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GREAT-TAILED GRACKLE (QUISCALUS QUISCULA) RANGE EXPANSION
AND BREEDING BIOLOGY IN THE CENTRAL GREAT PLAINS

by

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A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

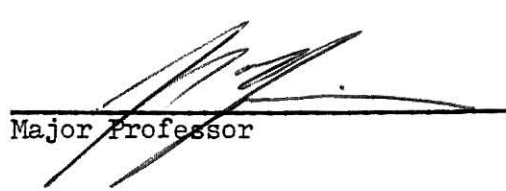
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INTRODUCTION

The Great-tailed Grackle (Quiscalus mexicanus) is a large, conspicuous blackbird with a range extending from northwestern Peru and northeastern Venezuela north through Central America and Mexico into the continental United States (De Schauensee 1970). Although a tropical and subtropical species throughout most of its range, the invasion of the Great-tailed Grackle into temperate regions of North America within this century, as far north as Nevada, Utah, Colorado, and Nebraska (Kingery 1980; Faanes and Norling 1981), has been one of the most exciting ornithological success stories for native species in this century. Not found north or east of the Nueces River in Texas in 1864 (Dresser 1865), the Great-tailed Grackle has extended its range over 1300 kilometers from a northern limit at San Antonio, Texas in 1912 (Selander and Giller 1961) to its present limit in southern Nebraska.

Several studies of the ecology and behavior of this species have been completed in the southeastern portion of its range in the United States. Selander and Giller (1961) completed a fairly comprehensive study of the species along the Texas coast in the area of overlap with its sibling species, the Boat-tailed Grackle (Q. major). Tutor (1962) did nesting studies on the Welter Wildlife Refuge in southern Texas in 1959 and 1960. Various other studies in Texas examined behavior (Kok 1972, 1974), gonadal and behavioral cycles (Selander and Hauser 1965), food habits (Davis 1972), sex ratio and clutch size (Selander 1960, 1961), and movements (Arnold and Folse 1977).

Range expansion has been examined in several studies. In Louisiana three papers have dealt with range extension since the early 1960's (Selander et. al. 1969; Pratt et. al. 1977; Guillory et. al. 1981). Guillory et. al. also

examined aspects of reproduction of the species in Louisiana. Pruitt (1974) summarized range expansion in the United States. In Oklahoma Davis (1975) reviewed the history of range expansion in that state. Schwilling (1971) listed the early breeding records from Kansas. Other information dealing with range extensions of the species can be found in short notes too numerous to be listed here.

The purpose of this study was to consolidate existing information on the ecology and biogeography of the Great-tailed Grackle in the central Great Plains and to add to that information through direct observation of breeding colonies.

STUDY AREAS

The nesting studies in the Manhattan area were conducted on four areas during the 1981 and 1982 nesting seasons (Figure 1). The first area, the Corner Colony, was located just north and west of the junction of Tuttle Creek Blvd. and Marlatt Avenue. This colony consisted of boxelder (Acer negundo) ash (Fraxinus sp.), and elm (Ulmus sp.), along a small stream flowing through an agricultural field. At the onset of breeding activity by the Great-tailed Grackles in 1981 the trees were leafed out enough to provide cover for the nests. The field surrounding the colony was planted in winter wheat which was growing at the time of initiation of the colony. In 1982 the trees were not leafed out until one to two weeks after the onset of breeding. In addition the wheat was never harvested in 1981 and weeds provided a jumbled cover of dead stalks in 1982. The field was not plowed during the 1982 breeding season. A second area, the Cedar Colony, was located along Denison Avenue near the KSAC radio tower. The predominant structural species in this colony was red cedar (Juniperus virginiana), with a few elm also present. The locations of trees in this colony were mapped in late winter of 1982. The third area, the River Pond Colony, was located in the old river channel of the Big Blue river south of the Tuttle Creek Dam. The major structural vegetation was two species of cattail, Typha latifolia and T. angustifolia. The fourth area, the New Colony, was located 1.1 kilometers north east of the corner colony, just south of a housing addition. This colony was located on two sewage disposal ponds with cattails growing around the periphery. Primary structural vegetation at the ponds consisted of T. latifolia and willow (Salix sp.). Several large trees around the ponds and some electric line poles provided additional perches for the grackles.

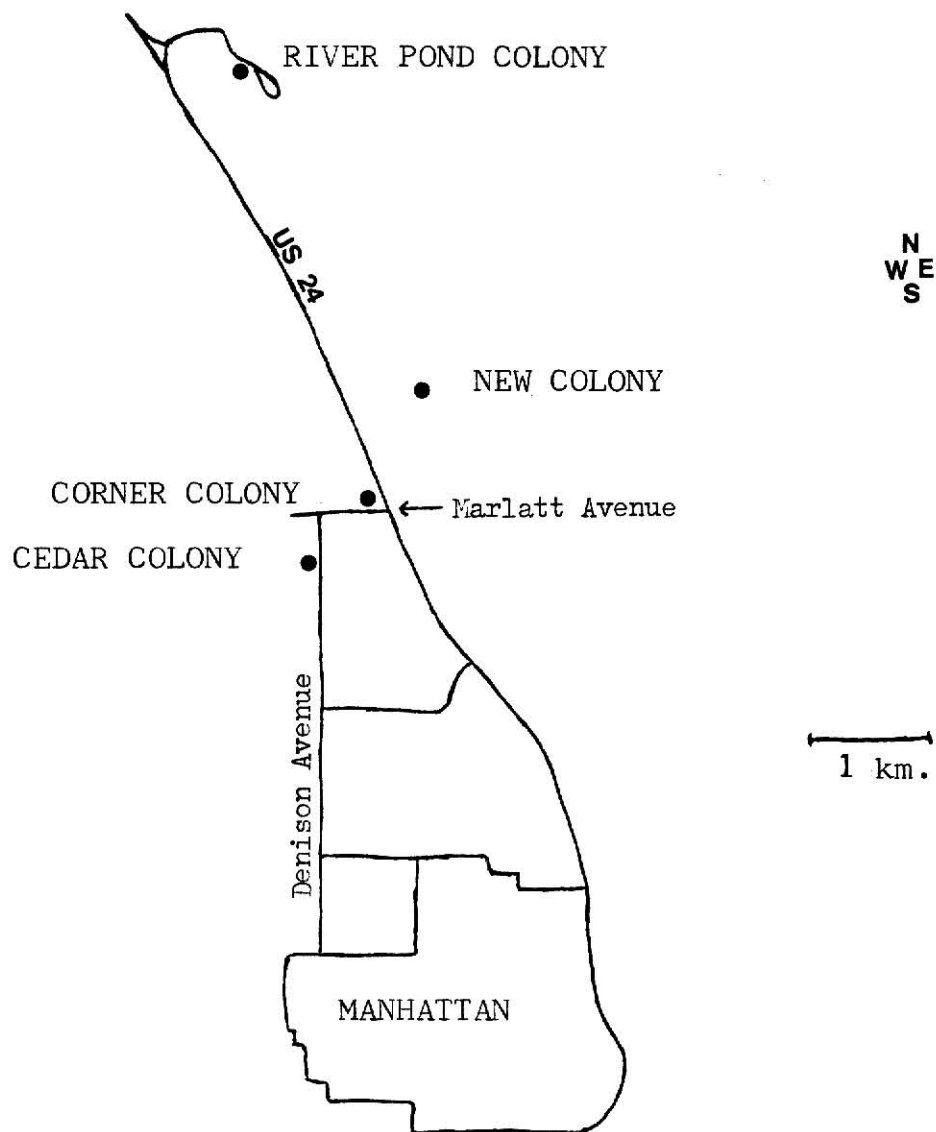


Figure 1. Colony sites in the Manhattan area.

METHODS

Some clutch size and distributional data were collected in Kansas and southern Nebraska during trips used to visit known colony locations and likely colony sites. The remainder of the data were collected in the Manhattan, Kansas area. During March and April searches were conducted by car for active colonies. When colonies were located in 1981, observations of the bird's activities were made with the aid of a 20-60x telescope and 8x40 binoculars. I remained far enough away so as to not disturb the birds. Nests were checked at three day intervals, using a mirror on a pole for nests above eye level. Young were weighed using a spring tension scale. Data were collected in a more systematic manner at the Cedar Colony of 1982. The colony was mapped to allow precise location of nests, and arbitrarily divided into three sections. An observation station was set up 5.5 meters north of the northeast corner of the fence surrounding the colony. Numbers of Common Grackles (Quiscalus quiscula) and both male and female Great-tailed Grackles were recorded in each of the three sections. Data were collected from 12 April to 31 May, seven times a day at two hour intervals beginning at 0530 CST, with 10 counts taken at 30 second intervals during each count period. Any behavioral observations plus notes on the location of the birds if they were not in the colony were also taken after each count period. Egg size was measured using calipers from two nests in the 1982 New Colony.

BIOGEOGRAPHY AND RANGE EXPANSION

The Great-tailed Grackle has been extending its range northward into the central United States for most of this century and is apparently continuing this expansion at the present time (Figure 2). A summary of sightings and nesting records is given in Figure 3.

TEXAS - Residence of the Great-tailed Grackle in Texas predates the presence of the species in all other states in the central region of the country. Prior to 1865 the species was not found north or east of the Nueces River in southern Texas (Dresser 1865). Range expansion of the species apparently began sometime between that date and 1912 when the species was found as far north as San Antonio (Selander and Giller 1961). In 1915 a nest was found in Austin but the species remained a rare and local summer resident until the late 1920's (Oberholser 1974). The fastest rate of range expansion evidently occurred along the coastal plain and up the major river systems in the east (west of the forested region). The species reached Waco by 1938 and Fort Worth by 1944 (Oberholser 1974). Despite early presence of the species in the state some regions have remained unattractive to the species as breeding areas (Oberholser 1974). No nesting was noted in the eastern forested region up to the late 1950's and breeding is evidently still uncommon there. Similarly the Edward's Plateau had little activity of the species until recently when breeding records were found in Tom Green and Midland counties in 1977 (Maxwell 1980). The Panhandle region was also late receiving the species. First sightings of the species occurred in Amarillo in the late 1950's with first breeding apparently in the early 1960's (Oberholser 1974). Continued expansion has occurred in this area with first nesting in Lubbock in 1974 (Williams 1974) and Moore County in 1975

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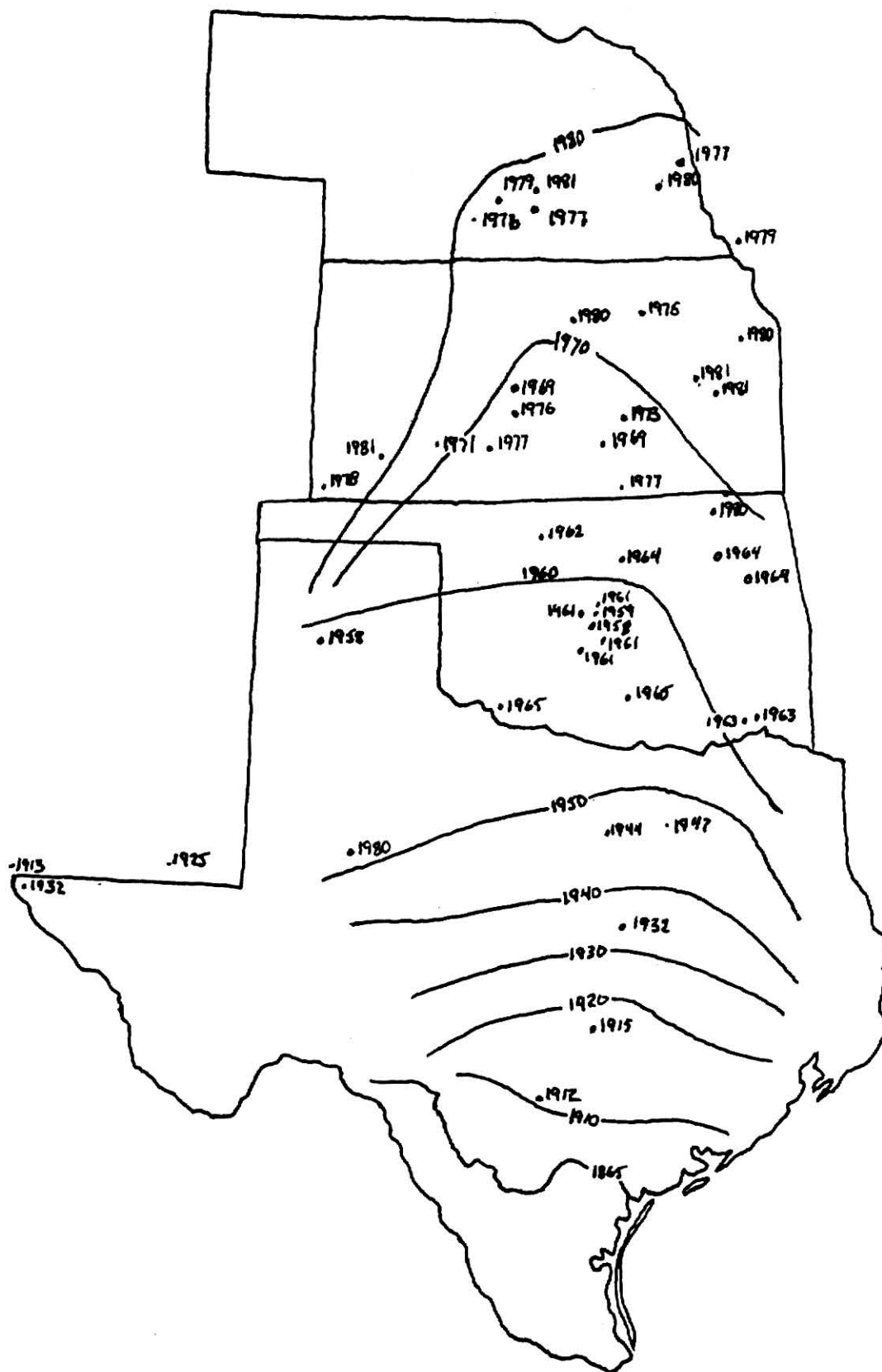


Figure 2. First dates of breeding and approximate boundaries of range expansion of the Great-tailed Grackle in the Great Plains.

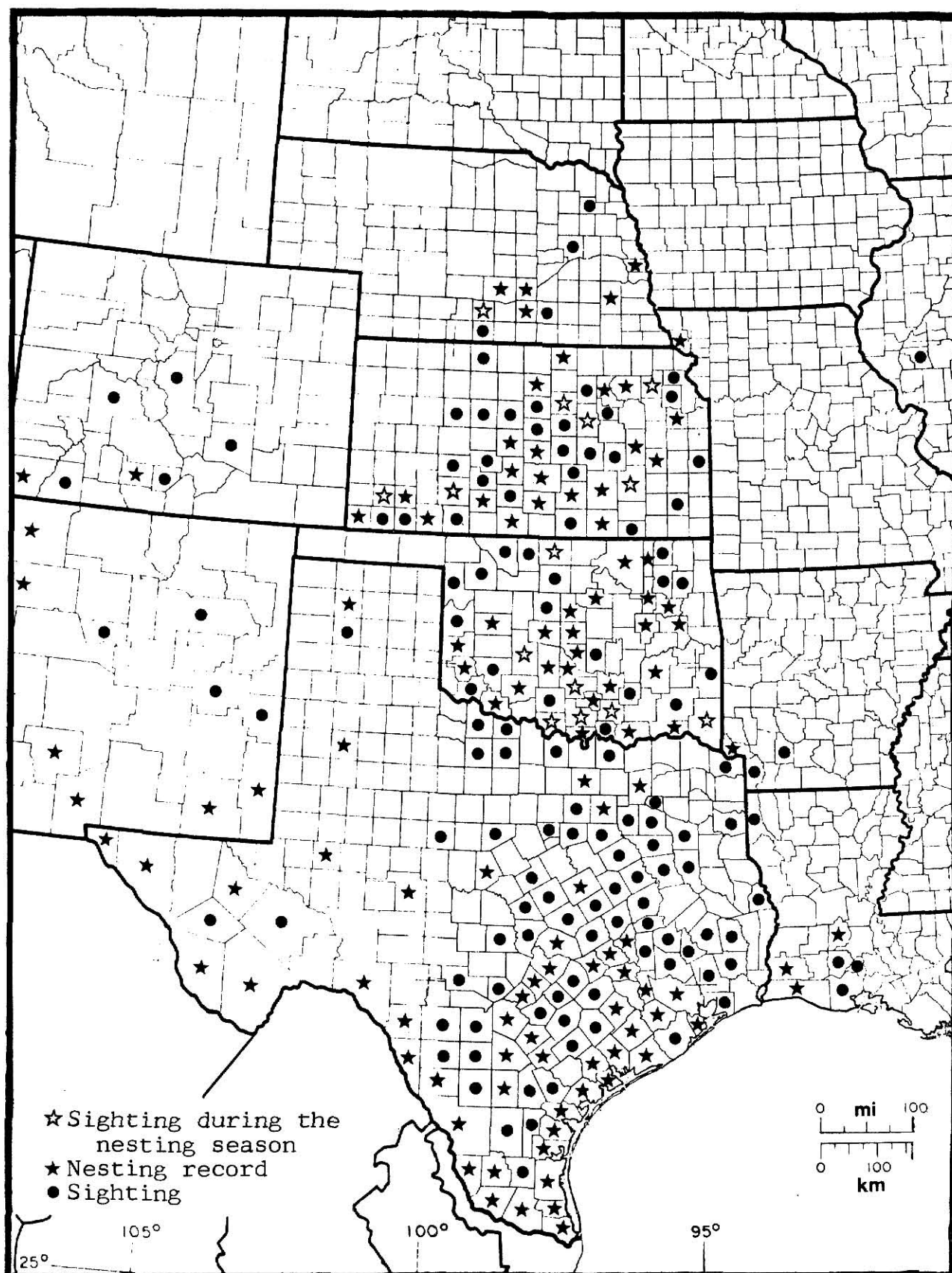


Figure 3. Present distribution of the Great-tailed Grackle in the Great Plains.

(Williams 1975).

NEW MEXICO - The first record for the state is from 1913 when a male was collected in Las Cruces and a pair was reported to be nesting in La Mesa, both from the southern region of the state in the Rio Grande river valley (Bailey 1928). The next reported breeding was also from the southern part of the state. This colony, however, was located in the Pecos river valley near Carlsbad in 1925 (Ligon 1926). By 1938 the species was found nesting over 250 kilometers to the north, this time near Isleta in the central region of the state and in the Rio Grande river valley (Compton 1947). At present the species is found in all regions of the state except for the northeast.

LOUISIANA - Invasion of Louisiana by the Great-tailed Grackle occurred along the coastal plain. First breeding in the state is calculated to have occurred between 1938 and 1959 in Calcasieu Parish (Selander et. al. 1969). By 1960 the species was confirmed as breeding in Calcasieu Parish (Selander and Giller 1961) and in Evangeline Parish as a disjunct population (Pratt et. al. 1977). Breeding in these two parishes has continued to the present. In 1968 the species was found in Cameron Parish (Selander et. al. 1969) where it bred by 1972 (Pratt et. al. 1977). In the early 1970's the species was sighted in Acadia, Lafayette, and Vermilion Parishes but breeding was unconfirmed. The only record of this species outside of the southwestern region of the state is a female collected at Shreveport in April of 1957 (Stewart 1976).

OKLAHOMA - Great-tailed Grackles probably first invaded Oklahoma in the 1950's (Davis 1975). The first sightings came in 1953 from Cleveland County in the central region and from Woods County in the northwest (Davis 1975). Both sightings were of single birds, the first a female and the second a male. First breeding came in 1958 in Cleveland County although breeding probably occurred at least a year earlier in the southcentral region of the state

(Davis 1975). By the mid-1960's the species was breeding as far north and east as Tulsa and as far west as Tillman County in the southern tier of counties (Davis 1975). Breeding in the westcentral region was recorded in the early 1970's, and by the mid-1970's a few colonies had been found in the southeastern corner of the state (Davis 1975). To date the species has bred in most regions of the state with the exception of the panhandle. Some regions, notably the southeast, do not yet contain high populations. That the spread of the species continues in the state is evidenced by the recent new county records from Washington County in 1979 (Porter 1980) and Osage County in 1978 (Delap 1980).

KANSAS - The first sight record of the Great-tailed Grackle in Sedan, Chautauqua County in 1964 (Baumgartner 1964) was not unexpected due to the presence of the species in northcentral Oklahoma prior to the sighting. The first breeding records for the state were from Barton and Sedgewick Counties in the Arkansas river valley in 1969 (Schwilling 1971). That actual breeding probably predated these records by several years is indicated by a record of a successful breeding colony of at least 20 birds in Reno County the following year (an unusually high number for a first year colony). By 1971 the species was sighted farther west in the Arkansas river system (Dodge City) and farther north in the Kansas-Smoky Hill river system (Schwilling 1971). Continued expansion in the latter river system brought sightings of the species in Riley County in 1976 (Zimmerman 1976) with breeding soon thereafter, and breeding in Douglas County by 1981 (Fleisher, pers. comm.). No movement to the west in this river system has been recorded other than isolated sightings in Ellis, Russell, and Trego counties. Breeding in the southwest corner of the state had occurred by 1978 when Mark Ports located a pair with a single nest in Morton County (Schwilling, pers. comm.). These birds probably reached the southwestern corner of the state through dispersal along the Cimarron river

valley from northwestern Oklahoma.

No breeding records have been reported from the northwest and southeast regions of the state. The densest populations at present are located in the central part of the state, just west of the Flint Hills. The strongest northward movement apparently also occurred in the central region of the state. Presence in the eastern and western thirds of the state is apparently limited to the major river systems.

COLORADO - Presence of the species in Colorado has been a fairly recent phenomenon. The first state record is of a single male present throughout the summer of 1970 in Gunnison County (Hyde 1971). Breeding of the species was first recorded in 1973 when eight nests were found in Monte Vista in the southcentral part of the state (Stepney 1975). Nesting has apparently continued to the present in Monte Vista, but only two additional nesting reports for other areas are available, despite regular sightings in the central, southcentral, and southwest regions of the state. One report, from Pueblo, describes an attempted nesting (a territorial "pair") in 1979 (Kingery 1979). The other report is of the nesting of a single "pair" at Totten Reservoir in 1980 (Kingery 1980).

ILLINOIS - The only record of the Great-tailed Grackle in Illinois is of an isolated occurrence in Morgan County in the eastcentral region of the state of a single female in October of 1974 (Bohlen 1976).

MISSOURI - At present the only records are in the northwest corner of the state. The first record in the state was from Holt County in May of 1976 (Kleen 1976). In 1979 a few birds nested at the Squaw Creek National Wildlife Refuge in Holt County (Kleen 1979). Breeding again occurred at Squaw Creek in 1980 (Kleen 1980) but has not since, although they have been sighted in the state (Kleen 1981). In 1982 the manager of Squaw Creek reported the species

was present for a short time in early spring and had since been reported at the nearby Big Lake State Park (pers. comm.).

NEBRASKA - Great-tailed Grackles were first observed in Phelps County in the southcentral region of the state in 1976 and were assumed to be breeding (Longfellow 1979). Definite evidence of breeding was obtained the following year when a nest was found in eastern Nebraska near Boy's Town and a colony was found in Adams County (anonymous 1977). Nesting in Adams County may have occurred one to two years earlier (anonymous 1977). Following 1976 no further reports of the species came from the eastern part of the state until 1981 when a nest was located north of Lincoln in Lancaster County (Ducey 1981). Ducey also reported territorial activity by a pair one year prior to this observation. In southcentral Nebraska the Adams County colony continued to increase to several hundred birds in the early 1980's when it apparently disbanded. Since then only a few breeding birds have used the site (Lueshen, pers. comm.). In 1979 a single nest was located in Buffalo County in the southcentral region at a site where nesting was suspected the previous year (Faanes and Norling 1981). In 1980 another colony was established in Grand Island in the same region (Williams 1980). A colony was also present at the nearby Gibbon Interchange of I-80 (Green, pers. comm.) in 1980 or 1981. In 1982 a male was observed in Buffalo County and the Grand Island colony was still present (pers. obs.). Evidence of further movement to the north is found in reports of a pair in Platte County in April of 1981 (Holtz 1981) and the continued presence of the species in Wayne County (northeast region) since 1979 (Lueshen, pers. comm.).

ARKANSAS - The first record of Great-tailed Grackles in Arkansas is from Little River County in the southwestern corner of the state in the summer of 1976 (Stewart 1976). This observation provided both the first occurrence and

first breeding for the state. The few records published since 1976 have all been from the extreme southwest corner of the state with a record in Prescott (Imhof 1979) being the farthest northeast the species has been observed in the state.

PATTERNS OF EXPANSION

The main thrust of expansion of the Great-tailed Grackle in the continental United States has occurred in the Great Plains. Although the species has also pushed northward to the west, and has even bred in San Francisco on the west coast (Laymon and Shuford 1981), it has extended its range much more thoroughly in the eastern Great Plains. The expansion in the Great Plains was probably due to two important reasons. First, the habitat in the Great Plains is apparently more closely matched to the species' needs. Selander and Giller (1961) observed that the species prefers open areas with a source of water and raised nest sites while Skutch (1954) noted that the species avoided mountains. Much of the area west of the Great Plains is mountainous and the areas where the mountains do give way to flatter terrain are often arid. Secondly, rivers appear to be the avenues of expansion for the species in most parts of its range. Kincaid (1977) found in Texas that movements of the species appeared to be along river systems. The exception to this tendency to follow rivers occurred when the rivers entered woodlands. In this case the birds would skirt the edge of the wooded area until they reached the next river system. In most areas of the west as well as in Texas the river systems run mainly north and south. This orientation allowed the Great-tailed Grackles to move northward along each river system, always in contact with the former edge of their distribution. In the central Great Plains, however, the river systems run east and west. Here, northward movements involved leaps from one river system to the next. This increased the rate of the northward expansion. These leaps

were followed by secondary expansion along each river system, and finally by tertiary expansion to suitable habitats between river systems.

The center of expansion in the Great Plains region started in eastern Texas, just west of the eastern wooded region, moved slightly west into central Oklahoma, farther west into central Kansas and southern Nebraska, and now appears to be swinging back east into northern Nebraska (Figure 4). This longitudinal shifting appears to follow optimum combinations of foraging areas, water, and elevated nest sites. Great-tailed Grackles appear to require fairly short grass for optimal foraging. The species apparently will not forage under trees as Common Grackles do (pers. obs.). The optimal foraging habitat has been described by Pruitt (1975) as "a golf course-like environment". Grass height decreases from east to west across the Great Plains. Within the east to west trend of tall grass to short grass there are aberrations. In the Flint Hills region of Kansas and northern Oklahoma tall grass remains as a dominant feature of the landscape due to a topography which thwarts cultivation in all areas except river valleys. To the north and west of the Flint Hills, the Sandhills of Nebraska remain as tall grass at a longitude normally dominated by mid and short grasses. In contrast to the increase in suitability of grasses for foraging by Great-tailed Grackles as one moves from east to west across the Great Plains there is a simultaneous decrease in the availability of surface water and elevated nest sites. Due to these opposing factors one would expect to find a band of optimal habitat close to the western edge of the tallgrass region, indeed the bulk of the northward expansion by the species has occurred in this band. In addition one would expect colonies to the east and west of the optimal habitat to be located mainly along the river systems where in the west elevated nest sites and a source of water are readily available and in the east cultivated fields and non-native cool season grasses kept short by

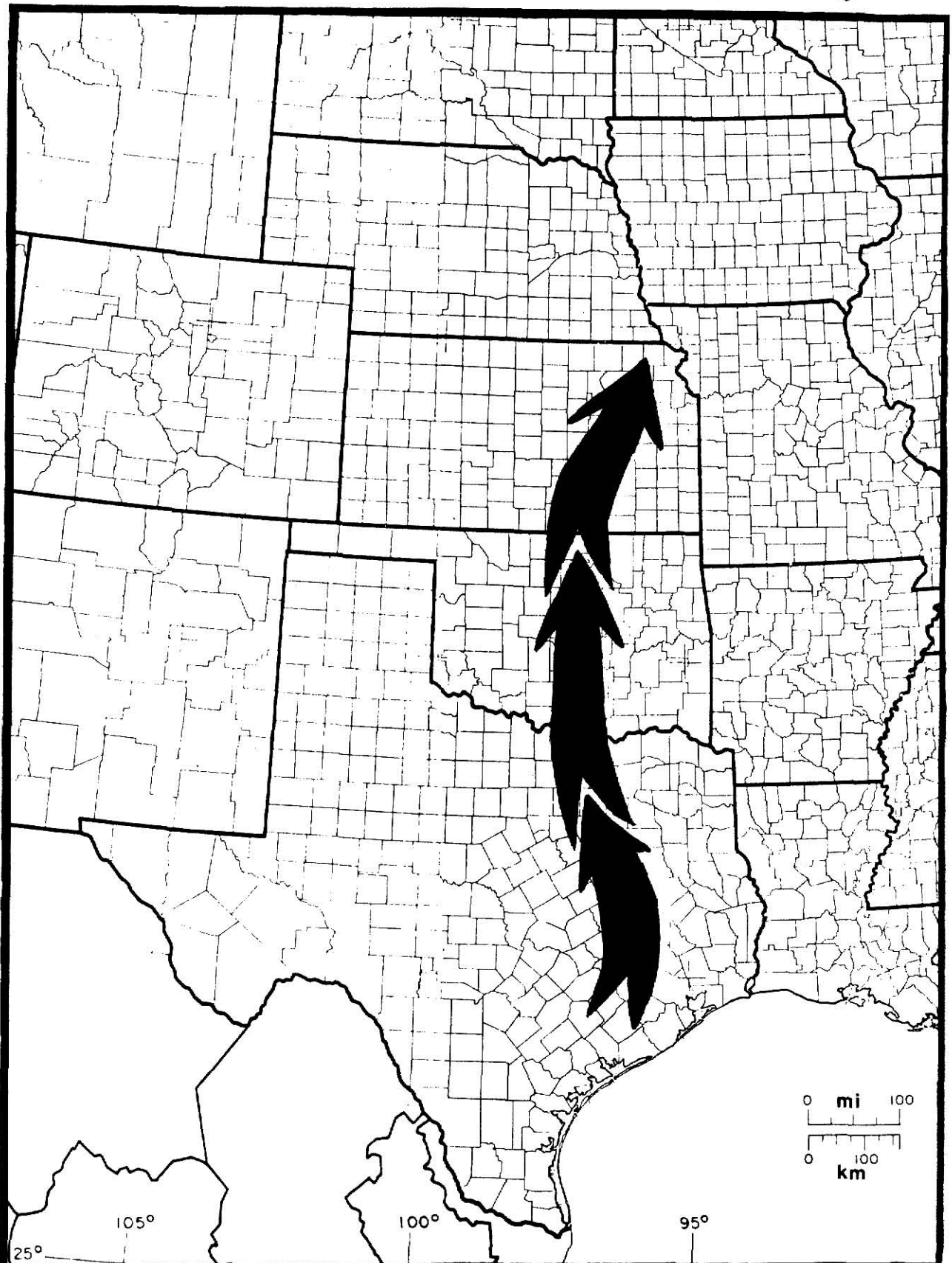


Figure 4. Major avenue of expansion by Great-tailed Grackles into the Great Plains.

heavy grazing or mowing are available for foraging. Where cultivation of the tallgrass prairie is possible in the east one would also expect an increase in Great-tailed Grackle populations due to the increase of towns with their requisite bluegrass or fescue lawns. This latter case is apparently found in tallgrass prairie areas of Oklahoma and recently in eastern Nebraska where northward movement has apparently swung to the east of the Sandhills.

COLONY PHENOLOGY

Corner Colony - 1981. The exact date of establishment of this colony is unknown due to a lack of information on previous colony sites and nesting dates for the species in the Manhattan area. Several sightings of lone males and pairs of males were made in mid-March in the Manhattan area. None of these sightings appeared to be associated with active colonies. On 19 April birds were first observed at the Corner Colony with at least eight males and three females present.

On 20 April 12 nests in various stages of development were located and at least 12 different females were observed at the colony. By 23 April most of the nests in the colony were externally complete, and females were found sitting on a few of the nests. On 24 April several of the nests were found to be empty, but one contained a single egg. The nests were again checked on 1 May, and most held complete or nearly complete clutches. Five or six females were seen at the colony at the time of the nest check and several males were heard in the colony. Later that day at least five and probably seven or more males and at least three females were discovered at the nearby Cedar Colony location. Several birds were also still present at this time in the Corner Colony. By 5 May only one female was found at the Corner Colony while seven males and six females were present at the Cedar Colony, and one male and one female were discovered at the River Pond Colony. On 6 May all the nests checked at the Corner Colony were empty. Some Common Grackle nests were also checked in the colony at that time and were found to contain complete clutches. Egg fragments were seen in at least one of the Great-tailed Grackle nests. The Great-tailed Grackles were still present in the Cedar Colony at this time.

Following the abandonment of the Corner Colony by the majority of birds, at least one female remained and apparently fledged a nest of young. A male with little or no tail was observed occasionally at the colony for not more than five to ten minutes on the hour. Although this male was not found at any other colony in the area he consistently flew to the northeast when he left the Corner Colony. The last date Great-tailed Grackles were seen at the colony was 3 June.

Cedar Colony - 1981. Activity at this colony began between 24 April and 1 May when at least five males and three females were discovered at the colony. Nest building apparently began prior to 1 May as the first egg date was estimated as approximately 3 May on the basis of young present on 20 May. By 5 May at least seven males and six females were present and a male-female chase was noted. At least three males and two females were present in the colony on 15 May, but overall activity in the colony had decreased. An egg shell of the species was found beneath the former activity center at this time. No Great-tailed Grackles were found at the colony on the following day during two short observations of the colony. From 17 May through 20 May one male and at least two females were seen regularly at the colony and an additional two males were noted intermittently on the 19th and 20th. On 20 May two nests were located near the former Great-tailed Grackle activity center of the colony, one with three young and one with four. After 20 May, sightings of one male and two females were fairly regular up to 6 June, and one male and one female were regularly found until 9 July with a single observation of a female on 20 July, the last date any Great-tailed Grackles were found in the colony. Groups of up to three additional males, including one first-year male, were noted irregularly up to 2 June, with isolated occurrences of one additional male on 18 and 28 June. The nest containing four young was predated prior

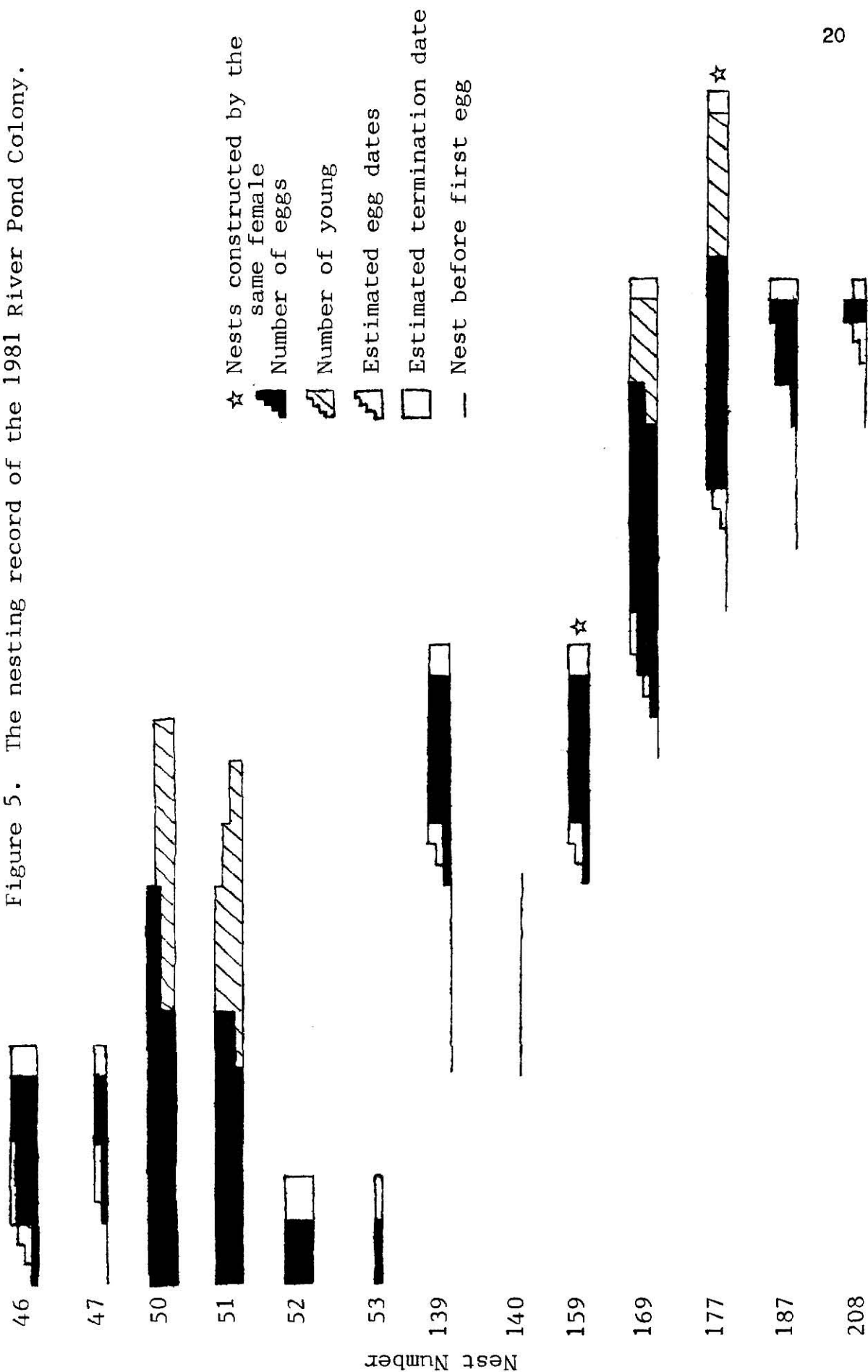
to 31 May and only one young remained in the nest formerly containing three young. This nest was empty and filled with mites by 3 June. On 2 June one young was found in the colony. By 5 June a young Great-tailed Grackle was flying around in the area of the colony and was seen with the male and/or female many times after this date up until 20 June.

River Pond Colony - 1981. Activity at this colony began in April when a single male was observed a number of times by several individuals at the marsh south of the Tuttle Creek Dam. This male was first noted by me on 23 April as he displayed on various perches around the marsh. The first sighting of a female at this location was made on 5 May when one male and one female were seen foraging in a lawn north of the marsh area. On 7 May two males were observed flying south from the marsh area in the morning and at least two females and one male were present later in the day. One of these females was building a nest in a cattail clump. On 8 May four females were seen during one hour of observation in midafternoon, and five males were present in the area immediately after the observation period. No more than one male was found in the area from this date to 12 May when three males and four females were seen foraging in the lawn to the north of the marsh. A nest check on 12 May located a total of six Great-tailed Grackle nests in the marsh, three with four eggs, two with one egg, and one with no eggs. Although 13 nests were located in the marsh in 1981, no more than six of these nests were active at the same time (Figure 5). Out of the 13 nests started in the marsh two were fledged, 10 were predated, and one remained empty. The temporal spacing of these nests indicated that renesting occurred, although at least one female was replaced by a late-arriving female as two of the later nests contained eggs with a much darker ground color. Fledged young were not observed more than one week after fledging. One male was seen regularly along with the nesting

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Figure 5. The nesting record of the 1981 River Pond Colony.



females until the last nest was predated between 7 and 9 July. The only bird found after 7 July was a single female sighted on 13 July.

New Colony - 1981. Activity at this colony probably began at least one week prior to the first observation of activity. This colony was located on 23 May when a first-year male flew directly from the Cedar Colony to the New Colony site, joining four other males around the waste stabilization ponds. Eight males and at least two females were found the following day. The colony was not visited again until 30 May when two males were found. The number of males present at the colony following this date varied from two to seven up to 16 June, afterwhich only two males were seen with the exception of 2 July when one additional male was noted. No males were found after 15 July. Females were present in numbers as high as 10 on 2 July and appeared to remain at high numbers until 20 July when at least six females and/or young (not distinguishable) were observed. At least two females remained on 27 July, no females were seen on 11 August. Only one nest was located in the colony due to deep water which made wading difficult. This single nest contained two young, two to three days old on 16 June. Many fledged young were present at the colony in mid to late July although the exact number could not be determined due to their similarity in size and color to adult females.

Cedar Colony - 1982. During March and continuing into April the colony was used as a roost for a number of species including European Starlings (Sturnus vulgaris), Common Grackles, American Robins (Turdus migratorius), and House Sparrows (Passer domesticus). These birds, numbering in the hundreds, arrived at the colony each day shortly before sunset and departed shortly after sunrise.

The first sighting of Great-tailed Grackles at the colony in 1982 occurred on 21 March when one male was seen in the elms across the highway shortly

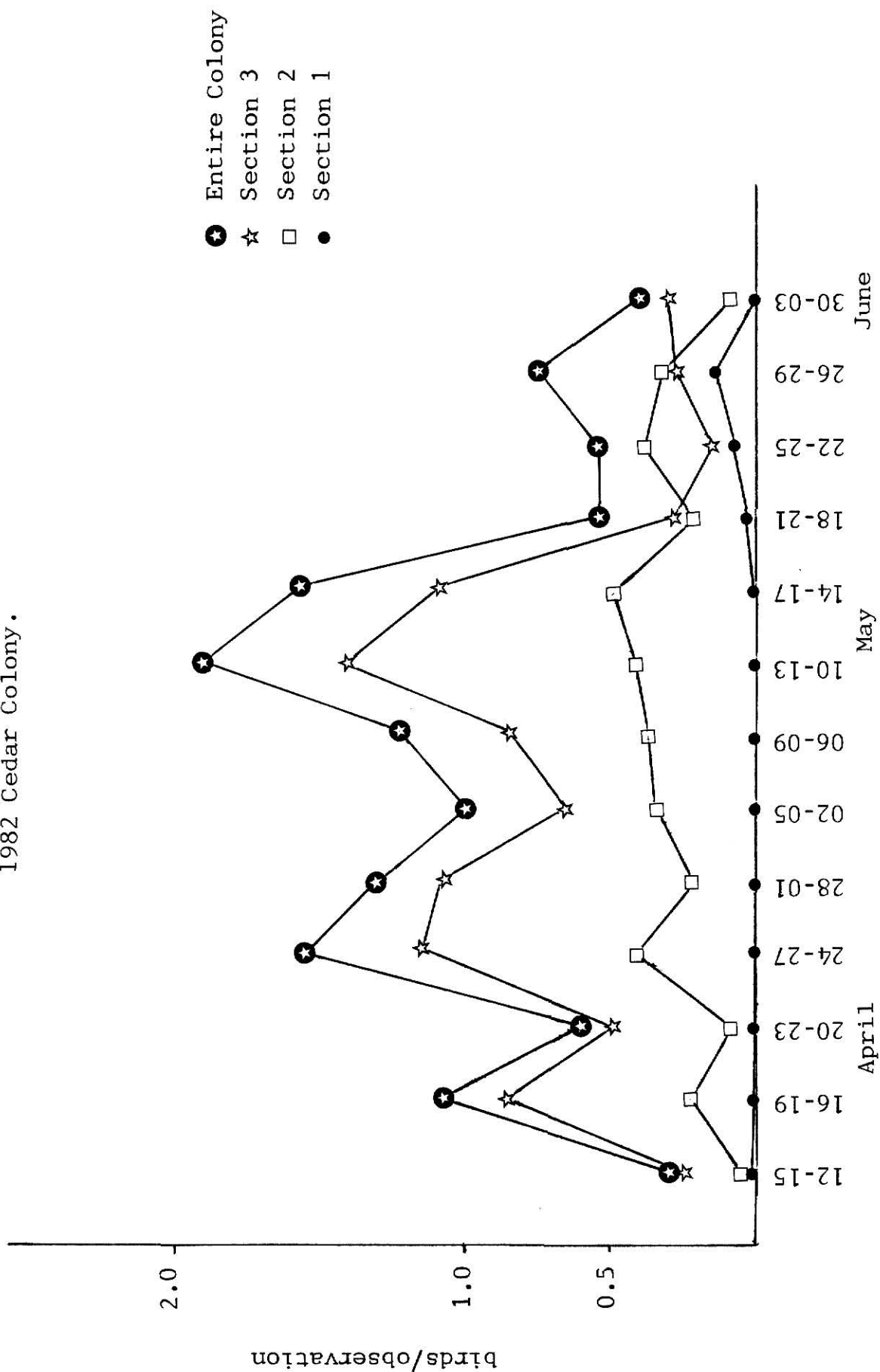
before sunset. A second sighting of two males was made within a few days of the first sighting, again shortly before sunset. The males at this time of year were extremely wary and flew out of sight when I walked into their view.

By 1 April, one male Great-tailed Grackle was present in the colony for short periods during the day along with some Common Grackles. By 9 April this activity had increased to include regular midmorning and late afternoon periods of activity in the colony in addition to the sunrise and sunset activity periods. On 10 April one male Great-tailed Grackle was present in the colony for most of the day and one female had been observed briefly in the colony.

The first sign of nesting by any species in the colony was noted when a female Common Grackle was noted with nesting material in the colony on 11 April. At least two male Great-tailed Grackles were in the area on 12 April as two were seen flying north from the colony shortly after sunrise. Just before sunset on the same day, at least two female Great-tailed Grackles were also found. One male and two female Great-tailed Grackles were present at the colony on 13 April. On 14 April a second male appeared at the colony early in the day which prompted guarding by the male in the colony. By 1012 three males were present in the area and the number of males had increased by sunset to at least seven. At this time at least three females were also seen. The highest number of birds noted in the colony after this date at one time was nine males and eight females.

Male activity in the colony showed three peaks during the period between colony establishment and colony abandonment (see figure 6). The first peak occurred just after the arrival of the main group of Great-tailed Grackles and appeared to represent the establishment of territories. Once territories were established male activity decreased until a second peak occurred just

Figure 6. Male Great-tailed Grackle Activity in the 1982 Cedar Colony.



prior to abandonment. Apparently, most of the Great-tailed Grackle nests in the colony were predated during or prior to this period. Some renesting activity was noted during this period along with an increase in long distance flights and sightings of Great-tailed Grackles away from the colony area.

Colony abandonment was fairly abrupt with a sudden disappearance of most of the birds on 18 May. During the week following abandonment there were several visits to the colony by small groups of males or females but no other sign of the missing birds was found until 21 May when several were found at the nearby New Colony location. Several previous visits to this location prior to that time and subsequent to colony abandonment provided no sightings of the species.

Following colony abandonment one male and one or two females remained at the colony. At least one nest was successfully fledged as a female was observed carrying food to that area of the colony long after the nearly-fledged young were last observed in the nest. The male and at least one female were present through mid-July.

New Colony - 1982. The first sign of activity occurred four days prior to the abandonment of the Cedar Colony when a single male was seen near the waste stabilization ponds. A check on 19 May, one day after abandonment of the Cedar Colony, provided no sightings of the species. On 21 May two males and two females were found in the area. The following day two males and four females were observed shortly after sunrise. By midafternoon that same day seven males and at least two females were present but this number was reduced to two males and one female by late afternoon. By 25 May several nests in various stages of construction were found in the cattails and a willow. Three males were also seen on this date. At least two males were present in the area on the following day along with two to three females. One of the females was carrying nesting material. Two males were again noted on 27 May at which time a nest

check was made. Three nests were located, two (A and C) containing a single egg, the remaining one (B) empty. On 28, 29, and 30 May only one male was present at the colony and no more than one male was found in the colony after these dates. A bad storm hit the area on 5 June and a nest check on 8 June found nests B and C to be tilted. Nest B was empty but Nest C contained three eggs held by the rim of the nest cup. The remaining nest (A) contained four eggs. One male and two females were seen during the nest check. On 15 June one male and four females were present at the colony and one of the females was carrying food. Three females and one male were noted on 18 June and again on 25 June when another nest check was conducted. Two new nests were located within 10 meters of the remaining active nest (A) from the first nesting attempt. One of these nests (D) was not checked and the other (E) contained four eggs. A young Great-tailed Grackle was close to nest A and at least two others were present in the area. On 1 July one male and three females were again seen and another nest check was conducted. Nest A contained a single young and no fledged young were found in the area. Nest D held three eggs while nest E now contained four young, the last of which had just hatched. In addition a new nest (F) was located one meter north of the old nest and was found to contain four eggs. In a nest check on 12 July nests D and F contained an undetermined number of young, nest E appeared empty, and the beginnings of a new nest were located south of the old inactive nests, B and C, in the southwest corner of the east pond. One male and at least one female were seen at this time. A final check of the colony was made on 25 July. At this time one male was observed along with at least two females and two size classes of young. One young, indistinguishable from the adult females by size, was begging for food from a female in the pond area. Three additional young, not more than a week past fledging, were moving around in the cattails. No young were present

in the nests at this time.

SUMMARY OF COLONY PHENOLOGY

Great-tailed Grackle activity begins one to two months prior to nesting in the Manhattan area with the arrival of several males. These males roost in the colony and spend most of the day away from the colony. In early April a few males spend a small amount of time in the colony during the day. The amount of time males spend in the colony gradually increases until mid-April when the males spend most of the day in the colony. By this time the bulk of the males and females have arrived in the Manhattan area. Nesting activity begins close to 20 April with a high degree of synchrony among the females. The site chosen for the first nesting attempt is apparently dependent on the degree of cover provided by the various possible colony sites. Spring arrived early in the Manhattan area in 1981 and the Corner Colony location provided sufficient cover due to the early leafing out of the box elder. In 1982 the advancement of spring came later and closer to normal and the Cedar Colony was the only colony site previously used that provided sufficient nesting cover. The colony locations where cattails provided the nesting substrate did not have sufficient growth in either year to support nests at the time of first colony establishment.

Within two weeks after initial establishment, the colonies were abandoned. Abandonment was often preceded by a period of increased activity in the colony. During this period of activity Great-tailed Grackles were observed away from the colony more often than at other times. The first colony abandonment was followed by a second abandonment in 1981 and by none in 1982. In all cases of abandonment at least one and sometimes two females remained to fledge nests of young, and were generally accompanied by a single male. In one case the abandoning birds split into two groups, one founding the 1981 River Pond Colony

and the other the ill fated 1981 Cedar Colony. In both years the colonies eventually ended up nesting in cattails where no abandonment to another known colony location occurred.

No nests were known to be initiated after 22 June in 1981 and when clutches or broods were lost after this date the females involved apparently left the colony. In 1982 the beginnings of a nest were found on 12 July at the New Colony. Whether or not eggs were laid in this nest is unknown but if eggs were laid they were lost. Final abandonment of the last occupied colonies in the Manhattan area occurred in late July-early August in both years.

There were several possible causes for the colony abandonment observed in the Manhattan area. In the Corner Colony of 1981 the males left the colony when the females began incubating. The females subsequently abandoned their nests and joined the males in the Cedar Colony where they renested. Brown (1958) reported similar desertion by the Greater Flamingos (Phoenicopterus ruber) in Kenya following the departure from the colony of the majority of birds after hatching of most of the clutches. He found that the propensity to desert was inversely related to the length of time already invested in incubation. The flamingos did not reneest following desertion. In the 1982 Cedar Colony Great-tailed Grackles suffered heavy nest predation and apparently abandoned for that reason. Brown reported desertion of entire islands by the Greater Flamingos due to the presence of Marabou Storks (Leptoptilos crumeniferus), known predators on eggs and young. Disturbance by the researcher also may have been a cause of colony abandonment. Pratt, Ortego, and Guillory (1977) noted that Great-tailed Grackle colonies in Louisiana "are extremely sensitive to harassment by man". Brown found that Greater Flamingos are sensitive to disturbance early in the incubation period.

NESTING BIOLOGY

Colony Location - Several factors appear to be involved in the choice of a colony site. Pruitt (1975) described the ideal colony site as "semi-open country with scattered large trees for roosting and nesting". Pruitt's description describes the preferences of the species in the Central Plains region. An additional factor apparent from both the numerous colony site descriptions available in the literature and personal observation is availability of open water near the nest site. Colony sites in Kansas and Nebraska are located in such disturbed areas as city parks, state parks, the grounds of schools and business establishments, and closely grazed pastures. Nests are often located in any species of tree that provides sufficient cover. When cattails are available and sufficiently high to provide an adequate nesting substrate, these plants are favored for nesting over nearby trees (pers. obs.).

Nest Location - Great-tailed Grackles appear to be ill-suited to nesting in dense tree clumps in the central Great Plains when colony size is small. A disparity in nest site selection between Great-tailed Grackles and Common Grackles is readily apparent where both nest in the same colony. Common Grackles usually build their nests below the highest available site. This tendency is sometimes so strong as to place the nest half way down a red cedar. In addition, Common Grackles spread their nests out within the colony. In contrast, Great-tailed Grackles have a tendency to build their nests as high as possible in all species of trees and to clump their nests, often building less than a meter apart (Figure 7). Because of these differences in nest site selection, Great-tailed Grackle nests were often easily visible from above in the Cedar Colony whereas Common Grackle nests were all but invisible. Great-tailed Grackles also appeared to build their nests slightly higher in cattails

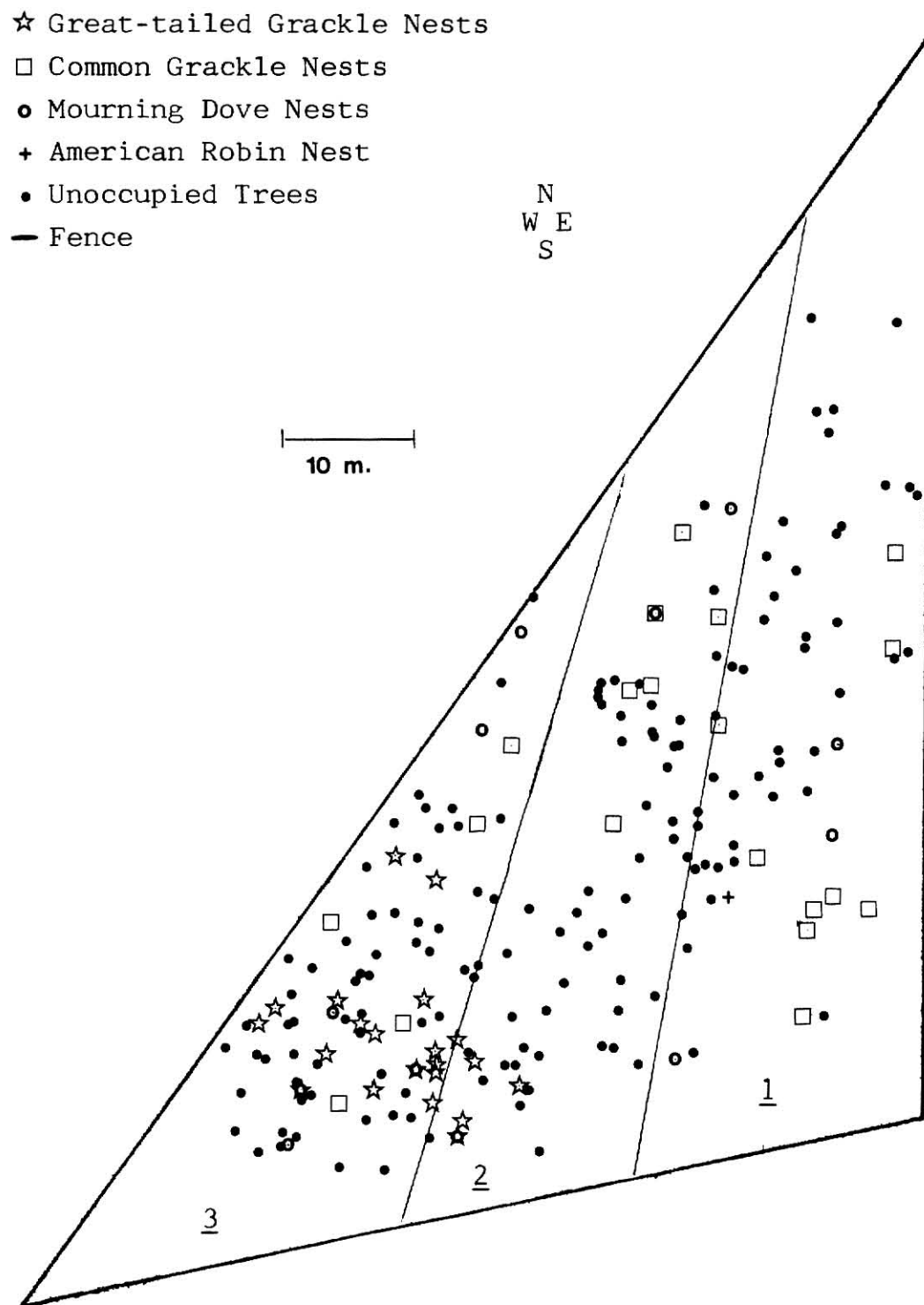


Figure 7. Nest locations and observation sections in the 1981 Cedar Colony.

than Red-winged Blackbirds (Agelaius phoeniceus) when the height of the leaves permitted a choice (pers. obs.). Early nests tend to be built at a height similar to that of Red-winged Blackbird nests due to the late growth of cattails providing no support beyond this height. Nests in the River Pond Colony were built in the part of the marsh most favored by Red-winged Blackbirds (near the center and open water) as previously noted in Texas by Rutledge and Chandler (1979).

First Egg Dates - Johnsgard (1979) did not list egg dates for Kansas but gave mid-May for Nebraska and May 7 for Oklahoma. Walker (1976) found nests in Kingman County, Kansas on 30 April in 1976 but did not report any eggs. In the Manhattan area the first egg in 1981 was found on 24 April, five days after females were first observed. In 1982 a clutch of five eggs was found on 1 May, thus the first egg date was 27 April or earlier. No eggs had been found during a prior nest check on 24 April. In Nebraska a nest with four eggs was found on 14 May 1977 in Douglas County (anonymous 1977). This would set a first egg date in Nebraska on 11 May or earlier.

Renesting following nest loss - Data on the length of time required for a female to produce the first egg of a new clutch following loss of her old clutch was obtained from the River Pond Colony during the 1981 breeding season. Although no birds were marked the number of new nests constructed shortly after a predation event was usually equal to the number of nests predate. In addition, one female laid eggs with a much darker ground color (almost purple as opposed to sky blue), and the two nests with eggs of this color can be attributed to this female due to the lack of temporal overlap between these nests. Nest building following a predation event was almost always initiated before six days had elapsed from the last observation of eggs in the nest. On one occasion a new nest was begun within three days of the last day eggs were

observed. Because nests were usually only checked once every three days the exact date of predation can not be ascertained. By using the midpoint of the interval between the last sighting of the complete clutch and the first observation that a predation event had occurred and subtracting this from the midpoint of the interval prior to discovery of the beginnings of nest construction an average length of 3.0 (range 0 - 4.5) days is found between nest predation and construction of a new nest. The first egg date is more easily determined since females lay one egg a day. Of the three assumed renestings observed at River Pond in 1981, the time interval between nest predation and the first egg date is approximately twelve days with an interval as short as six and one half days in one case (where the female was known).

Renesting in a new location following colony abandonment - In 1982 females were building nests in the New Colony within seven days of the abandonment of the Cedar Colony. The first egg date for two out of three nests was nine days after the abandonment. In 1981 full clutches were present in the River Pond Colony eleven days after the abandonment of the Corner Colony. Nest building had been observed six days after abandonment although nest building probably began prior to this date.

Timing of nest building, incubation, and the nestling period - The time involved in nest building varied among females (Figure 5). For example, nine days elapsed between the date when building activity was first noted and the first egg date for one female in the 1981 River Pond Colony. In contrast to this unusually long period, one female began building a second nest within three days of the date eggs were last seen in the first nest and laid the first egg in the second four days later. A period of six days between the beginnings of nest building and the first egg date appears to be the norm, with about four days required for actual nest construction.

Eggs are laid every day until clutches are complete. Incubation apparently begins immediately after the laying of the first egg as hatching is asynchronous. Incubation took approximately 13 and 15 days for two nests in the Manhattan area. Young remained in the nest for a period of 11, 13, and 16 days in one nest and at least 16, 17, and 18 days in another. In one nest at the New Colony of 1982 one young was still present in the area of the nest 30 days after the last egg was laid (two others were observed in the area five days earlier).

Clutch Size - Mean clutch size (3.82 ± 0.11 SE) was determined from 45 nests in Kansas and Nebraska over the entire nesting season. This clutch size is significantly higher ($F = 7.26$ df 1, 96 $P < .01$) than the clutch size of 3.45 ± 0.16 found by Selander in southern Texas and southwest Louisiana in 1959 (Selander and Giller 1961). When the data from Kansas and Nebraska is divided between May and June nests there is a clutch size of 4.00 ± 0.14 SE for May and 3.56 ± 0.15 SE for June. This decline in clutch size with progression of the season was significant ($F = 4.64$ df 1, 43 $P < .05$) and is expected (Lack 1954).

Egg Size - Egg size was determined from measurements of seven eggs from two nests in the New Colony of 1982. A mean length of 32.5 ± 0.36 SE and a mean width of 21.0 ± 0.16 was found. By lumping these data with those from Nebraska and comparing them to Selander and Giller's data from Texas (Table 1) a significant decrease in egg width is found ($F = 3.32$ df 1, 38 $P < 0.05$) while no change is found in egg length. Egg weight was determined for several nests in the 1981 River Pond Colony and was found to vary between seven and eight grams.

Food of the Nestlings - The food brought to the nestlings by the females was noted only casually. Females were observed carrying insects many times and an earthworm at least once. One unusual food utilized by one female nesting in the River Pond Colony of 1981 was mulberrys (Morus sp.). At the time this

Table 1. Egg Size Data.

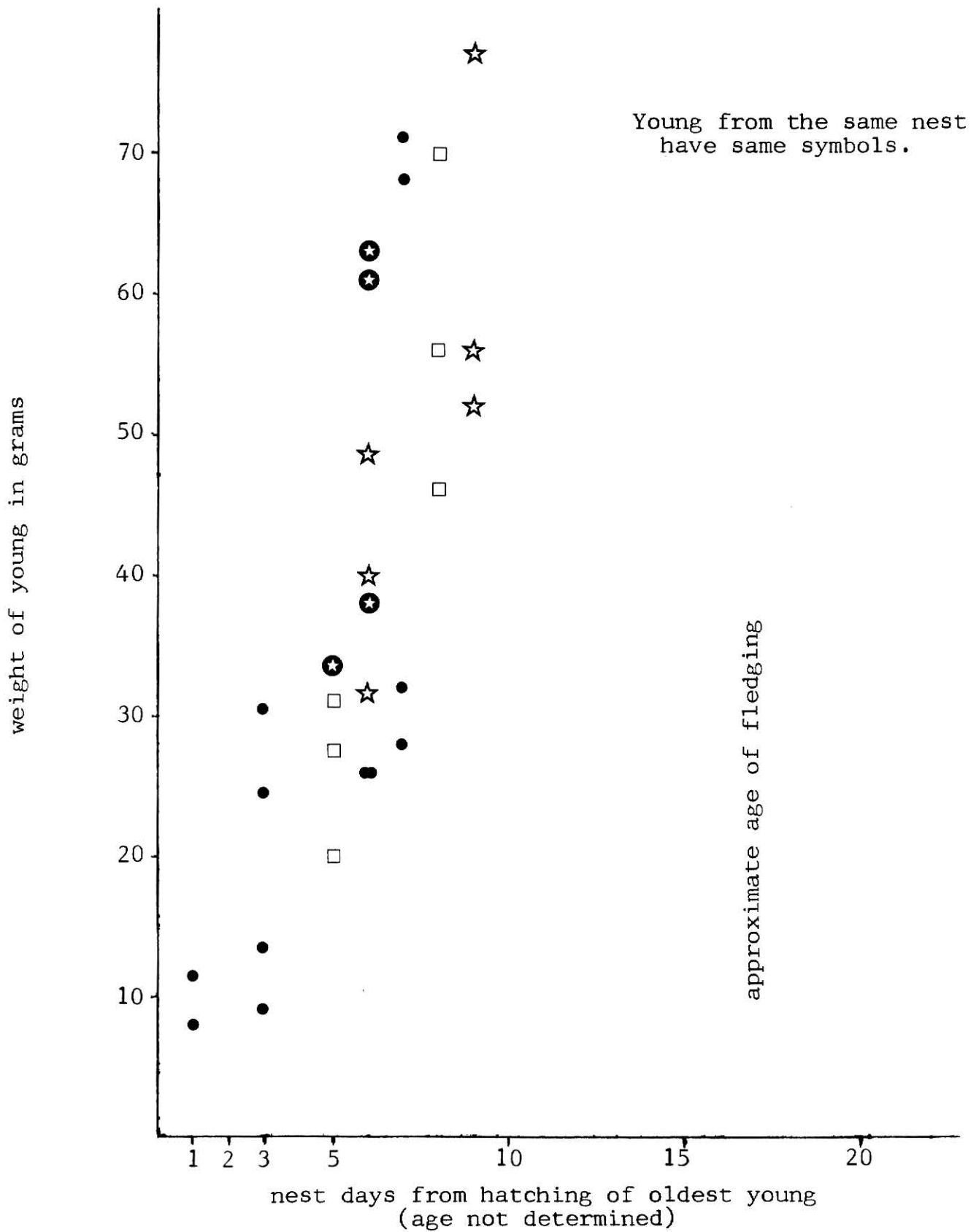
	no.	length (mm.)		width (mm.)	
		mean	range	mean	range
New Colony, 1982 Manhattan, KS	7	32.5 \pm .36	31.2 - 33.7	21.9 \pm .16	21.1 - 22.5
Guatemala-Honduras (Skutch 1957)	62	33.6	31.0 - 36.5	23.0	21.4 - 24.6
SW Louisiana-SE Texas (Selander and Giller 1961)	29	32.6 \pm .28	29.1 - 34.8	22.49 \pm .12	20.5 - 23.6
Texas (Bent 1957)	93	32.18	28.2 - 36.6	21.75	20.6 - 22.6
Nebraska (Faanes and Norling 1981)	4	32.7 \pm .95		21.5 \pm .57	

fruit was ripe one nest of young released purple droppings with no fecal sac when handled and the nest was stained with this material. Other nestlings at this time had white droppings contained in a fecal sac.

Growth Rate of the Young - No information is available in the literature on the growth of nestling Great-tailed Grackles. Most birds exhibit a sigmoid growth curve following hatching (Ricklefs 1968), with early growth approximating a straight line. Data were collected during the first half of the nestling period on the weight gain of young from four nests. A plot of the data shows almost straight line growth (figure 8). The largest variation appears to occur within nests rather than between nests. This variation might be attributed to a difference in growth rates between the females and males and/or to superior competition for food by older nestlings.

Male defense and the mating system - Great-tailed Grackles have previously been reported as promiscuous (Bent 1957; Selander and Giller 1961) and polybrachygamous (Selander 1965). In Manhattan a few males remain with the colony (usually one per colony) until the last young are fledged or predated, exhibit colony defense when potential predators approach the colony, and stay in the colony much of the time (day and night). This amount of parental investment suggests a polygynous mating system rather than promiscuity. Other males spend less time in the colony (often gone much of the day), show no colony defense, and leave the colony once incubation begins. These individuals perhaps are promiscuous. Skutch (1957) reported a similar situation in Costa Rica, with two males remaining with the colony until the final abandonment and providing some colony defense. Selander and Giller (1961) also reported one to two males remaining with the colony after the departure of the majority of males but reported no colony defense by these males. McIlhenny (1937) reported colony defense of small colonies (six to 20 nests) by a single male Boat-tailed

Figure 8. Growth of nestling Great-tailed Grackles. 35



Grackle but found no colony defense was exhibited by males in large Boat-tailed Grackle colonies (100 to 250 nests).

INTERACTIONS WITH OTHER SPECIES

It would be unreasonable to assume that the range expansion of the Great-tailed Grackle was accomplished without interaction with other species. It is a widely held belief among animal ecologists that competitive interactions are minimized between sympatric species over evolutionary time. Newly colonizing species are therefore the best place to look for these interactions.

Some information is available in the literature on interactions between Great-tailed Grackles and other birds in areas of range expansion. Oberholser (1974) believed that Great-tailed Grackles have competitively excluded Common Grackles from parts of their range. Rutledge and Chandler (1979) reported that Great-tailed Grackles had a deleterious effect on Red-winged Blackbird populations where the two nested in the same marsh in Texas. Tutor (1962) stated that waterbird populations nesting outside of Great-tailed Grackle colonies in a Texas marsh suffered almost 100% predation while waterbird populations within the colonies suffered no predation. Predation by Great-tailed Grackles on the eggs of other birds has been reported (Lamb 1944).

During the course of my studies of the Great-tailed Grackle in the Manhattan area, I made a special attempt to note any interactions of the species with other birds nesting nearby. Although Great-tailed Grackles do not nest in high numbers in Manhattan, a number of interactions were observed and are best listed by species.

Common Grackle - Nest mapping, seasonal movements of adults within the colony, and direct observation of interspecific interactions were utilized to describe Common Grackle-Great-tailed Grackle relationships in the Manhattan area. Nest mapping showed non-random nest placement within the colony.

Great-tailed Grackles generally utilized trees located in the center of the colony while Common Grackles favored the edges (Figure 7). No obvious shift in adult frequencies was noted among three sections of the colony between 12 April and 31 May 1982. These data suggest that neither species displaced the other from any section of the colony (figures 6, 9, 10). Finally, no Common Grackle attacks on Great-tailed Grackles were noted prior to 17 May 1981 and 8 May 1982. Two attacks were seen on 17 May 1981 in 90 minutes of observation and 67 attacks were noted after this date during 25 hours of observation between 19 May and 18 June. In 1982 observations were made during five minute intervals every two hours, seven times a day from 12 April through 31 May. No Common Grackle attacks were seen prior to 8 May. Eight subsequent attacks were recorded after this date. Several attacks by Great-tailed Grackles on Common Grackles were also noticed during the study. These attacks were observed during late May-early June of 1981. These attacks occurred when Common Grackles entered the western third of the colony where most of the Great-tailed Grackle nests were located. The lack of attacks early in the nesting period suggests that Great-tailed Grackles are perceived as nest predators by the Common Grackles rather than nest-site competitors.

Red-winged Blackbird - Rutledge and Chandler (1979) reported a negative effect on this species by Great-tailed Grackles. Using the Weatherhead-Robertson index (Weatherhead and Robertson 1977) they calculated that the Great-tailed Grackles nested in the areas of the marsh most favored by the Red-winged Blackbirds. By comparing the marsh in which the Great-tailed Grackles were nesting with one in which they were not, they found a higher percentage of the female Red-winged Blackbirds nesting in the preferred marsh nesting sites when no Great-tailed Grackles were present. Their data on nest success for these two marshes were incomplete and they noticed no interactions

FIGURE 9. Female Great-tailed Grackle Activity in the 1982 Cedar Colony.

- Entire Colony
- ☆ Section 3
- Section 2

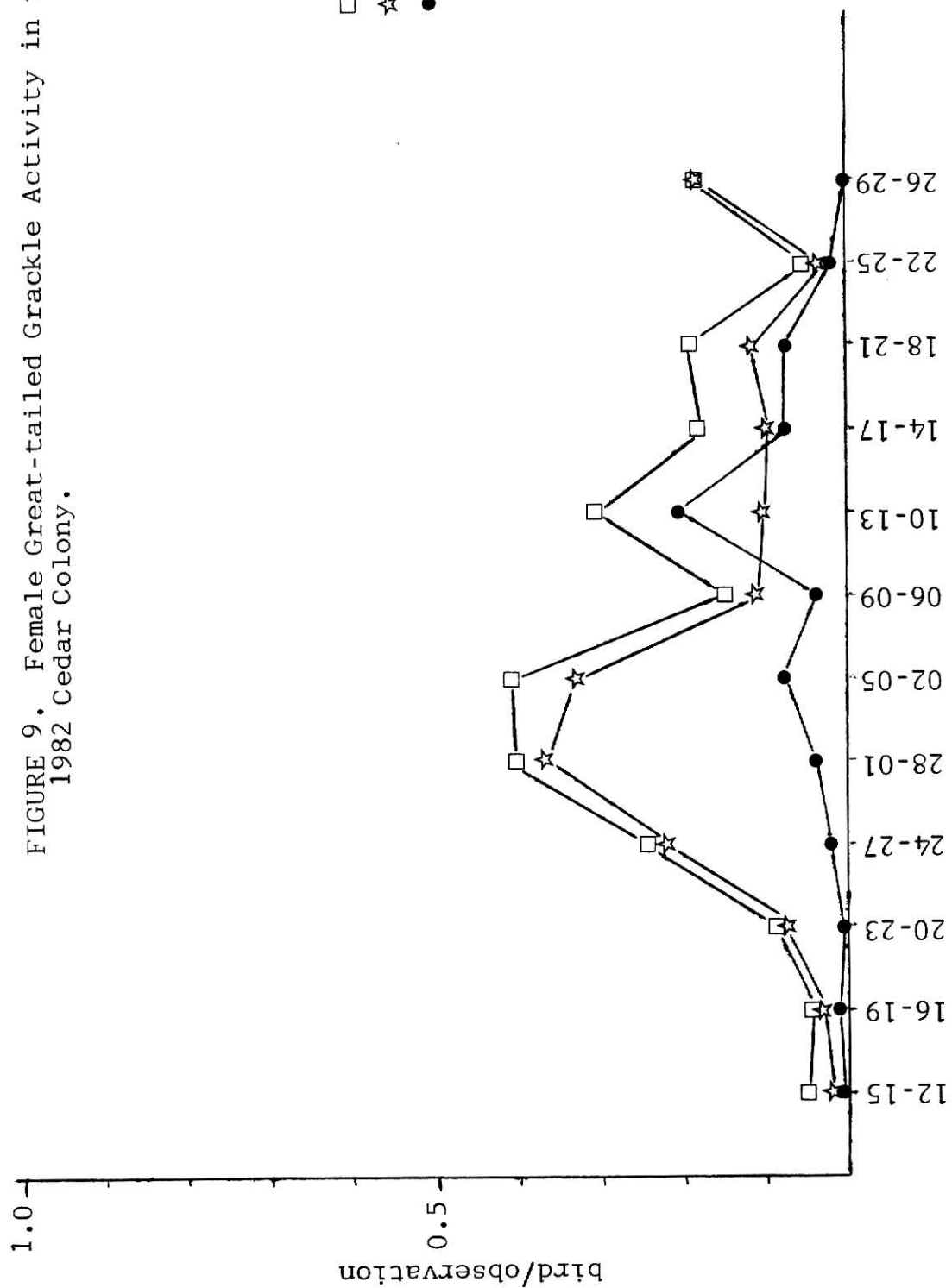
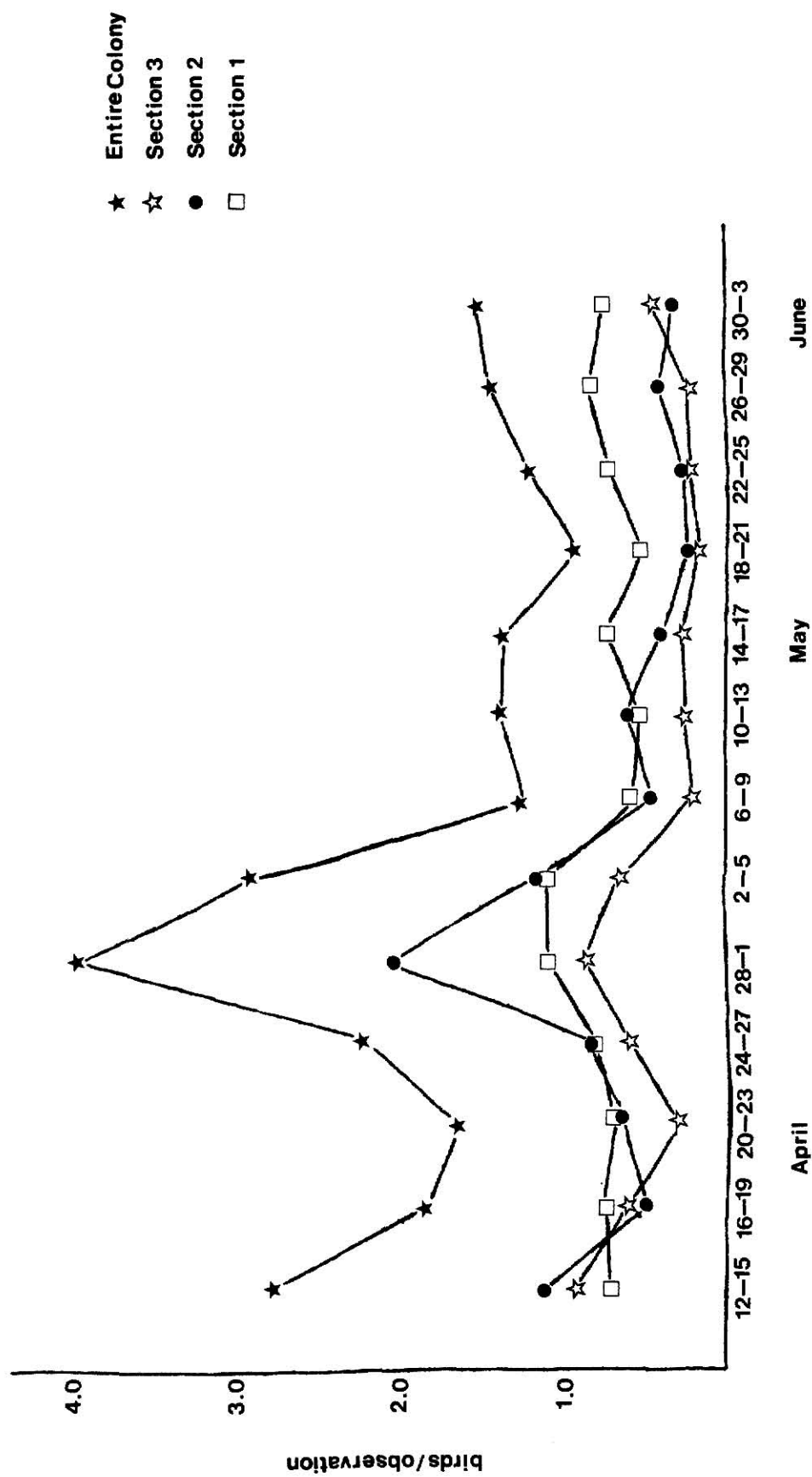


Figure 10. Common Grackle Activity in the
1982 Cedar Colony.



between the species. In the River Pond Colony the Great-tailed Grackles also nested in the deeper, central areas of the marsh. Nest success was determined for the Red-winged Blackbirds and was found to be 41% (26 out of 63 nests fledged at least one young) which is well within the expected range (23.9 to 61.3) listed by Ricklefs (1969). I made no observations of predation on Red-winged Blackbird nests by Great-tailed Grackles. Interactions between the two species were seen and consisted of attacks by a male Red-winged Blackbird on both male and female Great-tailed Grackles.

Western Meadowlark (Sturnella neglecta) - Only one interaction was noted between this species and Great-tailed Grackles. On 21 May 1982 a male Great-tailed Grackle flew low over the pasture north of the Cedar Colony and was attacked briefly by a Western Meadowlark.

Mourning Dove (Zenaida macroura) - Although Mourning Doves nested in higher numbers in the Cedar Colony than the Great-tailed Grackles, only one interaction was seen in two years of observations. On 12 June 1981 at 1029 a single Mourning Dove flew up from the cedars, appeared to strike a male Great-tailed Grackle several times with its wings, and flew back down out of sight.

American Robin - A single pair of American Robins nested in the Cedar Colony in both years of the study. No direct interactions with Great-tailed Grackles were observed although an American Robin was observed to chase a Blue Jay (Cyanocitta cristata) from the colony on 15 May 1982, thereby indirectly benefiting the Great-tailed Grackles through colony defense.

Northern Oriole (Icterus galbula) - No Northern Orioles nested in any of the Great-tailed Grackle colonies. Northern Orioles did nest in the cottonwoods (Populus deltoides) adjacent to the River Pond Colony on the east side of the marsh. Male Northern Orioles were observed to chase the Great-tailed

Grackles on several occasions when the Great-tailed Grackles flew through the cottonwoods or fed on mulberries on the east side of the pond.

Least Bittern (Ixobrychus exilis) - Four Least Bitterns nested in the marsh in which the River Pond Colony was located in 1981. Two of the nests were located within several meters of active Great-tailed Grackle nests. One of the nests located near the Great-tailed Grackle nests successfully fledged four out of five young while the other three nests were predated. Destruction of the predated nests suggested that large mammals, probably raccoons (Procyon lotor), were responsible. No direct interactions between the Least Bitterns and Great-tailed Grackles were noted although the bitterns were observed on a number of occasions.

The results of this study are inconclusive in suggesting that the success of the species in areas of expansion is due to superior competition with other species. The lack of data in this regard may be due to the low numbers of the species in the Manhattan area. Observations by Rutledge and Chandler (1979) of superior nest site competition by Great-tailed Grackles with Red-winged Blackbirds are supported by my observations in the Manhattan area but no concurrent decline in Red-winged Blackbird productivity could be demonstrated.

COLONY DEFENSE

Against non-humans - The first of five incidences of defense took place at the River Pond Colony on 22 May 1981 and began at approximately 1200. Four female and one male Great-tailed Grackles were observed along with at least ten Red-winged Blackbirds in and over a spot in the cattails on the east side of the marsh. The Great-tailed Grackles crawled in and out of the lower part of the cattails while the Red-winged Blackbirds fluttered around above. Activity gradually decreased and was mostly over by 1210. Near the end of the period of activity the number of Red-winged Blackbirds present had decreased to six

and some were observed to leave and be replaced by others arriving. The subject of the attack was not determined and the contents of a Red-winged Blackbird nest one meter south of the main area of activity were untouched following the incident.

A second defense against a non-human occurred on 11 May 1982 at the Cedar Colony. A male Northern Harrier (Circus cyaneus) was observed feeding in the field northeast of the colony at 1330. At 1339 the hawk flew southwest along the stream towards the colony. Two male Great-tailed Grackles were feeding in the field closer to the colony. One male flew back to the colony at this time while the other remained in the field. The hawk landed again along the stream and a male Great-tailed Grackle flew out from the colony, swooped at the hawk, and landed along the stream approximately 20 meters to the southwest, also along the stream. Shortly thereafter the hawk again flew toward the colony. The male Great-tailed Grackle also flew up, lagged behind, then drove in to peck as the hawk was crossing the road. This harassment was continued as the hawk flew over the colony. On close approach to the colony many grackles flew up, including both Common Grackles and male and female Great-tailed Grackles. Another male Great-tailed Grackle joined the first male in harassing the hawk which by this time had climbed to 30 meters above the colony. The hawk proceeded to head northwest with the two males following. As the hawk neared the radio tower the Great-tailed Grackles returned to the colony.

A third defense observed against a non-human occurred during a nest check in the Cedar Colony on 7 May 1982. A Blue Jay had been heard and observed in the colony previous to this date, and one entered the colony during the nest checking period on this date. At 1541 the Blue Jay was observed overhead in the center of the colony and a female Great-tailed Grackle chased it. This chase was ineffective in removing the Blue Jay from the area as it simply moved

to another part of the colony. The high levels of nest predation observed in the Cedar Colony during the 1982 nesting season may have been due to this or other Blue Jays as they would move beneath the cover of the cedars where the Great-tailed Grackles were never observed to go.

Two further defenses were observed against crows (Corvus brachyrhynchos) flying near the Cedar Colony. The first, on 30 May 1981, involved a male attacking a crow that flew near the colony. The second, on 19 May 1982, involved a male following two crows over the hill to the east of the colony and then returning to the colony.

Against humans - The opportunity to observe colony defense against humans occurred often as I was forced to enter the colonies to conduct nest checks. The best situation for observing this defense occurred in the River Pond Colony in 1981 as I regularly entered the marsh for nest checks, several of the nests were brought to or close to fledging, and the birds were easily observed over the relatively short marsh vegetation.

Defense early in the nesting period was minimal and consisted mainly of a continued presence in the colony area of both the male and females at a minimum distance of 10 to 20 meters from the observer. This defense increased as the young hatched and aged until the female owning the particular nest being checked would fly over the observer at distances of one meter or less, land in nearby vegetation, and actually hover over the observer while loudly vocalizing. This performance was always echoed by an almost equally vigorous performance by the male at a slightly greater distance. No more than one female ever engaged in this high level of defense at one time (the other females generally remained on nearby perches), and this high level of defense was only elicited when the observer approached to a distance of less than approximately two meters from a nest.

The above pattern of colony defense was generally mirrored in the other colonies in the Manhattan area. Where more than one male was present in the colony rarely more than one male, and never more than two males, participated in the above described highest level of defense.

SUMMARY

Great-tailed Grackles have extended their range 1300 kilometers to the north in the Great Plains in this century, now breeding as far north as southern Nebraska. Expansion into the Central Plains region appears to have followed the western edge of the eastern forests and tallgrass prairie, with secondary expansion occurring both to the east and west along the major river systems. In moving north the Great-tailed Grackle has increased its clutch size to a mean of $3.82 \pm .11$ from a mean of $3.45 \pm .16$ in southern Texas. No effect on other species nesting in the same habitats in the central Great Plains has been shown although this may be due to the small numbers of Great-tailed Grackles nesting in the area of study. Although primarily promiscuous it appears that some birds might be polygynous in the Manhattan area. Colony abandonment by the majority of birds with subsequent renesting at another location was common in the Manhattan area and occurred at least once in each year of the study in the Manhattan area. Abandonment was thought to be due to females following males to a new colony, predation, and/or disturbance of the colony by the researcher.

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GREAT-TAILED GRACKLE (QUISCALUS QUISCULA) RANGE EXPANSION
AND BREEDING BIOLOGY IN THE CENTRAL GREAT PLAINS

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ABSTRACT

Great-tailed Grackles (Quiscalus quiscula) have extended their range over 1300 kilometers to the north in the Great Plains in this century, now breeding as far north as southern Nebraska. The present study examined the history of range expansion and the breeding biology of the species in the central plains region. Expansion into the central plains appears to have followed the western edge of the eastern forests and tallgrass prairie with secondary expansion occurring to the east and the west along the major river systems. Breeding colonies are located in groves of trees or Typha marshes. Although primarily promiscuous in other parts of their range, it appears that some male Great-tailed Grackles may be polygynous in the central Great Plains. Clutch size has increased in the move north to the present size of $3.82 \pm .11$ SE. Some colony abandonment by a large percentage of the breeding population was noted along with a subsequent renesting at a new colony site. This abandonment appeared to be due to predation, colony disturbance, and/or females following departing males. No effect on other species nesting in the same habitats has been shown although this may be due to the small numbers of Great-tailed Grackles nesting in the area of study.