6. The oldest Oven-bird recorded during the study was a male which reached the age of at least seven years, one year more than the oldest known previous record. Its age equals that of each of four other warblers, a Yellow Warbler, Myrtle Warbler, Pine Warbler, and a Maryland Yellowthroat, which may indicate that the longevity in these species and perhaps in other warblers is similar to that of the Oven-bird.

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OBSERVATIONS ON THE ORCHARD ORIOLE IN LOWER MISSISSIPPI DELTA

BY JOHN V. DENNIS

This study was conducted entirely within the boundaries of the Delta National Wildlife Refuge in Louisiana. The refuge is located between the Mississippi River and the Gulf of Mexico, some seventy to eighty miles below New Orleans. The refuge marshlands are divided by innumerable waterways known as passes and bayous. These are distributaries of the Mississippi, which, since the Civil War, have deposited over eighty square miles of marshland in this portion of the delta, or almost all of the present refuge.

Lying on the east bank of the Mississippi two miles above Pilottown, is the refuge headquarters area, comprising approximately

seven acres. This area is surrounded by a levee and is filled in except for drainage ditches. Ten buildings, some quite large, are on the property, which, otherwise, is chiefly given over to lawns and shade trees. In addition, there is some land grown up in weeds and an orange grove. Seventy-eight shade trees, as well as numerous shrubs and ornamental plantings, are in the area. The shade trees, for the most part, form a double avenue facing the river front. Forty-five of the trees are hybrids of live oak and water oak. The other trees are mainly camphor, willow and magnolia.

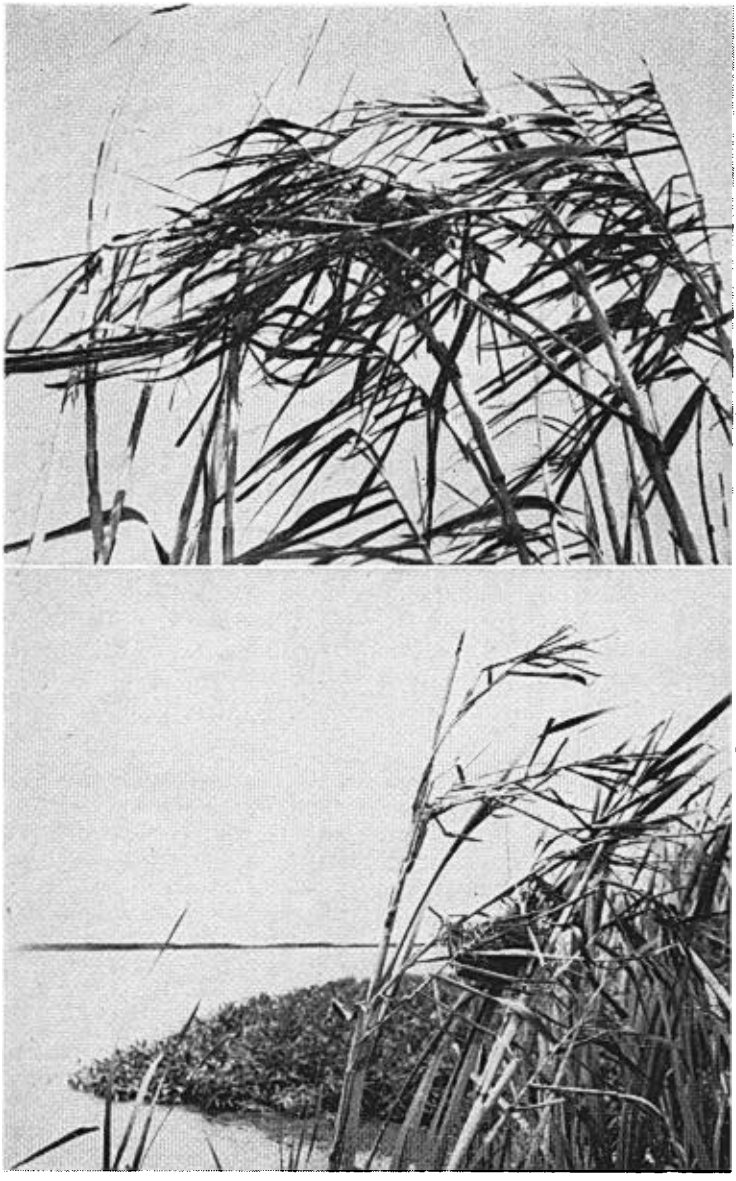
On March 28, 1946, I noted the arrival of male Orchard Orioles in the orange grove. They became most numerous within a few days. Several days later I saw immature males and a week later I saw a few females. Coincident with the arrival of the females, the birds spread out from the orange grove into large trees. Mating began on April 15, by which time the females were equally as numerous as the males.

Nest-building began about May 1. From that time I began compiling data on the nests and their location. New nests, which were rapidly appearing throughout the area, were marked on a map which contained every tree and shrub. At frequent intervals the trees were climbed in order to locate new nests. The higher nests were checked once a week, often with the aid of a ladder. Many of the lower, more accessible nests were checked daily. The peak of nesting activity occurred during the first half of June. The last nest to be observed under construction was one begun on July 4. A total of 114 nests were counted during this single nesting season on the seven-acre tract under study.

No information is available on the number of nests built in this area during the previous nesting season. It is interesting to note that even the finely woven oriole nest, which here is constructed from a wide variety of grasses and lined with thistle down, disintegrates rapidly as a result of the extremely humid climate and the activity of insects, particularly ants.

Only slightly less dense were the Orchard Oriole populations nesting in the willow thickets along the banks of the Mississippi and the larger passes. This habitat is not included in this study, owing to inadequate data.

The most surprising discovery occurred about a month after nesting had begun at the headquarters area. I had frequently seen Orchard Orioles in the vast marshes which extend eastward from the Mississippi for a distance of some ten miles to the waters of the Gulf. I had not suspected nesting in such an unusual habitat for the Orchard Oriole until I found some very agitated adult birds in a cane brake near the mouth of Dead Women Pass. A search revealed their nest. It was built in roseau cane, *Phragmites communis*. The outer edges



Two orchard oriole nests located in roseau cane in the marsh, bordering Dead Women Pass on the Delta National Wildlife Refuge.

of the nest were woven around stems of several branches of cane, allowing the nest to hang in between. This nest, and others which were discovered later, was located on the outer edge of a cane brake overlooking a body of water.

On all subsequent visits to the marsh I made every effort to find new nests. Eventually some ten nests were found. They were in widely separated areas of the marsh, and one was less than a hundred yards from the mud flats of the Gulf of Mexico. All were built in roseau cane, usually at a height of about seven feet. Some nests were built of a variety of grasses, while others were constructed almost entirely of salt meadow cordgrass, *Spartina patens*. Those farthest from willows, sometimes as far as five miles from a tree of any kind, lined their nests with cattail down. Those near willow thickets used the down from willow catkins. However, where there was filled in land such as at the headquarters area, thistle grew abundantly and the thistle down was used copiously in lining nests.

The marsh region is so inaccessible and the cane brakes so difficult to penetrate that no attempt was even begun to determine the nesting density for this habitat. Yet from the discovery of nests in widely separated areas and the presence of Orchard Orioles, often in large numbers, throughout the marshes, it is reasonable to assume that nesting occurs regularly and to quite a high degree in the extensive cane brakes. Oberholser (1938) speaks of finding large numbers of Orchard Orioles in the marshes, but does not specifically state that they nest in the marsh. He writes: "One of the interesting and rather surprising ornithological experiences in southeastern Louisiana, particularly in the region of the Mississippi Delta and the coastal areas west of that point, is to find the Orchard Oriole so common an inhabitant of the marshes, occurring even in the grasses and reeds as well as in the bushes and trees that fringe the bayous and ditches." In *Birds of North Carolina* further evidence shows the preference of Orchard Orioles for coastal areas, although, not necessarily, marshes. The authors write: "Although a summer resident in a great many sections throughout the state, the Orchard Oriole is particularly abundant in the low country of the coastal region. For instance, hundreds of them are to be found in Hyde County around the shores of Mattamuskeet Lake."

Of some interest was the presence, during a short trip in June, of Orchard Orioles on Breton Island, a small barrier island, about ten miles out in the Gulf. I was unable to discover any nests during my four-hour visit, although I saw some half dozen Orchard Orioles. It is likely that a thorough search would reveal nests in the dense mangrove and wax myrtle that covers a portion of the island.

Having used up the available nesting areas along the pass banks and such artificial sites as that at the refuge headquarters, it is prob-

able that an overflow population has sought additional nesting areas in the marsh and possibly on coastal islands. It would be of great interest to know how successful this nesting is, and whether it would continue to occur if there were not such a dense population competing for more conventional nesting sites. As I shall show, the nesting at the favorable headquarters area site was highly successful although there were indications that natural foes and accidents took a large toll of the fledged young. It is easy to imagine what extra hazards the young are exposed to in the marshy areas where murky waters or the jaws of venomous reptiles await the fledgling, should it fall while perched upon the insecure marsh reeds. Yet the basket-shaped nest is fully as well adapted to a marshy environment as that of the Marsh Wren, and it is possible that the Orchard Oriole may become as successfully acclimated to marsh nesting as other *Icteridae*, such as the Boat-tailed Grackle or the Red-wing. Only extensive study of the marsh nesting of the Orchard Oriole, such as occurs in Louisiana, can give a clue to the answer.

FEEDING HABITS

The Orchard Oriole is cited as feeding almost entirely on insects. While I saw adult birds chasing dragonflies and moths, and carrying various types of insects to their young, I also noted them seeking other types of food. When a section of the lawn grew up in burclover which ripened, orioles eagerly sought the seed. Mulberries were, perhaps, the most relished item in their diet. They made constant sallies on a tree which was being zealously guarded by a mockingbird.

Of some interest but not necessarily related to feeding habits are the findings from forty-four nests, which were closely examined. Five nests contained tiny fragments of oyster-shell; one nest containing twelve pieces, another six and the remainder two or three pieces each. The skeleton of a dead nestling was found in the nest containing twelve pieces. In addition, there was a smooth round piece of gravel or grit in this nest. Fragments of crustacea (very likely fiddler crab) were found in two nests. Parts of snail shell were found in one nest. One or more small acorns were found in ten nests. These could have fallen into the nests from the hyrbrid oak trees in which they were built. About half the nests contained an unidentified seed, slightly smaller than a grain of wheat.

HEIGHT OF NESTS

The lowest nest observed was two and a half feet from the ground. It was located at the tip end of a bough on a hybrid oak tree. The young of this nest, incidentally, were destroyed by a predator which gained access to the nest from the ground. It appeared to be the work of a raccoon. The highest nest observed was nearly forty feet

from the ground. S. A. Grimes, who made a study of the nesting habits of the Orchard Oriole in northeastern Florida writes: "From fifteen to thirty feet is the usual height, but I have seen nests close to fifty feet up and one only four feet from the ground."

The majority of the nests were located on the outer end of lower limbs and faced the greatest amount of light. During the early part of the nesting season the Orchard Orioles shared most of the trees with nesting Boat-tailed Grackles which occupied the uppermost portions of the trees. When grackle nesting ended early in June, the Orioles spread out into areas formerly occupied by the grackles, building a sizable proportion of new nests in the middle and uppermost portions of the trees.

RELATION TO OTHER SPECIES OF BIRDS

Boat-tailed Grackles, kingbirds, mockingbirds and Yellow-billed Cuckoos were the only other species in competition with the Orchard Oriole for nesting space in the limited number of trees. Other species frequenting the area or nesting on sites not available to the orioles were Red-wings, Florida Grackles, English Sparrows, cowbirds, cardinals, Screech Owls and several species of woodpecker. As often observed, the Orchard Oriole showed preference to trees occupied by the Eastern Kingbird. Two kingbird nests were in the study area. One of the nests was in a small hybrid oak. Nesting concurrently in the same tree were four pair of Orchard Orioles. At the conclusion of the kingbird's nesting, a fifth oriole nest was built in the tree. One of the oriole nests, active while the kingbirds were nesting, was on the same limb and only five feet away from the kingbird nest. In general, the Orchard Oriole is unobtrusive and seldom bothers or is bothered by other species. The only exceptions to this figured Boat-tailed Grackles and mockingbirds. With approximately three hundred grackles frequenting, from time to time, or nesting in, the area under study, it is natural that there should be some dissension. On one occasion, observing from a blind, I saw a male Boat-tail make a sally upon a very exposed oriole nest in a small shrub. Both the male and female Orchard Oriole joined in repulsing this and a subsequent attack. On other occasions I have seen orioles attack grackles in the vicinity of oriole nests. I suspect one to three percent of all nests in the area of being pilfered by grackles. Chiefly in competition for mulberries was antagonism noted between Orchard Orioles and mockingbirds. Active nests of both species were found in the same tree.

TERRITORIALITY

Defense of nesting territory appeared to be almost non-existent. Prior to nest-building, however, some squabbling was noted—just

as much among females as males. Violent fights were noted on several occasions between first-year immature males and adult males. Nests were sometimes built as close to each other as four or five feet. There was some tendency to group nests in certain trees or groups of trees—there being as many as five nests in one tree. Thus it would appear that territoriality played little, if any part, in the selection of nesting sites.

Thomas (1946), speaking of colonial nesting on a ten acre tract in Arkansas, (here only 5 to 11 pairs nesting yearly) finds little indication of territorial boundaries. She writes: "I have observed no defense of territorial boundaries, comparable, for instance, to that of Eastern Mockingbirds or Eastern Bluebirds." She did not find any nests of two pairs of orioles, however, closer than thirty yards. She continues with a quotation from Audubon in which he describes the "sociality" of the Orchard Oriole and contrasts it with the aggressiveness of the Baltimore Oriole. Her most significant quotation is one by Kopman on colonial nesting in Louisiana, and which I repeat: "Its abundance as a breeder in the southeastern portion of the State can scarcely be comprehended by those whose acquaintance with it is confined to its appearance in more northern localities. In one live oak in a plantation yard where there were many more trees of this kind I once counted nearly twenty nests of this species."

NESTING SITES

The table below gives a picture of the nesting density and the type of trees utilized on the seven-acre tract containing the colony under study. All were introduced trees and shrubs with the exception of the willow and the black elderberry.

Oaks (hybrid live and water oak)	45 trees	80 nests
Camphor	15 "	8 "
Magnolia	8 "	5 "
Willow	5 "	4 "
Elm	2 "	6 "
Cottonwood	2 "	2 "
Pecan	1 tree	4 "
Ornamental shrubs	About fifty	2 "
Black elderberry	Over a hundred	2 "
Loquat	2 shrubs	1 nest

S. A. Grimes (1931) mentions nine trees used as nesting sites in Florida. Since he describes a more conventional habitat and one in which there isn't such great density of population, these trees probably represent the type ordinarily selected by the Orchard Oriole in the south. He mentions the pecan, live oak, blackjack oak, black gum, sweet gum, hickory, chinaberry, longleaf pine and buttonwood. Many of the nests in these trees were built in clusters of Spanish

moss, which, incidentally, is not present at the Delta National Wildlife Refuge.

But returning to the Louisiana colony, the table shows that hybrid oaks, willow, elm and pecan were in greatest demand as nesting sites. This is as to be expected since the Orchard Oriole prefers to build its nest in the outer foliage where there are numerous small twigs around which the outer fabric of the nest can be woven and where there are leaves to, at least, partially conceal the nest. Yet trees and shrubs which did not meet these qualifications were extensively utilized — evidently due to the fact that nesting in the more favorable localities had reached the saturation point. Hence nests were found in small open shrubs, loosely foliated trees (camphor), and in dense shade, or, in otherwise unfavorably situated sites. Perhaps the most remarkable nesting site was one located on the lower limb of a magnolia tree and in deep shade. The nest was supported on one side only, the upper fabric being woven about a straight limb over an inch in diameter. This nest, as well as some of the other poorly located ones, was abandoned.

Inexplicably no nests were found in certain trees bordering the most congested areas, in particular, ten camphor trees which faced the Mississippi River. Interior camphor trees contained many nests. The orange grove which contained about seventy-five medium sized trees was completely devoid of nests. The grove had been abandoned and was grown up in weeds. Fledglings sought refuge in this tangled area while parent birds obtained food here. Although the small citrus trees did not present likely nesting sites, it seems strange that no nests at all were found in this area, especially in view of some of the unusual sites utilized.

Statistics on the number of eggs per nest are available from a study of sixty-six nests and are as follows:

2 eggs	4 nests	0.6%
3 "	15 "	22.8%
4 "	37 "	56.1%
5 "	10 "	15.2%

The number of young hatched and the number fledged in relation to the number of eggs laid is shown in the following chart compiled from a study of fifty nests:

Total number of eggs	157	
Total number hatched	131	84%
Total fledged	126	80.3%

Approximately ten percent of the nests contained an infertile or addled egg. Never more than one such egg found in a single nest. Occasionally a pipped egg, containing a lifeless occupant, was found. Destruction of nests through predation constituted a very low per-

centage. A number of abandoned nests were noted, usually swarming with ants. As soon as a nest is empty, it is rapidly over-run. The ants may have been a factor in nest abandonment, but it is more likely that harm befell the parents. Lice were seen on a small percentage of nestlings — a few of which were noted in a weakened condition and with frayed plumage. One fledgling was found with a small snail attached to its rump. Although no attempt was made to calculate the success of fledglings, it appeared that nestlings left their nests too prematurely to have as good a chance of survival as the young of some species. They were virtually unable to fly on leaving the nest and clung to whatever foliage there was available, uttering chirps to attract their parents. Such helpless birds are an easy prey to the numerous reptile population on the delta as well as raccoons and birds of prey. On one occasion I discovered a fledgling hanging from its nest by one leg. It probably fell while perched on the edge of the nest. Older fledglings were frequently seen attempting to fly to some distant object. Very often they failed to reach their goal and landed on the lawn.

NESTING DATA

The data in the following table were obtained from daily observation of seven nests:

Construction of nest	Laying of eggs	Total eggs laid
3 days	4 days	4
3 "	4 "	3
4 "	4 "	4
5 "	3 "	4
3 "	4 "	3
3 "	5 "	4
3 "	2 "	2

Incubation First egg laid to first hatched	*Fledgling* First hatched to first fledged	Total time for nesting	Total number fledged
14 days	12 days	13 days	4
14 "	13 "	30 "	3
14 "	. .	. .	. .
14 "	11 "	31 "	4
14 "	12 "	29 "	2
15 "	14 "	31 "	3
12 "	13 "	29 "	1

The third nest listed was destroyed through predation shortly after the completion of incubation. To explain the incubation period (average 14 days), it is necessary to add that the eggs are hatched in the same order as they were laid: that is, the first egg laid hatches first and the others follow in sequence about a day apart. The

fledglings leave the nest in order of age — the oldest being followed within one to three days by the others. An exception to this occurs when the nest is disturbed. Then all nestlings leave at once, even if several days prior to the time they would ordinarily begin to leave.

SUMMARY

1. 114 Orchard Oriole nests found in one season on a 7 acre tract of filled in land on the Mississippi delta.
2. Nesting occurred in cane brakes in the marshes, evidently as a result of population pressure in more favorable areas.
3. Territoriality was almost non-existent with as many as five pairs nesting in one tree and as close as four or five feet apart.
4. The Orchard Oriole is generally unobtrusive and nests in close proximity to mockingbirds, Yellow-billed Cuckoos, Boat-tailed Grackles and Eastern Kingbirds.
5. In a study of 50 nests containing 157 eggs 80.3 percent of the eggs resulted in fledged young.
6. The eggs do not hatch simultaneously but in the order they were laid and about a day apart.

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Moose Hill Bird Sanctuary, Sharon, Massachusetts.

GENERAL NOTES

Black-throated Green Warbler Eating Clouded Sulphur Butterfly.— On September 23, 1947, in Leland's Woods, North Andover, Essex County, Massachusetts, I saw a Black-throated Green Warbler, *Dendroica virens virens* (Gmelin) holding in its mouth a Clouded Sulphur Butterfly, *Eurymus philodice*. The insect was gradually disappearing into the mouth of the warbler when the bird flew away, and I did not witness the completion of the act of swallowing.

Herrick, *Wild Birds at Home* 1935:294-5 states that the evidence that butterflies are occasionally attacked by certain species of birds is not very impressive. He recorded from his own experience only four kinds of birds attacking butterflies or bringing them to their nests. But six species of the victims were identified. The birds and their prey which he cited are: House Wren, *Troglodytes aedon* subsp. with Mourning-cloak Butterfly, *Vanessa antiopa*; Purple Martin, *Progne subis subis* (Linn.) with Mourning-cloak; Least Flycatcher, *Empidonax minimus* (Baird and Baird) with three butterflies, a Copper Butterfly, probalby *Heodes*