SOME FLOCKING HABITS OF THE CROWNED SPARROWS

WITH THREE ILLUSTRATIONS

By JOHN B. PRICE

The Golden-crowned Sparrow (*Zonotrichia coronata*) and the Puget Sound White-crowned Sparrow (*Zonotrichia leucophrys pugetensis*) arrive on the campus of Stanford University, California, during the last week of September and leave on their migration north during the last week of April or the first week of May. These birds are numerous at Stanford and are by far the most ready to enter the bird banding traps.

The writer started banding at Stanford in 1925 with three traps placed at distant intervals about the campus and soon found, together with other banders at Stanford and elsewhere, the now well-known fact that these birds nearly always repeat at the original place where banded, showing that their local ranges are restricted. The questions presented themselves: (1) Do flocks of sparrows have a definite range in the winter? (2) What is the extent of a range? (3) Do individual birds often leave their flock for another? (4) Do individual birds return to the same range after their migration?

In the spring of 1928 the writer obtained 12 traps and placed them at near intervals about the campus as shown in figure 58. These traps were also operated in 1928-29. Mr. Hugh Israel and Mr. Fred Rettig also operated traps at Stanford and their results were included by the writer when there was an exchange of birds between traps. Banding, however, has the limitation that the bird must be recaptured to be identified, so in addition the feathers of the birds were stained distinctive colors so that they could be recognized when seen in the field. The stain used was originated by Dr. W. K. Butts at Cornell University (see Auk, XLIV, 1927, p. 329). It was made by dissolving an artist oil color in carbon-tetrachloride. In this way several distinctive colored stains could be formed. The stain was applied directly to the feathers on the back and breast of the captured birds (which were also banded). After the birds were stained and released they usually fluttered to some near-by bush and waited there a few minutes, until the carbon-tetrachloride evaporated, and then flew away. No ill effects were observed either then or later, and many birds stained were recaptured in good condition the following season, although, of course, the stain had long since vanished. The colors were easily distinguished in the field with field glasses for about a month and a half after staining. Birds captured at one trap were colored green, those at another red, and so on. Then by making field observations it was possible to see how far birds ranged from the trapping stations.

Results with Golden-crowned Sparrows. The following numbers of these birds were captured by the writer:

Year	Number banded	Recovered from other years	Total individuals captured	Total of all repeats	Average times each captured
1927-28	197	133	330	1131	3.42
1928-29	119	134	253	748	2.95

Although the traps were close together, by far the greater number of golden-crowns repeated at the same trap where first captured. The following table shows the numbers in each class. (The numbers refer to *individual* birds repeating at a trap.)

TABLE OF REPEATS

Year	Same trap	Distance from trap where first caught: 40-100 yards	101-200 yards	201-300 yards	301-400 yards	401-500 yards	501-600 yards
1927-28	154	33	42	61	2	2	1
1928-29	108	33	48	30	3	7	5
Total	262	66	90	91	5	9	6

These results give some information as to the extent of the birds' ranges, although of course the comparatively limited number of traps used and the fact that the theoretical chance of a bird being recaptured decreases in inverse proportion as the square of the distance between the two traps makes more exact infor-

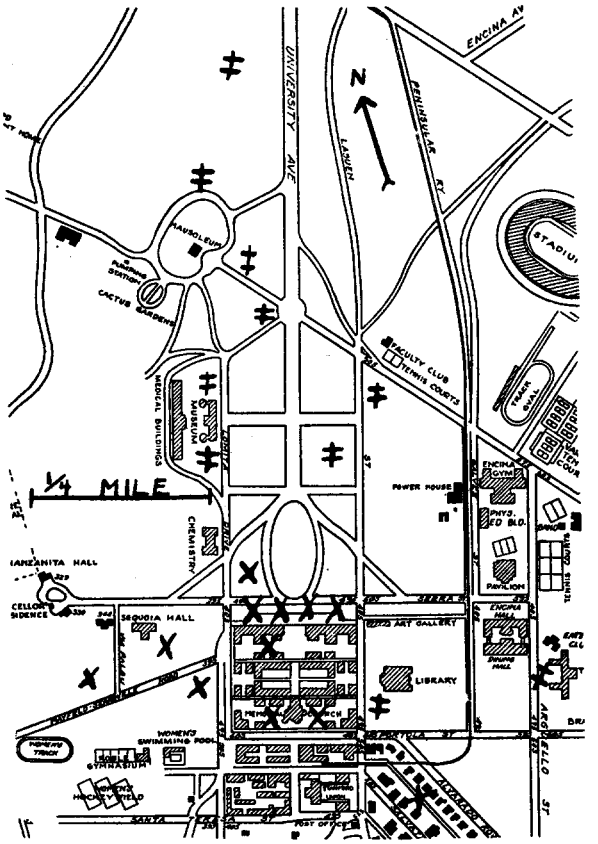

Fig. 58. TRAPPING STATIONS ON STANFORD CAMPUS. AUTHOR'S TRAPS (MARKED X) OPERATED IN FEBRUARY AND MARCH, 1928, AND SEMI-CONTINUALLY OCTOBER, 1928, TO APRIL, 1929. TRAPS OF OTHER BANDERS AT STANFORD MARKED ‡.

mation desirable. This was obtained, as stated above, by feather staining. Birds at one trap were stained red, at another green, at another yellow, and at another orange and green.

Although easier to trap than the white-crowns the golden-crowns are harder to observe in the field as they keep more in the bushes. The following numbers were stained and observed:

THE CROWNED SPARROWS

Color	Year	Number stained	Number observed in field
Red	1927-8	13	10
Red	1928-9	14	28
Green	1927-8	49	18
Green	1928-9	30	53
Yellow	1927-8	23	11
Yellow	1928-9	11	30
Orange-green	1927-8	9	8
Orange-green	1928-9	17	8
Total		166	166

None of the stained Golden-crowned Sparrows seen in the field was 600 yards from the staining trap and nearly all were within 400 yards of it. Lack of space prevents presenting maps to show all of these observations, but a typical one (fig. 59) is given, showing the field distribution of the green and red stained Golden-

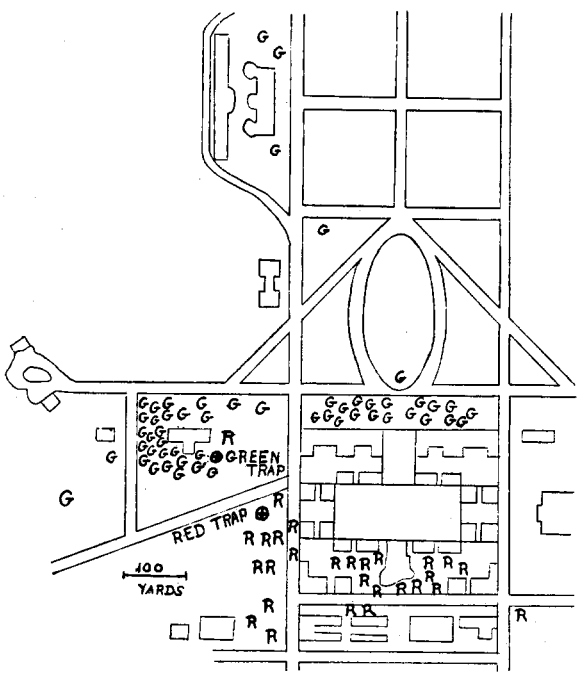

Fig. 59. OBSERVATIONS ON GREEN STAINED AND RED STAINED GOLDEN-CROWNED SPARROWS, AT STANFORD UNIVERSITY DURING FEBRUARY AND MARCH, 1929. G INDICATES A GREEN STAINED BIRD OBSERVED IN THE FIELD AND R A RED STAINED BIRD. THE BIRDS FORMED TWO SEPARATE FLOCKS, EACH WITH ITS OWN TERRITORY.

crowned Sparrows. It is interesting to note that the two groups (with one exception) did not mix although the two traps were only 100 yards apart, showing that these birds form definite *flocks* with a range, and *not* that each *bird* has its own separate territory.

Although each spring the Golden-crowned Sparrows migrate north, large numbers return to the Stanford campus. In the winter of 1927-28, 197 of these birds were banded by the writer at Stanford and in 1928-29, 28 per cent of these were recaptured at Stanford. Of course many more may have returned that were not

trapped. Not only did the birds return to Stanford, but they usually returned to the same trap. In 1928-29, 120 golden-crowns were recaptured that had been captured (banded or recovered) at Stanford the previous year. Of these, 96 were recaptured at the original trap and only 24 were recaptured exclusively at other traps, although the traps were quite close together.

Results with Puget Sound White-crowned Sparrows. The following table shows the numbers of these birds captured by the writer at Stanford.

Year	Number banded	Recovered from other years	Total number individuals captured	Grand total of repeats	Average times each captured
1927-28	115	28	143	287	2.00
1928-29	75	34	109	189	1.73

As shown below, in the great majority of cases the birds repeating were retaken at the same trap. It should be noted that the numbers refer to individual birds and a bird recaptured at a trap five times would be counted as one bird for that trap.

Number of individuals repeating during year:

Year	Same trap	Distance from original trap where banded: 40-100 yards	101-200 yards	201-300 yards	401-500 yards	501-600 yards
1927-28	55	3	2	3	0	2
1928-29	29	4	8	9	3	2

These results indicate that the ranges of these birds are surprisingly restricted.

All White-crowned Sparrows captured at trap 101b, which is between Jordan Hall and the Little Theater, were stained red during February and March, 1928; and during the same months birds captured at 532 Alvarado, 500 yards distant, were stained green and orange. The map (fig. 60) shows the range of the red White-crowned Sparrows in a definite flock. So many were observed that it is impossible to show them individually on the map. Twenty-two were stained red, and 176 red observations were made in the field within the flock area, or, on an average, each bird was observed eight times. Sometimes sixteen red birds at once would be observed with the flock feeding by the church. About 60 birds in all comprised this flock. Only one red white-crown was seen outside this range. It was trapped in front of Jordan Hall on March 20.

A portion of the range of the green-orange flock is also shown on the map. Sixteen were stained at this trap and 41 were observed in the field. In only one case was a green-orange White-crowned Sparrow seen outside its own flock area—on March 19, with the red flock near the church. It was observed in the morning and afternoon but was not there afterwards. No persecution was observed.

A third flock of White-crowned Sparrows frequented the bushes in the ovals north of the Quad; but with the one exception above noted, no red birds were seen with this flock although frequent observations were made of all three flocks.

The sparrows of the red flock roosted in bushes back of the Little Theater. The writer constructed a net of mosquito netting 30 feet by 15 feet and with the help of other banders surrounded some of these bushes and captured a few of the birds, although as the sparrow flock did not roost as a unit in one bush, only a few birds were captured with each "haul".

The staining experiment was repeated the next year (1928-29) with similar results. Both flocks had the same ranges as before except that apparently the red flocks extended a little more to the west.

Like the Golden-crowned Sparrows the Puget Sound White-crowned Sparrows return to the same small areas after their migration.

Recaptured in 1928-29 at same trap as year before, 18.
Recaptured in 1928-29 at different trap than before, 3.

Habits of other Zonotrichia. Mr. Joseph Mailliard of the California Academy of Sciences has recorded (Condor, XXXI, 1929, p. 192) some results in banding the Nuttall White-crowned Sparrows (*Zonotrichia leucophrys nuttalli*), which subspecies does not occur at Stanford University. He found that with three traps all within 200 yards of each other very few birds exchanged between any two traps. This shows apparently that the resident Nuttall Sparrows have much the same territorial habits in winter as the migratory Puget Sound Golden-crowned Sparrows.

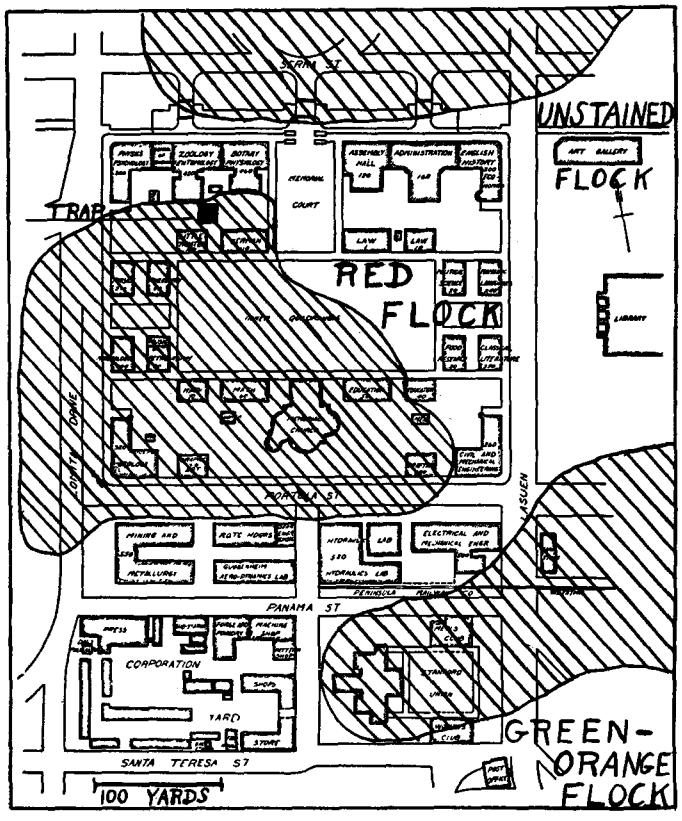

Fig. 60. THE RANGE OF THE RED STAINED FLOCK OF PUGET SOUND WHITE-CROWNED SPARROWS DURING FEBRUARY AND MARCH, 1928, AT STANFORD; 22 WERE STAINED RED, AND 176 FIELD OBSERVATIONS OF RED BIRDS WERE MADE INSIDE THE FLOCK AREA AND ONLY ONE OUTSIDE. ONLY ONE GREEN-ORANGE BIRD WAS OBSERVED IN THE RED FLOCK'S TERRITORY.

Conclusions. 1. Both the Golden-crowned Sparrows and the Puget Sound White-crowned Sparrows spend the winter on the Stanford University campus in definite flocks each with its own range of about 15 to 20 acres, and there is very little changing of individual birds from one flock to another.

2. In most cases an individual bird returns to its original flock territory after migration.

Stanford University, California, June 7, 1931.