A NESTING STUDY OF *SPIZELLA PALLIDA*

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IN 1964 the Clay-colored Sparrow (*Spizella pallida*) was selected as the subject of a study of embryonic striated muscle partly because it appeared to be a readily procurable species. During the search for specimens I obtained information on the nesting and territorial behavior of these birds. A search of published material showed that much of this information was new or was at variance with that previously recorded. This information is the basis of this report.

In all, I observed 24 nesting attempts. Some of the nests were subjected to the depredation necessitated by the primary investigation already mentioned but I made every attempt to keep its over-all effects minimal. This was done, for example, by taking specimens only from certain nests, thus depleting them but leaving the other nests unmolested.

It is apparent, however, that a statistical analysis would not be appropriate with these methods and therefore none is presented for the entire group, although some figures are given in instances where I think they are of value.

The assistance of Mr. Peter Whidden throughout this study is gratefully acknowledged.

STUDY AREA

The study area (Figure 1) selected was about 12 miles southeast of Edmonton, Alberta. It consisted of a rarely-used roadway almost exactly half a mile long with a small uncultivated field west of its blind end. The area of the roadway was 4.0 acres, that of the field 2.5 acres. A trail barely passable for automobiles ran along the middle of the roadway and ended in a small deciduous woods extending westward from the northern end of the roadway. North of the woods was a prairie slough. The uncultivated field, in which a dwelling had once stood, lay in an angle south of the woods. Elsewhere the study area was bordered by fields sown in wheat.

The woods consisted of aspen, *Populus tremuloides*, and balsam poplar, *Populus balsamifera*, with maximum height of about 30 ft. Undergrowth and border were mainly willow, *Salix* sp., dogwood, *Cornus stolonifera*, birch, *Betula* sp., saskatoon, *Amelanchier alnifolia*, and chokecherry, *Prunus virginiana*. Around the spot where the dwelling had been were a few Manitoba maple, *Acer negundo*, and caragana, *Caragana arborescens*, probably introduced. The field supported a heavy growth of grasses, mainly *Agropyron* sp. and *Bromus inermus*, which at maturity reached a maximum height of three feet. Rosebush, *Rosa* sp., and snowberry, *Symphoricarpus*

sp., usually in combination, formed tangled masses of brush especially at the borders of the field. Along the roadway the dominant vegetation was grasses dotted here and there with tangles of rosebush and snowberry brush. Small thickets of willow, sometimes with a few aspen among them, occurred at irregular intervals (Figure 1).

TERRITORIES

Along the roadway territories included areas of grass interspersed with patches of rosebush and snowberry. The cultivated fields were never part of the breeding territory; if pressed the Clay-colored Sparrows might retreat a short distance into them but they invariably returned to the natural vegetation at the first opportunity. Each territory contained at least one clump of willow-aspen bush. A stretch of 120 yards of grassy roadway devoid of other types of vegetation was not utilized by breeding Clay-colored Sparrows, a fact which emphasized the importance of shrubbery in their breeding environment. Elsewhere territories were contiguous. They were fairly uniform in size extending 100 to 120 yards along the roadway. Since a road allowance is four rods wide their areas varied from 0.45 acres to 0.55 acres. The average size of territories along the occupied roadway was slightly under 0.5 acre.

Territories in the uncultivated field contained grassy areas, patches of rosebush and snowberry and the bushes bordering the woods (Figure 1). Trees immediately adjacent to the clearing were used by male Clay-colored Sparrows as singing posts. Occasionally both sexes retreated into the woods if forced to do so but they returned to more open habitat as soon as possible. There was more variation in size among these territories than in those along the roadway. Small territories were approximately 0.25 acre, the largest about 0.5 acre. The controlling factor appeared to be the extent of grass-brush border.

In the entire study zone 15 territories were established by Clay-colored Sparrows. Of these, 11 are shown in Figure 1 which does not include the southern part of the roadway. Since the total area was 6.5 acres there was a pair of Clay-colored Sparrows for every 0.43 acres. However, the sparrows utilized only 5.0 acres of the area; thus the average size of the 15 territories was 0.33 acres.

NESTING

Clay-colored Sparrows arrived in the Edmonton district during the first week of May in 1964 but the males did not firmly establish their territories until about the middle of the month. In early May there was little new vegetation although grass and other ground plants had started to grow. Leaf buds did not burst on bushes and trees until 16–18 May. First nests were being built by Clay-colored Sparrows during the last week of May.

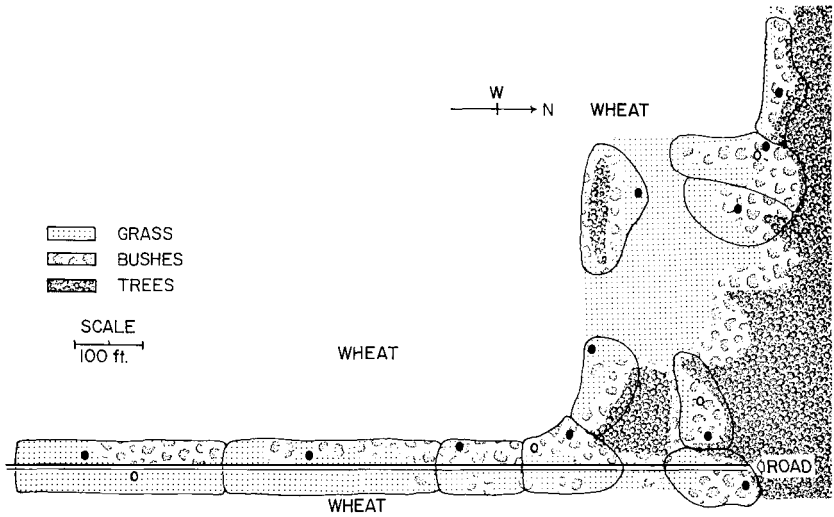

Figure 1. A portion of the study area, showing vegetation, nest sites, and territories (enclosed areas). Black dots = first nests; open dots = renestings.

At this time foliage on trees and bushes was sparse and new growth of ground vegetation was not over three inches high providing little shelter for nests. However, winter snows and winds had matted dead grass into clumps, particularly where a few stems of rose or snowberry acted as an entanglement. Within these tussocks Clay-colored Sparrows built their nests. Some were as much as 10 inches above the ground; the bases of others were so close to the ground that a finger could not be pushed beneath them. The average height above ground of these early nests was 5 inches. None was sunk into a scrape as was the case with Song Sparrows, *Melospiza melodia*, and Savannah Sparrows, *Passerculus sandwichensis*, which also nested in the area.

As the season advanced and growth became more luxuriant a change in choice of nesting sites became apparent. Then the nesting site became rosebush or snowberry and the height above ground increased to an average 13 inches. A similar increase in height of nesting site with the advancing season was recorded by Walkinshaw (1944: 122) for this species in Michigan. This tendency to select higher nesting sites as the vegetation became taller and denser suggests that this species is more responsive to distance from the surface of the vegetation than from the ground. Recognition of this possibility did not come until too late to make reliable measurements but from those made on a few of the later nests and from recollections of the earlier ones I think that the great majority of the Clay-colored Sparrows in this area built nests within 9 inches of the surface of the vegetation. One nest provided an exception which emphasized the results of building

a nest near the ground. It was built in a grassy area 6 inches above ground level in a tussock about 15 inches high. By the time the young had hatched the surrounding grass had grown so tall that the nest was 18 inches below the surface and by the time they left the nest this distance had increased to at least two feet. Clay-colored Sparrows in other parts of the Edmonton district used willow, caragana, and even spruce and pine as nesting sites but it is noteworthy that none of these was used by the species in the study area although the first two were available to them. A similar tendency within a local population to select one type of nesting site over all others has been recorded at Fawcett, Alberta, and Lovells, Michigan, by Walkinshaw (1944: 122) and at Kindersley, Saskatchewan, by Fox (1961: 221).

All nests were made of dead grass woven into a cup which was rather loosely attached to its support. The lining was mainly of fine grasses but included some fine rootlets. No hair or other animal matter was used. Nests were discovered in 14 of the 15 territories established by Clay-colored Sparrows on the study area. I was unable to find a nest in one territory but the sparrows successfully produced a brood which appeared as fledglings in early July. In 5 territories a second nest was discovered following failure of the first. Re-nesting may have occurred in 2 other territories although concrete evidence was not obtained. Thus a total of 19 nests was found on the study area. In addition 5 nests were discovered along roadways leading to the study area giving a total of 24 nests under observation. Information obtained from the 5 nests outside the study area was included in estimating the incubation period and percentages of success and failure.

Table 1 shows the nature of the cover and the height above ground of the original and a subsequent nest in each of the five territories where evidence of re-nesting was found. In three cases the new nest was in similar cover to the first but at a greater height.

One Clay-colored Sparrow built a second nest only 12 feet from the site of the original nest. The greatest distance between two such sites was about 110 feet. Although no direct evidence was found I think that, in two cases, the subsequent nest may have been a third or fourth attempt rather than a second. In all five recorded instances of re-nesting a clutch of four eggs was produced. Four of these followed unsuccessful incomplete clutches of one, two or three eggs. The other followed a complete clutch of three eggs which had been successfully incubated but the young were destroyed at the age of three days. Of the five attempts at re-nesting three were failures, one as a result of interference by Brown-headed Cowbirds, *Molothrus ater*, the others through unknown agents. There was no evidence of re-nesting after a brood had been raised to maturity.

TABLE 1
TYPE OF COVER AND DISTANCE FROM GROUND LEVEL IN FIVE CASES OF RE-NESTING OF CLAY-COLORED SPARROWS

Original nest		*Subsequent nest*	
Cover	*Height (inches)*	*Cover*	*Height (inches)*
grass	0	grass	12
grass	1	grass	8
snowberry	12	snowberry	15
grass	10	snowberry	10
grass	8	rosebush	18

EGGS AND INCUBATION

Laying was successfully completed in 18 of the 24 nests observed. Clutch size was three eggs in 3 nests and four eggs in 15 nests. In one nest the four eggs had an average weight of 1.22 g; in another nest of four eggs the average weight was 1.35 g. Extremes of weight in these eight eggs were 1.15 and 1.40 g.

The first clutch (three eggs) found on the area was completed on 27 May; the last (four eggs) was completed on 2 July and was very likely a third attempt by a bird which had completed a first clutch on 5 June. Egg-laying, therefore, must have occurred over a period of at least 39 days. Seven clutches, known to be first ones, were completed in the period 27 May to 11 June. All clutches completed between 11 June and 2 July were thought to be second or third layings.

No information was obtained on the interval between laying of the first two eggs. In one nest which contained two eggs when found, the third and fourth eggs were laid on two successive days. In three nests a fourth egg was found the day after they were discovered with three eggs. Further evidence that little time is lost in producing a full clutch was shown by a female whose brood was destroyed by a Loggerhead Shrike, *Lanius ludovicianus*, on 17 June. On 24 June the Clay-colored Sparrow was incubating four eggs in the same territory. Thus in seven days a new nest had been built and four eggs laid. In only one instance was a laying interval of more than one day recorded. This exception was in a nest found with three eggs on 30 June outside the study area. On 2 July it still contained three eggs but on 3 July there was a fourth. Thus this last egg was laid at least three days after the third one. The exact dates of hatching of these eggs were not recorded but one nestling was considerably smaller than its nest-mates and had probably hatched at least two days after the others. It died in the nest after the others had left, apparently a victim of parental desertion.

Incubation commenced with the laying of the third egg. Prior to this event females were observed to spend considerable time about the nest

but they left the vicinity at the slightest provocation. After the third egg was laid, however, they incubated closely, some remaining upon the nest while the surrounding vegetation was parted and moving pictures taken only a few inches away. Less direct evidence of early commencement of incubation is the fact that the eggs do not all hatch on the same day.

HATCHING

There was invariably an uneven hatch. With the exception noted above (in which one egg apparently hatched two or more days after the others) hatching was completed in two successive days. The number of young and eggs respectively on the first day of hatching in four undisturbed nests was 1:3, 2:2, 2:1, 3:1. In the only nest which provided complete data, hatching occurred on the ninth and tenth days after the fourth egg was laid. The incubation period was, therefore, approximately 10 days. Fox (1961: 222) gives an incubation period of 11 days and Walkinshaw (1939: 20; 1944: 124) 11 to 11.5 days.

Success of the hatch was directly affected in four nests from which eggs were removed to provide specimens for muscle studies. Surprisingly, none seemed to be deserted as a direct result of human interference. Whether or not my daily presence on the area had an indirect effect on hatching success could not be determined. Hatching success including human predation was 46.9 per cent; excluding human predation it was 48.5 per cent. In 20 nests undisturbed by humans 66 eggs were laid. In only 9 nests were eggs hatched. They contained 34 eggs from which 32 young hatched. Of the 2 eggs which did not hatch 1 was infertile, the other unaccountably disappeared. The other 11 nests were entirely unsuccessful for various reasons. Black-billed Magpies, *Pica pica*, were thought responsible for the destruction of at least 2 nests containing 8 eggs. One nest of 4 eggs was destroyed by a small mammal, possibly a skunk. Brown-headed Cowbirds were known to be responsible for the desertion of 4 nests (11 eggs) and were suspected of causing the desertion of others. Either the cowbirds found difficulty in maneuvering in such cramped quarters or they deliberately removed some of the host eggs for, in two cases after a cowbird's visit, eggs of the Clay-colored Sparrow were found just outside the lip of the nest but held by the surrounding grasses. Both nests were immediately deserted. Clay-colored Sparrows in this area did not tolerate parasitism by Brown-headed Cowbirds; in no instance was a cowbird's egg incubated by a Clay-colored Sparrow for as long as one day. This behavior was in striking contrast to that of Song Sparrows on the area which tolerated as many as three cowbird eggs in the nest. Fox (1961: 223) states that Clay-colored Sparrows in Saskatchewan incubated cowbird eggs but did not hatch them.

TABLE 2
WEIGHTS OF CLAY-COLORED SPARROW NESTLINGS

Age (in days)[1]	Weight[2] (in g)
1	1.15
2	2.1, 2.7
3	3.1, 4.0
4	4.5, 5.1
5	6.1
6	7.5, 8.5, 8.5
7	9.4
8	10.0, 10.2, 10.8

[1] Days refers to consecutive 24 hour periods following the hatching of the first nestling.
[2] Each weight represents a different nestling.

YOUNG

The young grow rapidly. A newly-hatched Clay-colored Sparrow weighed 1.13 g. Eight days later three young Clay-colored Sparrows had an average weight of 10.3 g, just 0.3 g less than the average weight of two adult males taken about the same time. Daily weights of an individual young bird were not taken but different nestlings were weighed from time to time (Table 2).

On the seventh or eighth day after hatching the young left the nest. At this time the contour feathers are well developed but the bases of many of them are still ensheathed. The wing and tail feathers, however, are still largely ensheathed except for about one-half inch of vane exposed at their tips. The young are quite incapable of flight at this time. Their early departure from the nest was at first thought to be precipitated by my intrusion. However, it soon became apparent that this was the normal age of departure. Invariably nests were found empty on the ninth day after hatch and the parents were "fussing" in the vicinity. On two occasions nestlings were observed through binoculars as they left the nest. They jumped to the ground and rapidly propelled themselves on their breasts with frog-like strokes of their legs ultimately ending up under the first tangle of dead leaves or twigs strong enough to obstruct further progress. Here they remained motionless for some time. Under these circumstances it was practically impossible to find them again unless their progress had been carefully marked. The danger of unwittingly crushing them was so great that an intensive search was never undertaken. As a result no young birds in the 10 to 13 day range were observed. Young Clay-colored Sparrows, just able to fly, were seen about 14 or 15 days after hatching had occurred on a territory.

The duration of the period of parental care could not be determined. For about a week after young were first able to fly the family could usually be located but territorial boundaries broke down considerably at this time.

Particularly, there was greater use of extra-territorial habitat such as the adjacent grain fields. The families then suddenly disappeared from the area. On 20 July only two adult and three juvenile Clay-colored Sparrows could be found on the study area. It was very apparent on this date that the great majority of the 15 pairs of adults and their progeny had left the nesting territories and the immediate vicinity.

For reasons previously given complete figures on mortality of nestlings would be meaningless. However, the rate of mortality from natural causes during this period was obviously quite low. Of 11 nests in which 38 young hatched only 2 suffered natural losses. A Loggerhead Shrike was seen removing the last of three nestlings at one nest and presumably had taken the other two. In another nest already referred to, one nestling was apparently deserted by its parents after its much older nest-mates had left.

SUMMARY

On a study area near Edmonton, Alberta, Clay-colored Sparrows occupied established breeding territories from about the middle of May to about the middle of July. Nest building started during the last week of May but did not occur after the end of June. Four eggs were usually laid. Incubation commenced with the laying of the third egg and continued for ten days. Young left the nest eight days after hatching and before they were capable of flight. Cowbird parasitism was not tolerated. Nestling losses were considerably lower than egg losses.

LITERATURE CITED

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