

# Bird-Banding

A JOURNAL OF ORNITHOLOGICAL INVESTIGATION

VOL. XV

JANUARY 1944

No. 1

## SEVENTEEN YEARS OF BANDING WHITE-THROATED SPARROWS AND SLATE-COLORED JUNCOS AT MICHIGAN STATE COLLEGE<sup>1</sup>

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BIRD-BANDING was started at Michigan State College on October 12, 1923. On that date the senior author placed the first bird trap on the college campus. It was located in the southeast corner of the Forest Nursery. From this meagre beginning bird-banding operations have expanded. At present as many as thirty bird-catching devices are operated on the campus throughout the spring, winter and fall terms.

Until the fall term of 1925 the senior author was the sole operator of the traps. During that term members of his advanced ornithology class were given an opportunity to handle and band living birds. Interest was thus stimulated and the method proved successful. Since that time bird-banding has been a project of Professor Stack and his classes in advanced ornithology.

The type of trap which has proved most successful and which has been used almost exclusively at this station is the modified government sparrow trap. It was originally designed, after extensive experimental work, by the late W. I. Lyon of Waukegan, Illinois<sup>1</sup>.

Another highly successful method of catching birds at this station has been by means of bird trammel nets<sup>2</sup>. This type of net was first used for capturing live birds in Italy, and was introduced into this country for bird-banding purposes by Dr. O. L. Austin. At present about one-half of the bird-catching devices used at this station are nets and one-half traps. The nets are never used when the temperature is below freezing.

In the spring of 1938 sanctuary rights were granted for an area

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<sup>1</sup>Journal article No. 544 (n.s.), Michigan State College Experiment Station. Mr. Harned submitted this paper in partial fulfillment of requirements for the degree of Master of Science.

<sup>2</sup>The bird trammel nets are 20' long by 7' high; the outside netting is a 10'' square mesh of No. 16 cotton twine; the inside netting is a  $\frac{3}{4}$ '' square mesh of No. 50/2 linen. They are hung with No. 24 twine at top through small black metal rings,  $\frac{3}{4}$ '' in diameter. The nets are dyed black, this color being least conspicuous.

rather isolated from the rest of the campus. This area affords protection, food, and nesting sites. In the fall of 1938 traps and nets were shifted to this area and have remained so placed until the present time.

The aim of this treatise is to summarize the data obtained from banding White-throated Sparrows (*Zonotrichia albicollis* (Gmel.)) and Slate-colored Juncos (*Junco hyemalis hyemalis* (Linn.)) over a period of seventeen years. These have been selected for study because they are the two species most frequently caught at this station, and relatively little is known of their migration habits. In general they breed in regions north of this area and winter in areas farther south. They are therefore caught at this station while on their migratory routes in spring and fall. This study was made primarily to learn something about the behavior of these birds while moving between winter and summer homes, and *vice versa*. The study has been concerned mainly with gross behavior patterns.

#### WHITE-THROATED SPARROWS

The White-throated Sparrow is one of the most abundant members of its large family. It breeds from northern Mackenzie and the southern part of the Ungava Peninsula south to southern Montana, north of Clare County in Michigan, northern Pennsylvania and western Massachusetts. The winter range is from the southern part of the nesting area south to the Gulf coast and northeastern Mexico. It is caught at this station in larger numbers than any other bird, except the Slate-colored Junco.

A total of 4,174 White-throated Sparrows were banded during the years of 1924 to 1940, inclusive. Of this number 2,712 were banded during spring migrations and 1,462 during fall migrations. It should be noted that no banding was done during the fall of 1930, therefore, the totals include one more set of spring than fall figures. The actual number banded each spring and fall for the seventeen year period is shown in Table I.

The mean yearly number of birds banded during fall migration period was 91.4. The average number banded during spring periods was 159.5. A difference as great as 68.1 would occur by chance about once out of twenty times. Therefore the difference is statistically significant. It might be expected that greater numbers would be banded during the fall because that period would include not only the mature birds but also the young of the year. Then too it has been shown that the fall migration is more leisurely, that is, it extends over a longer period of time. The average spring migration period is about one week shorter than the average fall

TABLE I  
NUMBER OF WHITE-THROATED SPARROWS BANDED DURING SPRING  
AND FALL MIGRATIONS, 1924 TO 1940, INCLUSIVE

<i>Year</i>	<i>Spring</i>	<i>Fall</i>
1924 . . . . .	75	39
1925 . . . . .	33	91
1926 . . . . .	122	111
1927 . . . . .	203	87
1928 . . . . .	135	164
1929 . . . . .	236	110
1930 . . . . .	136	..
1931 . . . . .	86	28
1932 . . . . .	170	168
1933 . . . . .	240	60
1934 . . . . .	204	38
1935 . . . . .	198	30
1936 . . . . .	124	148
1937 . . . . .	180	134
1938 . . . . .	202	104
1939 . . . . .	246	105
1940 . . . . .	122	45
Totals . . . . .	2712	1462

period at this station. Therefore it might seem that this would increase the chances of each bird to be captured and as a result the total catch would be greater during the fall.

It is evident that the above statement presents only one side of the question and that other factors should be considered.

First, since natural food is more abundant during the fall migration season it seems natural to expect that fewer birds would be attracted to artificial baits during that period. Therefore it is probable that a greater catch would be realized during the spring period which usually begins around April 20 and ends about May 20.

Second, contrary to popular opinion, not all species of birds seem to follow the same migration routes from year to year or even the same ones in spring and fall. Especially does this seem to be true for the White-throated Sparrow. According to all information at hand, at stations between winter and summer homes, local return records for this species are rare. The only information which has been obtained about an individual of this species, banded at this station, came from Eldorado, Arkansas. This bird was banded at Michigan State College, April 27, 1927, and was shot by T. Mooty at Eldorado in November 1929. It was evidently on migration or at its winter home. Since return records are so scarce, even though large numbers are caught each year, it is possible that individual migration routes vary yearly and even seasonally. It is entirely possible that first-year birds and parents follow separate routes in the fall migration.

A bird which is recaptured at the same station within a period of six months after the date of the last previous capture is called a repeat. This terminology is based on the theory that if only a short period elapses between captures it is probable that the bird has remained relatively close to the station between these times. The period of six months has been fixed arbitrarily to correspond with the length of the summer and winter seasons. If a period of time greater than six months elapses between catches, the bird is classified as a local return.

A great many things may be learned from studying the repeats of birds. The length of stop-over periods along the migration route, the tendency of species to form the trap-habit method of feeding, the length of time elapsing between repeats, the comparison between the repeat records of different species and between individuals of the same species, are all problems which may be studied from repeat records.

The average percentage of repeats during spring migrations was found to be  $24 \pm 14.5$  (standard deviations. Baten, 1938). The corresponding average for fall migrations was 63.3, 15.6%. The odds against this difference being due to chance are 19 to 1. Therefore this difference is considered significant. Bradt (1926), whose results were based on banding results for only one year, did not find a significant difference between the number of repeats in spring and fall.

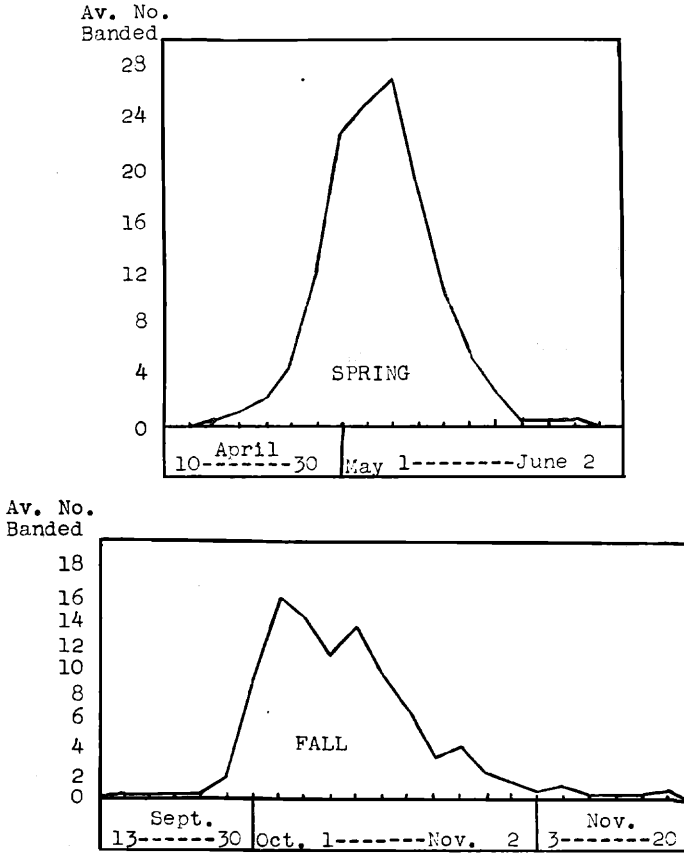
The difference shown in this work is probably due to the fact that migration in the fall is more leisurely. According to Rowan (1931) a greater speed of migration in the spring is due to a strong urge for mating and reproduction. This urge is attributed to a rejuvenation of the dormant sexual organs, which in turn are stimulated by the increasing length of light-days and an increasing amount of daily exercise. After termination of the breeding period these organs again degenerate. The urge therefore not being present in the fall would cause migration to be less rapid.

The average length of time spent in this locality was found to be significantly greater in the fall than in the spring. The average stop-over period in the fall is  $10.67 \pm 2.56$  days. The corresponding period for spring is  $4.5 \pm 1.56$  days. This difference would occur through chance about once in twenty times. These results show definitely that migration in the fall is less rapid than in the spring.

It is difficult to say that a migration reaches its greatest intensity on any one specific day because the numbers caught on succeeding days may vary greatly. In order to show a somewhat smoother migration curve and still give the impression of the fluctuation tendency it seems better for all practical purposes to group the

number of birds banded into two or three-day periods. For this work a three-day period has been adopted.

Graph I presents the spring and fall migration curves for White-throated Sparrows. Each point on the curves is the average number



GRAPH I  
AVERAGE SPRING AND FALL MIGRATION CURVES FOR  
WHITE-THROATED SPARROWS (1924 to 1939)

of birds banded on three successive days over a period of sixteen years, 1924 to 1940, inclusive. These curves may be used in the future as standards for comparison with curves for individual years. An inspection of these graphs leads to the following general con-

clusions concerning spring and fall migrations of White-throated Sparrows at East Lansing:

1. The bulk of spring migration occurs between the nineteenth and twenty-first of April and the nineteenth and twenty-first of May, a period of thirty-three days.
2. The average spring migration peak falls between the seventh and ninth of May.
3. The bulk of fall migration comes between the twenty-fifth and twenty-seventh of September and the twenty-fifth and twenty-seventh of October, a period of thirty-three days.
4. The average fall migration peak occurs between the first and third of October.
5. After the peak is reached, migration terminates in less time and the slope is more abrupt during the spring than during the fall migration. This further supports the theory that there is a definite urge in the spring to reach breeding grounds. This urge is non-existent in the fall and migration is more irregular.
6. The difference between the numbers banded in spring and fall is clearly shown.

The first and last captures of birds for both spring and fall migration seasons are of particular interest.

The earliest date of arrival recorded in the spring for a White-throated Sparrow is April 17th, and the latest April 30th. The average date for the sixteen years is April 23  $\pm$  3.5 days. The earliest departure date recorded for spring is May 8th, and the last May 19th  $\pm$  4.5 days.

It was not possible in this study to consider first arrivals in the fall because, in most of the years covered, migration had already begun before college was opened and the traps put into operation. The earliest date of capture in the fall was October 13th, and the last date of capture November 8th. The average date of last capture in the fall is between October 27th and 28th  $\pm$  7 days. It is seen that the fall migration extends over a considerably longer period than the spring.

#### SLATE-COLORED JUNCO

The Slate-colored Junco comes at a time when most of the other birds have left for their winter homes in the south, and usually remains until late in the fall. It breeds in the Hudsonian and Canadian Zones in northwestern Alaska, northern Mackenzie (the tree-limit of North America), northern Manitoba, central Quebec, south to the base of the Alaskan peninsula, southern Yukon, central Alberta, northern Minnesota, central Michigan, Ontario, and the

mountains of New York, Pennsylvania, and western Massachusetts. Its winters are spent in the eastern United States, southern Ontario, and south to the Gulf Coast. These birds are banded at this station in greater numbers than any other species. They are taken almost entirely during their migratory periods since relatively few remain in this locality throughout the winter months. For the period of 1924 to 1940, inclusive, 5369 were banded. If the total number of repeats were added to this, the number of catches would approximate 12,000.

The numbers banded by years and seasons are shown in Table II. Of the total number banded, 2236 were taken during spring migrations and 3133 during fall migrations. The mean number for the spring was  $131.5 \pm 86.6$ . The average in the corresponding fall migrations was  $195.8 \pm 100$ . The difference between the two means, 64.3, is not significant since it would occur through chance about once in five times.

One explanation for this dissimilarity is that in some years spring migration begins before traps are opened. The beginning of spring trapping corresponds roughly to the opening dates of the spring term. The beginning of trapping operations has therefore varied from April 4th to 16th during the past sixteen years. This variation would make a considerable difference in the number captured, since the maximum migration period often falls from April 7th to 12th. It is also difficult to determine the actual start of migration at this station because occasionally individuals do winter in this area. Records from students doing special problems during the winter terms show that a few Slate-colored Juncos are caught throughout the winter months. Bradt (1926) found spring migration beginning around April 9th in 1926.

Another probable theory to account for the difference is that in spring the migration is usually more rapid than in the fall. It might be that when favorable weather prevails in the spring, birds make a series of longer, non-stop flights until they reach their destination in the north. Stop-overs during fall migrations would be made oftener and for greater periods of time, and the chances for individuals to be caught would be greater. If this is true, it would seem partially to account for the smaller number banded in the spring.

An examination of Table II reveals an interesting point. The total number of Juncos caught during spring and fall migrations after 1932 is almost equal. Then why is the difference only before 1932? It is noteworthy that bird trammel nets were first employed as a supplementary method of capturing birds in 1933. It may be that this factor has played an as yet unrevealed influence in the

change. A more likely reason, however, would seem to be that captures of Slate-colored Juncos have always been relatively heavy in the fall.

TABLE II  
NUMBER OF SLATE-COLORED JUNCOS BANDED DURING SPRING  
AND FALL MIGRATIONS, 1924 TO 1940, INCLUSIVE

<i>Year</i>	<i>Spring</i>	<i>Fall</i>
1924.....	6	153
1925.....	7	199
1926.....	88	330
1927.....	52	151
1928.....	280	285
1929.....	119	335
1930.....	151	...
1931.....	17	78
1932.....	223	368
1933.....	146	155
1934.....	249	155
1935.....	252	215
1936.....	105	71
1937.....	137	131
1938.....	318	266
1939.....	146	185
1940.....	43	36
Totals.....	2236	3133

Several interesting things about the behavior of Slate-colored Juncos in migration can be learned from a study of their repeating habits. The repeats of these birds, that is, within a period of six months after original captures, show the length of their stop-overs and the relative tendency to repeat.

The percent of repeats is the total number banded divided by the number of repeats, times one hundred. The difference between the percentages of repeats during the two migration seasons was found to be insignificant. The average percent of repeats during fall migrations was  $42.6 \pm 19.4$ . The average during the spring periods was  $29.6 \pm 16.5\%$ . The actual difference (13.1%) would occur through chance approximately once in three times.

The percent of spring repeats for Slate-colored Juncos (29.6) is slightly greater than spring repeats for White-throated Sparrows (24.6) but the difference is not significant. The percent of fall repeats for White-throated Sparrows (63.3) was found to be significantly greater than the percent for fall repeats for Slate-colored Juncos (42.6). The difference would arise from chance once in about twenty times. This indicates a greater tendency for White-throated Sparrows to form the trap habit during the fall migration.

The difference between the average length of stop-overs in spring and fall was found to be insignificant. The average length of stay



for Slate-colored Juncos that repeated in the fall was found to be 13.6 days  $\pm$  3.2 days, and the average for those that repeated in the spring was 9.7 days  $\pm$  3.1 days. The difference would occur through chance about once in twenty times. This difference is particularly significant in this instance, since it shows that migration in the fall is more leisurely than in the spring.

The question of whether or not birds follow the same migration routes in different seasons has been long debated. The chance that the same bird will return to exactly the same banding station on its migratory route, usually hundreds of miles in extent, seems extremely small. Fourteen return records have been recorded for Slate-colored Juncos banded at this station. These records furnish the only evidence that the birds follow the same routes during different seasons.

Table III is a record of returns. It may be noted that nine of the records are of birds banded originally during the fall migrations. All were recaptured during the succeeding spring migrations. Only one of the birds, number B19,537, returned in any subsequent migration. This bird returned twice and is the only Slate-colored Junco coming back more than once to this station. The records of birds bearing bands numbered 34-6962, 34-6963, 34-6964, H90910, and H19537 are particularly interesting. Birds with the first three numbers were caught on the same day, October 24, 1936. Two of the three were retaken again the following spring on the *same* day, April 14, 1937. The third was recaptured only two days earlier, April 12. Birds with band numbers H90903 and H90910 were both originally caught on October 30, 1934 and both returned the same day, April 6, of the following spring. These examples are noteworthy because they raise an interesting question. Do Slate-colored Juncos remain in flocks throughout the winter? It is indicated from these records that they may remain thus united. This is even more amazing when one thinks of the many hazards of migration. It is not evident, however, whether this is a rule or true only in exceptional instances.

Two birds, A89923, and B19302, were banded while traveling north in spring migration and returned to our station the following fall during their flight south. The greatest period of time elapsing between captures for a returned bird (C30,207) is approximately three years.

The two most salient points shown by these return records are: (1) only one return record for this species has been recorded in which the length of time between dates of capture is greater than one year; and (2) an indication of a close flocking tendency is shown throughout the winter months.

TABLE III  
RETURN RECORDS FOR SLATE-COLORED JUNCOS BANDED AT THIS STATION  
(1924-1939)

<i>Band Number</i>	<i>Original Capture</i>	<i>Return</i>
34-6962	October 24, 1936	April 14, 1937
34-6963	October 24, 1936	April 14, 1937
34-6964	October 24, 1936	April 12, 1937
C30,343	October 5, 1932	April 19, 1933
F78,312	October 14, 1932	April 11, 1933
F79,290	October 19, 1937	April 8, 1938
H90,903	October 30, 1934	April 6, 1935
H90,910	October 30, 1934	April 6, 1935
B19,537	October 2, 1929	March 27, 1930
		April 18, 1931
A89,923	April 6, 1927	November 11, 1927
B19,302	April 27, 1928	November 4, 1928
C30,207	October 27, 1929	October 6, 1932
A92,232	October 9, 1928	October 3, 1929
B20,662	April 15, 1928	April 12, 1929

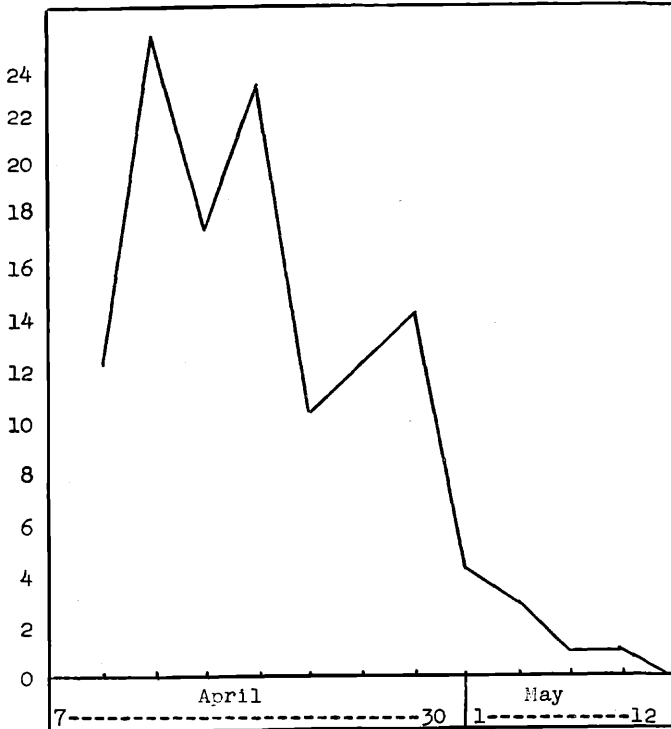
Considerable time has been devoted to the study of migration curves of Slate-colored Juncos at the Michigan State College Station. These birds attracted early attention at the station because of their arrival in large numbers and because of their unusual spring and fall migration habits. The records of bandings cover the years 1924 to 1939, inclusive, and form the basis for a study of migration peaks as well as duration of the migration seasons.

While the larger number of spring migration curves showed a clearly defined migration peak, it was noted that some of them illustrated the fact that migration was already in progress at the time the collection of data was begun. From these graphs it would be difficult to determine whether or not the peak of migration was reached before or after the beginning of trapping operations. For some of the years, 1924, 1925, 1926, 1927, and 1931, the number of birds banded was small, and definite curves were not shown.

During the years 1932, 1933, 1934, 1935, 1936, and 1937, definite peaks appeared some time after the opening dates. These peak-dates ranged from the earliest, April 10 to 12, in 1932 and 1934, to the latest, April 25 to 27 in 1936. In two different years the peak occurred from April 10 to 12. This is the only instance in which the peak occurred on the same date for more than one year. Graph II shows the average percents of the total number banded for these years in which a definite peak is shown, after the traps were opened, *i.e.*, 1932-37, inclusive. It may be seen from this curve that for these years the average peak is from April 10 to 12.

The number of birds banded in the fall during the first three-day period is seldom more than two or three. We are therefore fortu-

nate in having an almost complete set of fall migration records. The maximum period of fall migration was most frequently found to be from October 16 to 18. The peak was from October 7 to 9



GRAPH II  
AVERAGE SPRING MIGRATION CURVE FOR SLATE-COLORED JUNCOS  
CHARTED BY THE PERCENT OF TOTAL NUMBER BANNED<sup>1</sup>  
(1932-1937)<sup>2</sup>

during the years 1924, 1929, and 1930. For two years the period of maximum movement occurred from October 10 to 12. In the five years 1926, 1932, 1935, 1936, and 1939 (33% of the total number of years) the peak came from October 16 to 18. The peak for 1933 was reached between October 19 and October 21. The

<sup>1</sup>Total number banded is 863.

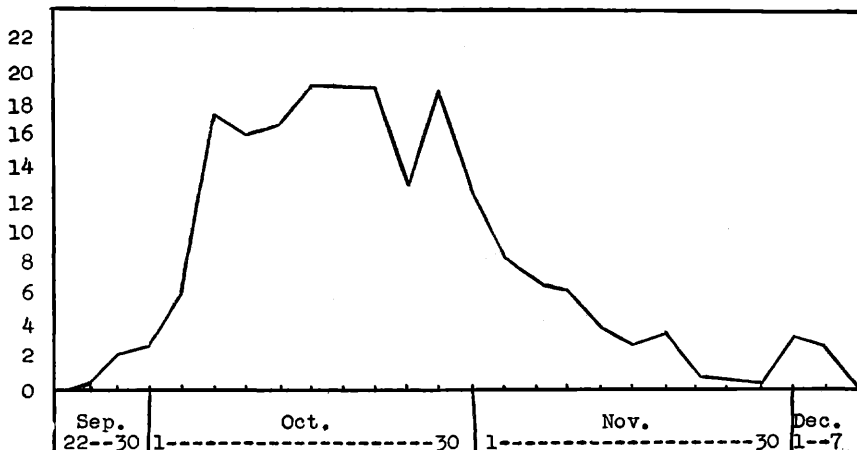
<sup>2</sup>These years are the only ones for which complete information is available.

fall of 1937 the period of greatest intensity was from October 22 to 24; and the peaks in 1925 and 1934 fell from October 28 to 30.

Graph III presents the fall migration curve for Slate-colored Juncos. Each point on the curve is the average number of birds banded on three successive days over a period of sixteen years, 1924 to 1939. This curve and the curve presented in Graph II, showing the average percent of total numbers banded, may be used in the future as standards of comparison with curves for individual years.

Inspection of these curves leads to the following general conclusions concerning the spring and fall migrations for Slate-colored Juncos:

Av. no.  
banded



GRAPH III  
AVERAGE FALL MIGRATION CURVE FOR SLATE-COLORED JUNCOS  
(1924-1939)

1. The fall migration lasts longer than the spring migration. This assumption is based on evidence that spring migration begins usually around April 9. The difference is primarily due to a more leisurely passage in the fall than in the spring.
2. The period of maximum intensity is much longer in the fall than in the spring.
3. Some birds spend their entire winters in this area. This is indicated by the fact that individuals are captured as long as

the traps are operated in the fall and is further supported by records of students conducting special banding studies in the winter term.

4. The curves are very irregular. This is probably due to the relatively irregular migratory habits of this species.

#### SUMMARY

1. A greater number of Slate-colored Juncos is banded during fall than during the spring. The differences, however, are not significant.

2. A significantly greater percent of repeats for White-throated Sparrows occurs in fall than in spring.

3. There is a greater percent of repeats for Slate-colored Juncos in the fall than in the spring.

4. Stop-over periods are significantly longer for both White-throated Sparrows and Slate-colored Juncos in the fall than in the spring.

5. The average peak of spring migration for White-throated Sparrows is from May 7 to 9.

6. The period of greatest banding activity for Slate-colored Juncos during spring migrations is April 10 to 12.

7. The average peak of fall migrations for White-throated Sparrows is from October 1 to 3.

8. The greatest number of fall migration peaks for Slate-colored Juncos was recorded for October 16 to 18.

9. The average spring migratory period for White-throated Sparrows is April 23  $\pm$  4 days, to May 19  $\pm$  4.5 days, or a period of 27  $\pm$  8.5 days.

10. It was impossible to determine average first-capture dates in the fall for White-throated Sparrows since migration usually begins before traps are opened. The average date of last capture in the fall for this species was found to be between October 27 and 28  $\pm$  7 days. First banding records at this station range from September 16 to 30. Using September 23 as the median date, fall migration lasts a minimum of 35 days.

11. It was impossible to determine exact beginning dates for spring migrations or closing dates of corresponding fall periods for Slate-colored Juncos. Migration usually begins in the spring before traps are set. The minimum date for first records at this station is approximately April 9. The average date for last records in the spring is approximately April 30. The minimum spring period is therefore 21 days.

12. The termination of fall migration is not well defined for Slate-colored Juncos since a few are taken as long as traps are open in the

winter. Some of them evidently winter in this region. Migration begins at about October 1 and appears to be over at approximately November 20. Thus the period of fall migration is about 50 days.

13. In general, fall migration covers a greater period of time and is less regular than the corresponding spring period. This is true for both Slate-colored Juncos and White-throated Sparrows.

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## WINTER RETURNS OF SLATE-COLORED JUNCO AT NORRISTOWN, PENNSYLVANIA By RAYMOND J. MIDDLETON

SLATE-COLORED JUNCOS (*Junco hyemalis hyemalis* (Linn.)) are common winter residents of the countryside surrounding Philadelphia. They arrive at Norristown which is some eighteen miles north of Philadelphia, about October 1st and are present until the last of April; we have only one May record, the 7th in 1940.

Our banding station which is on the edge of a well-built up community with open fields beyond and around three sides is composed of a small deciduous woods, a white pine grove, many thickets and lawn, about five acres in all.

The first flocks to arrive in autumn are rather restless and roving, here one day and missing the next; one has the feeling they are merely transients and must soon press on; when trapped at this time nearly all are taken where water is used as bait. This continues through October and it is only after the fall migration has about ceased and the colder weather of November comes that they begin to show any interest in traps where small grains are used as bait.

Rarely do any of the October birds repeat in the traps and never do we get any returns from them in subsequent years. One may