FURTHER STUDIES ON THE CARDINAL

By HOWARD YOUNG

The continual spread and increase of the Eastern Cardinal (Richmondena cardinalis cardinalis) has been frequently noted in various ornithological journals, but other than Sherman’s paper in 1912, and the previous paper in the Passenger Pigeon, no attempts to explain or trace the movement have been published. The additional data here presented may therefore be of general interest.

Scope and Method of Study

The purpose of the study is to augment the previous work, and to correct it where new information makes this possible. The material was gathered to a large extent from the Audubon Magazine Christmas Bird Censuses; a great deal of statistical breakdown on these was available from work previously done by Dr. Leonard Wing of Pullman, Washington. The number of cardinals noted, per man-hour, was recorded for all censuses from 1900 through 1945. This included all states east of the Mississippi, with the exception of Florida, where the picture is complicated by a sub-species, and the first tier of states west of the Mississippi, plus Colorado, and excluding Texas (further sub-species complications). Questionnaires were sent to observers and banders in the state, and all back issues of the Auk, Wilson Bulletin, and Passenger Pigeon were thoroughly searched from the earliest available issues to date.

Cardinal Populations

By means of the Christmas census statistics it is possible to map the densities of the cardinal. When this is done it is apparent that the center of population lies generally in Kentucky and Missouri, and that the density tends to become progressively less in every direction from these centers. (See Fig. 1). In interpreting these statistics it must be kept in mind that the weather, zeal and ability of the observer, and type of habitat observed are all variables affecting the figures, so that only general conclusions may be drawn. However, the consistently high densities reported in the areas above mentioned, over a period of forty-five years, cannot be ignored. Their value is enhanced by the fact that the cardinal is a conspicuous bird, one not easily overlooked, and is distinctive enough so that there is little probability of its being confused with other species.

It may be noted at this time that the comparison of cardinals seen per man-hour, year by year, presents a very confused picture. Near the center of its range violent fluctuations in density appear from one year to another. (See Fig. 2). These fluctuations are irregular in nature, and vary from state to state, with little or no correlation. Doubtless some of the factors previously mentioned are at least partially responsible. When the combined figures for all states are plotted it appears that the cardinal is showing a slow increase. In 1900 the average was .37 birds per man-hour, and a density of 1 bird per man-hour was unusual previous to 1914. Since 1928 the average has not fallen below 1 bird per man-hour, and in 1945 it was 1.78. No indications of any cycle were found.
One possibility is that population pressure may be the mechanism of the spread. The notorious pugnacity of the cardinal, and the common intolerance of non-gregarious species would be supporting evidence of this view. Observers occasionally note cardinals in sizeable flocks during censuses in the southern states; a situation seldom, if ever, noted in Wisconsin, which could possibly be interpreted as a pre-migrational phenomenon. The populations to the south are much higher than in Wisconsin; for example, in 1943 the observers in Ohio counted 1214 cardinals in 18 censuses, but its density was still lower than that of Indiana, Tennessee, Missouri or Kentucky for the same year. In contradiction, the average for the entire range from 1900 through 1946 is 1.55 while the average for 1936 to 1945 is only 1.59, showing very little increase in recent years.

The Range of the Cardinal

The approximate range limits of the cardinal are shown in Fig. 1. The greater portion of it lies east of the Mississippi, following the southern border of the Great Lakes, and shows a close correlation with the
extent of the humid divisions of the Austral Region. What is believed to be the most northern record for the species was in northeastern North Dakota in 1921. Chapman lists it as a characteristic species of the Carolinian Fauna, and it is in this region that it reaches its highest densities. Most references limit it to the northern part of the gulf states, but censuses from Georgia, Alabama and Louisiana reveal that it extends to the coast. It has been introduced in the vicinity of Los Angeles, and is a resident in Bermuda. The great plains have so far proven an effective barrier to the west. The most western record is from Colorado around 1883. Murray, studying birds in the mountains of North Carolina, found it restricted to below the 4000 foot line where the Canadian Zone started, and various other observers later substantiated him. Yet in recent years it has penetrated the Canadian Zone which covers northernmost Wisconsin. (See Figs. 1 & 3). There are also two records of the cardinal in New Brunswick, and one from the upper Michigan peninsula, both well within the Canadian Zone.

Range Expansion

In reading the old journals little mention of any range expansion is found prior to 1900. At this time and extending through 1920 there is an abundance of references which describe a sudden spread over a wide area extending from western Iowa to eastern Michigan. It is interesting to note that the only reports of new appearances of cardinals were along this front.

Of the many articles appearing during this time, the following are typical: Talbot states that the cardinal was first seen at Sioux City, Iowa, in 1900; Jones found them on islands in western Lake Ontario in 1901; Sherman states they moved into northern Iowa in 1903; Tenever notes them invading southern Michigan in 1906; Fleming classified them as “accidental” for Toronto in 1907, but by 1915 they were being regularly reported in Ontario Christmas censuses.
The cardinal has been seen many years ago at points well in advance of the present spread. Early northern records include Michigan in 1837\textsuperscript{14}, Wisconsin in 1847\textsuperscript{15}, and Minnesota in 1875\textsuperscript{16}. And various reports from correspondence and literature substantiate the conclusion of the previous paper that the northern invasions have been somewhat sporadic. In Wisconsin the cardinal was recorded for Forest County in 1910\textsuperscript{*}, but many more southern counties have no records until two decades later.

\*FIG. 3. WISCONSIN CARDINAL SPREAD
(DATES DENOTE EARLIEST RECORD FOR COUNTY)

The earliest ascertained date for Brown County, as an example, is 1932. In connection with this, the 1907 notes of Swala and Tavener\textsuperscript{17}, in reference to Michigan, are of interest:

There is no doubt but that the cardinal is on the increase 
. . . there seems to be good evidence that some half century ago it was a still more common feature of our landscape. . . .

\*Most county records are from answers to questionnaires, and the co-operators are not listed in the bibliography for reasons of space economy.
Perhaps the recession was not complete, leaving northern "islands" which would explain the occasional reports of continuous presence in northern Wisconsin counties.

The Cardinal in Wisconsin

In considering the spread of the cardinal in Wisconsin some assumptions must be made. No data is available for some counties, and in others the information on hand obviously presents an incorrect picture. In Columbia county, for example, 1935 was the only record date uncovered by time of writing.

Generally speaking, the main impetus of the movement has been from the west, and the spread has come from the valleys of the Mississippi and Wisconsin Rivers, and their tributaries. The birds tended to avoid the central sand area, although they have now entered it. (See Fig. 3). As previously mentioned, in the northern counties they have penetrated the Canadian Faunal Zone.

The earliest records show the cardinal present in Wisconsin as early as 1847, at least in the extreme southeastern corner. They eventually disappeared from this area, and there are no more definite records for the state until 1900. At this time they appeared again in Milwaukee County, and also the west in Grant County. The following chronological list of records shows the spread as indicated in Fig. 3.

In the next five years there was little movement, but by 1920 the cardinal had extended along the Mississippi to Pierce County, along the Wisconsin to Sauk, and west to Jefferson County. From 1920 to 1930 the movement was mainly in the eastern part of the state where the range was extended to Waupaca, Oconto and Manitowoc Counties. There were some small scale cardinal plantings in Milwaukee County (Grant Park) in 1928, which may have affected part of the movement.**

Summary

1. The cardinal populations center around Kentucky and Missouri, becoming progressively less in any direction from these centers.
2. Christmas Census statistics show a slow increase in the general cardinal population since 1900.
3. The cardinal apparently is non-cyclic.
4. The cardinal generally is confined to the zones of the Austral Region, but is now penetrating the Canadian Zone.

**Letter from Mrs. F. L. Hook describing the appearance of an unmated male, the purchase and liberation of a mate for him, the trapping and holding of birds over the winter, and later additional plantings. By 1935 the cardinal had moved into Juneau, Adams and Portage Counties in central Wisconsin, and had moved west from the Mississippi to Taylor. At the present time there are cardinal records for all the northernmost counties except Ashland and Florence, so while it is more common in the south, it may now be considered as occurring throughout the state. No data has been found for occasional counties such as Washington and Rusk, but the presence of birds farther to the north indicates that this is due to a lack of records rather than of cardinals.
5. There are numerous northern records of cardinals antedating the present spread.
6. In Wisconsin the spread is since 1900, and in the main part has been from the valleys of the major rivers in the western part of the state. The spread was slow into the central sand area.

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