

LIFE HISTORY OF THE BOAT-TAILED GRACKLE
IN LOUISIANA

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Plates 18-20

As my observations of the Boat-tailed Grackle (*Cassidix mexicanus major*) in Florida, Alabama, Mississippi and Texas, have been casual rather than intensive, I prefer in this paper to cover its life history as it exists in Louisiana, where it is one of the most plentiful birds of the marsh lands, exceeded in numbers only by the Red-winged Blackbird (*Agelaius phoeniceus littoralis*). Here I have been in constant touch with it for many years and at all seasons, for it is an abundant resident in the marshes, both fresh and brackish, which surround my home, Avery Island, located in the south-central coastal plain of the Louisiana Gulf Coast. In these marshes the Boat-tailed Grackle is easily the most conspicuous, the noisiest, the most individual and in its habits the least known of any of our birds.

BREEDING RANGE AND WINTER RANGE

In Louisiana, the Boat-tailed Grackle is, generally speaking, a coastal bird, as it does not stray far from the tidal marshes or the borders of the larger lakes of the coastal district, and nests entirely within this area. When in search of food, its range extends inland some thirty or forty miles, to the grain fields,—especially rice,—but at night it returns to roost in the marshes bordering the larger bodies of water.

The winter range is identical with the summer range, except insofar as the birds go farther inland to feed during the winter than they do during the breeding season.

ADULT PLUMAGE

The adult male Boat-tailed Grackle in full plumage, which is not attained until the September–October moult a year after hatching, is one of the most conspicuous birds of our marshlands. Its brilliant, metallic blue-black and purple plumage, together with the exceedingly long, graceful tail, deeply 'V'-ed, and its habit of perching on the tops of the marsh growth,—whether grass or bush,—as well as its exceedingly loud and varied raucous notes, frequently emitted, make it a bird that is bound to attract attention. The plumage of the adult male in life may be described as follows: the entire head, the neck, both front and back and the throat are a brilliant, metallic blue, almost black in its intensity. This color on the back of the neck grades gradually into dark, metallic blue-green at the base of the neck; this color, in turn, gradually changes along the back to a metallic purple-blue on the lower back and upper tail coverts. The greater wing coverts are purple-

blue, and the median and lesser coverts are a metallic purple. The breast is a dark, brilliant blue, almost black, which takes on a metallic-green tone when viewed from different angles. The under tail coverts are dusky, with a metallic-purple cast. The iris is hazel, changing under the excitement of battle or courtship to a brilliant gold color. The outside of the bill is dull black. The young males of the year and until the second autumnal moult are much duller in color than the old males. Their general plumage is a rusty black with very little iridescence in any part. The breast feathers of the males of the year, at the time of changing from the juvenal plumage to the first adult plumage, are gray tipped, giving the appearance of a light wash of gray on the breast. These gray tips, however, wear off within a few weeks.

The adult females, in modest tan-brown plumage with dark brownish-black upper wings and back, are so much smaller, less conspicuous and less noisy than the males that with their habit of flocking by themselves, they might seem to the casual observer to be another species, rather than the mate of the loud-voiced, brilliant male Boat-tailed Grackle.

JUVENAL PLUMAGE

The young, when first hatched, are almost devoid of feather covering. Their blood-red skin is sparsely covered with a few tufts of cream-tan down.

The young grow rapidly, and in ten days after hatching, are pretty well covered with their first juvenal plumage of a muddy tan color, which is identical in both sexes. The sex of the nestling cannot be determined by its plumage, but is easily told after the young are six or eight days old by the difference in size of body, beak and tarsus. The beak and tarsus are also considerably darker in the nestling male than in the female.

Within a few days after leaving the nest, the young males begin to show a few dark feathers around the eye and along the sides just below the point of coverage of the wing, and a few black feathers also show at this time in the upper wing coverts. As the summer progresses the plumage change continues gradually from the rusty brown of the nestling to the adult black. Usually by the first week of August, the first hatched, that is, the young males of the April hatch, show considerable of the adult black plumage. At this time the black feathers extend from the gape to and below the eye, and to the line from the eye to the back of lores and front part of crown. These parts of the plumage are the first to show the change from the nestling to the first-year adult plumage.

By August 20, these same birds show an almost complete change from the nestling plumage to the adult winter plumage. Male birds examined on August 20 showed the change as follows: black plumage beginning at the upper side of beak, extending across crown, around neck to back, down

back to tail, including upper tail coverts, this entire area covered by the rusty-black winter plumage; no change yet in tail feathers, which are, however, badly worn. Upper wing coverts and most of secondaries and tertiaries are now black, leaving only four or five primaries and the four or five tertiaries unchanged. The entire sides of the breast have changed, but the central area of breast is unchanged. Under tail coverts changed. Chin and throat just changing to black. All brown feathers have been shed on these areas, and the new black feathers are just beginning to appear. The feathers of the breast which have been changed, are all slightly edged with gray. Areas on the sides of the crown, including lores and sides of throat, still covered with juvenal brown plumage, much worn, and faded to a brownish white, giving the head a hard, grotesque appearance, as if the birds had gray side-whiskers.

The outer circle of the iris of the young male's eye is yellow-gray, with a narrow border of brown around the pupil. This brown ring is expanded when the bird becomes frightened, almost hiding the outer circle of yellow-gray.

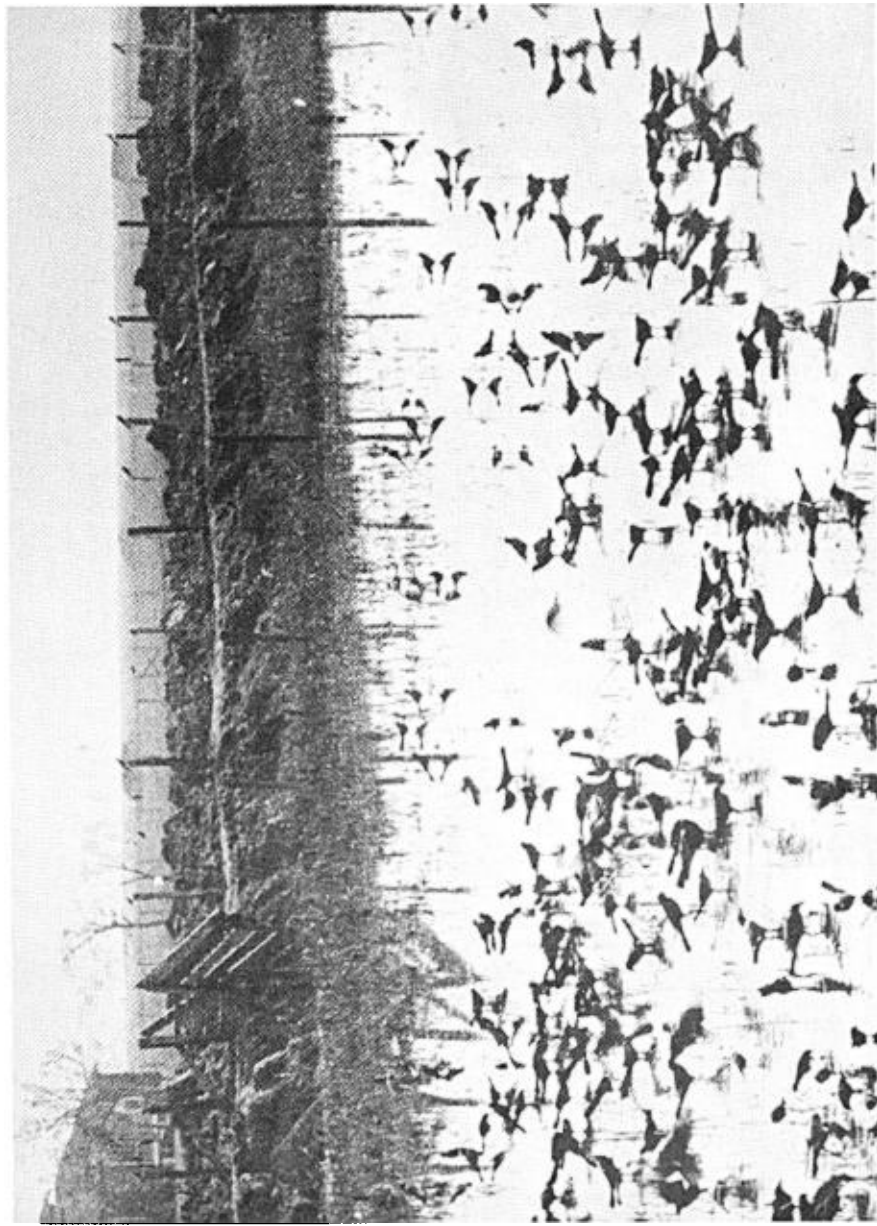
The change in plumage of the female, from nestling to adult, is less pronounced. The muddy tan of the nestling plumage changes gradually during the summer to a warm light chocolate on breast, head and neck. The back, upper wing and upper tail are dark chocolate, almost brown-black. This pronounced color gradually fades until by the next spring it is light chocolate brown.

August 26: The first hatch of the year have now completely shed their juvenal plumage. It is odd to see flocks of both males and females, now segregated as to sex, flying about without tail feathers. A very few of the early-hatched young still have two or three of the juvenal primaries, and a few of the juvenal feathers on their shoulders. The later-hatched young still have the juvenal plumage on the breast, sparsely interspersed with the second plumage. This is true also of the back, neck and shoulders. The first-hatched males have their second plumage except the tail. In the eye, the area around the pupil of the male is much lighter than in the fledgling.

September 1: Some few of the first full-plumaged juvenal males now have the tail feathers grown out about three inches, and all juvenal feathers have been shed.

COURTSHIP

With the first warm days of February, the adult males begin to exhibit their plumage as a sex attraction. When a number of males are engaged in their plumage exhibition they invariably face one another, sitting perfectly still on the ground or on the tops of the grass or low bushes, occasionally on small trees; they compress their feathers tightly over the entire body, de-



BOAT-TAILED GRACKLES FEEDING IN SHALLOW WATER ON TADPOLES OF *Acris crepitans*

press the tail, extend the neck straight up, with beak pointing skyward, and remain in this position for minutes without moving a muscle. All this time their eyes are contracted until the pupil is a mere pin-point of black, while the remainder of the eye is brilliant gold.

Suddenly one bird takes flight with a loud rattling of the primary quills, the feathers of the body and head fluffed out and tail spread broadly, uttering as he flies, oft-repeated squeals, harsh cries and throaty gurgles and, proceeding to some nearby perch, is quickly followed by his companions, who imitate the cries and antics of the leader. As soon as they again alight, they sit like statues, pointing their beaks at the sky. Should a female approach, the entire party of males takes after her in noisy chase. She easily keeps ahead of them, and they, after following a little distance, return to a resting place, only to repeat their sky-gazing. These plumage exhibitions by the males are made a short time before and during the breeding season wherever the Boat-tails gather, on the feeding grounds or in the marshes.

By late March, the adult males,—it is a fact that the males of the preceding year's hatch do not mate,—begin to gather in the vicinity of the spots where the colonies of nests will be built. The same sort of plumage exhibition and antics goes on in this locality. A group of males will occupy a spot on the edge of a marsh, usually at some distance from where the nesting colony will be located but near where the females feed. These groups stay near together, and there may be a number of groups in sight, but they are usually a couple of hundred feet apart.

Their favorite station for plumage exhibition is the top of a small bush or low tree. If these are not available, they will alight on the ground or on a muskrat nest or pile of débris. Here they stay quietly for some minutes, with their feathers compressed and beak and neck pointing skyward, then suddenly one of them will give a series of squeaking, chuckling, raucous cries, during which all of the feathers are fluffed, tail spread, wings half opened and vibrated rapidly, making a loud, rattling sound. The others of the group immediately follow the leader's example, and for a minute or two each individual is animated and noisy, only to drop back to the compressed statue-like pose. This noisy exhibition takes place either while at rest or on the wing.

Preceding the nesting period the females and immature males usually feed on the wet or dry prairies some distance away from the nesting area. The females are in small groups by themselves. As one watches the groups of adult males, every little while a female may be seen to leave her feeding place and fly toward them. As she nears the group, the individuals of that group begin calling and chattering loudly, at the same time fluffing their plumage, spreading their tails and rattling their wings. Their cries have a large variety of sound. The first and most often given is best represented

by the word *squeak* uttered a number of times in a high falsetto. Then follows a rattling throaty call, accompanied by loud and repeated flapping of wings, with a rattling of primary quills, which sounds exactly like a small stick drawn quickly across a picket fence. During this noisy period, there is a shimmering and fluffing of plumage, as if the wearer was much impressed by his own beauty and importance. The noisy display lasts a couple of minutes, and when over, all of the company resume again their statue-like poses, gazing at the sky.

If, over such a group of males, flies a female seeking a mate, all of the males at once take flight on loudly flapping wings and with rattling quills, squeaking and calling in their most seductive manner, begin chasing her. Should none of this group of males attract her, she quickly outflies them and proceeds to look over other groups until she finds her choice. When a male is selected she flies in front of and near him, leading him off to one side, until the other males in the group drop out of the chase. The pair then alights on the ground and mating is accomplished.

MATING POLYGAMOUS?

The Boat-tailed Grackles are not monogamous; neither are they polygamous. They seem to be promiscuous. The female chooses her mate, who is decidedly temporary, and as soon as sexual mating is accomplished, she leaves him, and he does not attempt to follow.

In the early part of the nesting season, the male takes no part in the colony life of the female, and, although these colonies are visited by a few males, the visits seem to be attempts on the part of the male to attract the females for sexual purposes only, as the male gives no assistance to the female in nest construction or later in the feeding and care of the young; nor do the males, usually, show any uneasiness when the nests or young are handled. This is the rule in the large colonies; but occasionally a small colony is presided over by one male, never two. Yearling males, and males that have not yet attained the adult plumage (which comes with the second summer's moult), do not visit the nesting colonies, nor do they attempt to attract the females.

NESTING AND NESTS

Three varieties of growth are used by Boat-tailed Grackles in which to build their nests. All of these are water-loving, and unless they are actually growing in water, the Boat-tails will not use them as nesting places. The earliest colonies are always located in sawgrass (*Cladium effusum*), as this is an evergreen but does not continue the individual stem growth from one season to another. The mid-season colony may be in either tules (*Scirpus californicus*) or flags (*Typha latifolia*). While tules are evergreen, they frequently continue their growth to the second summer and for this reason

the Boat-tails will not attach their nests to them until late in the spring, after the spring growth is finished, for this rush is such a strong grower that if one side of the nest is attached to stems that are still growing and the other side to stems that have finished their growth, the growing stems will tilt the nest, often upsetting it. For this same reason flags are not used until early summer. Flags are not evergreen, but the new growth is rapid and the flower stalks grow much more rapidly than the leaves. Should nests be attached to both flower stalks and leaves, the flower stalk would overturn the nests. I have seen nests in this condition a number of times. In fact, on June 25, 1936, I saw three nests, built in flags, that had been tilted by the bloom stalks so that the eggs were rolled out of the nest. The nests built in flags are usually much larger than those built in either of the other types of growth. I measured some of the flags used in nest construction and found them to be from four to five feet in length.

The weaving of the flexible, long leaves to the growing stalks in nest construction is intricate, and is accomplished by the female taking one end and working it backward and forward around and around in the form of a loose, deep basket. Should the grass that is being woven become stuck, the weaver leaves that end and, going to the other end, weaves that into position. Some of the flags I took note of as used in nest construction made as much as two and a half complete circles of the nest. When the nests are built in bushes growing along the borders of the bayous, they are much less bulky than those built in grass.

In years now long gone, when alligators were abundant in the coastal marshes of Louisiana, a favorite nesting place of Boat-tailed Grackles was in the Cut Grass (*Zizaniopsis miliacea*) which grew with great vigor around the dens of these great reptiles. Large alligators dug their own little ponds, and in and around them Cut Grass grew higher and greener than anywhere else, and in this grass around the alligator dens, colonies of Boat-tailed Grackles were always to be found nesting in the spring.

The Boat-tail's nesting territory is always in close proximity to water, usually over water. As these birds always nest in colonies both small and large, their nesting sites are governed by proper locations where a number of nests can be constructed near together. The sites are either the low bushes growing on the banks of tidal streams where the nests are usually hanging over the water, or in the marsh grasses growing in water. Their nests are never built in marsh grasses that are not growing in water.

The birds return to the same nesting localities in succeeding years. It is not uncommon to find a colony of a hundred or more female grackles nesting in close association in the heavy coastal sawgrass marshes, or in the marshy borders of ponds or lakes where the nesting growth rises directly from the water.

The nests of Boat-tailed Grackles are bulky, deep and basket-shaped. The outside is built of long strips of grasses ingeniously woven to the growing stalks; or if in bushes, to the twigs of the bushes. The material used in the outside of the nest is usually long strips of sawgrass or flags. The nest is open at the top. When a sufficient foundation is made, the inside, bottom and sides are lined heavily with shorter sections of the same material as used in the outside construction. This, in turn, is lined with partly decomposed vegetable matter taken from underneath the water, together with some mud. This soggy material and mud are plastered inside the bottom and sides of the nest, coming well up the sides for several inches. This, in turn, is lined with fine strips usually of sawgrass, although other fine stiff grasses are used when available. Some nests, when built near fields of Bermuda Grass, are lined with the fine stiff stems of this grass.

The nests vary considerably in size. A small nest may be twelve inches across the top and sixteen inches in depth, outside measurement. I have measured some nests as much as thirty inches in depth, outside measurement.

COLONY NESTING AND NEST CONSTRUCTION

Beginning April 5, 1936, I visited almost daily a large colony of Boat-tails nesting in sawgrass in a lagoon just north of Avery Island. There was only one colony where nests were under construction and occupied on this date. This colony was in what I term Pond No. Three, an area of water covering about four hundred acres, in which a number of varieties of marsh plants are growing. The average depth of the water varies from twelve to eighteen inches. On April 7, I estimated that the colony contained over two hundred nests, either fully built or under construction. Many of the nests contained one egg each, and a few nests held two eggs. This is the most populous and closely built colony of Boat-tail nests I have ever seen. In an area of less than three hundred feet square, I counted 153 nests finished or under construction, and there were many sections in the occupied area where the grass was so thick I could not get my boat near enough to count the nests. Some of the nests were not more than three or four feet apart. They were built only in sawgrass, although there were numerous clumps of tules and flags growing in the same area. I have often observed that the first nesting of these birds, when in grass, is in the previous year's growth of sawgrass. Later in the summer, nests may be built in other vegetation, but only after spring growth is complete. There were fully 250 female Boat-tails in this colony. An occasional male would fly over the colony, sometimes alighting for a short time, giving its squeaking and guttural cry and making a show of its brilliant plumage. Again taking flight on loudly flapping wings, it would pursue any female that came near,

but the latter always eluded its amorous attentions with ease. There was no evidence of a male taking any part or interest in the nest-building, and such males certainly were not mated. By April 12, most of the nests contained the full complement of three eggs. There were two small adjacent colonies also in sawgrass, perhaps three hundred feet away across open water from the main colony with probably fifty or sixty nests in each.

The females sit very closely, allowing the approach of my boat to within a few feet of the nest before leaving. On this date there were perhaps twenty noisy males flying about the nesting grounds or at rest on top of the taller grass stems, where by loud calls and show of plumage, they endeavored to attract the attention of any female moving about, but without success insofar as I could determine. I have never seen a mating in the nesting grounds.

I also visited on April 12, a second rather large but much more scattered colony of these birds about one-half mile east of the first large colony. It is on the same pond, and all of the nests were built in sawgrass. I judge about one hundred and sixty nests were in this colony, covering an area of about fifteen acres. Here, the clumps of sawgrass are much farther apart, often separated by open water and with considerable growths of tules and flags growing among them. All of the nests were in sawgrass, and most of them contained three eggs each on which the females were sitting. About fifteen or twenty males were around this second colony, but seemed to get no more attention from the females than elsewhere. The young in about half the nests of these two colonies were destroyed by predators, shortly after hatching.

May 28: Most of the female grackles that had first nested in the large colonies in the sawgrass and whose young had been destroyed, are now nesting in the flags growing among sawgrass due south of the first nesting site on an island about one hundred feet long by fifty feet wide. There are more than one hundred and fifty nests, all in flags. The females showed a great deal of uneasiness at my near approach to their nests. There is only one male in attendance on this colony. He seems quite unconcerned at my examination of the nests. These nests are all newly built, most of them containing two or three eggs. A very few are under construction and empty. The nests are most ingeniously woven of the flags. There is great variation in the outside measurement of the nests. Some of them measure seventeen inches in depth by nine inches in width. In the nests of this colony, flexible, dried flag leaves were used for the outside construction. The entire leaf is sometimes woven several times in and out around the sustaining stalks. Some of these dried flags used in nest construction measured forty-six inches in length. The outside portion of the nest is first built of the long pieces in basket form. Inside of this is a layer of partly decayed vegetable

matter taken from the bottom of the pond, lining the nest half-way up the inside, to a thickness of from three-quarters of an inch to one and a quarter inches and much thicker at the bottom than on the sides. The finishing of the inside is a lining of fine strips of sawgrass, almost thread-like in fineness. These strips are stiff, but flexible; some of them measured twenty-one inches in length and were neatly placed to form a perfect basket.

May 28: in a small island of tules measuring thirty-four feet in length by thirty-two feet in width in Pond No. One, I noted today a much-congested colony of Boat-tailed Grackle nests. There are two larger islands of tules within fifty feet of the nesting area, but these contain no nests, for the colony is concentrated in the small island. The nests in this colony have about the same inside dimensions as other nests mentioned, but the outside depth is greater. They are built entirely from the flexible leaves of last-season's growth of flags. These old leaves are tough and easily woven and tied into knots. Some of them measured today were five feet in length, woven many times around the sustaining tules to form the outside basket in which the nest lining is placed. Inside the flag basket there is the usual layer from one to one and a half inches in thickness of partly decayed vegetable matter taken from under the water. The lining of this lot of nests consisted of fine stalks of Bermuda Grass brought from the highland at least five hundred feet away. There are thirty-four nests in this little clump of rushes, some of them within four feet of one another. All of these nests contain newly hatched young or eggs. A few sets of eggs are not yet complete. The female grackles hovered around me, showing great concern at my near approach. Only one male is in attendance at this colony, and he seems quite unconcerned at my examination of the nests.

EGGS

The complement of eggs is invariably three. In only one instance have I seen four eggs in a nest. They are much more pointed at one end than at the other. The color is a glaucous green, heavily scrawled and blotched over most of the surface but more heavily at the larger end, with deep black and burnt umber. The eggs of the earlier nestings, that is, late March and early April, are more heavily marked as a rule than those laid late in June. Occasionally in the June clutches an unmarked egg may be found.

INCUBATION

Incubation begins when the second egg is laid. The period of incubation normally is fourteen days. In the early part of the nesting season, if the weather is unusually cool and rainy, fifteen days will cover the incubation period.

INFERTILE EGGS

On June 11, I made special note of the number of infertile eggs in nests in which the young had just hatched. Twelve out of nineteen nests examined contained each one egg that did not hatch, and three out of nineteen nests contained two eggs each that did not hatch. In the other four nests under observation, all three eggs hatched. In the first nesting, that is, late March and early April, there were no infertile eggs. In the second nesting, in early May, occasionally an infertile egg was observed. In the third nesting, through June, the majority of nests contained one or more infertile eggs.

MALE IN ATTENDANCE ON COLONY

In his courtship and attention to the female and in his lack of attention to the young, the male Boat-tailed Grackle differs from any other American bird I have ever observed. Courtship takes place at some distance away from the nesting colony by the males grouping themselves on the tops of bushes, on the ground or in other dry places. The females come to the males and select their mates. The male pays not the slightest attention to the female after copulation is accomplished; neither does he visit the nesting location in the early part of the nesting season with any regularity, nor does he assist in the building of the nest or in the care of the young.

A few males may be seen around the colonies of nests, flying from place to place, exhibiting their plumage, and chasing the females as the latter fly about to gather building material or food for their young, but they are there apparently only for amorous purposes. It is very evident that the males which visit the large colonies have no interest in the individual nests or the young; for, while I was banding the young birds, the males that might be in the vicinity, paid no attention to the loud distress cries of the young, although every female nearby would fly about my head chattering and scolding vigorously. The males occasionally would chase one of the females. This behavior of the males was the rule at the large colonies.

A different situation often developed where small colonies of from six to eighteen or twenty nests were established. A number of such colonies existed in Ponds No. One and No. Three, and in many instances these smaller colonies were in charge of one male, never two. The male in charge kept near the colony at all times, except during the night, when he would repair to the common roost occupied by all the male grackles in this vicinity. This roost was in a heavy growth of tules bordering a small bayou that meandered through Pond No. Three.

I observed, both in 1935 and in 1936, the establishment and building of several small colonies. They were always established late in the breeding season, that is, after the 15th of May. Some colonies were established in

flags, and others in tules. A male in full plumage would take possession of an island of grass (for they were islands, separated by considerable water from other growths) where the colony was to be established, and watch over this particular area for days, driving off any other male that might come near, and chasing and coaxing any female that flew near him, to visit his domain. Gradually he would attract to himself a number of females which would begin nest-building. In no instance, however, did I observe a particular male in charge of a small territory, mate with any of the females which he attracted to him. He did not assist in the nest-building, but seemed to act as a master-protector of the colony he was striving to start. During the nesting period, this lone male all day long was constantly calling and exhibiting his plumage with the apparent desire to attract to himself additional females. As soon as a female came to his location, she would almost at once begin nest-building. As the nesting season advanced, it was usual to find in the same small colony, nests just beginning to be constructed, nests with full complements of eggs, others with half-grown young and others from which the young had departed, all under the protection of one male. The greatest number of nests I found in such a colony was thirty-two. There was no re-nesting in these small groups. The nest-building did not begin until toward the end of the nesting season, and no second nest was constructed, since the young in these small colonies were never destroyed. The male in charge of such a colony exhibited great anxiety whenever I examined the nests under his care, and if the nestlings gave frightened cries while being banded, he would hover near and show as much solicitude as did the females. In two instances, at least, I found two colonies presided over by a single male.

I had been paying little attention to the small, scattered colonies near the two main colonies in Pond No. Three, but on June 3, 1936, I decided to investigate some of these. I first went to one built in sawgrass about sixty feet south of a large colony among flags. Some of the young birds in the nest were large enough to band, and the mother birds showed great solicitude when I approached the nests and took the young in my hands. There was one adult male bird, full plumaged, that showed great distress at the cries of the young, and at my invasion of this colony. On leaving this colony, which contained about twenty nests, I went to another small sawgrass colony perhaps two hundred feet farther south, where there were about fifteen nests. This male bird followed me to this second colony, and showed great displeasure at my invasion. It was quite evident that he had an especial interest in these two colonies, as there was no other male near them. Although I visited a number of other small colonies nearby, this male bird did not follow further; nor did any other male show any evidence of interest or displeasure at my disturbing the nests of the other small colonies.



A MALE BOAT-TAILED GRACKLE ON A SAWGRASS FLOWER-STALK



FEMALE BOAT-TAILED GRACKLES ABOVE THEIR NESTS IN SAWGRASS

On June 11, 1936, I visited a new group of nests which had been built in two small islands of flags in Pond No. One, separated from each other by about thirty feet of open water. There were eleven nests in one group and six nests in the other. One old male was in attendance on both groups, and seemed much disturbed at my invasion of his harems. Most of these nests contained fresh eggs, but a few others were in process of being built. All the nests were tagged and a full record of them was kept.

In Pond No. One there are a number of larger islands of flags and especially one group of two pairs of islands. They are almost round and vary from thirty-five to fifty-five feet in length, by from thirty-five to forty feet in width. The islands of each pair are separated by about fifty feet of water and the two pairs are separated by about five hundred feet of water. In the smaller pair of these islands there were thirteen Boat-tailed Grackles' nests, newly built. These two colonies were guarded by one male. In the other pair of islands there were eleven nests, six in one group and five in the other. These two colonies also were guarded by one male. In this same pond is a small island of tules containing nine nests also guarded by one male. No other males were in evidence around these groups of nests, and it was quite plain, by the distress of the attending male when I visited these different nest sites, that he was in charge. I visited these groups of nests regularly from June 11 to the end of the nesting season in July, and never found more than one male in attendance on each group. The males around these small colonies of nests this late in the season exhibited a marked difference in their behavior from that of the males around the large colonies early in the season. In the large colonies, the males showed no interest in my approach to the nests, nor any solicitude when I handled the young birds, although the females fluttered about me in great distress.

On June 11, 1936, I also visited the large colony in Pond No. Three, which was the first colony in which nests were built this season. I had estimated at the height of the nesting season in early April that there were more than two hundred occupied nests. Most of the young of this colony were destroyed in their nests, and most of the females moved to other locations. I observed, however, on this day, thirty-one occupied nests, some of them only recently built. There were no males in attendance at this colony on this date or later. Heretofore, several males had been observed flying about and watching the females, but now all had left the vicinity. By July 2, the male Boat-tailed Grackles had all deserted the nesting areas, with the exception of single males in charge of small, scattered colonies. The old males are now gathering in larger flocks by themselves, having ceased their plumage display and noisiness, and are beginning to show some moult.

DESTRUCTION OF NESTS AND YOUNG

Under date of May 3, 1936, I find the following note: Spent the morning in and about the large Boat-tailed Grackle colony in Pond No. Three. I was surprised to find that most of the nests I had tagged a few days ago as containing newly hatched young, were empty. In not a single nest did I find three young. The few nests containing young had one or two each. In a group of sixty-two nests, all of which when I started taking notes on April 26, contained three eggs each that subsequently hatched, only one contained two young; all the others were empty. Many of the smaller groups of nests were in the same condition. In only one lot of nests,—those along a small bayou in a narrow strip of sawgrass about fifty feet long and six feet wide,—were there a good many containing young birds. Here, I found thirty-one nests with young, mostly three, some with two. These nests were built rather close together, and some of the mother birds were always in attendance to drive away predators.

Sunday, May 10, 1936: I spent this morning in the large Boat-tailed Grackle colony in Pond No. Three, and found some changes in the colony not noted on my visit of May 3. Many of the nests which contained newly hatched young on my last visit, are now empty. The oldest young are now almost ready to leave the nest, but there are a number of nests containing three newly hatched young. In the oldest part of the colony in which the young of the first hatch had been almost completely destroyed, a few new nests have been built. These nests contained two or three fresh eggs each. Out of thirty-four nests examined in the old part of the colony, I found twelve I had marked as containing young on May 3, empty. One that I had marked as containing three young, had but one left. The other nests were undisturbed.

In the later nestings the destruction of the newly hatched young is not nearly so great as it is in the early spring. I kept notes, from the day they hatched until the young birds left the nests, on seventy-four nests in which all three eggs were hatched. These observations were made from May 24 through June 11, 1936, and the results were:

Number of nests in which 1 young was raised	5
Number of nests in which 2 young were raised	26
Number of nests in which 3 young were raised	20
Number of nests destroyed	23

THE MALE IS PREDATORY AND A CANNIBAL

That male Boat-tails are predatory is a fact. The first time I observed one of these birds kill another bird for food was in April, 1911, while taking Mr. George Bird Grinnell on a tour of inspection of Marsh Island, Louisiana, for the purpose of determining its possibility as a wild-life refuge. We were

in my big launch anchored about two hundred yards off the mouth of Bayou Michow. Near the boat was a stake standing some distance above the water, on which a swallow had alighted. A male Boat-tailed Grackle flew out from the land, coming to the stake to alight. The swallow did not move until the Boat-tail was almost on it, when it spread its wings, but the Boat-tail gave a quick snap and killed it. I could not state positively, but it seemed as if it had severed its neck, as the bird fell dead. The grackle sat on the stake a half minute or so looking at its victim floating on the water, then swooped down, picked it up and went ashore with it.

I have frequently seen male Boat-tailed Grackles feasting on ducks that had been killed and drifted to shore. I have also had complaints from trappers who claimed that the male Boat-tailed Grackles pecked holes in muskrats after they were caught in their traps, and ate the flesh. On two occasions I have seen Boat-tails pursue, catch, kill and devour Red-backed Sandpipers (*Pelidna alpina sakhalina*) whose wings had been broken. On one occasion I saw a male Boat-tailed Grackle destroy a nest of young Red-winged Blackbirds (*Agelaius phoeniceus littoralis*), eating the three little ones while the parents tried in vain to drive the predator away.

It was not, however, until the spring of 1936 that I saw them actually eat their own young. I had found from time to time many Boat-tailed Grackle nests from which the young had disappeared shortly after hatching, and often the inside of the nest was torn out. What became of the young puzzled me considerably until by keeping a close watch, I solved the riddle on May 3, 1936. I had previously noted that whenever a male Boat-tail, in flying over the colony, alighted near occupied nests, the females would chase him away. This gave me the idea that the old males were destroying the young ones. On that morning, I placed my boat about one hundred feet from a group of nests built on the edge of a small bayou that ran through the largest colony, determined to see whether or not the males were feeding on the young. I watched for perhaps one-half hour without result. Every little while an old male would fly over the nesting area, screeching and loudly flapping his wings, often alighting on the tops of the flower stalks of the sawgrass that were just at this time beginning to show above the clumps of old grass. If a female was near the point where the male alit, she would at once fly at him uttering a scolding cry of *chuck-chuck*, which signifies displeasure, and he would at once move on. There were seven males 'cruising' about this nesting area. Keeping up my vigil, I saw one of the males alight on a bunch of grass in which earlier in the morning I had noticed a nest containing three newly hatched young, and on which I had tied an observation card. He teetered, called and made a show of plumage for a minute or two, then disappeared down into the grass. After waiting for about five minutes for him to reappear, without results, I pushed my boat

over toward the bunch of grass, and got within twenty feet of it before I could see him. He was standing on the nest, busily pulling its inside to pieces. On my nearer approach, he took flight with loud *chuck-chuck* cries, and on examining the nest, I found no trace of the three young it had contained a while before; nor could I find a trace of them in the grass around or under it. My conclusion was that the male had eaten them.

I then went back to watching, and it was not long before I heard a young grackle giving distressed cries in a clump of sawgrass a little farther in the colony than the nest just despoiled. Several of the females flew toward the sound, giving their scolding calls, and at once disappeared into the bunch of grass, when out flew a male with a half-grown young one in its beak. Pursued by several females, it flew to the bank of the pond, a couple of hundred feet away, and placing one foot on its victim, proceeded to tear it to pieces, swallowing the tender morsels. More than twenty times thereafter, did I see male Boat-tails destroy the young in this and one other colony. From my observation of their methods, I do not believe they actually search out the nests with the idea of eating the young. It seems to me that, as they fly about the colonies alighting here and there, if they see a nest containing young unguarded, they drop down from their higher perch to the nest and eat the young.

In my banding activities I use large wire traps for catching grackles, Redwings, Cowbirds, etc. These traps are 8 by 12 feet, and 8 feet high. The birds enter from the top through a V, and are not able to find their way out. When adult male Boat-tailed Grackles go into these traps, they kill and eat the smaller birds. I have found numbers of both Red-winged Blackbirds and Cowbirds freshly killed, and partly eaten by the Boat-tails, and have seen them pounce on and kill the smaller birds while in the traps.

It is worthy of comment here that on June 19, 1936, I visited the large colony, which was the first occupied this spring, and in which fully forty per cent of the young were destroyed within five or six days after hatching. There were, on this date, about thirty new nests in the colony, all of which contained the full complement of young or eggs, and no male grackles or Purple Gallinules were seen around the colony. These predators had deserted the nesting area, probably because there is now a great abundance of insects, frogs, minnows, crayfish, tadpoles, and dragonfly nymphs easily available as a food supply, that was not available in the cool weather of early spring.

PURPLE GALLINULES DESTROY YOUNG

I definitely determined, while watching colonies of Boat-tailed Grackles during the spring and summer of 1935 and 1936, that the young are preyed

upon to a considerable extent by Purple Gallinules (*Ionornis martinica*). I have seen Purple Gallinules fly out of grackle colonies, with young Boat-tails in their beaks, to the bank of the pond and tear the young birds to pieces, eating them. In going through the Boat-tail colonies during the early spring, I frequently saw Purple Gallinules sneaking through the grass of the colonies, and on three different occasions between May 1 and May 12, I saw Purple Gallinules standing on nests and eating young Boat-tailed Grackles, which they had taken from the nests. Unlike the nest depredations by the male Boat-tails, which I believe are casual, the Purple Gallinules deliberately search out the nests and despoil them of their young.

FOOD OF ADULTS

The food of the Boat-tailed Grackle covers an extremely wide range. Generally speaking, they are not seed eaters, preferring insects, fish, and flesh when these are available. In the late summer and autumn, they flock in enormous numbers to the rice fields, and do great damage to the standing grain even before it hardens, squeezing out and feeding on the milk from the half-formed grain, and also damaging the grain that has been stacked in the field. With their strong beaks they tear away the straw covering of the stacked grain, often opening the small stacks to such an extent that the unthreshed grain becomes spoiled by rains. In the spring they also do some damage to freshly sown corn and rice fields, following the sowers and picking up such grain as is not covered, or uncovering it with their strong beaks.

Their favorite food, however, is various insects and small fish, frogs and other water creatures inhabiting ponds, ditches and marshes. They show considerable activity in catching their live food from the water, thrusting their head completely below the surface in order to secure any small water creature that they may see as they hop from stem to stem of the water-growing plants, always keeping just above the water level. The females frequently hover over shallow water, swooping down gull-like, and capturing small frogs or other water creatures by a quick snap of their beak, without touching their bodies to the water.

This bird might be properly termed water-loving, as it spends most of its life in close proximity to water when securing its food, when nesting, and when roosting.

Their principal feeding periods are early in the morning, and late in the evening. When on land in search of food these birds move about with stately stride without the usual hopping gait of perching birds.

One of the favorite foods of the Boat-tailed Grackle, and especially of the males, is crayfish (*Cambarus*), which they may be seen hunting with great determination in the shallow, fresh-water marshes. When a crayfish is captured, the bird grips it in its beak and flies to some dry spot, bank or

broken-down debris, where after killing its prey by vigorous shakes, it proceeds to tear off the tail, feeding on the flesh of the tail portion only. When in the spawning season the crayfish are carrying their eggs, the Boat-tails catch them in great numbers, hold them bottom-side up by standing on them, and deliberately strip and eat the eggs from the small swimmerets which line the under side of the tail of the crayfish, and on which the eggs are carried. The adult crayfish is then discarded, and is most often not killed.

In my banding operations, a considerable amount of the rice feed spread as bait for my duck traps, which are, of course, in water, floats on the surface. It is interesting then to see the female Boat-tails flying low over the water and picking this feed from the surface, sometimes hovering in the same spot for an appreciable time if there are a number of grains of feed nearby to be secured. This method of feeding is carried on only by the females, as the long, heavy tails of the males prevent any attempt at flight-feeding that entails hovering close to the water's surface.

Both males and females pursue and capture large insects on the wing. Frequently, in the autumn, fields of soybeans may be infested by great numbers of caterpillars which sometimes destroy the entire bean crop. When the Boat-tails find such an infestation they flock to these fields in enormous numbers and do not leave them until all caterpillars are eaten.

FOOD OF THE YOUNG

In the care of their young, the female Boat-tails are diligent and attentive, getting most of the food for their nestlings from the water-covered area adjacent to the nesting site, but at times, especially on cold mornings when food in this area fails, they will go farther inland, sometimes a mile or more in search of insects in the fields or of small fish in the shallow ponds and ditches. The food of the young is apparently entirely insects, fish or other water creatures.

In capturing small fish, if there are no shallow ponds or ditches partly dry in which imprisoned fish are an easy prey, the mother Boat-tail hops from rush to rush just at the water's edge, and with a quick downward stroke of the beak captures any little fish that may be lurking in the shade of the under-water growth. In feeding their young, they carry to them only one small fish or insect at a time; they do not swallow food and then regurgitate, but feed the entire freshly caught fish or insect directly to the young.

The food supplied to the young varies considerably. On some days, it is almost exclusively small fish; on other days, it may be spiders, and on still other days almost entirely crickets, grasshoppers or other insects which they hunt on the highland by turning over small masses of dry grass or

other objects. Then again, when a hatch of dragonflies (either *Libellula* or *Diplax*) is coming off, the food supply consists entirely of dragonfly nymphs. On other days, if tadpoles and small frogs are especially abundant, these will constitute the food for the young. The Cricket Frog (*Acris crepitans*) is the one most used. I have not seen seed or grain or plant food fed to the young.

Thus, on June 11, 1936, the food of the young grackles was almost entirely spiders (*Arachnida*). Under date of June 25, I found that the young Boat-tails were fed almost exclusively on the nymphs of dragonflies, which were especially abundant in the waters near the colony. The old birds diligently searched the rushes growing in the water for these nymphs, often retrieving them from several inches below the surface. They also hovered over the thick growths of lily pads, flying at about eighteen inches above the water, and seemed very quick in locating the nymphs and other underwater creatures on the sides of the lily pads and on their stems, hovering above the water and picking up their prey very much as do gulls. They never actually dove into the water as terns do. A few days later, on June 29, the food of the young consisted almost entirely of the tadpoles and young of the Cricket Frog. These tiny little frogs, not larger than one's fingernail, are caught by the bird swooping down and following them as they hop across the lily pads. For the last two days these little frogs and tadpoles seemed to have been the only food given the young.

SEX RATIO

During the spring of 1936, in order to determine the incubation, development and sex ratio of the young Boat-tails, I tied cards measuring 3 by 4 inches to grass stalks at the bottom of eighty-nine nests in which the young matured. Many other nests to which cards were tied had the young destroyed before they were old enough to leave the nests. In almost every nest the full clutch of three eggs was hatched, but many of the young were destroyed by male Boat-tailed Grackles or by Purple Gallinules. The young in the eighty-nine nests that reached an age when sex could be definitely determined, were as follows:

- 1 nest contained 2 males only
- 8 nests contained 1 male only
- 3 nests contained 2 males and 1 female only
- 26 nests contained 1 male and 1 female only
- 28 nests contained 1 male and 2 females only
- 6 nests contained 3 females only
- 15 nests contained 2 females only
- 2 nests contained 1 female only

Total number of nests, eighty-nine; total males, seventy; total females, 145. The ratio is thus a little more than two females to each male. During 1935,

I banded 874 Boat-tails taken in my three banding traps. Of these, 271 were males, 603 were females; or more than two females for each male. Between January 1, and October 16, 1936, I banded 974 Boat-tails. Of these, 338 were males, 636 were females; again almost two females for each male. In the two years I have banded 1,848 of these birds, of which 609 were males, and 1,239 were females, or a few more than twice as many females as males. The sex determinations in the nests check almost exactly with the sex ratio of the birds caught in banding traps. These checks prove without a doubt that the normal sex ratio of Boat-tailed Grackles is a little greater than two females for each male. Another interesting fact proved by banding is, that while the females of the previous year nest as yearlings, the males do not reach the breeding age until the second year.

WEIGHTS OF ADULT AND JUVENAL BOAT-TAILS

Average weight of 10 juvenal males, August 8, 1936.	5 $\frac{5}{8}$ oz.
Average weight of 10 males of the year, October 4, 1936.	6 $\frac{7}{8}$ oz.
Average weight of 10 full-plumaged males, October 4, 1936.	8 $\frac{1}{2}$ oz.
Average weight of 10 juvenal females, August 8, 1936.	2 $\frac{1}{2}$ oz.
Average weight of 10 adult females, October 4, 1936.	4 $\frac{1}{8}$ oz.

MISCELLANEOUS NOTES

These birds have two, possibly three nesting periods. The first begins in late March or early April. The first nesting is usually in rather large colonies; the later nestings are in much smaller colonies.

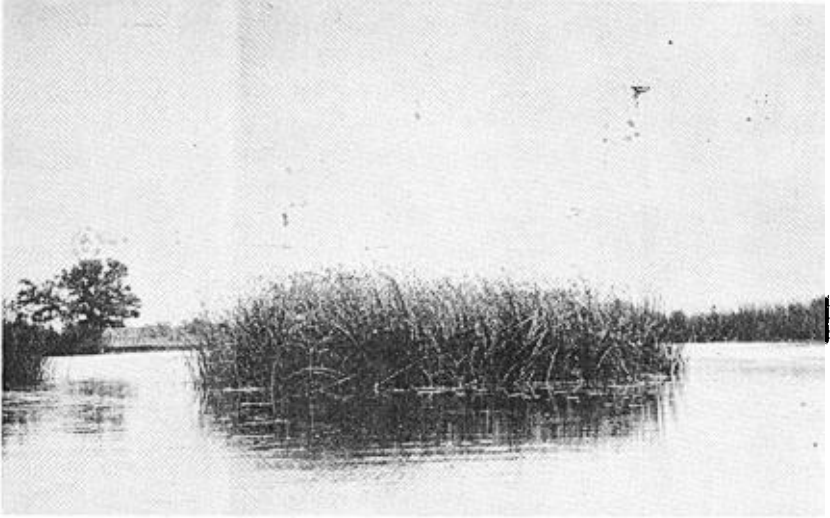
The female grackles pay no attention to their first broods after these leave the nest, but they leave their young to shift for themselves as soon as the latter are able to fly. They take great care of the last brood hatched, caring for and feeding them for many days after they are well able to get their own food.

July 11, 1936, was the first date this year on which young Boat-tails were seen following their mothers. Many groups of two or three young and the mother were observed on the edge of the dry prairie near the nesting colonies. When groups of young grackles were taken in my banding traps, the mothers were very much worried and continued feeding their young through the two-inch wire mesh of the traps.

August 26: Adult male Boat-tails have now shed all their tail feathers and are in very ragged moult.

September 8: The early-hatched males of the year have now shed all tail feathers and are three-fourths covered with their new fall plumage. The old males have their new tail feathers about three inches long and are now in small flocks by themselves.

October 12, 1935: Boat-tailed Grackles are now flocking according to sex,



AN ISLAND OF TULEs CONTAINING OVER THIRTY NESTS OF BOAT-TAILED GRACKLES



A BOAT-TAILED GRACKLE'S NEST 32 INCHES IN DEPTH BUILT IN FLAgs

males and females in separate flocks. Occasionally a few of the opposite sex may be mixed in the flocks. It is noticeable that the flocks of males are very much smaller than the flocks of females,—I should judge at least half the size,—and the flocks of males are less numerous than those of females. This is easily determined when I stand on the fly-way between the rice fields (where they feed up to thirty miles inland) and the marshes where they roost. These birds are now concentrating in their roosting areas and a great many thousands follow the same air line to and from the rice fields and the roosting marsh. They usually fly at a height of about one hundred feet or a little more, and, as the largest roost I know of is located on my lands just north of Avery Island, I see this flight practically every day. Even at a considerable distance it is easy to distinguish the flocks of males from those of females.

It is in order, before closing this paper, to make record of a morning in the Boat-tailed Grackles' colony, as of Sunday, April 26, 1936. My visit to the nesting colony in Pond No. Three began before daylight, as I wished to determine definitely whether or not the males spend the night in the colony or elsewhere. I paddled quietly down the little bayou, along which most of the nests are located, coming to rest at about the center of the eastern edge, some time before day began to break. There was not a sound from any of the birds as I passed within a few feet of their nests. The sky was overcast, with a brisk northeast wind blowing. About a thousand feet south of my location and outside this lagoon is a very large roost of Red-winged Blackbirds (*Agelaius phoeniceus littoralis*), Cowbirds (*Molothrus ater ater*) and Florida Grackles (*Quiscalus quiscula aglaeus*), located in a heavy growth of sawgrass. The Redwings were the first of all the marsh birds to begin their morning song, at first a few calls from widely scattered points, gradually increasing in numbers, until at twenty minutes of five, their voices were in lively chorus, although only the faintest gray light could be seen in the east. The Redwings had hardly well started with their song of greeting to the approaching day, when the Kingbirds (*Tyrannus tyrannus*) began their cheery, twittering calls from the myrtles growing on the levee forming the pond. On the nearer approach of day, all about me could be heard the calling of Night Herons, both Yellow-crowned (*Nyctanassa violacea violacea*) and Black-crowned (*Nycticorax nycticorax hoactli*), and the thumping, stake-driving call of the American Bittern (*Botaurus lentiginosus*) sounded clear and loud from every direction. Occasionally, the low, before-day call of the Green Heron (*Butorides virescens virescens*) could be heard from the clumps of tules nearby.

The first Boat-tailed Grackle notes were heard at four minutes of five, and came from a group of males, roosting in a heavy growth of tules along which I had just passed, and at least five hundred feet from the edge of the nearest

nesting colony. Not a sound came from the occupants of the colony of nesting females, some of which were within twenty feet of me.

As the light grew stronger, the chorus of marsh music swelled to a great volume. Large flocks of Redwings in full voice were leaving their roost for the feeding grounds farther inland and the air vibrated with the morning calls of many kinds of marsh-dwelling and marsh-roosting birds. The noise became almost deafening when swelled by the deep, bass voices of hundreds of bullfrogs, and the rolling bull-like bellows of several large alligators whose dens were in the marsh nearby.

At 5.15 a. m. the first male Boat-tailed Grackle made an appearance, flying from its roosting quarters to the nesting colony with much flapping of wings and loud calls, and alighting on the dry tip of a sawgrass seed-stalk that extended well above the general growth in which the nests were located. Here he balanced himself for a few minutes like a statue, head and neck straight up, tail down, all feathers tightly pressed against the body. As no other joined him, he fluffed out his feathers, flapped his wings noisily and with many whistling screeches and chucklings, announced his presence to the nesting females around him. Getting no response, he flew to the pond's bank and began a search for his breakfast in the shallow water of its borders, where he was soon joined by other males which left their roosting places in ones and twos, always flying over the nesting colony with loud flappings of their wings and raucous calls before proceeding to the pond's bank in search of food. At 5.25, the first females began leaving the nesting colony, going inland singly. Some few began looking for food in the low grass growing in the water very near me.

Occasionally a male would leave the feeding area along the pond's bank and fly with loudly flapping wings and many screeching, gurgling and chuckling calls over the nesting colony, but would not stop. At 5.30 one male alit on the top of some dry sawgrass near me and was soon joined by another. Both assumed a statue-like pose, neck extended, bill straight up, tail depressed, feathers tightly compressed. Thus they stood facing each other, about sixteen inches apart. Occasionally they would fluff their plumage and utter raucous cries as one of the nesting females passed them, but they made no attempt to pursue. Shortly after sunrise, many of the females left the nesting colony, going inland; soon a number of them returned with food in their beaks. I realized then that a number of the nests must contain young. I had estimated that this colony, built in the sawgrass area I was then watching, and covering not more than two and a half acres, contained not less than two hundred nests in which the egg clutch of three was completed a week ago. In adjoining sawgrass areas are several small colonies comprising last Sunday, perhaps seventy-five additional nests, all of which contained eggs on my last visit. This morning, there seemed to

be only about half as many females in the large colony as I had observed a week ago. About 6.30, I decided to investigate the nests I had previously marked as containing eggs. On pushing my boat from nest to nest, I was greatly surprised to find the majority of them empty while many of those containing young had one or two little ones and no infertile eggs, instead of the full complement of three. None of the young seemed to be more than four days old and many of them only one day old. This checks about right, as the period of incubation for the Boat-tailed Grackle is fourteen days, and the first sets of eggs were complete on April 8. The first young were hatched on April 22. Whenever I visited a nest containing young, the mother bird, if near, would show great uneasiness and was often joined by several other females that scolded my invasion of their nursery with discordant cries of *chut-chut*, oft repeated. Never a male came near, or seemed disturbed at my intrusion into the nesting colony. The few males that were about, flew unconcernedly from place to place, making plumage displays and giving loud calls and wing flappings, in hopes of attracting the attention of some female ready for mating. I checked as far as possible the nests I could easily reach from my boat, finding sixty-three empty, but with evidence of the young having been hatched; seventy-six contained eggs and fifty-one contained young from one to four days old. In the fifty-one nests in which there were young, eight contained one, twenty-six contained two, seventeen contained three young. A three-hours' stay in and near this colony left me without evidence as to what became of the newly hatched little ones.

Avery Island,
Louisiana