110, 1938—146, 1939—1123. A general increase has been taking place in this period or else banding operations have been gradually increased.

Dr. Arthur A. Allen at Ithaca, N. Y. summarized the Cornell records as follows:

"The Purple Finches were unusually common during the winter and spring and summer of 1938. In the early fall of 1938 they disappeared, so that by December there were apparently none around, nor were any reported during January and February. In March a few were seen and by the middle of April they were once more quite regularly distributed although not in the abundance that they were the preceding year. They continued in fair numbers until the middle of May and then again disappeared except for a few breeding birds. They have not been at all common since (letter January 16, 1940). We apparently, therefore, did not get the invasion that you did, or if we got it, it was the year earlier."

There may be some correlation between the 1938 occurrence of finches at Ithaca, N. Y. and the experience of Mr. M. J. Magee at Sault Ste. Marie, Michigan. In the seventeen years of banding Purple Finches, Mr. Magee had the largest number, 2326, enter the traps in 1938. In 1939 the total of 1,121 was 15% below the seventeen year average of 1,328 birds. Perhaps the birds from the area participated in our invasion of 1939. He gave as the reason for the decrease in 1939, the drought of the summer before.

Mr. S. H. Weakley of Fort Smith, Arkansas records two minor invasions during eleven years of banding, one in 1933 when 158 birds were banded and one in 1939 when 540 birds were banded from January to February. Birds were taken in only five of the eleven years and the total was but 41 birds in all. This latter invasion would certainly not have much connection with the New England one, and yet the stimulus for the two may well have been the same and the birds may have come from similar localities.



Map with date lines showing the spread of the Purple Finches from the north and west to the south and east, based on the peaks of abundance as indicated by banding results.

Mrs. A. L. Whigham of Century, Florida noted more finches in 1939 than in any previous year. Prior to 1939 only a limited number of the birds visited her station during late winter, but in 1939 at least 200 of the birds appeared and this was about four times the usual number. A shortage of wild berries is suggested as the reason inasmuch as other berry eating species such as the Robins were also more common at this time.

In the fall of 1939-40, a reoccurrence of large numbers of Purple Finches in the Ardmore, Pa. region adds still another chapter to this complex story. Mr. Horace Groskin has banded about 500 of the birds in this period which is by far the most he ever banded in fall and early winter. In 1937-38 only 54 birds were banded before March 1, and in 1938-39 only 43 were banded prior to the heavy concentration which occurred after March 1.

CORRESPONDING INVASIONS OF REDPOLLS AND SISKINS

The 1939 season was not only an unusual one for Purple Finches but also for Pine Siskins and Redpolls and to some extent Crossbills. The Siskins and Redpolls accompanied the Purple Finches southward arriving at about the same time and dispersing to the northward with them. The Siskins traveled in numbers as far southward as Ardmore, Pa. where 160 were banded. At Hanover 142 Siskins and 248 Redpolls were banded during the invasion of finches. The Redpolls were centered a little more to the north than the Purple Finches and Siskins. Thousands of Redpolls were observed moving northward along the Connecticut Valley during the first week of April. Both Siskins and Redpolls came to the stations with the Purple Finches and gorged themselves on the smaller food such as millet and hemp. White-winged Crossbills while not as numerous as the other three mentioned did arrive in numbers around Hanover, New Hampshire, Wells River, Vermont, and Bar Harbor, Maine in March and April.

EXTENT OF THE INVASION

The area covered by the Purple Finch invasion of 1939 can be delimited as follows: heaviest populations in southern Maine, all of New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, southeastern New York, northern and central New Jersey, and eastern Pennsylvania; smaller populations invaded northern Maine and the Maritime Provinces, and northern Maryland. Nothing unusual was noted in southern Ontario, Quebec, central New York, central Pennsylvania, or Washington, D. C. The area invaded has been indicated on the map on page 85.

Some of the data obtained from the observers located on the periphery of the area invaded are of interest. Professor V. C. Wynne-Edwards at Montreal, Canada noted that the birds were not present in more than ordinary numbers during the winter of 1938-39 but lists 1932-33 and 1934-35 as years when he considered

them abundant and 1937-38 as a year when they were very scarce.

Mr. Robie Tufts, Chief Federal Migratory Bird Officer for the Maritime Provinces, saw some evidences of an invasion throughout the provinces but kept no records of numbers. The extent of the invasion in this region is illustrated somewhat by the number of birds retaken throughout the Maritimes during the period. They were as follows:

	<i>Banded</i>			<i>Recovered</i>	
38-141730	April 29, 1938	Milton, Mass.	April 1, 1939	Glencoe, Pictou Co., N. S.	
37-65122	July 25, 1937	Milford, Mass.	Mar. 29, 1939	Charlotte Co., N. B.	
36-134634	May 1, 1936	N. Scituate, Mass.	Mar. 10, 1939	St. Joseph, N. B.	
38-79267	May 5, 1938	Albion, Maine	Mar. 25, 1939	Kingston, N. B.	
37-144380	July 7, 1937	Northeast Harbor, Me.	April 10, 1939	Bayswater, N. B.	
H750085	Oct. 10, 1937	Demarest, N. J.	Mar. 20, 1939	Sambro, N. S. (Halifax)	
38-58276	April 30, 1938	Belmont, Mass.	Mar. 31, 1939	St. Mary's Co., N. S.	

Mr. Arthur H. Norton of Portland, Maine outlined the extent of the invasion in Maine as follows: "abundant in the vicinity of Portland, (no records for York County), eastward at least to Mt. Desert, and northward at least to Presque Isle in the northeast and Rumford in the northwest."

Mrs. Merty R. Webb of Albion, Maine and Mr. Clarence Aldous of Orono, Maine recorded hundreds of the birds in those areas. Mr. Glenn Chamberlain of Presque Isle banded 51 but indicated nothing unusual.

The only records for southern Canada in Quebec and Ontario were made by Dr. Harrison F. Lewis, Chief Federal Migratory Bird Officer for those provinces. He found two on the north side of Lake Erie on Long Point on April 18, but found none on February 3-4 near the Vermont line in Quebec.

In eastern New York, Mr. Guy Bartlett observed that the invasion was not as pronounced at Schenectady as in New England. Dr. Dayton Stoner said they were less common in Albany in 1939 than in 1938.

At Mohonk Lake, N. Y., which is situated about fifteen miles west of Poughkeepsie, Mr. Daniel Smiley, Jr. saw one or two Purple Finches on several different occasions, which is their usual winter status there. He recorded the first migrant on April 1, but saw no flocks or large numbers of the birds at any time.

Dr. Arthur A. Allen's summary for Ithaca, N. Y. given previously indicated a possible influx in 1938 but nothing unusual for 1939.

At Manorville and Elmhurst, Long Island the birds did appear, but in small numbers. They had been observed very rarely previous to 1939 by Mr. Gilbert S. Raynor and Mrs. Marie V. Beals.

The heaviest concentration in Pennsylvania seemed to have occurred in the vicinity of Philadelphia, especially around Ardmore, where hundreds of the birds were banded. The stations at Swarthmore, Wayne, Chestnut Hill, Wyncote, Glenolden, Norristown, and Paoli accounted for several hundred in addition to the 1,146 banded by Mr. Horace Groskin at Ardmore. Mr. William Pepper, Jr. at

Wyncote banded 113 in 1939 and only 9 in the ten years previously. Mr. John Dorman of Chestnut Hill banded 297 in 1939 and only 100 in 1938. Mr. Groskin's banding increased from 106 in 1938 to 1,146 in 1939 and is again above 500 in 1940

Dr. Harold Wood of Harrisburg, Pennsylvania saw twenty finches and banded one during the winter. From his tabulation of birds recorded in previous years this is less than the normal number since he saw 45 in 1938, 39 in 1937, 19 in 1936, 162 in 1935, 4 in 1934, and 114 in 1933. Dr. Merrill Wood and Dr. Logan Bennett noticed no signs of the invasion at State College, Pennsylvania, the winter population being normal in 1939.

According to Miss May Thatcher Cooke of the United States Biological Survey, no great number of Purple Finches was banded in 1938-39 south of the above mentioned localities.

ORIGIN OF THE INVASION

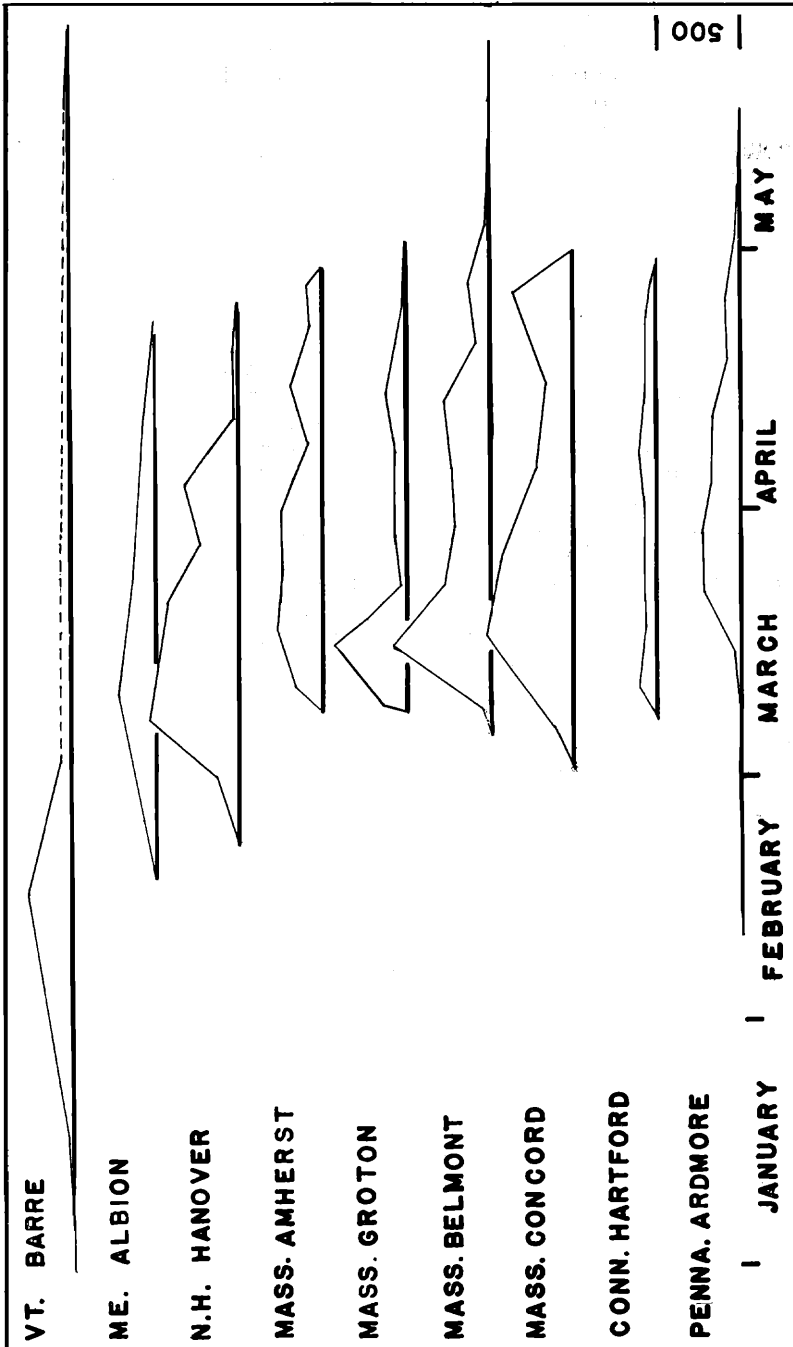
Many of the birds participating in the invasion were birds which had previously been in New England. This is illustrated by the following returns of birds caught in 1939 and banded in previous years. Two birds banded in May 1938 in Maine were caught in New Brunswick in March 1939. Four others caught during July and August 1937 in Maine were retaken in March and April 1939 in Pennsylvania, Massachusetts and New Brunswick. Other birds banded in the three years previous to 1937 were retaken in March and April in Pennsylvania and Maine. Five birds banded in April 1938 in Massachusetts were retaken in March and April in Connecticut, Maine, and Nova Scotia. Several banded in Massachusetts in August and September 1938 were retaken there in March, April and May 1939. Two other birds banded in Massachusetts, one in 1937 and one in 1936, were recaptured in New Brunswick in March 1939. One bird banded at Boonton, N. J. April 8, 1938 returned to Boonton March 28, 1939. Another banded at Demarest, N. J. in October 1937 was retaken in March, 1939 at Halifax, Nova Scotia. One banded October 19, 1931 at Elmhurst, Long Island returned to Woodbridge, Conn. March 17, 1939. One banded in October 1938 in Baton Rouge, Louisiana also participated in the invasion, being recaptured April 17 at Milton, Massachusetts.

There was some indication of a movement from west to east and from east to west. The following four instances were reported:

	<i>Banded</i>		<i>Recovered</i>	
138-2424	May 22, 1938	Sault Ste. Marie, Mich.	Mar. 10, 1939	Ardmore, Pa.
39-163068	Mar. 29, 1939	Ardmore, Pa.	May 1, 1939	Sault Ste. Marie, Mich.
39-143366	Mar. 12, 1939	Boonton, N. J.	April 13, 1939	Branchport, N. Y.
39-15525	Mar. 17, 1939	Concord, Mass.	April 9, 1939	Coldsprings, N. Y.

Therefore, some birds were originally banded in the area invaded and had gone elsewhere prior to the invasion, while some came from the south and others from the west.

As to just which route was used in reaching the area invaded,



Graphs showing the fluctuations of banding of Purple Finches at nine representative stations throughout the region invaded in 1939.

little is known. The fact that the birds first appeared in numbers in the northern states and the peaks of abundance were successively reached going southward, complicates the problem. If the birds were to have returned by the regular route taken when coming northward in the spring, banders in the southern part of the area should have had the birds appear at their stations before those in the north. If the birds were to have come from the west generally, observers in central Pennsylvania and New York should have seen them and the birds would have appeared at such places as Ardmore, Pa., Fairfield, Conn., Amherst, Mass., and Hanover, N. H. at about the same time. As it happened, the birds appeared in the northern and western part of New England and worked southward and eastward. How they were able to reach this area unnoticed is also hard to explain. There are few observers or banders in the region from which the birds seemed to have temporarily originated.

The birds must have migrated southward and possibly westward in the fall of 1938. Conditions, possibly scarcity of food due to the drought, caused the birds to move back northward and eastward. They could have reached Vermont and New Hampshire through the large area bordering the Great Lakes and northern New York in small enough numbers to be unnoticed. Their congregation in the small area later occupied, then caused the influx to become an invasion. Some of the birds returned in this general direction while others moved northward to their former nesting grounds, when the regular migration took place in April and May.

DIRECTION OF THE MOVEMENT

Three sources of information were available to determine the direction of the movement of the Purple Finches as they spread throughout the northeast. They were:

- (1) Observations and records of banders indicating when the maximum abundance occurred at the various localities.
- (2) Returns of birds banded during the invasion.
- (3) Observations of plumed birds, marked at Hanover, N. H. during the entire period of the invasion. At least three hundred letters were received in response to requests regarding the whereabouts of plumed birds, one hundred of which contained specific usable information.

From the first source of information the graph on page 89 was prepared indicating when the peaks of abundance were reached in each locality. The date lines show the general spreading from the north and west to the east and south. The key localities for the construction of the chart were: Barre, Vt., Hanover and Manchester, N. H., Albion and Orono, Me., Athol, Groton, Belmont, and Concord, Mass., Hartford and Fairfield, Conn., Demarest and Boonton, N. J., and Ardmore, Pa.

From the banding returns and the observations of plumed birds the direction of movement can be more accurately determined. For convenience of treatment the records have been arranged in approximately fifteen day periods.

PERIOD 1, FEBRUARY 10-28. The birds which were banded or plumed during the month of February were all taken in New Hampshire and Vermont. All of the observations and returns were to the south, southeast, and east. The map number 1 on page 93 shows the observations of white plumed birds marked at Hanover, N. H. from February 20-26. Seven of the twenty-one were seen in March, while eleven were observed on scattered dates throughout April and three were seen in May. Mrs. Elaine Drew reported fifteen observations of plumed birds in the vicinity of Barre, Vt., and none of them were of birds plumed in this period. One white-plumed bird remained at Hanover until July 2 and probably nested, being observed by Dr. Frederic P. Lord. Another one was feeding at the station of Mrs. Frank Dubois of Georgetown, Mass. as late as May 27. The following were the only returns of birds banded in February and recaptured during the invasion:

	<i>Banded</i>		<i>Recovered</i>	
138-109962	Feb. 27, 1939	Barre, Vt.	Concord, Mass.	April 23, 1939
39-134670	Feb. 24, 1939	Hanover, N. H.	Amherst, Mass.	April 24, 1939
39-134670	Feb. 24, 1939	Hanover, N. H.	Hamden, Conn.	April 5, 1939

PERIOD 2, MARCH 1-15. In the period of early March the birds spread rapidly to the south into southern Connecticut and northern New Jersey and east into Maine as shown on Map 2 page 93. The birds plumed at Hanover in the period February 27 to March 10, received yellow plumes. Seven of the sixteen observations of yellow plumes south of Hanover were made in March while the others were made before April 20. One bird reached Ridgewood, N. J. by March 11. Only two were seen in eastern Massachusetts, whereas the majority of the ones plumed in the previous period were seen in that region. Of the nine observations made north of Hanover, not one was made in March, the month of banding. All were made after April 11, showing that a month had elapsed after banding before any were seen to the north. Since some of the birds banded in this period were in Hanover until March 30 as shown by the repeats at traps, the records north of Hanover may represent the birds that went no farther than Hanover, but it is just as probable that they had gone south and were seen on their return trip north.

The banding returns for this period bear out the above conclusions based on the plumes. All birds banded in New Hampshire March 1-15 were retaken to the south. Of the four birds banded in Hanover and retaken elsewhere, one was taken directly south in the Connecticut Valley in Massachusetts, two farther south in Connecticut, and one in New Hampshire to the southeast. Even

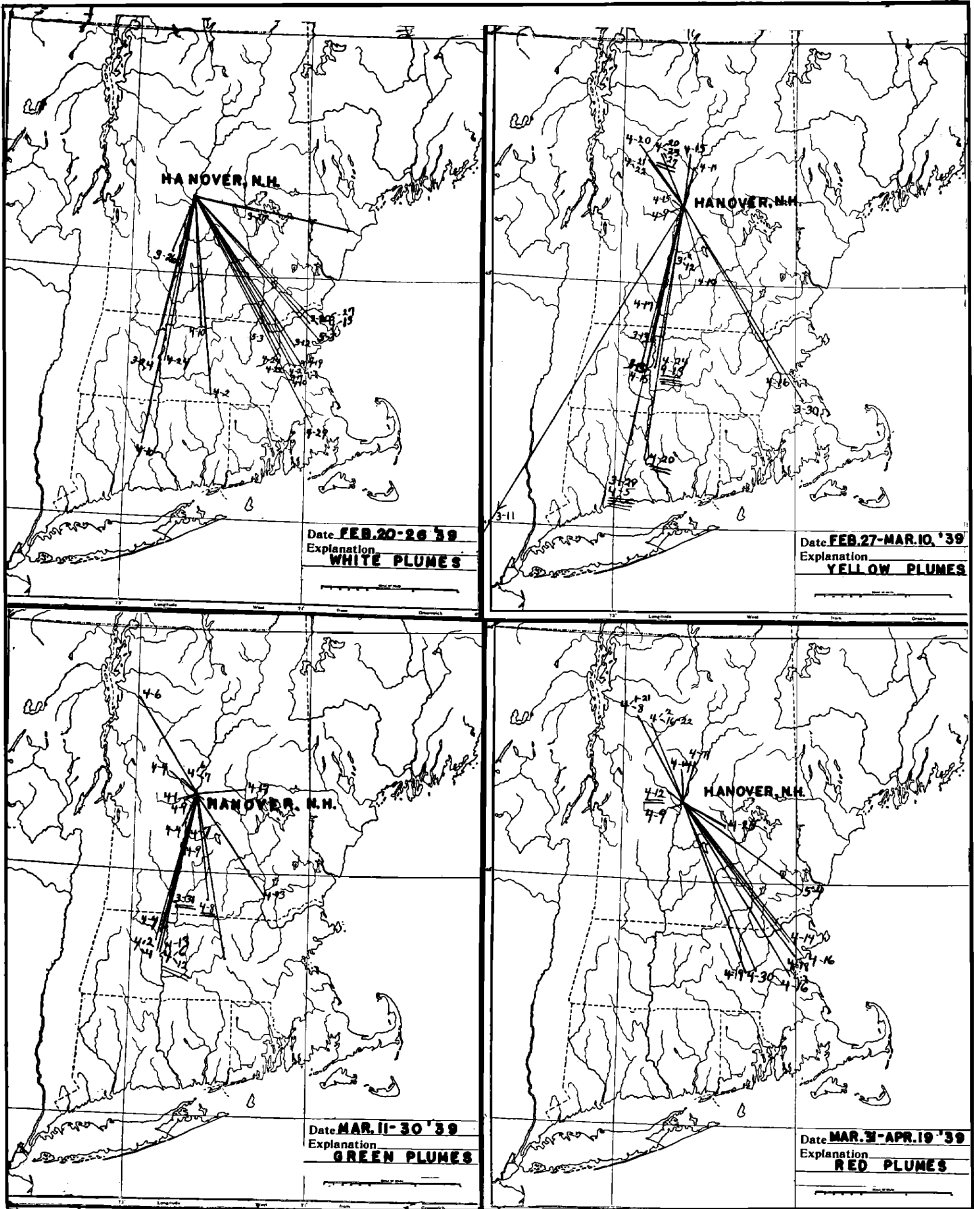
the bird banded at Manchester, N. H. on March 15 took a southwestern route to Hartford, Conn. in the general direction taken by the yellow plumed birds. Six of the birds banded in Massachusetts March 1-15 were likewise taken again in Connecticut to the south or southwest and two reached Ardmore, Pa. Four birds were retaken to the north of the place of banding but over a month had elapsed in each case and the distance was not very great. One return of a bird banded in Connecticut was also taken to the north 31 days after banding. One banded March 12 at Boonton, N. J. moved west to Branchport, N. Y. in 33 days.

The returns of the birds banded in this period March 1-15 and upon which the foregoing discussion is based, were as follows:

	<i>Banded</i>			<i>Recovered</i>
<i>New Hampshire</i>				
39-134667	March 1	Hanover	April 13	Amherst, Mass.
39-151540	March 3	Hanover	April 5	Hamden, Conn.
39-151411	March 4	Hanover	April 20	Hartford, Conn.
39-151900	March 15	Hanover	April 9	Dublin, N. H.
138-3404	March 15	Manchester	March 29	Hartford, Conn.
<i>Massachusetts</i>				
138-481	March 1	Athol	March 11	Hartford, Conn.
38-185254	March 3	Athol	March 26	Hartford, Conn.
138-563	March 6	Athol	April 5	Ardmore, Pa.
138-594	March 7	Athol	April 24	Hartford, Conn.
139-23675	March 9	Groton	May 11	Nashua, N. H.
39-126447	March 10	Amherst	April 15	Manchester, N. H.
39-152797	March 10	Concord	March 19	Hamden, Conn.
39-126498	March 11	Amherst	March 29	Hartford, Conn.
139-23767	March 11	Groton	April 6	Hartford, Conn.
139-14160	March 12	Northampton	April 28	Barre, Vt.
139-27069	March 12	Groton	April 12	Athol, Mass.
139-27076	March 12	Groton	May ?	Rindge, N. H.
138-7397	March 13	Belmont	April 3	Ardmore, Pa.
139-27152	March 14	Groton	March 20	Sturbridge, Mass.
138-4296	March 14	North Eastham	April 3	Groton, Mass.
<i>Connecticut</i>				
139-24711	March 10	Hartford	April 9	Northampton, Mass.
38-69559	March 15	Hartford	April 27	Windsor, Conn.
<i>New Jersey</i>				
39-144366	March 12	Boonton	April 13	Branchport, N. Y.

PERIOD 3, MARCH 16-31. In this period the birds continued to move southward but plumed ones did not travel as far as in the previous period as can be observed on Map No. 3 on page 93, although several banded ones from Massachusetts did reach Ardmore, Pa. The main part of the northward and westward movement occurred in this period and is illustrated especially in the returns from birds banded in Connecticut, New Jersey, and Pennsylvania. The beginning of the movement was evident at the end of the last period, however.

Green plumes were used in the days from March 10-31. Peculiarly there were no observations of this color in the Boston region. The northern records were made very soon after the banding period and might represent birds banded on their return trip from the south. Many of the birds banded in this period at Hanover, N. H. remained in the area until April 3 and a few until April 20. Two birds marked with green feathers probably nested in Hanover as



Maps showing the observations of the plumed Purple Finches marked with four different colors of feathers representing different periods of banding at Hanover, New Hampshire.

they were observed on May 24. Likewise one was seen at Taftsville, Vt. May 13 and might have remained.

The five birds banded in New Hampshire and listed below illustrate a spreading in all directions. The birds banded in Massachusetts in this period indicate a continued movement to the southward with one bird going west from Concord to Cold Springs, N. Y. in 24 days. A bird from New Jersey banded at Boonton went north to Mohonk Lake, N. Y. in 8 days. An exception to the southward movement was the one bird banded at Groton, Mass., and retaken at Dublin, N. H. 11 days later. Several others banded in Pennsylvania went northward and one went westward as far as Sault Ste. Marie, Mich., making the trip in 34 days. One individual banded March 18 at Hartford, Conn. was retaken during the nesting season in the White Mountains of New Hampshire.

Returns of birds banded March 16-31, 1939 and retaken during the period of the invasion in 1939 were as follows:

	Banded		Recovered	
<i>New Hampshire</i>				
39-153791	March 17	Hanover	March 31	Brattleboro, Vt.
39-154029	March 26	Hanover	April 13	Manchester, N. H.
39-57292	March 27	Dublin	May 5	Winchendon, Mass.
39-153669	March 30	Hanover	April 24	Royalton, Vt.
39-153614	March 30	Hanover	April 12	Northampton, Mass.
<i>Massachusetts</i>				
139-33911	March 17	Northampton	April 6	Hartford, Conn.
39-155025	March 17	Concord	April 9	Cold Springs, N. Y.
39-155079	March 18	Concord	April 8	Wyncote, Pa.
?	March 18	Athol	April 4	Ardmore, Pa.
139-32627	March 18	Groton	April 30	Demarest, N. J.
?	March 26	Amherst	April 13	Athol, Mass.
?	March 26	Amherst	April 4	Williamstown, Mass.
139-32847	March 30	Groton	April 9	Dublin, N. H.
<i>Connecticut</i>				
38-69597	March 18	Hartford	July 24	White Mt. Nat. For., N. H.
<i>New Jersey</i>				
39-159507	March 22	Boonton	March 26	Ardmore, Pa.
39-161011	March 25	Boonton	April 2	Mohonk Lake, N. Y.
<i>Pennsylvania</i>				
39-155079	March 18	Wyncote	April 8	Concord, Mass.
138-8254	March 25	Ardmore	May 22	Clarksville, N. H.
39-163068	March 29	Ardmore	May 1	Sault Ste. Marie, Mich.

PERIOD 4. APRIL 1-15. In this period the birds were moving northward from the southern portions of the territory invaded. Plumed observations of birds marked with red feathers March 31 to April 19 showed some birds still going southward, as outlined on Map No. 4, page 93. Eight birds were reported south of Hanover, most of them from eastern Massachusetts. This is of interest since there were none in this region for the previous period. It is peculiar that there were none observed in the Connecticut Valley, which was so popular in March. Many of the records to the north were made within the banding period so that the birds were moving in both directions from Hanover. One red plume was seen at Hanover as late as May 4, and one at Canaan, N. H. by Mrs. Alice McAllister, May 15.

One bird banded April 11 in Waterville, Me., went to Dorset, Ont., where it was found August 15, and one banded at Belmont, Mass.,

April 3 was found at Eagle Lake, Maine June 24. The April 14 Amherst record indicates a definite northward movement as it was taken 15 days later at Barre, Vt., as does the one banded at Wyncote, Pa., April 8 and retaken at Conway, Mass., April 25. These are supplemented by one banded April 6 at Hamden, Conn., and recaptured April 24 at Concord, Mass. No returns were taken in this period noticeably south of the place of banding but the evidence obtained by the red plumes shows some birds were still going south as late as this.

Returns of birds banded from April 1-15, 1939 and retaken during the period of the invasion were as follows:

<i>New Hampshire</i>	<i>Banded</i>		<i>Recovered</i>	
None				
<i>Maine</i>				
39-168223	April 11	Waterville	Aug. 15	Dorset, Ont.
<i>Massachusetts</i>				
139-50540	April 3	Belmont	June 24	Eagle Lake, Me.
139-54826	April 9	Concord	April 24	Hancock, N. H.
39-168345	April 14	Amherst	April 28	Barre, Vt.
<i>Connecticut</i>				
139-36627	April 6	Hamden	April 24	Concord, Mass.
<i>New Jersey</i>				
39-164645	April 3	Boonton	May 3	Morristown, N. J.
<i>Pennsylvania</i>				
38-57963	April 8	Wyncote	April 25	Conway, Mass.

PERIOD 5. APRIL 16-30. Only a few returns were available for this period as most of the birds had moved northward and westward by this time. Several local returns as from Concord to Groton, Mass., indicated local and possibly northward movements. Certainly the two captured at Belmont showed a continuation of local wandering and shifting despite the general northward migration toward the breeding grounds. Very few plumes were added during this period and no significant data obtained from them.

Most of the birds nesting to the north of Pennsylvania, New Jersey, and southern New York would normally have departed by now and the regular migrants going northward would have gone through. Some of the birds participating in the invasion were recaptured within the same breeding season to the north of where they were banded.

Returns of birds banded April 16-May 3, 1939 which were retaken during the period of the invasion were as follows:

	<i>Banded</i>		<i>Recovered</i>	
<i>Massachusetts</i>				
139-59874	April 21	Concord	April 28	Belmont, Mass.
139-65330	April 22	Concord	April 28	Belmont, Mass.
139-58043	April 28	Concord	April 30	Groton, Mass.
139-80884	May 3	Concord	May 14	Groton, Mass.

DURATION OF THE INVASION

By charting the banding records of the banders who were able to band a considerable number of birds, the time and duration of the invasion can be seen to have extended from February to May. Nine localities were selected for the graph on page 89 and the records were plotted individually above each other so that the begin-

ning, the ending, and the various peaks of abundance reached during the invasion can be easily compared.

As was pointed out earlier, the peaks of abundance were reached in the northern states before they were in the southern part of the area invaded. Vermont was first, followed by New Hampshire, Maine, Massachusetts, Connecticut, and finally by New Jersey and Pennsylvania. The three Massachusetts localities situated near Boston and fairly close to each other, Groton, Belmont, and Concord, confirm the fact that the peak of abundance was reached there about the middle of March.

The birds left the various areas at about the same time, which was near the end of April and the beginning of May. The departure was less regular than the arrival and more difficult to follow. In the cases of Barre, Vt., Belmont, Mass., and Ardmore, Pa., where banding was continued into May, no doubt a number of regular migrants were banded.

Although banding alone is not necessarily a true index of the abundance and length of stay, due to the fluctuations in emphasis at the various stations, it does show a general trend and is perhaps rather accurate in this instance. The banders soon became cognizant of the unusual situation and banded as many birds as could be enticed into the traps. In most cases, too, the daily fluctuations of birds trapped were small and when weekly averages are used the error is not very great.

The northward movement of the vagrants coincided with the regular spring migration northward. The birds moved to the breeding areas in April and May and a few were taken during or near the breeding season. They were as follows:

	<i>Banded</i>			<i>Recovered</i>	
138-8254	Mar. 15, 1939	Ardmore, Pa.	May 22, 1939	Clarksville, N. H.	
39-168223	April 11, 1939	Waterville, Me.	Aug. 15, 1939	Dorset, Ont.	
38-69597	Mar. 18, 1939	Hartford, Conn.	July 24, 1939	White Mt. Nat. For., N. H.	
39-154678	Mar. 12, 1939	Concord, Mass.	July 1939	Kenogame, Que.	

TURN-OVER OF POPULATIONS

Failure to give explicit directions for the tabulation of the repeat data, caused such a variation in the reports that very little comparable information was collected. Therefore, a limited number of localities can be compared. The following table gives the percentages of the birds repeating at four localities for six banding periods:

<i>Place</i>	<i>Feb. 15-28</i>	<i>Mar. 1-15</i>	<i>Mar. 16-31</i>	<i>April 1-15</i>	<i>April 16-30</i>	<i>May 1-15</i>
Albion, Maine	23	45	43	14	0	..
Hanover, N. H.	14	35	18	0	0	..
Groton, Mass.		70	53	25	15	..
Ardmore, Pa.	46	29	31	36	25	17

The period when the greatest percentage of birds repeated in Maine, New Hampshire and Massachusetts was March 1-15, followed by March 16-31. Although the percentage for Ardmore, Pa. is highest in the latter part of February only a negligible number of

birds was banded, and the high during April 1-15 is more nearly the representative one.

At Hanover, N. H., of the 130 birds banded in February, five remained until March 31 and none stayed longer. Of the 766 birds banded March 1-10, only seven remained one month and all had departed by April 20. The largest number of this group of 766 birds left within ten days and a small proportion stayed over the twenty day period. From March 11-20, 237 birds were banded and only three of these were present one month later, most of them having departed during the first ten days. From March 21-30, 345 birds were banded and three were present April 19, but all the others had departed before April 3, many leaving by March 30. This was the period of greatest turn-over during the invasion at Hanover.

At Groton, Mass., a great number of the birds repeated in the first part of the period after banding. Of the 160 birds banded in the first half of March, 47 remained beyond April 1, several staying until April 26. Of the 340 birds banded during the last half of March, 11 remained beyond April 16, and none stayed longer than April 26. Of the 220 birds banded in the first half of April, only three stayed until April 26. Of the 80 birds banded the latter half of April, three remained until May 1 only.

At Belmont, Mass., 300 birds were banded March 1-15, and 9 remained one month or more. Of the 583 birds banded March 16-31, only 4 remained one month, 3 others three weeks, 13 two weeks, and the others one week or less. Of the 557 birds banded April 1-15, 1 stayed four weeks, 1 three weeks, 19 two weeks, 91 one week, and the others were not recaptured. Of the 234 birds banded April 16-30, 1 stayed four weeks, 2 two weeks, and 42 one week. Of the 21 birds banded in May, 1 remained three weeks, 1 two weeks, and 4 repeated only during the first week.

At Ardmore, Pa., the following records are of interest, showing the average length of stay and the number of birds banded in each period:

	<i>Birds banded</i>	<i>Aver. stay</i>		<i>Birds banded</i>	<i>Ave. stay</i>
Feb. 10-16	10	50 days	Mar. 31-April 6 . .	192	11 days
Feb. 17-23	8	37	April 7-13	179	9
Feb. 24-Mar. 2 . .	23	39	April 14-20	83	7
Mar. 3-9	6	32	April 21-27	97	5
Mar. 10-16	49	24	April 28-May 4 . .	36	6
Mar. 17-23	213	21	May 5-15	11	4
Mar. 24-30	239	16	Total	1,146	Ave 15

These figures show the gradual decrease in the length of stay from the beginning of the period in February to the end of the invasion in May. Prior to March 17 the numbers were fairly constant, averaging above thirty days, from March 17-31 the average was around twenty, in the first half of April the average dropped to ten and from then until May 16 it was around 5. About 68% of the birds banded at Ardmore passed through the station without repeating.

TIME OF THE INVASION

BARRE, VERMONT—MRS. ELAINE DREW. Three birds arrived at the feeding station December 27, 1938 and the first bird was banded on December 31. The birds continued to appear in numbers so that forty-two were banded during January. During February 258 were banded, 83 during the first half of the month and the rest near the end of the month. The absence of Mrs. Drew for eight weeks in March and April, prevented the banding records from showing the continuous increase observed elsewhere, but the birds were present in sufficient numbers upon her return, so that she was able to band 61 during the last week of April and 27 during the month of May. Mrs. Drew estimated that she was able to band from one-half to one-third of the birds present at any one time during the invasion.

WELLS RIVER, VERMONT—MR. WENDELL P. SMITH. The last Purple Finch of the fall of 1938 was seen at Wells River on November 11. The first appearance of the invasion occurred December 16, 1938 when two were observed. On December 20 a walk of eleven miles yielded two flocks numbering 23 individuals. Small numbers were seen at rather long intervals throughout January and February, but March brought an increase. March 15 marked the arrival of large numbers and the population remained larger than normal until April 16. After the latter date the usual migrant population was noted. Mr. Smith's banding records support the observations above. He banded the first bird February 8 and the second on March 6. Seven were banded March 15 and by April 16 a total of 101 were banded.

BRUNSWICK, MAINE—DR. ALFRED O. GROSS. "We had an unprecedented influx of Purple Finches in Brunswick about March 10. At one time I had fully a thousand individuals about my feeding shelves. The bulk had left by the end of the month. Similar reports of great numbers came from Lewiston, Bar Harbor, and Bangor."

ORONO, MAINE—MR. C. M. ALDOUS. "Some time about March 15, 1939 Purple Finches in numbers far in excess of normal were first observed about the buildings on the campus of the University of Maine. Sixty-two were trapped and banded on March 20 and 21. The birds remained around the campus and vicinity until April 1 when they began to thin out."

ALBION, MAINE—MRS. MERTY R. WEBB. "I saw no finches until February 6. On that date a flock of 40 or 50 came into the top of several elms in the yard. They remained only about five minutes. The same flock or another returned February 8. From then until February 16 a flock appeared in the yard for a few minutes at least once a day, but did not feed at the traps. I banded my first bird February 16 and continued to band them until the middle of April. Fifty to seventy-five finches were around February 16-26, 31 of them being banded. The birds then increased greatly with 33 being banded in two days. During the first week of March, 60 others were banded and on March 13 they arrived in great flocks during a severe snow storm. At least 200 were present, 110 being banded from March 8-13, and 171 from March 14-21. The greatest concentration was from March 9-31. During April, 89 were banded, the last one being trapped April 24. After April 13 only a few birds fed regularly in groups of five or six. A total of 515 birds were banded."

PORTLAND, MAINE—MR. ARTHUR H. NORTON. "On February 28 fifty or more finches were observed in South Portland. During the next few days equal numbers were observed in Portland and Brunswick. A heavy snow storm on March 12-13 forced the birds to congregate at the bare spaces opened for human transportation and at bird feeders. The birds increased regularly and the maximum population was reached March 15 to April 10. When the snow melted they gradually dispersed and were not noticeably abundant after the middle of April."

BAR HARBOR, MAINE—MRS. EFFIE A. ANTHONY. Hundreds of finches arrived in conjunction with the blizzard of March 12-13. On March 18-19, 135 birds banded, but the birds began to die in such numbers that banding was stopped

until March 25. A total of 191 birds was banded but this represents only a small part of what could have been banded under more favorable circumstances. At least a thousand finches were present March 14 accompanied by siskins and crossbills. A second snow storm April 8 caused another minor influx. The vagrant finches were around in numbers until April 11 when the migrants began to arrive.

PRESQUE ISLE, MAINE—MR. GLENN D. CHAMBERLAIN. "We had no unusual influx last winter. The birds were here and some were banded but the fabulous reports of birds settling down in backyards by the thousands can definitely not be matched in this section. In 1939, 51 birds were banded from March 27 to April 18, three less than the number banded in 1928, the only other year when the birds arrived early and in numbers."

WOLFEVILLE, NOVA SCOTIA—MR. ROBIE W. TUFTS. "Several birds were observed February 23 and 24 and several flocks on March 4. By March 25 there were small detached flocks of 10-25 at frequent intervals, several hundred being seen in one day."

HANOVER, NEW HAMPSHIRE—DR. RICHARD WEAVER AND MEMBERS OF THE DARTMOUTH NATURAL HISTORY CLUB. The finches arrived on or near the 13th of February in small flocks of 5 or 6 and increased rapidly to flocks of 20-25 and eventually to flocks of 200-300. The first ones to be banded were caught February 20 and by February 26, 125 birds had been banded. Many of them received white tail plumes. From February 27 to March 10, 675 more were caught and these received yellow tail plumes as well as the regular bands. Green plumes were used on the birds caught from March 13-30 and red plumes were used March 31 to April 19. The peak of the banding occurred in Hanover about March 6 and from then until April 28 when the last one was banded, a gradual decrease occurred. A noticeable exodus was noted, however, the last week of April and by the end of the month the vagrants were gone and the migrants began to arrive.

DURHAM, NEW HAMPSHIRE—MRS. MAUDE N. BISBEE. The first Purple Finch arrived February 20 and was banded. On March 11-18 the peak of the invasion was reached. 171 birds were banded during and following the heavy snowstorm of March 12-13. A total of 350 birds were banded during the invasion.

MANCHESTER, NEW HAMPSHIRE—REV. EUGENE J. GOELLNER. The first evidence of the unusual invasion occurred March 2 when ten birds were seen and on March 3 when ten more were observed. On March 7 and 9 nearly three hundred were counted. On March 10 the first one was banded and by the end of the month 168 were marked. Only 95 were caught in April. The peak of the invasion was reached March 7-18.

SANBORNTON, NEW HAMPSHIRE—MR. E. C. WEEKS. The finches arrived March 20 and 11 were banded during the month.

WILLIAMSTOWN, MASSACHUSETTS—MRS. E. CROSBY DOUGHTY. Purple Finches came in hundreds from March 2 to April 16. A few were still present in May and some nested. Several hundred were banded during the first two weeks of April.

AMHERST, MASSACHUSETTS—MRS. FREDERIC MORSE CUTLER. Only one bird was banded in January and one in February. From 10 to 50 birds were banded daily during March, starting on the 9th. Birds were present in undiminished numbers during most of April but only two were banded in May. The majority of the birds banded were trapped in the period from March 10-17.

NORTHAMPTON, MASSACHUSETTS—MRS. CHRISTABEL S. ROCKWOOD. Finches were first banded March 12 when 44 birds were caught. Banding was fairly regular through March and early April, becoming less so about April 14. It continued until May 12. A total of 570 birds were banded. "The Biological Survey did a wonderful job in replenishing the supply of bands."

ATHOL, MASSACHUSETTS—MR. ROBERT ALLISON. A great many birds were banded during March and April and many returns were captured. Many of the Athol birds were recaptured elsewhere.

WESTFIELD, MASSACHUSETTS—MR. CHARLES L. HILDRETH. The first Purple

Finches were banded March 26. 26 birds were banded during March and April.

NORTH ANDOVER, MASSACHUSETTS—MR. OSCAR M. ROOT. The first of 85 birds was banded March 15 and the last on March 18. Some were still present in April and May, however, since 15 more were banded from April 29 to May 23 when banding operations were resumed.

LYNN, MASSACHUSETTS—MR. WILLIAM ARTHUR MARCY. The first birds were observed on March 9. Banding began March 11. 18 birds were banded during the month and only six more were added in April.

GROTON, MASSACHUSETTS—MR. EDWIN MASON, WHARTON BIRD BANDING STATION. On February 28 there were 13 birds about the station for a short time. Small flocks stopped each day until March 4–5 when 300 appeared. Banding was started March 7. Of the 1,123 finches banded, the majority were caught March 11–15. The number of new birds captured thereafter decreased steadily until April 27 when the last of 11 birds was trapped.

CONCORD, MASSACHUSETTS—MRS. M. A. BOWERS. "There were not many Purple Finches here in January, 1939 when we banded but 4 birds, nor in February when only 5 more were added, but in March we banded 1,125 and in April 736. From May to October 1, 1939 we added 119 more. We estimated by counting groups of 50 and comparing it with the whole number, that we had from 250–300 birds here at one time for a number of days. We used 200 pounds of sunflower seed during March. With the trapping of foreign finches we found some poorly applied bands and I wish banders might be urged to use proper pliers in doing the work." This station banded the largest number of birds during the invasion.

BELMONT, MASSACHUSETTS—MESSRS. SAMUEL D. AND CHANDLER S. ROBBINS. The first birds were observed on February 25 when a small flock appeared. Normally there are a few present each winter. On March 5, forty-two were counted on an all-day census in the Sudbury Valley and Essex County. The first bird trapped was on March 8. The birds remained in numbers until May 3. March 12–18 was the period of greatest abundance. A total of 1,665 birds were banded during the invasion.

HAMDEN, CONNECTICUT—MR. H. L. HUTCHINS. 539 Purple Finches were banded in 1939. During the six years previously only seven were caught. Banding began on March 3, 1939 and continued to May 2 with the peaks being reached March 11–13 and March 17–18. The majority of the birds were banded in the period from March 9–20.

FAIRFIELD, CONNECTICUT—DR. ARETAS A. SAUNDERS. "Although finches are usually present here in winter, they were not seen until February 25 in 1939 when a flock of ten was observed. A still larger flock was seen February 27. Thereafter, they were seen fairly regularly, but at first not in large numbers. The big flocks and the spread of the birds to many places took place March 12 and from then until about March 17 the birds seemed to be everywhere that there were trees and shrubbery. A slight decrease was evident in numbers after March 17 but they were still present generally until March 29. After this date they had decreased sufficiently to be somewhat local in distribution. Flocks were in certain definite localities all through April and up to about May 11. After that a few remained and were summer residents. During the height of the invasion flocks with as many as 200 birds were observed and they were scattered through Fairfield, Bridgeport, Stratford, Norwalk, Hartford, and Westport."

HARTFORD, CONNECTICUT—MR. C. HAPGOOD PARKS. The first Purple Finches to be observed were seen March 4 and the last one on April 29. Of the 786 birds banded by Mr. Parks, 653 were caught in Hartford and 113 were caught at Winchendon, Massachusetts. Banding of finches was started March 4 but the main increase began March 10 and lasted nearly a week. Banding during March and April fluctuated but averaged higher in late March and early April than during late April.

BRADFORD, RHODE ISLAND—MRS. MARY K. SOUTHWICK. Fifteen to twenty Purple Finches were present during January and February. On March 1 the numbers increased and by March 5 there were 50–60 birds and on March 6 at

least 100 present. From March 8-11 at least 700 birds were present. During the snowstorm on March 12, 900 or more flocked to the feeding places. Great numbers were reported all over Rhode Island. On March 12 at Winnapaug, it was estimated that at least 1000 were feeding.

EAST PROVIDENCE, RHODE ISLAND—SETH G. JAMESON. The arrival date was March 9. A daily increase occurred until March 12 when 150 birds were counted. There were at least one hundred present during the following thirty days. By April 30 only five or six could be counted.

PROVIDENCE, RHODE ISLAND—MRS. ALICE HALL WALTER. Twenty-five to one hundred birds were present regularly at five localities in the city during March and April.

LARCHMONT, NEW YORK—MRS. HENRY DOEPEL. Fourteen birds were counted during the first week of March and they were present regularly thereafter until April 21 when the last one was observed.

HUNTINGTON, NEW YORK—MR. GEOFFREY GILL. There were small scattered flocks of about a dozen birds within three miles of the station from mid-February to early May. No trapping was done but in 20 years they were never as common as in 1939.

SCARSDALE, NEW YORK—MR. GEORGE DOCK. A few scattered finches were seen as early as February 20 but no unusually large flocks were seen until early March. The first one was trapped March 12 during the snowstorm. The largest concentration occurred between March 18-29. Only sixteen birds were banded. The finches were more abundant in 1939 than in any of the three previous winters and were less common at Scarsdale than across the river in northern New Jersey.

ELMHURST, LONG ISLAND, NEW YORK—MRS. MARIE V. BEALS. A small number of birds were banded but it was the first time that any were ever caught in the spring at this station. On March 14 there were 14 birds banded. Several others were banded March 15-17.

MANORVILLE, LONG ISLAND, NEW YORK—MR. GILBERT S. RAYNOR. The first birds were banded March 13. Eighty-five others were observed and a few were banded at or near the station during the rest of March.

ALBANY, NEW YORK—DR. DAYTON STONER. "The finches seemed to reach the greatest abundance in 1939 during May and were present earlier but not in the usual numbers. Apparently the invasion was more conspicuous to the east of us."

PEQUANNOCK, NEW JERSEY—MRS. MARIE DUMONT. Although only six birds were banded, there was only one other bird that visited the traps in six years of banding.

MONTCLAIR, NEW JERSEY—MRS. CHARLES S. HEGEMAN. The first bird was observed March 15. The first one to be banded was caught March 23 and the last one May 4. A total of 91 birds was reached for the period of the invasion. They were well distributed all over Montclair.

BOONTON, NEW JERSEY—MRS. IRENE D. SWART. Banding started March 1 and by March 15, 160 birds were banded and by March 31, 352 more. In April, 325 were banded during the first half of the month and 222 during the latter half. In May only 37 birds were added, the last one on May 6. The total for the invasion was 1,091.

DEMAREST, NEW JERSEY—MR. B. S. BOWDISH. The first two birds were banded on March 10. They continued to arrive through March so that the major part of the 661 banded were caught during the month. Forty-six were banded on April 15, however, more than on any day in March. The last one was banded May 7 and the last repeat recorded on May 8.

ARDMORE, PENNSYLVANIA—MR. HORACE GROSKIN. A total of 1,146 birds was banded in the period from February 10 to May 16 with the peak of the invasion reached March 17-31. However, the birds were present in large numbers during the period of March 30 to April 14 and they did not decrease noticeably until after May 1. Not over 50 birds were banded during any week until after March 17. Of the 1,146 birds banded, 450 or about 39% were adult males and 696 or about

60% were olivaceous females or immature birds. This is contrasted with the fall migration of 1939 and 498 birds were banded and only 10% were adult males. Four of those banded in the spring invasion were retaken during the fall migration.

CHESTNUT HILL, PENNSYLVANIA—MR. JOHN DORMAN. A total of 297 finches was banded during the invasion compared with 100 during 1938.

WYNCOTE, PENNSYLVANIA—MR. WILLIAM PEPPER, JR. A total of 113 birds was banded in 1939, a larger number than ever banded before. The first one was caught March 18 and the last one repeated May 6. The height of the wave was reached April 2 and 3.

MORRISVILLE, PENNSYLVANIA—MR. RANDOLPH ASHTON. Finches arrived March 3 and were seen occasionally up to March 12 when about 30 birds arrived, increasing to 50 by March 13. About 20 birds remained during March and then decreased during April until the 17th when no more were seen.

LACEYVILLE, PENNSYLVANIA—MR. CHARLES C. VANDERVORT. Purple Finches were first recorded April 18 and last seen May 6.

CHESTNUT HILL, PENNSYLVANIA—MR. A. M. CLARK. The finches were regular during the fall of 1938 but increased noticeably after December 26, becoming more numerous than in any previous year. There were 10 or 12 feeding regularly at each feeding shelf. On February 5 fifty birds arrived and the numbers gradually increased thereafter reaching over 100 by April 8, which was evidently near the peak of the invasion. The numbers decreased rapidly after that. Mid-March to April 25 covered the period of the invasion proper although several birds were observed as late as May 7.

SWARTHMORE, PENNSYLVANIA—DR. C. BROOKE WORTH. Only a few birds were observed near the end of March and early April and none entered the traps. It was their first appearance at the station. Many were observed during this period at Wayne, Pa.

Other banders in the Philadelphia region who banded a few finches during this period were Horace D. McCann of Paoli, Raymond J. Middleton of Norristown, Mr. and Mrs. John Gillespie of Glenolden, and H. P. Bailey of Overbrook.

RATE OF TRAVEL

The rate of travel was determined in miles per day for about 40 of the returns of birds banded and retaken during the invasion. An attempt was made to segregate the results into time or distance groups to see if the birds were traveling faster at any one time during the invasion or if the birds taken a short distance away from the place of banding were traveling any faster than those taken at longer distances. However, distance traveled made little or no difference on the rate of speed but those banded in February and early March averaged 3.54 miles per day while those banded the latter part of March and early April average 9.26 miles per day.

The general rate of speed of the birds during the invasion regardless of distance or time was approximately 7-8 miles per day. The greatest rate of speed was of a bird banded at Ardmore, Pa., March 29 and recaptured May 1 at Sault Ste. Marie, Mich., which is an average of approximately 20 miles per day. Other returns showing a rather rapid rate of speed were as follows:

39-155079 banded at Wyncote, Pa., March 18 and recaptured at Concord, Mass., April 8, an average of 11.36 miles per day.

38-57963 also banded at Wyncote, Pa., April 8 and recaptured at Conway, Mass., April 25, making an average of 11.1 miles per day.

138-563 banded March 18 at Athol, Mass., was retaken at Ardmore, Pa., on April 4, which makes an average of 14.7 miles per day.

The following chart shows the average rate of speed of birds banded and recovered during the invasion, arranged in fifteen day intervals:

<i>Feb. 15-28</i>	<i>Mar. 1-15</i>	<i>Mar. 16-31</i>	<i>April 1-15</i>	<i>April 16-30</i>	<i>May 1-June</i>	
No. of birds			Average			
1.....			5.41			
2.....				2.2		
	2.....		4.98			
	8.....		3.46			
	3.....			1.93		
						AVERAGE 3.54
		2.....	10.3			
		8.....	6.51			
		2.....		10		
		2.....			12.2	
			4.....	7.8		
						AVERAGE 9.26

MORTALITY

Not a great amount of significant data were obtained regarding the deaths of Purple Finches during the 1939 invasion. The following notes were the only contributions:

Purple Finches suffered slightly from the depredations of predators, ten to twelve cases being reported. Sharp-shinned and Sparrow Hawks were mentioned as predators in two instances but cats topped the list as the principal enemy.

Several birds collided with the windows of houses and automobiles and were killed. About six such instances were reported.

In several localities, mostly in Maine, many birds were found dead or dying. These places were: Bangor, Millbridge, Albion, Bar Harbor, and Orono, Maine and St. Johnsbury, Vermont. A letter from Mrs. Webb of Albion gives the following interesting account of the mortality around her home. She says:

"While the number of finches killed is a matter of conjecture, there is no doubt that many were killed when they flocked around houses of the towns in such numbers to take food offered to them. Their extreme tameness made them easy prey for cats. Several of the people in town told me of their cats catching many finches in spite of their precautions. Three were killed by automobiles in front of my house. It was my habit to keep the family cat in the house during the day and allowing her to go out for a short time after dark. Two nights in succession the cat appeared with a bird. The first one I took for granted to have been found dead, but on watching her the second night I discovered she was prowling along close to the house foundation. With the aid of a flashlight I found two birds huddled against the house sleeping. I confined them overnight in a cage and released them in the morning. During the day I noticed a finch being pecked and pushed around by the other birds so I captured it easily, and found it to be one of those I had taken the previous night. It seemed feeble so I placed it in a cage where it lived two days. This bird and another found at night were sent to Harvard University where an examination disclosed extreme emaciation in both cases, one bird showing congestion of the lungs, cloudy swelling of the

kidneys and cranial hemorrhage. For several nights I searched the crevices between the snowbank and the house foundation and found two other birds. A bird was found asleep on the stone door step early in the morning and another on the floor of the garage where it had apparently taken shelter the night before. Once or twice previous to the discovery of these finches I had noticed feathers around the yard in the morning so prowling cats must have accounted for others. I have definite knowledge of fifteen birds killed. The cause of the deaths were: cats—8, automobiles—3, illness—2, found dead, cause unknown—2.”

Harvard Medical School also examined one bird sent to them by Mr. Wendell P. Smith of Wells River, Vermont. The report was “pulmonary congestion, possibly pneumonic condition.”

Eighteen birds were examined by Dr. C. M. Aldous of the Wildlife Research Unit at Orono, Maine. He reported the birds had a blood parasite, microfilaria, and showed no signs of starvation or freezing.

At Bar Harbor, Mrs. Effie A. Anthony writes that after the blizzard of March 13 when hundreds of the birds arrived, many began to starve and freeze to death, so much so that she discontinued banding and spread seed in every possible place for the birds. The worst period was about five or six days after the storm.

ACKNOWLEDGMENTS

The author wishes to express his sincere appreciation to all those who so generously contributed their time, their records, and their interest, which made this summary of the 1939 Purple Finch invasion possible. Many of the banders and observers who contributed have been recognized in the context but there were many others not mentioned who helped greatly by making individual sight observations of plumed birds, by indicating the absence of the birds in their areas, and by making detailed compilations of their banding data.

The author is especially grateful to Mrs. Florence Weaver, Mrs. Louise Forsyth, Mr. Clinton Reynolds and Mr. Flagg Southerland for giving so much time and assistance in the pluming and banding activities at Hanover, N. H. and for assisting in the preparation of the manuscript.

REFERENCES

- BAGG, AARON CLARK AND SAMUEL ATKINS ELIOT, JR.
Birds of the Connecticut Valley in Massachusetts. 1937: 741-744.
- BAIRD, S. F., T. M. BREWER AND R. RIDGWAY.
A History of North American Birds. Land Birds, Vol. I. 1875: 462-464.
- BIRD LORE MAGAZINE.
National Association of Audubon Societies.
Christmas Censuses.
- BULLETIN OF NEW ENGLAND BIRD LIFE.
New England Museum of Natural History.
Monthly Reports.
- CHAPMAN, FRANK M.
Handbook of Birds of Eastern North America. (1912) 1927: 377-378.

FORBUSH, EDWARD HOWE.

Birds of Massachusetts and Other New England States. Vol. III. 1929:10-13.

LINCOLN, FREDERICK C.

Returns From Banded Birds 1923-1926. Tech. Bull. No. 32, U.S.D.A. 1927: 5, 48.

The Migration of American Birds. 1939: 48, 96, 103, 139, 144, 159.

MACOUN, JOHN AND JAMES M. MACOUN.

Catalogue of Canadian Birds. 1909: 453-455.

MINOT, H. D.

The Land and Game Birds of New England. 1895: 179.

UNITED STATES BIOLOGICAL SURVEY.

Bird Banding Notes 1932-1939.

Bird Banding Returns 1938-1939.

Dartmouth College, Hanover, New Hampshire.

A RECORD OF BIRDS BANDED AT AVERY ISLAND, LOUISIANA DURING THE YEARS 1937, 1938 AND 1939

By E. A. McILHENNY

FOREWORD

IN BIRD BANDING, No. 3, July, 1937, there was published a complete list of the birds banded by me at Avery Island, Louisiana during the year 1936. The number banded that year being 17,981, enumerated as far as possible as to sex. Since then, I have received, from time to time, from others interested in bird banding and the sex ratio of birds, requests for information similar to that given for 1936. I now present a tabulation of the birds banded at my station for the years 1937, 1938, and 1939. A comparison of these records with that for 1936 gives some interesting data as to numbers banded and sex ratio. My banding traps for the smaller land birds are operated every day in the year, and my four traps for migratory wild fowl are operated from September 1st to February 1st; then closed until March 15th., at which time one trap is operated on Blue-winged Teal (*Querquedula discors*), as their return from the south can be expected about that time.

My reason for closing the wild fowl traps in mid-winter is, that the great majority of wild fowl using the territory adjacent to the traps have been banded by that time. These banded birds, knowing grain is available in the traps, crowd into them as soon as the feed is spread in the morning, making it necessary to handle many hundreds of banded birds in order to get a few that are not banded. This also seems to be true of the Red-wings (*Agelaius phoeniceus littoralis*) and Boat-tailed Grackles (*Cassidix mexicanus major*) taken in my small bird traps, as these traps take more banded birds during the summer than those not banded.