

FALL MIGRATION AND WEATHER, WITH SPECIAL REFERENCE TO HARRIS' SPARROW

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DISCUSSION of weather in relation to migration has usually pertained to the spring season. There are several reasons why fall migration should receive more attention. Systematic trapping and banding on a large scale have resulted in the accumulation of many new data. From 1926 to 1955 I banded approximately 7,000 Harris' Sparrows (*Zonotrichia querula*), about 80 per cent of them in the fall. This species has a narrow migration path, is easily trapped and seems well suited for such study. Harkins (1937) concluded that these birds do follow the same routes and stop at the same places, but he was working within the winter range where movements are limited. The only station return that I have had was a bird banded October 13, 1953, and recaptured October 1, 1955. No birds banded at other stations have been caught by me, but one banded here on September 16, 1937, was caught at Aberdeen, South Dakota, May 4, 1940.

In the spring, Harris' Sparrows reach Fargo, North Dakota, about May 7 (Stevens, 1950) and are present about two weeks. It seems evident that both their arrival and length of stay are delayed by cold weather, and that their departure is hastened by a warm wave. They are restless and there are few repeat records of individual birds. In the fall they appear about September 20 and are common for about four weeks. From 1927 to 1940 large numbers were trapped (Table 1). Fewer were taken from 1941 to 1951, but there were more again in 1952 when 52 of 210 individuals (25.2 per cent) registered repeat records.

Figure 1 shows the fall migration of Harris' and White-throated sparrows (*Zonotrichia albicollis*) based upon numbers of birds banded over a period of 14 years. For an individual year there are alternating highs and lows in numbers (Fig. 4) and, since these occur on different days in different years, an actual daily average would give a relatively flat curve.

USE OF TRAPPING DATA

The significance of the numbers caught in any one day may be questioned, but in the main I feel that the total captured corresponds to the numbers present. Large numbers trapped indicate influxes of birds and vice versa. In the spring an influx often represents a check in migration due to unfavorable weather. The often-observed "warbler waves," when correlated with high temperatures, suggest that an influx may also be a normal rest period. In the fall we might expect accumulations during favorable weather but it seems more likely that the peaks represent either minor local movement or normal

rest periods. The frequent reappearance of individuals after an absence of several days is indicative of local population shifts.

I had noted (Stevens, 1930) that regular trapping operations contribute to general information because of the frequent visits to traps. Workers not engaged in trapping have questioned that numbers trapped are as reliable an index as those obtained from sight records. I feel that trapping records are useful for species that can be taken readily. They have seemed to me

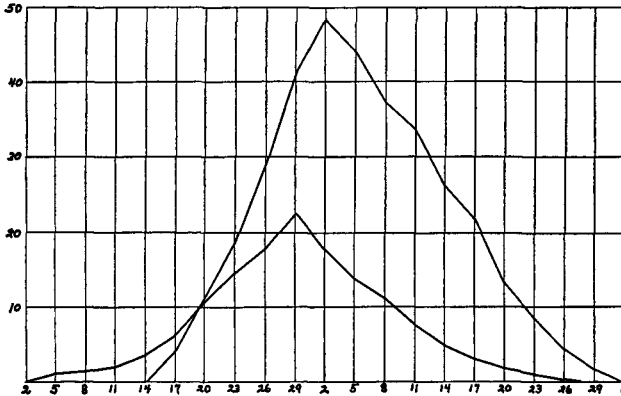


FIG. 1. Fall migration of Harris' (upper line) and White-throated sparrows at Fargo, North Dakota. The numbers are totals for three-day periods using a running average of five days for each day of the months of September and October from 1927 to 1940 inclusive.

TABLE I
REPEAT RECORDS OF HARRIS' SPARROW AT FARGO, NORTH DAKOTA, IN RELATION TO OCTOBER TEMPERATURE

Year	Number banded	Per cent repeating	Avg. days stay	October Mean, °F.	Temperatures Departure from normal
1927	165	38.7	7.5	48	+3
1928	412	51.9	7.5	46	+1
1929	248	38.3	4.7	48	+3
1930	361	47.4	6.3	44	-1
1931	273	46.2	5.7	50	+5
1932	478	47.7	6.0	41	-4
1933	436	53.7	5.8	43	-2
1934	287	27.2	4.3	50	+5
1935	337	41.8	7.6	44	-1
1936	186	38.8	4.5	42	-3
1937	392	31.6	7.1	44	-1
1938	204	19.6	7.4	52	+7
1939	347	20.5	4.7	43	-2
1940	185	36.2	6.1	52	+7

more reliable with *Zonotrichia* than with *Junco*. Banded birds are definitely identified, but unbanded birds re-entering the area could not be distinguished by sight from new arrivals. Certainly trapping reveals some rare species

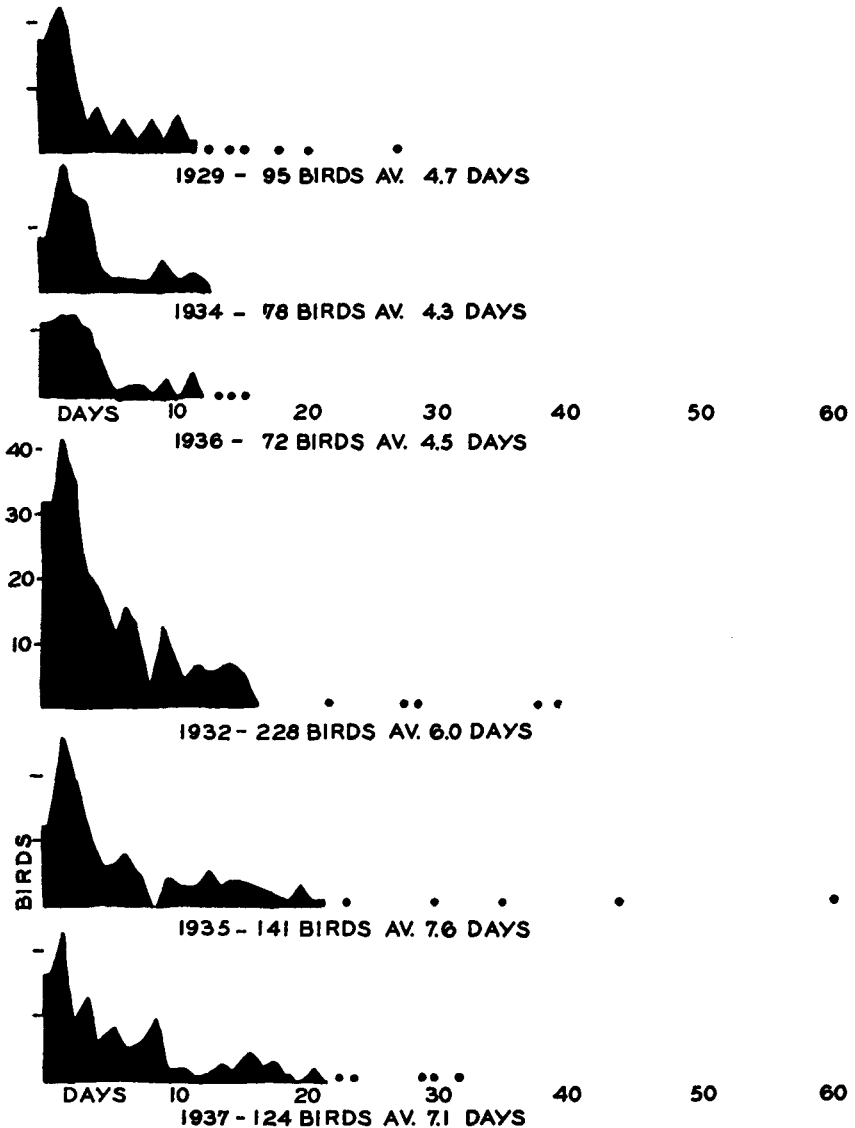


FIG. 2. Number of Harris' Sparrows repeating and length of their stay in autumn for different years. Black areas represent the total number of birds repeating and scattered dots, individual birds.

that would be unlikely to be seen on field trips. Usually only a small area is sampled by the traps and some species will be missed unless special efforts are made to secure them.

WEATHER PATTERNS AND NUMBERS TRAPPED

Necessary absence of the operator and unfavorable weather at times interrupt trapping. In 1938 the weather was unusually warm and there were no interruptions. The number of birds taken (Fig. 3) shows a pronounced double peak unusually late in the season. More often there is a peak about September 25 to 30 and a second about October 15.

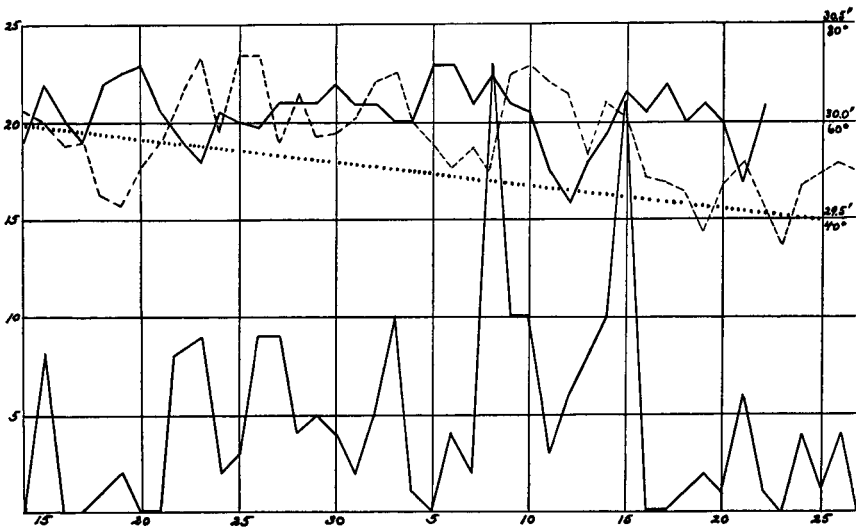


FIG. 3. Number of Harris' Sparrows banded in 1938 (lower line). Solid line above is barometric pressure at 7:00 a.m.; broken line, mean temperature in °F; dotted line, normal mean daily temperature.

It might be argued that the data for 1938 (Fig. 3) show the effects of warm weather in the late peak of birds. The weather of 1952 was similar to that of 1938 but the curve for birds banded was quite different. The largest numbers were taken on September 19 and 20. There were no well-marked fluctuations through October and very few Harris' Sparrows were taken after October 15.

The largest numbers were taken in 1952 on September 19 and 20. This was during a cool period. The temperature began falling from the 16th and remained below normal until the 23rd. There was a pronounced drop in birds on the 21st followed by a recovery for the next three days and then another drop for two days. A warm wave from September 25 to 30 showed little

effect nor did another cool wave, October 1 to 7. The next cold wave on October 13 to 16 coincided with the end of the main migration.

It is often suggested that birds are detained longer by the feeding that accompanies banding operations but after many years of study I feel that very few individuals are so affected (see Fig. 2). For example, in October, 1952, very few repeats occurred, although the weather continued unusually mild. Other causes may be responsible for the persistent repeats. Occasionally a bird trapped frequently is found to be ill. Since 1932 I have used water traps almost entirely because they capture nearly all species. This method would eliminate the feeding factor, and dry, warm weather seems not to have an obvious effect on numbers taken by water traps. Unavoidable changes in cover and in natural feeding areas beyond the traps from year to year probably are more important.

In 1936, with about the same number of birds as in 1938, twice as many repeated. The distribution of the repeats was similar to that of 1938 but the average length of stay was much shorter. The banding pattern was fairly normal (Fig. 4), and not well related to temperature, which was average but with wide fluctuations.

SIGNIFICANCE OF REPEAT RECORDS AT TRAPS

For the present purpose repeat records are of much interest. I have reported (Swenk and Stevens, 1929) that, as judged from repeat records, the average stopover of Harris' Sparrows in this latitude is about a week. Later records indicate that it has varied appreciably from year to year. There seems a tendency toward a larger proportion of repeats when birds are more abundant (Table 1), but little relation between length of stay, or mean October temperature and number repeating. The length of time over which individual birds repeated is shown in Figure 2 for three each of the longer and shorter averages. In calculating repeats, birds that were recaptured only the same day as banded are counted as one day.

These conclusions are based upon general observations and the day-to-day log of birds caught. In 1952, eight birds were taken on September 15 and 16. All but one of these repeated one or more times over periods of from one to 10 days (extreme 24 days). Since these were the first of the species taken we could surmise they had traveled some distance and were due for a rest period. On September 17 and 18 eight more birds were banded but none of these repeated. Of 21 banded on September 19, only five repeated, four on September 27 and one October 12. Of 14 banded on September 20, three repeated once in the next day of two, but three others and eight of 11 banded on September 21 repeated several times until the end of the month. Of the next nine only two repeated, but again all but one of the last four on September 23 and the first five on the 24th repeated over several days. After

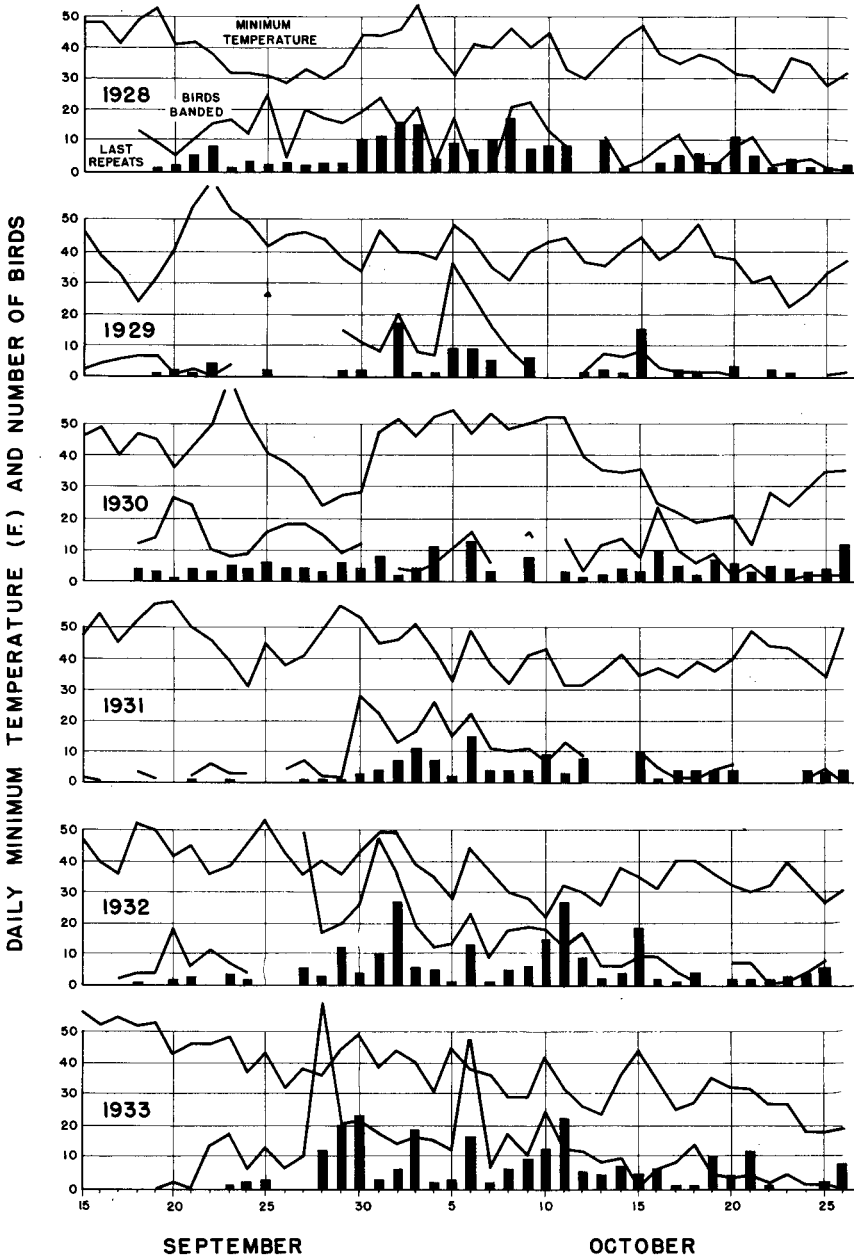


FIG. 4. Numbers of Harris' Sparrows banded and repeating for the last time; also minimum temperatures, 1928-33. Lower line, birds banded (trapping interrupted where broken); bars, birds repeating for the last time; upper line, minimum temperature in °F.

September 24 there were few repeats except for four of 10 birds banded October 4.

WEATHER PATTERNS AND AUTUMN DEPARTURES

The dates of departure from a given locality should show whether or not the weather is a major factor. When large numbers of birds have been banded and many have been retaken daily, we have good evidence of departure dates.

On the night of October 3, 1938, we saw a marked departure of all species. The wind shifted from southeast to northwest and a decided drop in maximum but not in minimum temperature followed. The largest number of Harris' Sparrows was taken October 15, when the wind was again from the *southeast*. They seemed to move on at once though the wind remained in the south and the temperature was relatively high. Notwithstanding the mild weather and lack of storms in 1938, the numbers of birds taken and numbers repeating were small but the length of stay was long.

An interesting point is the frequent observation that birds will be scarce the day the weather turns warmer, apparently having moved southward with the beginning of a south wind, rather than the day or two before during the cool period.

For the present study the departure of birds from the vicinity should indicate the time at which southward flights are begun. When the last dates on which individual Harris' Sparrows repeated in the fall of 1952 are plotted, they form as nearly a normal curve as one could expect from a limited number. The only well marked depressions are on September 25 and 28. A slight drop in temperature on September 25 was followed immediately by the greatest rise of temperature for the season. September 28 showed only a slight, temporary decrease in temperature.

Dates of pronounced arrivals and departures for the trapping periods from 1928 to 1940 were compared with weather changes. Marked increases and decreases of birds were associated about equally with either rising or falling temperatures and also with either rising or falling barometric pressures. Decided changes in numbers were most often associated with north winds, but nearly as frequently with winds from the south, less frequently with west and rarely with east winds.

Minimum temperatures might be expected to govern fall flights. In Figure 4 these are shown with numbers of birds banded and repeating for the last time on each day, 1928 to 1933. The data for October 3, 1928, seem to show heavy departure with a drop in temperature but departures on October 8 were on rising temperature. Similar cases appear on October 3 and 15, 1929, and October 2 and 11, 1932. Four departure dates in 1933 coincide with temperature drops.

SUMMARY

About 7,000 Harris' Sparrow were banded at Fargo, North Dakota, from 1926 to 1955, four-fifths of them during fall migration. They arrive at Fargo about September 15 and are abundant until October 14 to 20, reaching the peak about October 2. Only one return record has been secured during this period and no birds banded at other stations have been taken. Many individuals remain in the vicinity for several (usually five to seven) days, occasionally as much as a month. Birds banded on certain days frequently seem to remain in the area while those taken on other days do not repeat.

The number of birds taken each day was examined for peak records, as were the departure dates of individuals that were re-trapped. Southward flights seemed to follow the calendar and were not well correlated with weather fluctuations. Departures are commonly noted with the beginning of a rise in temperature and beginning of a south wind. Continued warm weather did not delay departures.

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