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NESTING ACTIVITIES OF THE EASTERN
MOURNING DOVE IN SOUTHERN
MICHIGAN

Thesis for the Degree of M. S.
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James Victor Lund
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This is to certify that the
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Nesting Activities of the Eastern
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James V. Lund

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NESTING ACTIVITIES OF THE EASTERN MOURNING DOVE
IN SOUTHERN MICHIGAN

By

James Victor Lund

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NESTING ACTIVITIES OF THE EASTERN MOURNING DOVE IN SOUTHERN MICHIGAN

INTRODUCTION

The Mourning Dove as a Game Bird

The eastern mourning dove (Zenaidura macroura carolinensis (Linnaeus)) and the related western mourning dove (Zenaidura macroura marginella (Woodhouse)) are considered by many to be ideal game birds. Their fast flight and small form make an illusive target which is providing sport for an increasing number of hunters each year. In addition the bird is considered good table fare (Heilner, 1947).

Before game seasons and restricted bag limits were common it seems probable that mourning doves were shot wherever found. Michigan, in 1905, may have been the first state to provide the species year-round protection. The following year several other states prohibited any dove shooting, or established open and closed seasons. The average length of season for the 21 states which allowed a dove season in 1909-10 was seven and one-half months. Tennessee permitted an open season of eight and one-half months, Mississippi seven months, Kentucky and Georgia six months. Longer seasons were more common in the southern states than in central and northern regions.

Those states which first established seasons on doves have since that time been fairly consistent. These include: Alabama, Arizona, Arkansas, California, Colorado, Delaware, Florida, Georgia, Idaho, Illinois, Kansas,

Kentucky, Louisiana, Maryland, Minnesota, Mississippi, Nebraska, Nevada, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

Until 1918 individual states had regulated seasonal dates and bag limits on migratory birds. In 1918 enactment of the Migratory Bird Treaty Act initiated federal control on all migratory birds including mourning doves and several other species of doves and pigeons. One article of the treaty provided open seasons on certain game birds not to exceed three and one-half months between September 1 and March 1 of consecutive years. The limitations imposed by this article were significant when we consider that many states allowed dove shooting during the nesting months of July and August.

Provisions regarding bag limits were not established until 1934-35. At that time 18 doves were allowed daily per hunter, but the number was increased to 20 in the 1935-36 season. Since this date the bag limit has gradually been reduced to 10.

Present Status of the Mourning Dove

Regardless of the increasing protection given the mourning dove indications are that the population has recently been declining. This situation has caused alarm and promoted extensive research by states and federal research biologists.

SCOPE OF STUDY

Purpose

The purpose of this study was to determine and interpret those activities associated with nesting of the mourning dove. It was hoped that this undertaking might result in a better understanding of the bird's life history and also provide data useful for its management in those states where it is a legal game bird. Several years prior to 1950 the mourning dove population had been decreasing at an alarming rate. This situation promoted research by biologists in the states concerned and by the federal government. Little information was available from states where the bird was not considered a game species, yet, these states were in the bird's breeding range and yearly produced substantial numbers of young. Better management of the mourning dove will be possible when information on nesting is available from all parts of the bird's range.

Observations were made over a two-year period. Between March 6 and May 30, 1951, all nests observed were in the vicinity of East Lansing, Ingham County, Michigan. In 1952, in addition to areas in Ingham County, an area in Shiawassee County was studied. In both years all observations were made within 15 miles of East Lansing. This region is rather uniform and fairly representative of south central Michigan. A few gently rolling moraines trend east and west across the region; the maximum elevation does not exceed 850 feet above sea level. Between the moraines occur till and outwash plains. Drainage is accomplished through several small shallow

streams which empty into the Grand River. About 50 percent of the region is farmed, with corn, small grains, and hay as the chief crops.

No definite areas were especially selected for the study; however, the majority of nests were found in concentrations and this limited the study to a few places in both years. In 1951 three areas in particular were found containing nests. The Michigan State College campus yielded several nests. These were found in conifers, mostly in Norway spruce (*Picea abies*) which is the dominant tree on much of the campus. The under story of blue grass (*Poa pratensis*) was kept mown. All nests on the campus were within a few feet of sidewalks or paths used by students throughout the day. The close association of nests with humans seemed to have little effect on nesting doves. One nest located directly above a path fledged young; another by an archery range was also successful. During both years nests were found in a five acre nursery at the edge of a residential district. A total of 11 nests was found on the nursery, 8 in 1951 and 3 in 1952. Ten of these nests were located in a row of Norway spruce and one was in a red pine although deciduous trees were more common. Young elm, oak, maple, locust, apple, cherry, birch, aspen, cedar, and willow on the grounds had grown sufficiently to afford nesting sites. The row of Norway spruce where most of the nests were located included 157 trees which were planted four feet apart and were from 20 to 25 feet high. Profuse branching made the row dense and supplied an abundance of substantial and well hidden nesting sites. Many of the trees had been topped at an earlier age, resulting in dichotomous crowns. Where the trees had been topped was a favorite nesting site. The other area in

1951 was a lot and dwelling 60 x 80 feet, outside the city limits. Three sides of the lot were surrounded by Norway spruce 30 to 35 feet high. A few white cedar (*Thuja occidentalis*) were on one side of the lot. All nests on this area were found in the spruce.

In 1952 the nursery and college campus were included in the study. In addition to these, two other areas with nesting doves were selected. A farm lot, two-tenths of an acre, was found with a windbreak on two sides. One side included nine spruce planted 40 years ago. They were 40 to 50 feet high with branches 15 to 20 feet long. The other windbreak included Black Willow trees 30 to 35 feet high. All nests of this area were found in the spruce. The other area was on the Rose Lake Wildlife Experiment Station in Shiawassee County. This site included a rural residence occupied by two families. Two windbreaks were in front of the house; one at a distance of 20 yards, the other 90 yards away along a gravel road. Both windbreaks were mixed stands of Norway spruce and white cedar. Spruce, pine, and cedar were also found in the residence yard. Nests were found in all of these plant species, the greater number in the windbreak closest to the dwelling where the trees were higher and more dense than those along the road. Although this area was not visited until June 3, it accounted for more than two-thirds of nests of the entire season. During July a pheasant road census was taken by the biologists at the Rose Lake Station. A distance of 8.7 miles was covered daily for a week. It was found the area here described held the greatest concentration of doves. As many as 25 were seen perched at one time on or near the area.

Methods Used

Nests were found by careful examination of areas where adult doves were seen. Such areas were cruised slowly and all trees and shrubbery examined. It was found that by looking up from beneath nests were more visible than when viewed from the side. Frequently conifers were too dense to permit observations in this manner. In these instances branches and tree trunks were shaken or if the conifer was large the tree was climbed. Climbing and shaking proved the most effective means of flushing nesting doves. Three nests were observed in the process of construction. A few were spotted by the presence of young or the incubating dove. When one or more nests had been found in an area regular searches for more were made at intervals of a week or less. Often nests by-passed in the first searches were located on subsequent trips. It became apparent that only by careful examination of each tree in an area where adult doves were seen could all nests be found. I often found it possible to pass within two feet of well hidden nests without flushing incubating birds.

A four-foot square blind, designed by Lester Eyer, a Michigan State College graduate student, was used to observe nesting activities. The sides and top were made of an olive-green heavy gauge, waterproof canvas. The bottom was open. On three sides were vertical slits which could be opened and closed by means of zippers. The blind was first placed on the ground; however, this proved unsatisfactory since the nest under observation was elevated. Later a 12-foot tower was built and the blind placed over the top. Observations of the nest from the tower were first made

from 20 feet away. This distance was then decreased to eight feet where the blind remained without apparent disturbance of nesting activities.

Other observations in the field were often made from whatever concealment was available. As long as I remained quiet and stationary dove activities proceeded undisturbed. An automobile often served as an effective blind. Three nests being constructed were viewed from my car window. Courtship and feeding were frequently observed by this method.

Measurements and compass directions were taken to determine the location of nests. Height of nests from the ground and distances of nests from tree trunks were measured by means of a steel tape. Distances between nests and nearest dwellings were determined in yards by pacing. Size of nests was taken by measuring the depth and diameter with a 12-inch rule.

Daily weights and measurements were taken of the young from the day of hatching to fledging. Weights were taken by a Hanson Dietetic Scale. Measurements of bill, tarsus, wing, and tail were secured by a straight millimeter scale and a micrometer. A micrometer was used in measuring width and length of eggs.

A total of 30 nestlings was banded with No. 3 Fish and Wildlife Service bands. Young were usually banded between the seventh and tenth day. At this age the legs have nearly assumed adult proportions and the young remain calm during the banding process.

No. 3 color bands were used on 6 young. The use of these bands was helpful in following the movements of individual young after leaving the nest. The tarsus of a dove is short and often hidden from view when in a

perching position. For further identification of young different colors of enamel were used on body feathers. Three adults were marked by painting nest rims.

An attempt was made to capture incubating doves for marking by flushing them into a 6' x 12' bird net. This method proved ineffective. Walk-in funnel traps were also used without success.

GENERAL CHARACTERISTICS OF THE MOURNING DOVE

Physical Characteristics

The mourning dove, often referred to as wood dove, turtle dove, carolina dove, and dove, is a medium sized bird approximately 12 inches in length. The pointed tail is strongly graduated, consisting of 14 narrow and tapering rectrices. The outer rectrices, tipped with white and grayish-white, are easily seen as the dove flushes. A dark band passes across the middle of all pairs of rectrices except the first. In flight the long pointed tail serves to distinguish this dove from other members of the family.

The prevailing color above is grayish-blue; underparts are brownish, tinged with pink. The sides are a lighter cream-buff. A black spot is found on the auricular regions and on each tertial. The sides of the neck reflect a purplish-pink, metallic sheen which frequently extends to the ventral portion of the neck. Adults of both sexes are similar in coloration; however, the female is duller with less metallic sheen on the neck, smaller ear spots, and lacks the pronounced pinkish tinge on the breast. Generally I found it possible to recognize the sexes in good light with binoculars. The metallic sheen was looked for most frequently as a distinguishing mark.

Until three months of age juveniles are recognizable from adults. Until this age they lack the metallic sheen, black ear spots and body feathers have buffish tips.

Systematic Relationship

Since the extermination of the passenger pigeon (Ectopistes migratorius (Linnaeus)) only two members of the family Columbidae have persisted in Michigan, the feral rock dove or domestic pigeon (Columba livia Gmelin) and the eastern mourning dove. Nine genera of doves and pigeons are currently recognized as belonging to the family Columbidae in North America (American Ornithologists' Union, 1931 and supplements). One of these genera, Zenaidura, includes only one species (macroura) and two subspecific forms (carolinensis and marginella).

The classification of the eastern mourning dove is as follows:

Class	Aves
Subclass	Neornithes
Superorder	Neognathae
Order	Columbiformes
Suborder	Columbae
Family	Columbidae
Genus	<u>Zenaidura</u>
Species	<u>Z. macroura</u>
Subspecies	<u>Z. macroura carolinensis</u>

Range

"The breeding range of the eastern mourning dove (American Ornithologists's Union, 1931) occurs in Austral and Lower Transition Zones from New Brunswick, Nova Scotia, southern Maine, Ontario, Michigan, and Wisconsin; west to eastern Kansas and Iowa; and south to the Gulf Coast and the Bahamas. The bird winters from Iowa, southern Michigan, and Massachusetts, south throughout its range, and casually along the eastern coast of Mexico and Central America to Panama; casual or accidental in Greenland, Quebec, Labrador and Bermuda."

In Michigan Barrows reports:

"The mourning dove is an abundant resident of the southern half of the Lower Peninsula during the warmer two-thirds of the year, and in the southern most counties a few doves frequently winter; indeed it is not an uncommon thing to see a few individuals as far north as Lansing at any time of the year when the ground is bare or nearly bare of snow."

More recently Wood (1951) reports:

"Summer resident, abundant in southern half of the Lower Peninsula; locally common northward, but there is no confirmed nest record from the Upper Peninsula. Winter resident, sometimes common in southern third of the Lower Peninsula rare and local north to Luce County."

Contrary to Wood's account of distribution of doves in Michigan I would not consider the bird an abundant resident species, especially when compared to populations in southern states. The distribution is spotty and this may give an impression of abundance. An observer can cover many square miles without seeing or hearing a dove; however, I found one concentration where as many as nine pairs were nesting on less than one-tenth of an acre.

Migration

Early migrants can be expected the latter part of February or early March. The main spring flight for southern counties comes during later March and early April; and from late April to early May for northern counties. Doves have been reported on Isle Royale on May 17.

Considerably more information is available on fall migration. A total of 33,247 doves have been banded in 33 states and provinces between 1920 and June 30, 1948 (Peters, 1949). In Michigan out of 1,963 doves banded, 109 were recovered, 92 outside of the state. From my correspondence

with Mr. Harold Peters, I learned that from these 92 out-of-state recoveries, 60 had been banded in Ingham County, one of the counties studied. Florida and Georgia each accounted for 15; Louisiana, 7; Alabama, 5; Mississippi and North Carolina, 4; Tennessee, Texas, Maryland, South Carolina, Indiana, Illinois, less than 4. This would indicate the majority of doves banded in this region travel across the Appalachians.

In general doves from Michigan, Ohio and Indiana follow one of three routes in southern migration. One flight moves southwest across Kentucky and Tennessee, then crosses the Mississippi valley into Louisiana, Texas, and Arkansas. Others travel south to Mississippi and east along the Gulf Coast. Another flight moves east across the Appalachians and then either north or south.

ARRIVAL AND SELECTION OF TERRITORY

Spring Arrival at East Lansing

Doves were first observed on March 8, 1951 and March 12, 1952. These may have been winter residents but it seems improbable since they were observed in areas which had been visited several times prior to these dates. More pairs than singles were observed among early arrivals.

Preceding nesting the male selects a breeding territory which includes a mating area and nesting site. The area is variable in size, but usually is from 100 to 300 yards in diameter. After the nest is built the area may be reduced to only the nest and a few surrounding feet. Males of paired doves actively defend their breeding territory by pursuit. Frequently a male was seen pursuing another male which happened to fly close to the nest site. The intruder was often chased for several hundred yards before the defender would return to a position near the female. Territorialism is strongest during mating, selection of nest site, and periods of nest construction; it seems to diminish with incubation and brooding.

Territorialism is intraspecific. On one occasion I observed three chickadees closely examine a dove's nest that was under construction. Shortly after this a sparrow flew after the male of this nest and still later three cowbirds and a robin perched near the nest. In none of these cases was an attempt made to defend the territory from these other species.

Courtship and Mating

From conspicuous and usually high perches the male initiates a flight and song pattern designed to gain a female's attention. The nuptial flight usually begins with a cooing perch. A short flight is made with wings flapping conspicuously. This terminates in a glide earthward. The glide may be straight in course or may take on several lazy S turns. During the glide the wings are set slightly below the horizontal plane. Several hundred yards can be covered in one glide and if at the end of a glide the dove has not reached another perch or returned to the one from which he started, another short oblique flight is made.

Barrows (1912) says:

"An individual leaves its perch on a tree, and with vigorous and sometimes noisy flapping, rises obliquely to a height of a hundred feet or more, and then, on widely extended and motionless wings, glides earthward in one or more sweeping curves. Usually the wings, during this gliding flight, are plane of the body, in the manner of a soaring yellowlegs or sandpiper and sometimes the bird makes a complete circle or spiral before flapping its wings, which it does before alighting. This peculiar evolution is commonly repeated several times at intervals of two or three minutes and appears to be a display of flight for the benefit of its mate, the assumption being that only the male dove soars."

Barrows stated further that he had never seen the soaring behavior outside of Michigan, although he was familiar with the habits of mourning doves in New England.

The nuptial flight was most frequently observed before first nesting of the season; however, it was interesting to note the flight during all months of the study, March through August inclusive. Courtship flight and cooing are associated activities; however, they do not occur simultaneously, but rather follow each other. Unpaired males are more

demonstrative and persistent in these behaviorisms than mated males.

I have observed what I believe were single males in courtship flight late in the nesting season. Courtship flight and cooing are more frequently observed between seven and nine in the morning and again between four and six in the evening.

The courtship flight occurs at each phase of the nesting cycle. A marked male from nest three was seen performing a courtship flight and pursuing his mate while the first young of the season, though about ready to fledge, were still in the nest. A day after the young from nest six were fledged the male was observed in nuptial flight. The female was perched nearby.

The most familiar of the courtship activities in doves and pigeons is cooing. Although both male and female mourning dove coo it is the male's song which is most recognizable. The voice of the female is a weak, staccato tone, which is barely audible. The male's song is composed of a low note, followed by a higher note, slurred downward, and from three to five lower notes held at length. Due to the vibrant and penetrating quality of the low notes the coo can be heard up to distances of 300 yards. I found it possible to hear cooing at this range despite a slight breeze against the dove.

Cooing can be heard during all daylight hours of the nesting season; however, time, temperature, and light influence the rate of cooing. Under fairly normal weather conditions cooing will start from one-half to three-quarters of an hour before sunrise and continue for one and one-half to two hours. Cooing then decreases and may cease altogether for a two-hour

period. Presumably this two-hour period is spent by the male feeding before relieving the female at the nest. From eight to nine A. M. cooing resumes and the majority of paired males are cooing shortly before relieving the female of incubation duties which usually occurs between eight and nine A. M.

Other Courtship Activities

Other courtship activities are enjoyed when the male has been accepted by the female. The pair is then often seen perched or flying together. On one occasion I observed such a pair perched on a maple limb 20 feet from the ground. The male bowed to the female from 18 to 30 times during several one-minute intervals. The male then turned his head over his scapulars several times as if preening; however, the motions were too rapid for preening. At the conclusion of this behavior the male pecked the female on the crown and nape. The female was receptive toward all these demonstrations, although the pecking was severe enough to jar her head. Following pecking the male grasped the female's bill with his bill and proceeded to shake her head vigorously while bowing up and down. Copulation followed, the male mounting the female for two seconds. During these procedures feathers were slightly elevated and the wings of the female somewhat drooped; she remained perched close to the branch, and trembled sporadically. Occasionally she would retaliate with a feeble peck at the male's chest region. A 35 minute interval elapsed during this observation. After 15 minutes the male resumed bowing to his mate.

I did not observe these activities after a nest had been established, and it seems rather improbable for them to occur since the eggs are incubated almost continuously.

NESTING

General Characteristics of the Nest

At its best the nest of the mourning dove is flimsy and poorly constructed. In most instances small sticks are loosely laid together to form a rather flat irregular platform. On top of this is placed a limited amount of finer material, e.g., weed stems, rootlets, pine needles and leaves. So limited and poorly woven is the material that frequently the eggs are visible through the interstices of the nest. The nest is only slightly concave with no apparent rim. Were it not for nests usually being placed on firm supports the mortality of young and eggs would undoubtedly be much higher. As it is, most nests remain throughout one season and even up to three and are often used several times. I have a record of one nest being no less than three years old and used during at least two seasons.

The weak tarsi and bill of Columbids may be a factor in their characteristic inability as nest builders.

Although nest margins are rather indefinite, ten nests were selected at random and measured (Table I, page 48).

Frequency of Nesting

The beginning of nesting varies from year to year and seems dependent on prevailing weather conditions. The first nest for 1951 was found on April 8 and for 1952 on April 17. However, a very early nest was reported

to me by Aelred D. Geiss, a Michigan State College graduate student. He found a nest with two eggs being incubated at the Kellogg Bird Sanctuary, Michigan, on March 26, 1952. The nest was later deserted, but reoccupied later in the season.

The first nesting for 1952 came about two weeks later than in 1951. A rather long cold March with frequent rains and snow apparently deterred nesting. Of 20 nest observed during 1951, ten were known to have eggs before April 15. Before the same date in 1952 not even one nest was under observation although birds were observed a month prior to this date and the same areas were inspected for nests both years.

Dove nests have been recorded from Michigan during seven months of the year, March through September (Wood, 1951). March and September nests can be considered as early or late nests and are unusual for this section.

During a relatively normal spring, first nesting begins about the second week in April and may continue through May. All pairs under observation both years had made one nesting attempt by mid-May.

The location of four pairs of nesting doves on a small area during April of 1951 made possible determination of first and second nesting dates and intervals between. Although birds of these four pairs were unmarked the area was under daily surveillance and any arrivals or departures would have been noticed. Data on the first nesting of these pairs are given below:

Nest 3	started April 14.....destroyed April 28
Nest 7	started April 14.....fledged young May 11
Nest 8	started April 24.....destroyed May 8
Nest 6	started May 8.....destroyed May 21

Three new nests with eggs were found in mid-May; Nest 16 on May 12, Nests 17 and 18 about May 19. It seems probable that the pair from Nest 3 renested in Nest 16 and pairs from Nest 7 and 8 renested in Nests 17 and 18. If this was the case an interval of from 11 to 14 days occurred between nestings. Study on this area ended before it could be determined if the pair from Nest 6 renested.

The number of nests by months is graphically shown in Figure I, page 47.

The interval between completion of the nest and laying of the first egg is variable, but usually is from one to three days. It often happens that nest material is added after the first egg has been laid. The pair at Nest 19 added material with two eggs in the nest. In Nests 1 and 3 there was a two-day interval between nest completion and laying of the first egg, in Nest 4 a one-day interval.

Nest Building

Both male and female take an active part in nest building. The female apparently selects the nesting site and begins the nest by bringing a few sticks to this site. On a few occasions I flushed females from locations where no nesting material was present, but appeared a day or so later. It was also fairly common to find where a few sticks had been placed and the nesting discontinued. In these instances we can surmise the female changed her mind about a nesting site or perhaps weather conditions discouraged the attempt.

After the site has been selected and a few sticks laid down, the male selects and carries materials to the female until the nest is completed. I was fortunate in being able to observe three nests under construction; however, interruptions prevented me from taking notes except on Nest 2.

Before nest building started the pair was perched on a nearby wire. At 7 A.M. nest building commenced. There were already a few sticks at the nest site, presumably placed there by the female. Sixteen trips were made by the male with material between 7 and 7:20 A.M. Following this attentive period a ten-minute recess ensued during which time the pair made short flights together or were perched near each other while the male cooed. At 7:30 A.M. nest building was resumed and lasted until 8 A.M. Twenty-four trips were made by the male to the nest during this period. When gathering material the male made several trips to small areas within 75 feet of the tree. Within these areas the male walked about searching for material. Stems and sticks were often fast and after a futile attempt to lift these the male would proceed to search for a piece of material which was free. Only one piece of material was carried to the nest at a time and if this was dropped enroute the male continued on to the nest before returning to the ground for another piece of material. Sixteen trips to the nest were made by the male between 7 and 7:20 A. M. and 24 trips between 7:30 and 8 A.M. or a total of 30 trips in 50 minutes, an average of one trip every one and two-thirds minutes.

When I returned to the area at 4 P. M. the nest appeared no further along and I could not find the pair in the immediate area. Following

are a few brief observations concerning this nest beginning the following afternoon:

April 13, 1951: 4:30 to 5:00 P. M.
Weather: Rain; temperature 45°F. Nest appeared no further along. Both doves were perched together about 20 feet from the nest.

April 14, 1951: 7:00 to 7:15 A. M.
Weather: Cloudy, temperature 34°F. Female on nest, male made four trips with nest material to nest during this 15-minute period.

April 15, 1951: 1:00 to 2:00 P. M.
Weather: Cloudy, windy, temperature 43°F. Dove was on the nest during this period.

Nice (1922) made the following observation during the construction of a nest: "In three and one-fourth hours the male made 82 trips with material. At about a third of the trips he stepped on her back and laid his offering before her but the rest of the time he merely placed it on the rim."

Materials used in nests were found close to the nesting site. Small dead sticks three to five inches long and from one-eighth to one-half inch in diameter were used in the platform. Smaller sticks, grass and weed stems, and rootlets were often found lining the nest. The number of pieces in a nest is variable. Nests 7 and 12 were selected at random and pieces of material counted. Nest 7 was composed of 161 pieces, Nest 12 of 98 pieces.

OCCURRENCE OF NESTS

Although deciduous trees are the more common type in this region, nests were more often found in conifers, especially spruce and cedar (Table II, page 49). These and other evergreens are rather uncommon except as they have been planted in landscaping or to serve as windbreaks. As a result nests were usually found in the vicinity of dwellings. The average distance of nests from dwellings in 1952 was 58 yards; however, considerable variance was found among nests. Two nests were found only three yards from the outside wall of a dwelling. Five nests were less than ten yards from a dwelling, and five were over 100 yards. The greatest distance of a nest from a dwelling was 500 yards. The majority of nests over 100 yards were located in marshes in black willow trees. Of 20 nests in 1951, two were in a marsh; in 1952 three out of 33 nests were found in marshes. All marsh nests were over water. Nest 14, the lowest of all nests, was built on bent-over marsh grass one foot above the water (Plate I, page 46).

Nests varied a great deal in their height from the ground or water. No nests were found on the ground, although this condition has been reported by McClure (1942). Several nests were less than three feet from the ground. The highest nest, Nest 30, was 37'4" high in a Norway Spruce. The average height of 20 nests in 1951 was seven feet, two inches. Of 33 nests in 1952 the average was 14'6". This variation was due to the taller trees found in the additional areas studied in 1952. The majority of nests observed in 1952 were in areas where many trees were over 30 feet high;

however, only three nests were found above this height. As a general rule doves are low nesters.

The average distance of nests from the trunk was found to be similar for both years. In 1951 the distance was four feet, four and one-half inches. In 1952 the average was four feet, eleven inches. Here again the slight increase in 1952 may be attributed to the larger trees on the areas. One-half of the nests in 1952 were found with one side in contact with the trunk; the same position was observed in about one-fourth of the nests in 1952.

Of those nests removed from the trunk some preference may exist as to direction. Of the 33 nests in 1952 there were 25 dependent entirely on branches for support. Of this number 15 were on branches pointing in a southerly direction, i.e., south, southeast, or southwest. Five nests were found on branches pointing north and four on easterly and two on westerly branches.

On several instances nests were found close enough together to suggest a semi-colonial nesting behavior. At the Rose Lake area, which was perhaps the optimum in nesting sites, two nests were found in a single tree on three different occasions. Nests 29 and 31 were five feet apart; one directly over the other. This was the closest nests were found together. Nests 21 and 28 and 18 and 19 were 12 and 24 feet apart respectively. A total of 11 nests was found active at one time in a small windbreak less than 25 yards long plus four conifers included back of the windbreak in the residence yard at the Rose Lake area.

EGGS AND EGG-LAYING

Characteristics of the Eggs

The eggs are white and smooth with little gloss. Their shape is usually elliptical-oval, but frequently ovate (Bent, 1932).

The average length and width of 12 eggs which were selected at random from 7 nests was 21.54 mm x 28.29 mm. Eggs of one nest were found identical in size. The maximum difference between eggs of the same nest was 2.5 mm. Table III, page 50, gives the measurements of the 12 eggs.

The clutch number of 52 nests observed did not exceed two. In four nests only one egg was found, but broken shells and yolk remains near two of these indicated predation. Tree-cutting operations accounted for the destruction of another egg and the remaining one-egg nest was inactive. This egg appeared infertile. More than two eggs have been reported by other workers, but in these cases more than one female may have contributed to the nest. Nice (1922) made inquiry of Dr. Wallace Craig and Dr. Oscar Riddle concerning nests with more than two eggs. She quotes from their letters.

Dr. Craig replied:

"The question is partly a physiological one whether it would be possible for a female dove to lay three eggs in one set. As to the question of behavior I suppose it possible that a female might lay in another's nest. Or I suppose it possible that two females might form a homosexual union as they sometimes do in captivity."

Dr. Riddle made the following reply to Mrs. Nice:

"I very much doubt that mourning doves ever lay three eggs in one clutch. It seems to me probable that where three mourning dove eggs are found in one nest they have one of the following origins:

"(I) The same female has laid eggs or an egg and while incubating has again laid in the same nest. (We have a very few ring-doves who do this.)

"(II) The eggs are laid by two different mourning doves.

"If the latter happens, one conjecture would be that the same male had mated temporarily or otherwise with two females. We have observed considerable lapses of fidelity of male doves to their mates."

On one occasion I observed two females and one male perched near a partially constructed nest; however, I did not determine whether both females contributed to the nest. Taylor (1941) observed one male carrying nest material for two females which were constructing a single nest.

The interval between the beginning of the nest and laying of the first egg is variable. In three instances this time was known to be from one to three days. Nest material is often added after appearance of the first egg and for one nest I observed material brought to a nest with two eggs. Usually there is not a definite interval between building the nest and egg-laying, but rather a continuous process. Nest 6 in the nursery area was an exception. On April 21 a female was flushed from this partially constructed nest, but on several later visits a dove was not seen near the incompleated nest. On May 8, 16 days after the nest was discovered, a dove was flushed from two eggs. Young were later hatched from eggs assumed to be laid on May 7 and 8. It seems unlikely that another pair of doves would have utilized the nest, since four pairs of doves were seen regularly in the area and three of these were nesting during the 16-day interval.

The interval between laying of the first and second egg is usually 12 hours. First eggs are often laid in the evening between 4 and 6 P. M. Second eggs are then laid the following morning between 6:30 and 9:00 A. M. (Nice, 1922).

INCUBATION

From a study of several sets of captive birds the period of incubation has been found to be $14 \frac{1}{2}$ to $15 \frac{1}{2}$ days for the first egg and from $14 \frac{1}{8}$ to $14 \frac{7}{8}$ days for the second egg. (Whitman, 1919) In four nests I found the incubation period to be 14 days plus or minus a few hours. The eggs are hatched between 6 and 10 A. M., the first egg one morning, the second the following morning.

Whitman states from his observations:

"If the egg does not hatch by 3 P. M. one can be fairly certain that nothing will be done until the next morning. It may be fully time for the bird to hatch, but for some reason the hatching is not completed and the bird goes to sleep, apparently to rest, and then wakes up very early with the rest of the birds in the morning and concludes the hatch."

Hatching is made possible by a "egg tooth" located on the tip of both the lower and upper mandible. The egg shell is pipped and cracked in a counterclockwise direction at about the line of maximum circumference. Approximately 44 pecks per minute are made by the young (Taylor, 1941). The two portions of the shell remain in the nest until the incubating dove has been relieved by his or her mate, at which time they are carried away. The cap or smaller portion is placed inside the larger portion and the two parts are then removed together. Shells were found 60 feet from one nest and it seems probable they are carried much farther. Often shells were found below nests. Whether these may have rolled from the nests above or been carried by doves was not determined. A white scrap of paper was placed in one nest to see what disposition would be made of it. The paper was promptly carried 40 feet from the nest and dropped to

the ground. Carrying shells away from the nest site undoubtedly provides some protection from predation.

From the time the first egg is laid until the young are fairly well grown the nest is attended almost continuously by one or the other parent. When eggs and very young birds were found unattended they usually had been deserted. Both male and female incubate the eggs, the male during the day and the female at night. The hours of exchange may vary, but are usually between 8 and 8:30 A. M. and 4 and 4:30 P. M. Observations were made of Nest 2 and 3 from a blind during incubation. Following are a few of the notes recorded in the blind:

"Entered the blind at 2 P. M. the temperature is 62°F. The incubating male is undisturbed. He seems to carry on a fitful sleep, eyelids closing for a few seconds at a time. A sparrow scolding near by alerts the dove. The noise caused by the sides of my blind flapping in the wind alert the dove.

"4 P. M. I hear the wings of a dove nearby and then the faint coo of the returning female. The male dove on the nest is standing and walks around the nest once then out on a spruce limb from which he flies. One minute elapses. The female then appears on the nest and resumes incubation.

The female remains on the nest through the night and early morning without relief. The male roosts in the nest tree or a tree nearby. Between 8 and 8:30 A. M. he exchanges duties with the female. Prior to the morning exchange the male is usually found close to the nest site, cooing or feeding.

Incubating doves are little disturbed by mechanical noises. Trains passing within 100 yards of the nest were unheeded, as were nearby automobiles and airplanes. When not dozing or watching activities in the vicinity of the nest, the incubating dove may pick insects from the nest

or preen itself. The position of the dove on the nest is frequently changed during the day.

The reaction of incubating doves to my approach varied. Some were wary and would flush when I was several feet from the nest tree. It was interesting to observe such a pair nesting in approximately the same location both years. I assumed the pair to be the same because their extreme caution was not typical. As it happened two of their known nesting attempts were failures and one of the adults was a victim of predation on the nest. Perhaps individuals which are easily flushed from the nest are more susceptible to predation by drawing attention to themselves.

Other doves were fairly tolerant of my presence. In one instance an incubating dove was marked with yellow enamel across the tail without flushing. It was not uncommon to come within three feet of incubating doves without flushing them. As incubation progressed the tendency to remain on the nest increased and when doves flushed they did so conspicuously with loud flapping of wings and irregular flight. However, they seldom feigned injury of a wing as was common of doves with young.

THE NESTLING PERIOD

The period from hatching to fledging is referred to as the nestling period. At hatching the young dove or nestling is a blind creature incapable of holding up its head. The skin is gray and partially covered with a fine buff-colored down.

The length of the brooding period varies. When undisturbed the young are brooded from 13 to 15 days; however, young develop enough in 10 days to jump from the nest and often do when disturbed. At this age they are incapable of flight and when frightened from the nest flutter helplessly to the ground. Young which fledge prematurely can often be successfully replaced in the nest if the hands are cupped over them, temporarily darkening the nest.

One of the interesting characteristics of the family Columbidae is the method of supplying food for the young. A highly nutritive, yellow viscous fluid is regurgitated by both adults into the mouths of the young. This substance is primarily composed of sloughed-off cells from the inner lining of the crop (Hyman, 1942). Prior to hatching of the young, the nesting adults have crop walls which are thin and transparent; however, after hatching the walls thicken. The substance regurgitated is commonly referred to as "pigeon milk", but this is a misnomer since the substance is not a true glandular secretion. For lack of a better term I will refer to the substance as crop secretion.

The rapid growth of the young would indicate a high nutritive value of the crop secretion. Reed and others (1932) analyzed the secretion from pigeons as follows:

Protein	18.8	per	cent
Fat	12.7	"	"
Ash	1.6	"	"
Water	64.3	"	"

Reed found 100 grams of the substance equivalent to 90 calories. He proved it to be a poor source of Vitamins A and B; however, relatively large quantities are fed squabs and this accounts for their rapid growth. This is also the case with doves where I found the weight of the young more than doubled two days after hatching.

Young are entirely dependent upon crop secretion until three or four days after hatching. From this time until fledging seeds are added to the diet and after seven days of age little if any crop secretion is supplied. Young four days of age and less were generally found with distended crops indicating the large and constant supply of secretion furnished small young. Dissection of the crops from two young, three or four days of age, revealed a mass of yellow curds, each curd resembling a house fly egg. The crop contents were almost 100 per cent secretion, two or three small seeds and a piece of grit were found in each crop.

The young from all except one nest appeared sufficiently fed. Nest 6 was the exception. One of the young in this nest received little if any food after three days of age. At the age of six days the other young, which was fed regularly, was twice the size of the malnourished chick. At my inspections of the nest the undernourished nestling weakly cried for food, its crop completely empty, whereas the normal young had a full crop and was content. The undernourished young was found dead 11 days after hatching; it may have died at nine or ten days of age. The dead nestling remained in the nest until it was completely decomposed. The

other young developed at a normal rate and fledged at the age of 14 or 15 days. Why only one young of this nest was fed was not determined. Both parents were seen brooding the young, but it was not determined if both were contributing food to the nestling.

Gabrielson (1922) gives a detailed account of the process of regurgitation as he observed it from his blind as follows:

"At 7:30 A. M. a swuab backed toward the blind and getting beneath the parent raised its head and mutely begged for food. The adult (presumably the female) responded immediately by opening her beak and allowing the nestling to thrust its beak into one corner of her mouth. She then shut her beak on that of the nestling and after remaining motionless for a short time began a slow pumping motion of the head. The muscles of her throat could be seen to twitch violently at intervals, continuing about a minute, when the nestling withdrew its beak. The other nestling then inserted its beak and the process was repeated, fifteen seconds elapsing before its beak was removed. With intervals varying from five to ten seconds (watch in hand) four such feedings, two to each nestling, occurred. The nestling not being red was continually trying to insert its beak in that of the parent and at the fifth feeding both succeeded in accomplishing this at the same time. The nestlings' beaks were inserted from opposite sides of the parent's mouth and remained in place during the feeding operation although I could not say whether or not both received food. While being fed the nestlings frequently jerked the head from side to side and also followed the motion of the parents' beak by raising and lowering themselves by the use of the legs. They were not more than five days old but had better use of their muscles than the young of passerine birds at from eight to ten days of age. The entire process described above occupied about six minutes after which the nestlings crawled back beneath the parent."

Nestlings are fed until fledged and possibly longer. Marked young from Nest 3 were seen on six different days after fledging. Two days after fledging an adult from Nest 3 was seen to alight in a weed patch at the same spot where a young of Nest 3 was later flushed. I was not able to see if the young was fed. Nine days after fledging the young was observed walking on the ground picking at insects and seeds. During the

evening of this same day the male parent was perched on a wire above the young. The young then flew up to a tree branch nearer the parent. The parent flew to the ground and the young followed. As soon as the young had reached the parent the adult flew back to the wire, leaving the young. The young was not fed during any of these encounters and from every indication the parent was trying to wean the young. The following morning, ten days after fledging, one of the young and the male parent were observed perched together on a wire. The adult flushed and the young followed closely behind for a distance of 300 to 400 yards. The young was not fed at this time.

I have a record of one young which was definitely fed out of the nest. From Nest 27 one of the young had fallen after approximately ten days. This young was marked and observed by Mr. and Mrs. Zorb who saw it fed six days after falling from the nest at which time it would have been approximately 15 days of age.

There is a total lack of nest sanitation among mourning doves. Fecal pellets from the nestlings remain in the nest from the hatching date until fledging. During the first five days pellets are relatively few; however, as seeds are substituted for crop secretion in the diet they become more numerous. The pellets are fairly resistant and remain intact during the summer of the nesting season, but were not present in nests of the preceding year from which young were known to have fledged. I feel that it would be possible on small areas to determine the number of young produced through careful examination of nests. A standard of pellet numbers per fledged young would have to be established.

Although the dove is not aggressive in protecting its young, the trick of feigning injury is an effective means of diverting an enemies attention. This behavior is usually exhibited while brooding the young; however, it was occasionally seen in incubating birds. The ruse varies among individuals, but generally the adult flies 30 to 50 feet from the nest, then flutters to the ground. On the ground one or both wings are extended out and downward. The dove then drags itself along, wings slightly fluttering. Often both adults demonstrate at the same time. The ruse is of short duration and after a few seconds the dove flies to a nearby perch.

DEVELOPMENT OF THE YOUNG

The growth and development of young doves was determined by taking weights and measurements. Weights of two young from Nest 19 appear in Table IV, page 51. Measurements of one young from Nest 14 are found in Table V, page 52. Observations were also made on changes in plumage. One young was taken from Nest 22 and kept in captivity for a period of 42 days for further observations on development.

When hatched the young is almost naked. On the head, tail, abdomen, and wings are traces of fine down or neossoptiles which faintly mark the feather tracts. The down is arranged in clusters of from six to eight long hairlike feathers, light yellow in color. A small white "egg tooth" is present near the anterior end of both the upper and lower mandible. The feet, bill, and eyes are dark brown in color.

The young at one and two days are similar in appearance; the outstanding difference is a considerable change in weight. By the third and fourth day the eyes begin to open and pin feathers are first recognizable on the wing. They appear next on the scapular and tail regions and at five days of age are distributed along all feather tracts, giving the young a very spiny appearance. The clusters of down are pushed out on the end of the pin feathers and are readily broken off as the young moves about. At seven days of age the webs of a few primaries, secondaries, and their coverts begin to show. Most remarkable changes occur on the eight and ninth day when webs become exposed on nearly all feather tracts. Feathers below and in front of the eye and under the wing are

the last to show webs. Pinfeathers still show in these regions several days after fledging. From the ninth day until fledging feathers break from their sheaths at a rapid rate. A few clusters of down still remain attached to the juvenile feathers of the breast and crown regions until fledging and shortly after.

Most contour feathers of the juvenile are tipped with a narrow edge of buff. Except for the retricies the buff-colored edge remains until the juvenile plumage is replaced. The buff edging was very obvious on a captive bird at 40 days of age and this characteristic was used on several occasions to identify young in the field.

The upper "egg tooth" disappears on the ninth or tenth day; however, the lower "tooth" remains after fledging. On a captive bird it was recognizable until the 17th day.

The allantoic scar is a light yellow colored circular area about five millimeters in diameter and is found just anterior to the anus. It is apparent until fledging.

The technique of ageing juvenile doves is still in its infancy. When better developed this will be an important tool for the game manager (Peters, 1951). So far work in this field has dealt with the sequence of moulting primaries and their coverts. The innermost primary covert is the first juvenile wing feather to moult. This is closely followed by the first (innermost) primary. The coverts and primaries moult progressively outward; each primary and its covert is replaced before the next is moulted. Birds with a full set of primaries are very young, probably not out of the nest more than a month. Young with the ninth or tenth

primary missing are at least four months old (Peters, 1951). Birds with the first or second missing are less than a month. Young with the third, fourth, or fifth primaries gone are about five, seven, and eight weeks old respectively. Approximately one primary is lost per week from the 10th through the 13th week; primary six is usually lost the 10th week. Peters reports the moult in captive birds begins 17 days later than that of wild birds; however, once the moult has started it progresses at the same rate. In a captive dove I found the first primary gone at 40 days of age. Unfortunately this bird was killed by a cat two days later. The bursa method of ageing the young of gallinaceous birds apparently is not applicable to doves (Petrides, 1950).

The progress of my captive bird was observed from 9 to 42 days of age. The young weighed 60 grams when taken from the nest and was fed on a diet of corn, bird seed, milk, grit, insects and berries. By 11 days of age the bird had lost 15 grams, which was not regained until 16 days after capture. From this time until 42 days of age an average gain of 1 gram per day was made. At death the bird weighed 80 grams. Daily measurements were taken of the bird's bill, wing, sixth primary, tarsus, and tail. Table VI, page 53, gives these measurements at five-day intervals. It was found that the growth of primaries and rectrices continued during this period, but that the bill and tarsus were almost full length by ten days.

NESTING SUCCESS

As many nests as possible were used in determining nesting success for both seasons, though only nests where results were quite certain were selected. In all instances young had reached ten days of age and from the majority of selected nests the fledged young were seen. The nesting success by months for both seasons appears in Table VII, page 54. These figures represent as nearly a correct account of nesting success as seems possible. In 1951 the study was discontinued the latter part of May; two nests active the latter part of May could not be used. During 1952 the study was continued through August; however, only one nest was found in August and time did not permit following this single attempt.

During both seasons the success for April and May nests was low (Table VII, page 54). As the season progressed in 1952 the success increased to above 60 percent which seems comparatively good for this region. Most failures were due to desertions, which were common early in the season. It was not determined what factors contributed to the large number of desertions, but I believe that low temperatures through April and May discouraged incubation. In only one instance were young deserted. Predation may have accounted for some failures; however, where eggs were found preyed upon it could not be determined if the predator had caused desertion. In the majority of desertions eggs remained in the nest for several days, but in time they would disappear. There were no indications that predation was an important factor in destroying nests. Predation on nesting birds was uncommon. The remains of an incubating adult from Nest 5 were found beneath the nest tree, the only known instance of this kind.

MOVEMENT OF THE YOUNG

Considerable time and effort was spent trying to determine the movement of young after leaving the nest, but with only partial success. Both color bands and enamel were used to mark young before fledging. On four young both bands and enamel were used, since it was found that No. 3 color bands are not conspicuous on the short tarsus of the dove which is usually hidden from view as the bird perches.

Two young of Nest 3 were seen on the third, seventh, ninth, and tenth day after fledging from the nest at 15 days of age. During late afternoon of these days the young were flushed only a few yards from the nest tree. Earlier in the day they could be flushed 60 to 100 yards from the nest tree. Their time on the ground was spent walking slowly about, picking at bits of grit, seeds, or insects, then dozing for brief periods or preening their feathers. Adult birds were seen with the young on the third and tenth day after fledging. It was suspected that on the third day one of the young was being fed; however, on the ninth day the parent disregarded the young which followed it around while feeding. On the tenth day an adult and one young were seen perched on a wire 30 feet above the ground. They flushed and flew a distance of 300 yards; the young following close behind the parent. The parent may have been trying to lose the young. At least this was the last time young and a parent were seen together, although the parents were later seen in this area.

An observation at Rose Lake suggests that the young of several nests tend to group after fledging. On July 4 at 7 A. M. a group of at least

eight young was flushed from an area a few feet square. They flushed similar to a covey of quail and flew in a northerly direction out of sight. These were first nesting young, some of which had been out of the nest three weeks. This group was not seen again.

On several occasions young were seen perched near nests where young had fledged a day or so before. Indications are that the nest tree is used by young for a few days after fledging.

SUMMARY

1. Nesting activities of the mourning dove were studied during the spring and summer of 1951 and 1952 in the vicinity of East Lansing.
2. Doves preferred nesting sites in Norway spruce and other conifers. Nesting concentrations were usually found where conifers had been planted to serve as windbreaks.
3. Migrants begin to arrive early in March. Cooing and nuptial flights are the principle courtship activities of the male. These are performed in a territory which the male defends and which includes the nesting site.
4. Although nests are poorly constructed they are usually well placed and often remain for several seasons. They are frequently used more than once in a season and sometimes during successive seasons. Both sexes help in constructing the nest; the male carries the material, the female arranges it.
5. In 1952 the average distance of nests from dwellings was 58 yards; average height 14'11"; average distance from tree trunks 4'11".
6. A few nests were found close enough together to suggest a semi-colonial nesting behavior.
7. The clutch invariably consisted of two eggs. Eggs were usually laid about 12 hours apart. Nest building often continues after the first egg is laid.

8. Incubation requires 14 to 15 days with both parents sharing in incubating duties. The young are aided in hatching by a small "egg tooth" located at the tip of both mandibles. Empty egg shells are carried from the nest by one of the parents.
9. Young are brooded by both parents for a period of 13 to 15 days during which time food for the nestlings is regurgitated by both adults. Very small young are fed on a diet of "pigeon milk"; however, seeds are gradually substituted for the "milk" after the second day. Usually both young were found well fed. One of the two nestlings in Nest 6 was left unfed and died.
10. Development of the young was studied by taking weights and measurements. These appear in table form. Other developmental changes were observed in nestlings and a captive bird.
11. During both years nesting success was poor in April and May. In 1952 success for June and July was approximately 65 percent, i.e., that percentage of eggs yielded fledged young. The majority of nesting failures was due to desertions which were more common early in the season. Indications were that predation was a minor factor in nesting success.

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PLATE I

Mourning Dove Nest on Marsh Grass



FIGURE I

Number of Active Nests by Two-Week Intervals During 1952

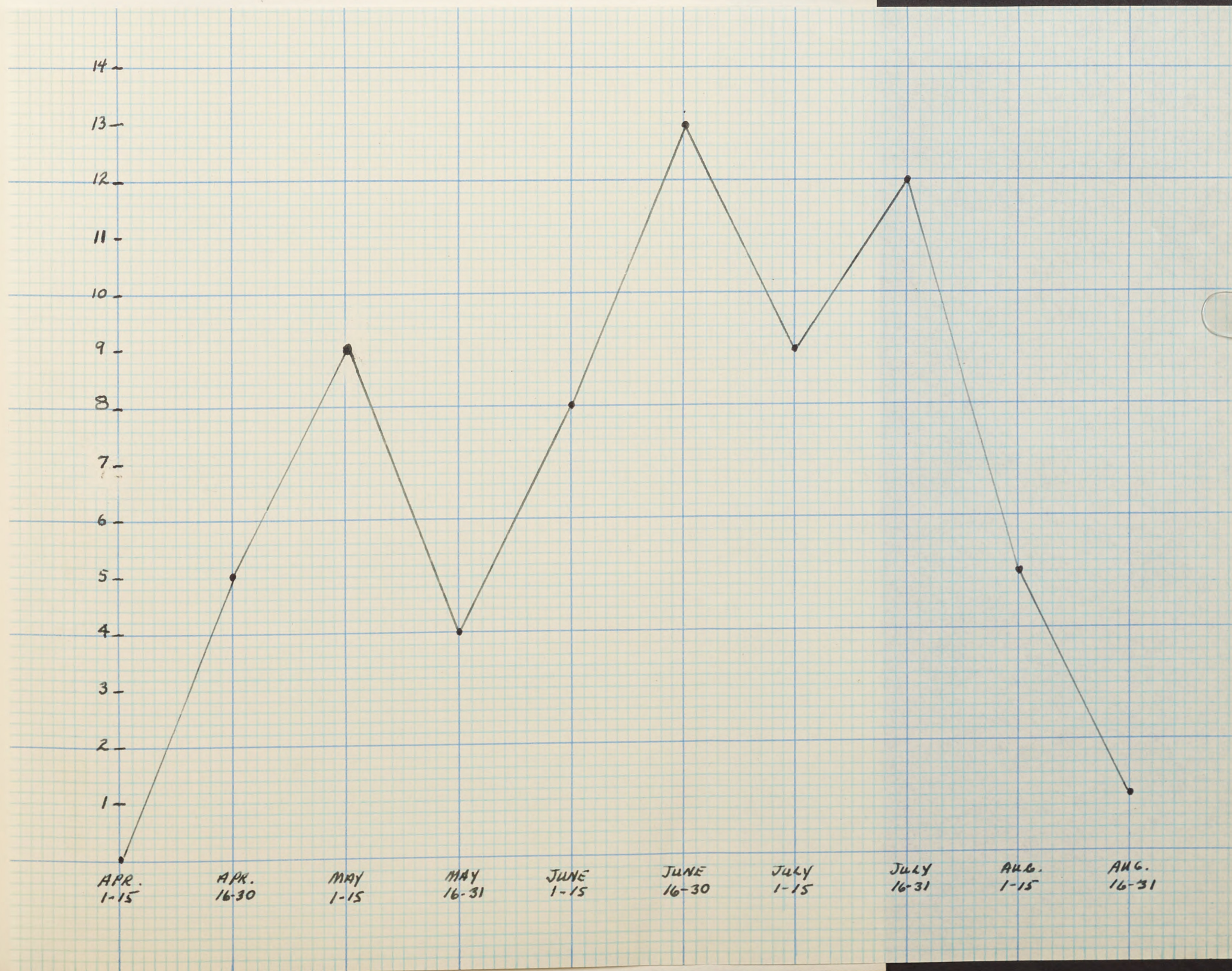


FIGURE I

Number of Active Nests by Two-Week Intervals During 1952

TABLE I
MOURNING DOVE NEST MEASUREMENTS
(calculated from 10 nests)

	Inches
Maximum outside diameter	5.5
Minimum outside diameter	4.5
Average outside diameter	5.0
Maximum inside diameter	3.5
Minimum inside diameter	2.5
Average inside diameter	3.17
Maximum outside depth	2.5
Average outside depth	2.22
Average inside depth	.57

TABLE II
PLANT HOSTS OF 53 DOVE NESTS

Plant Species	Number of Nests	Percent of Total
Norway Spruce (<u>Picea abies</u>)	35	66.03
Black Willow (<u>Salix nigra</u>)	5	9.43
White Cedar (<u>Thuja occidentalis</u>)	4	7.54
Red Pine (<u>Pinus resinosa</u>)	3	5.66
Apple (<u>Pyrus</u> sp.)	1	1.89
White Pine (<u>Pinus strobus</u>)	1	1.89
American Elm (<u>Ulmus americana</u>)	1	1.89
Burr Oak (<u>Quercus macrocarpa</u>)	1	1.89
Bur Reed (<u>Sparganium</u> sp.)	1	1.89
Dead Stump	1	1.89
Totals	53	100.00

TABLE III
MEASUREMENTS OF 12 EGGS IN MILLIMETERS

Nest Number	Width	Length
14	22.0 22.0	29.0 29.0
16	21.0 20.5	27.5 28.0
17*	21.0	28.0
21	22.5 21.5	26.5 28.0
22	21.5 20.5	28.5 28.0
25	22.0 22.5	28.0 30.0
26*	21.5	29.0
Averages	21.54	28.29

* The other egg in this nest was destroyed.

TABLE IV
DAILY WEIGHT IN GRAMS OF TWO YOUNG MOURNING DOVES

	Bird	1 Day	2 Day	3 Day	4 Day	5 Day	6 Day	7 Day	8 Day
Daily Weight	19A	9.5	13.0	22.0	27.0	35.5	40.0	46.5	54.0
	19B	9.5	11.5	22.0	27.0	32.0	35.0	48.0	
Daily Gain	19A		3.5	9.0	5.0	8.5	4.5	6.5	7.5
	19B		2.0	10.5	5.0	5.0	3.0	13.0	
Average Weight Of Both		9.5	12.25	22.0	27.0	33.75	37.5	47.2	

TABLE V

GROWTH RECORD IN MILLIMETERS OF ONE DOVE
FROM NEST NUMBER 14 DURING A 12-DAY PERIOD

	1 Day	2 Day	4 Day	5 Day	6 Day	7 Day	8 Day	9 Day	10 Day	11 Day	12 Day
Bill	8	8	8	10.5	10.5	13	13	14	14	14.5	14.5
Tarsus	7	7	10	10.5	12	13	15	17	17	18	18.5
Bend of Wing	12	15	24	34	44.5	52	60	65	75	80	95
Extent	55	50	69.5	71	82	82	90	100	112	120	130
Tail	0	0	3	9	10	13	15	20	25	27	40

Average Daily Growth
Of Dove In Millimeters

Bill	1.14
Tarsus	.95
Bend of Wing	6.91
Extent	6.66
Tail	3.33

TABLE VI
GROWTH RECORD OF A CAPTIVE MOURNING DOVE FROM 9 THROUGH 40 DAYS
(Measurements in mm at 5-Day Intervals)

Age in Days	Bill	Tarsus	Tail	Wing	6th Primary
10	16.0	20.0	42.5	93.0	46.0
15	16.0	20.0	53.0	101.0	74.0
20	16.0	20.0	57.5	111.0	75.0
25	16.0	20.0	61.0	114.0	75.0
30	17.0	21.0	61.0	120.0	76.0
35	17.0	21.0	62.0	129.0	79.0
40	17.0	21.0	62.0	136.0	79.0

TABLE VII
NESTING SUCCESS BY MONTHS IN 1951 AND 1952

Year	Month	Number of Nests	Number of Eggs	Young Fledged	Percent Success
1951	April	11	22	9	40.9
	May	6	12	2	16.6
Totals		17	34	11	Average 28.7 Success
1952	April	5	10	3	33.3
	May	6	12	2	16.6
	June	14	24	18	64.2
	July	6	12	8	66.6
Totals		31	62	31	Average 50.0 Success

NESTING ACTIVITIES OF THE EASTERN MOURNING DOVE
IN SOUTHERN MICHIGAN

By

James Lund

AN ABSTRACT

Submitted to the School of Graduate Studies of Michigan
State College of Agriculture and Applied Science
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for the degree of

MASTER OF SCIENCE

Department of Zoology

Year 1952

Approved

George J. Wallace

THESIS ABSTRACT

The recent decline of the eastern mourning dove (Zenaidura macroura carolinensis (Linnaeus)) over most of its range has caused alarm among game biologists and sportsmen. The purpose of this study was to contribute toward a better understanding of the bird's life history and its management as a game species.

A total of 53 nests was found during the nesting season of 1951 and 1952 within a 15-mile radius of East Lansing, Michigan.

Although a few doves winter in parts of Lower Michigan, migrants start arriving late February and early March. Males establish a territory usually over 100 yards in diameter. Courtship activities include cooing and nuptial flights. The territory includes the mating area and nesting site.

Nests are poorly constructed, but usually well enough placed to remain intact for several seasons. They are frequently used more than once. Both male and female aid in building the nest. Norway spruce was the host tree for 66 percent of the nests. This and other species of conifers were preferred especially as they occurred in windbreaks. Nests vary considerably in their distance from the ground, depending largely on the height of the trees in the nesting area. In both years of the study the average height of nests was under 15 feet.

The clutch was found to number two consistently. Eggs are incubated by both sexes for a period of 14 to 15 days. Young free themselves by means of a small "egg tooth" on the bill.

Young are brooded approximately 14 days by both parents. A secretion from the crops of both parents, known as "pigeon milk", is fed to the young for the first two days. A diet of seeds gradually replaces "pigeon milk" from the third day on. The young are fed by regurgitation by both sexes.

Nesting success was low during April and May of both years. Success in June and July was 64 and 66 percent respectively, which is good for this part of the bird's range. Poor success early in the season was due largely to desertions.

Fledged young remain in the vicinity of the nest for at least ten days. Where several fledglings are present on an area they may group to form a covey.

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JY 22 '53

JAN 24 '55

8 Apr 57

~~NOV 16 1961~~

~~APR 30 1962~~

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