

REPRODUCTION IN THE DICKCISSEL

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GROSS (1921) studied reproduction in the Dickcissel (*Spiza americana*) in Illinois, but owing to the secretive habits of the female little is known about some aspects of reproduction in this species, especially outside of Illinois. Most of the information discussed here was obtained by Long, Knops, and Long in Kansas; the duration of incubation was determined by Long, Matulionis, and Long in Illinois. Our investigations were made in moist, disturbed, prairie areas. One study area, nearly one-quarter-mile square, is approximately one mile northeast of Lawrence, Kansas, in the Kaw (= Kansas) River valley. This habitat is decidedly marshlike with cultivated fields on one side. The soil is exceptionally sandy. Approximately one-third of the marshlike area was covered by shallow water, but the area of water varies greatly from season to season. The water table is only a few inches to a few feet below the surface of the ground. Vegetation consisted of dense grasses, sedges, elm saplings, clover, dock, alfalfa, bindweed, cattails, and other low plants. Other birds nesting in the area were the Robin (*Turdus migratorius*), the Brown Thrasher (*Toxostoma rufum*), and the Red-winged Blackbird (*Agelaius phoeniceus*) which was especially abundant. This study area, where most of our observations were made, is known locally as the "gravel pits." A second area known to us as the "south area" was low and marshlike. It was narrow (20–30 feet in width), and extended about one-quarter mile between a road and a plowed field. Small black locust saplings, elm saplings, dock, grasses, and other low plants were abundant in this area, which is approximately 5 miles south and 2 miles west of Lawrence. In Illinois, Dickcissels were observed one mile south of Champaign in a hayfield and in a grassy roadside habitat adjacent to the field. A few elm saplings were present.

We investigated the gravel pits almost daily from 27 May to 5 July 1963. The south area was studied regularly from 20 June to 5 July 1963. In Illinois, we made observations almost daily from 4 June to 24 June 1964.

COURTSHIP AND TERRITORIALITY

In Illinois, only males were seen as early as 4 June 1964. On 11 June we saw a few females. Whenever a female appeared, she was immediately chased by from one to three males in the area. The female would fly about, closely pursued, and would then dive into the grass followed by the males. On 13 June 1964, about 3:00 PM, Matulionis observed a female, perched passively on an alfalfa plant, being mounted several times by a male. In Kansas, breeding begins at least as early as May.

Territories at the gravel pits varied in shape from oval to circular, often changing in size and shape. In one instance where a clutch had been destroyed, the territory became incorporated into another. In a similar instance a territory was infringed on by the birds of the adjoining territory. In each of these instances the female abandoned the nest soon after her clutch was destroyed. The males lingered a day or so longer but then gave up their territories. This is interesting in view of an observation of one male holding a territory in which no nests were built, while a female which occasionally entered this territory lingered in the area until young birds in a nearby territory had left another female's nest. Shortly thereafter, the mother left her territory and the unmated female then built her nest in it and laid a clutch of eggs, which were later robbed.

When we first noticed this interesting relationship we were marking eggs of one female while being watched by two females. We observed the strange female closely and noted that it was once aggressively chased in the territory by the male, definitely not in courtship. The mateless male held a territory only 40 to 100 yards away, and held it through the time we observed nesting by both of the females. Willson and Pianka (1963) in their discussion on "sexual selection," sex ratio, and the "mating system" mention a similar relationship in wrens, and suggest that such relationships indicate that the "mating system is not necessarily the direct result of a skewed sex ratio."

Dickcissel males chased only Dickcissels; they were occasionally chased by Red-winged Blackbirds and by Brown Thrashers.

NEST BUILDING AND EGG LAYING

Nests of Dickcissels are not tied to plants as are the nests of Red-winged Blackbirds and must be placed among groups of at least three stems or branches. In this study, nests were found supported by trios of alfalfa stems, of dock stems, and of branches of elm saplings. Often the nests were near the ground in dense vegetation at heights of 100–170 mm. Nests were also found about one meter (or less) above the ground in elm saplings. When Dickcissels are seen singing along grassy roadsides adjacent to fields of unsuitable habitat, careful examination of elm and other saplings along the road is a good way of finding nests.

Fitch (1958: 298) observed a female in northeastern Kansas carrying nesting material on the morning of 9 July 1953; and a completed nest containing one egg was found the afternoon of the same day. At the gravel pits, we observed one nest partially constructed on the evening of 9 June 1963; the nest was completed but lacked eggs on 11 June. Eggs were laid in this nest on successive mornings from 12 June to 15 June. Another partly constructed nest was found at 8:00 AM on 15 June 1963, was completed 17 June, and

contained its first egg 18 June. An egg was laid daily in the early morning for 4 days. An egg, one day old, was removed by us from this clutch of four, and it was not replaced. Gross (op. cit.: p. 169) mentioned a nest completed in 4 days, and the first egg was laid in it 2 days after its completion.

Clutch size near Lawrence varied from three to five eggs (mean, 4.22) for nine nests. Four nests contained five eggs; three contained four; two contained three. Johnston (1960:59) mentioned a range of three to five (mean, 3.88; mode, 4) for nine other nests in Kansas. The mean clutch size for the 18 nests is 4.05. Gross (loc. cit.) found clutch size in Illinois to vary from three to five (mean 4.03, 29 clutches). In our study at the gravel pits, early nests usually contained five eggs, but later nests contained fewer eggs. When clutch size is being considered, sterile eggs should also be considered. Long (1963) reported that four of five clutches of the Dickcissel contained sterile eggs, and 26 per cent of the eggs examined were sterile. Gross (loc. cit.) reported sterile eggs in 6 of 11 clutches.

INCUBATION AND HATCHING

The duration of time that a female incubates a full clutch may differ from the incubation period, which according to a generally accepted, working definition, lasts from the time of laying the last egg in a clutch until that egg hatches. Gross (op. cit: p. 170) found in one nest that the incubation period lasted possibly more than 10–11 days. Fitch (loc. cit.) mentioned that a clutch of four eggs "had been completed" on 14 July 1953, and hatching occurred on 23–24 July. This incubation period was at least 11 days. We found a nest containing five incubated eggs on 3 June 1963, at the gravel pits. Two eggs were pipping on 12 June, and one hatched before 8:00 AM on 13 June. This clutch or brood was destroyed about 3 hours later, probably by a garter snake. Thus, incubation lasted at least 10 days for this clutch, and probably longer. A careful review of the literature by Nice (1953) led to the conclusion that "authenticated incubation periods of less than 11 days [are] rare."

A nest at the gravel pits found partially constructed was observed, and incubation of eggs in it seemingly began after four eggs of a clutch of four had been laid. For another clutch of four, incubation began on the penultimate day of laying; but a strong windstorm with heavy rain buffeted the nest on the evening of that day (20 June 1963). This nest was several feet above the ground in an elm sapling and was severely tossed about by the wind. During the storm the female was deep in the wind-tossed nest protecting the eggs so that we first thought the nest to be empty with eggs thrown out. The next day we broke one of the eggs; the embryo had a primitive groove. For a clutch in the south area and another in Illinois incubation also began on the penultimate day (both were clutches of four). Incubation began in the south

area on 23 June 1963, and in Illinois on 12 June 1964. At the gravel pits the nest that had been buffeted by the wind was watched until 30 June 1963, but was not again observed until 5 July. At that time Knops found young in the nest which he judged to be at least 2 days old, which would indicate that hatching had occurred by 3 July. Incubation may have lasted about 13 days, which duration appeared to be too long considering our other records and published records, but Knop's observation indicates incubation lasts longer than 10 days.

In Illinois, a nest containing two eggs was found on 11 June 1964. The female was on the nest at 5:30 PM on 12 June, and three eggs were in the nest. The clutch was completed 13 June, and incubation lasted until shortly after 11:00 AM, 23 June, at which time two eggs were obviously pipping. By 4:00 PM two eggs had hatched, and another was nearly hatched (it hatched by 5:00 PM). By 11:00 AM of 24 June all eggs had hatched. Thus incubation of an egg lasts in the Dickcissel 11 days, possibly 11½ days. The four eggs hatched in the order that they were laid, but in a period of less than a day. The egg laid last did not even show signs of pipping while the others were hatching. Probably it hatched about 12 hours later; and if it did its incubation period (from approximately 6:00 AM, 13 June, until approximately 6:00 AM, 24 June) was 11 days.

Hatching described by Gross (op. cit.: p. 19) of a clutch of four occurred in 2 days, one egg hatching the first day, two the second, and one being sterile. This observation indicates that incubation time for eggs varies one day; for if incubation begins on the last day of laying *or* on the penultimate day (and if the time of development of embryos is the same for all eggs), then all eggs would have hatched *together*, or *only one* would have hatched a day late.

PREDATION

Nests near the ground were frequently robbed, with no trace left of eggs or young, probably by numerous garter snakes in the area. Franklin's ground squirrel was common in the area, and probably one nest in a sapling was robbed by this species. The nest was partially pulled down and two eggs were broken (contents eaten, shells on the ground) on one day and the last two eggs broken likewise the following day. Of nine nests of eggs or broods in Kansas, four were found robbed.

DEVELOPMENT AND BEHAVIOR OF NESTLINGS

The eyes of young Dickcissels opened approximately 4 days before the fledglings left the nest. Fledging in the Dickcissel is described by Gross (op. cit.). According to him young birds remain in the nest 8-10 days. Young

birds remained in one of our nests for 8 days and weighed approximately 14 grams (13.8, 14.0, 14.7) each the day (7 June 1963) before the nest was abandoned. The length of the longest secondary was 26 mm on 7 June. In another nest birds remained several days longer than 5 days, for on 3 June when the nest was found they had some black papillae or feathers as well as some white down. These papillae indicate that the birds were at least 4 days old (Gross, op. cit.: p. 171). One of the four young had left the nest on 6 June; the remaining three weighed 17.9, 16.4, and 15.7 grams. On 7 June a single bird weighing 18.1 grams remained in the nest. The length of this bird's longest secondary was 30 mm. Gross (op. cit.) reported the average weight of the egg is 2.76 grams.

Young in nests opened their mouths for food a few minutes after hatching. After several days in the nest, nestlings resisted efforts to remove them by clutching the grasses of the nest strongly with their feet. No noises were heard from nestlings until 1 or 2 days before they left their nest.

SUMMARY

Reproduction in the Dickcissel in moist, disturbed prairie in northeastern Kansas was investigated, and information supplementary to the extensive studies of Gross (1921) is presented. Territories are defended by males and are effectively spaced through suitable habitat. Copulatory behavior is described. One male seemingly mated with two females, whereas a neighboring male remained unmated. Territories changed in area, and in two instances after a clutch was destroyed its territory, vacated by the parents, was partially incorporated into that of another male. The position of the nest in vegetation in northeastern Kansas is described. Elm saplings along grassy roadsides are frequently nest sites of Dickcissels. The mean size of 18 clutches in northeastern Kansas is 4.05, and the number of eggs varies from three to five. Sterile eggs are common in Dickcissels, and 26 per cent of the eggs observed were sterile in northeastern Kansas. The incubation period, determined in Illinois, is 11 days. The female ordinarily begins incubation on the penultimate day of laying, but one example is given of a Kansan female beginning incubation on the last day of laying. The eyes of nestlings open about 4 days before the nest is abandoned. Young leave the nest in 8-10 days, each weighing at that time approximately 14-18 grams. Of nine clutches and broods, four were robbed by predators in northeastern Kansas. Nestlings open their mouths for food shortly after hatching; they seemingly remain silent in the nest until a day or two before leaving it.

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