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GREAT-TAILED GRACKLE REPRODUCTION IN SOUTHCENTRAL LOUISIANA

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In recent years the Great-tailed Grackle (*Quiscalus mexicanus*) has expanded its breeding range in several states (Pruit et al. 1978), including Louisiana (Selander and Giller 1961, Pratt et al. 1977). This species' reproductive habits are poorly known in the United States, particularly in areas of recent range expansion. Skutch (*in* Bent 1958) researched breeding biology in Guatemala and Honduras. Selander and Hauser (1965) and Selander and Giller (1961) worked on some aspects of clutch size, fertility, and gonadal and behavioral cycles in Texas. This paper reports various aspects of the reproductive biology of this species at the eastern periphery of its breeding range in southcentral Louisiana.

STUDY AREA AND METHODS

We studied the grackles during breeding seasons between 24 April 1976 and 31 July 1978. In 1976 our observations were made after hatching had begun, however in 1977 and 1978 the study began when the birds arrived on the breeding grounds.

Data were obtained from nesting areas at 2 manmade lakes in Evangeline Parish, Louisiana: LaHaye Lake (LL) and Miller's Lake (ML), which are located 1 km SW Vidrine and 4.8 km NE Vidrine, respectively. LaHaye Lake is a shallow, almost treeless, reservoir of about 120 ha with a maximum depth of 3 m. It is used for rice irrigation, fishing, and duck hunting. Spadderdock (*Nuphar advena*) is the predominant emergent vegetation and grows so densely that by May there is little open water and boat travel is extremely hampered. Miller's Lake is a shallow 14 km^2 impoundment that is similarly used. There are several heronries comprised mostly of Cattle Egrets (*Bubulcus ibis*) within the Miller's Lake area (Ortego 1976).

Grackle nests were examined weekly, and occasionally biweekly, to reduce the chances of nest and colony abandonment that often occurs when nesting birds are disturbed (Pratt et al. 1977). We examined 184 nests at the 2 lakes. Each new nest was marked with a numbered tag for easy identification. Records of breeding activities at each nest were maintained throughout the breeding season.

A clutch was considered complete when no additional eggs were deposited within successive data gathering periods. For monthly analysis of clutch size, clutches begun at the end of one month and completed in the next were included in the former. Incubation period was determined from the date of the appearance of an egg, which was marked for recognition, to hatching of the same egg. Great-tails are known for asynchronous hatching (Selander and Giller 1961).

Hatching success and fledging success at each nest were determined.

Successful fledging was assumed when we observed no young in a nest which had contained fledging-sized young a week before, or when we found banded young in the vicinity of the nest. We did not assume successful fledging if a nest disappeared or showed possible predation or weather damage.

Only nests in which we had no doubts as to the outcome of the nest success of the particular category being analyzed were used; consequently the number of nests used for clutch size determination was greater than the number of nests used for hatching success, which was greater than the number of nests used to determine fledging success.

A nest was considered to be active if it contained eggs and/or young. In several cases, when active nests per 2-week period were determined, the same nest could be counted twice or more for successive 2-week periods, because nests could contain eggs and then young for a total of at least one month. More nests appeared in this category than indicated by Tables 2 and 3 because we included nests in the analysis whose reproductive outcome was uncertain. For instance, a nest that contained approximately 1-week-old young when first discovered was considered active during the 2-week period of its discovery. However, this nest was also considered active during the 2-week period prior to hatching. Such a nest, however, was not used for clutch-size analysis because of the possibility that only 3 eggs out of a larger clutch hatched.

RESULTS AND DISCUSSION

Arrival on the breeding grounds.—Males were the first to arrive on the breeding grounds and were first seen on 8 February 1976, 14 March 1977, and 11 March 1978. At LL males almost immediately began territory establishment by calling and displaying on fence posts, duckblinds, trees, and stakes within the lake. Up to 9 males were present at LL in 1977 and 1978 before nest construction began, however, only 3–4 of these were successful in establishing territories.

The greatest number of females was 19, seen on 23 March 1978. More may have been present later in the year after nesting began.

Nest sites and construction.—At LL most nests were attached to pine (*Pinus* spp.) boughs used the previous hunting season as camouflage on 4 duckblinds. At the onset of the breeding season, the branches were still covered with needles. The remaining nests on the duckblinds were attached to fence wire on which the pine branches were affixed, or they were constructed in a statant fashion on boards and beams supporting the duckblinds. Most nests were constructed in April in the upper portions of the pine branches. Those nests made in late May and early June were attached in the lower, shadier, more protected portions of the duckblinds. By mid-May, pine needles had fallen from the uppermost portions of most branches and exposed the earlier-constructed nests to the elements. Great-tails at LL also nested in black willow (*Salix nigra*) and Chinese tallow (*Sapium sebiferum*), but to a lesser extent. Grackles at

ML nested in buttonbush (*Cephalanthus occidentalis*) within a Cattle Egret heronry.

Nests were constructed of fishing string, twine, rags, plastic strips, coarse and fine grasses, sedges, and big floating heart (*Nymphoides aquatica*) stems and leaves. The bottom of the nest cup was coated with cow dung or mud gathered on the lake edges. We never observed female grackles gathering big floating heart, however, they probably collected pieces that had been cut by nutria (*Myocastor coypus*). The dried stems and leaves of *Nymphoides* constituted only about 5% of the total nest weight.

Only a few nests were constructed in trees. These tended to be placed singly and ranged in height from 1–8 m above ground. Apparently the nests on duckblinds were placed closer to each other due to space limitations and a tendency to place nests on remote locations far from the lakeshore. Nests were not placed in trees until about mid-May when cover conditions on the duckblinds deteriorated.

Selander and Giller (1961) reported nests as close as .75 m apart. We found nests on duckblinds commonly this close or closer, and twice we found 2 active nests in contact with one another. At ML there was no apparent competition for nest sites and the closest 2 nests were 3 m apart.

Females gathered much nest material several hundred meters from the duckblinds. The distance to sites containing suitable nest material, coupled with the effort needed to retrieve that material, may be the reasons that we frequently observed pilfering of nest material from nearby unattended nests.

In 1976 we estimated that nest construction began during the first week of March. This estimate was based on the condition of the nestlings and length of the incubation period as described by Skutch (*in* Bent 1958). In 1977 and 1978 nest construction began on 26 March and 4 April, respectively. A few nests were never completed; these included 9 nests in 1976, 2 in 1977, and 6 in 1978. Two nests in 1976 and one in 1978 were completed but never received any eggs.

Egg laying and clutch sizes.—In 1976 we estimated that egg laying began during the first week of April. In 1977 and 1978 the first eggs were found on 4 and 11 April, respectively. Selander and Hauser (1965) reported the first eggs in the Austin, Texas, area were laid during the first week of April. Skutch (*in* Bent 1958) found the first eggs in nests of eastern Guatemala Great-tails on 3 March and also concluded that birds in western Guatemala began "nesting" in January.

The mean clutch per nest at LL included 3.68 ± .07 eggs (n = 106, Table 1). Selander and Giller (1961) and Selander (1960) reported average clutches of 3.45 eggs for nests located in southwest Louisiana, southeast Texas, and the Austin, Texas, area. The lower mean clutch size in their study is probably an artifact of the data used to calculate the mean. Selander and Giller (1961) used June clutches for their cal-

TABLE 1. Monthly mean clutch size of the Great-tailed Grackle, 1976–1978.

Month	1976	1977	1978	1976–1978
April	—	4.00 ± .13 (27)[1]	3.82 ± .13 (17)	3.98 ± .10 (44)
May	3.68 ± .12 (28)	3.44 ± .25 (9)	3.50 ± .20 (14)	3.48 ± .09 (51)
June	3.09 ± .34 (11)	—	—	3.09 ± .34 (11)
Cumulative	3.51 ± .15 (39)	3.80 ± .10 (36)	3.68 ± .12 (31)	3.68 ± .07 (106)

[1] Mean ± standard deviation (number of nests).

culations; we found June to be a period of relatively little reproductive activity with smaller average clutches produced (Table 1).

Selander (1960) reported that clutches of 3 and 4 eggs occurred most frequently, the former being most common, while clutches of 2 and 5 eggs were uncommon. The LL population produced approximately twice as many clutches of 4 than 3 (Table 2), and clutches of 2 and 5 were uncommon. We discovered only one single-egg clutch, which hatched.

We were unable to determine positively if 2 clutches were produced by some females because adults were not marked. However, 9 nests in 1976, 3 in 1977, and 5 in 1978 held 2 clutches during the course of the breeding season. Those nests receiving a second clutch were quickly repaired before any eggs were deposited.

Incubation period.—The incubation period was 13 days for 2 eggs (one nest) and 14 days for 7 eggs (2 nests). Skutch (*in* Bent 1958) reported that clutches "from four nests" and "from two nests" had an incubation period of 13 and 14 days, respectively.

Eggs hatched and nestlings fledged.—About 55.3% of the total number of eggs laid hatched in our study, this value varied considerably among years (Table 3). We neither examined nor removed unhatched eggs to determine if they were fertile or addled. Selander (1960) reported that hatching success of all eggs laid in his study was less than 75%. The fledging rate in our study was 35.8%, which is much lower than the 58% reported by Selander (1960). Possible causes of such high mortality are discussed below.

TABLE 2. Clutch sizes of the Great-tailed Grackle, 1976–1978.

Clutch size	Number of clutches			
	1976	1977	1978	Total
1	1	0	0	1
2	3	0	2	5
3	12	11	7	30
4	21	19	21	61
5	2	6	1	9

TABLE 3. Nesting success of the Great-tailed Grackle, 1976–1978.

	% Eggs hatched (n = 183 eggs from 92 nests)	% Young fledged (n = 85 young from 67 nests)
1976	58.2	32.1
1977	62.1	32.9
1978	43.9	39.2
Total	55.3	35.8

Nesting activity.—More nests were active, i.e., contained eggs and/or young, from mid-April through mid-May 1977–1978 (Fig. 1). In 1976 there were more active nests from mid-May through mid-June, but the percentage of active nests in May and June was relatively static.

Nesting activity at ML continued through 1 July. The number of grackles at ML increased when nesting decreased at LL. On 17 June 1978, at ML, 12 nests, 5 of them active, were found; on 24 June we located an additional 7, 5 of which were active; and on 1 July, 6 more, 1 active, were located.

Mortality factors.—The close proximity of nests to each other, and the poor cover provided by the duckblinds after April were indirect causes of most mortality. Crowded nest sites could have led to frequent pre-

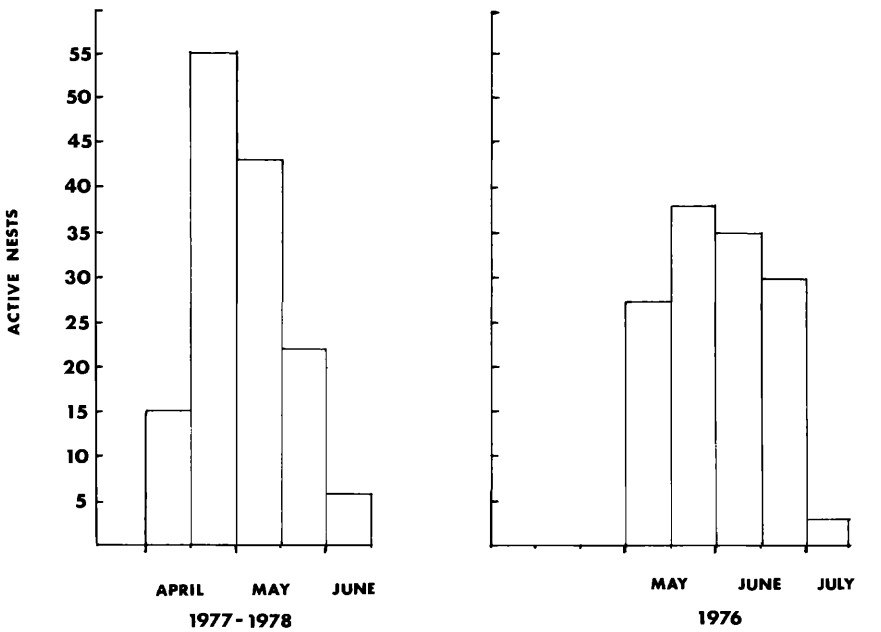

FIGURE 1. Active Great-tailed Grackle nests, per 2-week period during the breeding seasons of 1976 and 1977–1978 at LaHayes' Lake, Louisiana.

dation, probably by water snakes and cannibalism. Tudor (1962) reported that snakes were a major cause of *Q. major* mortality: snakes either preyed on nestlings or emptied nest contents when they used nests as sunning platforms. We noticed few water snakes near the duckblinds, but they were commonly encountered along the lakeshore and on spadderdock leaves. Some nestlings showed wounds that appeared to have been inflicted by pecking adults, an indication of possible cannibalism. McIlhenny (1937) reported that cannibalism was common in Boat-tailed Grackles (*Quiscalus major*).

By mid-May, following heavy rains, water frequently collected in nests, mostly because of a lack of leafy overhead cover. This destroyed nestlings and eggs. Additionally, heavy rains and occasional hail storms ($\bar{x}$ = 1.3 hail storms per nesting season) destroyed many nest attempts by striking eggs or young directly or by breaking nests apart or detaching them from their anchorage, thereby, spilling eggs or young into the water.

Nestlings approaching fledging, when spilled from a nest, exhibited a remarkable ability to clamber on the pine branches of the duckblinds. We frequently observed this behavior when older nestlings were disturbed by our banding activities. Several banded nestlings in good physical condition were found in different unused nests after their nests were destroyed by the weather. Apparently, females have no trouble locating their offspring to feed them after they are forced to leave their original nest.

In most instances, older nestlings that fell into the water returned to the duckblinds by swimming. They accomplished this by vigorous wing-flapping along the water's surface, and frequent resting on the numerous spadderdock leaves. These were usually capable of supporting nestlings and adults.

Population status.—Pratt et al. (1977) reported Great-tails in Evangeline Parish from 2 locations since at least 1960. After 1966, they were not observed until 1973 at LL, although we believe that they were present during these years in the LL vicinity. Ortego (1976) observed Great-tails at ML but found no nests. On 8 June 1977, Ortego found 4 females, 3 carrying food, and 5 males at ML. We found 12 nests on 16 July, at the same location, and observed females carrying food to another inaccessible area. Although we were not able to conduct a nest survey of ML during 1975–1978, the increase in nesting and number of Great-tails generally corresponded to a yearly decrease in nests and individuals at LL. Ortego, Dennis H. Fontenot, and Guillory located 88 nests at LL in 1975. In 1976 we found 83; 1977, 65; and 1978, 36. The causes of this gradual move to ML are unknown, however, we strongly suspect that the decreasing availability of nest attachment sites at the duckblinds was the major factor. LL duck hunters abandoned 2 duckblinds and added few pine branches to the other 2 in 1977 and 1978. Since 1978, the LL population has stabilized at approximately 20 nests per year; only 2 duckblinds are still in use.

On 5 June 1980 Ortego and Dan Combs found 196 males and "many females" using ML. Great-tails in Evangeline Parish presently nest only at LL and ML, but if the ML population continues to increase, other nearby areas will undoubtedly be used. The rice-farming areas of southern Evangeline Parish appear to contain much suitable habitat and might support a significant population increase.

SUMMARY

Data were collected on 184 nests of the Great-tailed Grackle (*Quiscalus mexicanus*) at LaHayes' Lake and Miller's Lake both near Vidrine, Louisiana, from 1976 to 1978. Grackles normally arrived in early March and began nest construction, primarily on duckblinds, in late March. Nesting began in early April and normally continued until July; the height of the nesting season was mid-April to mid-May. Completed clutches contained an average of 3.68 ± .07 eggs; 55.3% of the eggs hatched; and 35.8% of the nestlings fledged. Mortality was attributed to weather, snake predation, and cannibalism.

The LaHayes' Lake nesting population has decreased due to a loss of nest attachment sites, and that at Miller's Lake is increasing.

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