A NESTING STUDY OF THE MOURNING DOVE IN KALAMAZOO COUNTY, MICHIGAN

Thesis for the Degree of M. S.

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Larry D. Caldwell

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This is to certify that the

thesis entitled

A Nesting Study of the Mourning Dove

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A NESTING STUDY OF THE MOURNING DOVE IN KALAMAZOO COUNTY, MICHIGAN

BY

Larry D. Caldwell

AN ABSTRACT

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

MASTER OF SCIENCE

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A study was made of mourning doves nesting on adjacent 514-acre and 32-acre study areas in Kalamazoo county, Michigan, from April to September, 1954. An effort was made to determine productivity of doves on the study areas. Cooing dove comparisons were made between the 514-acre area and a 20-mile cooing dove route.

45 adult pairs on both areas nested 165 times and fledged 101 young. 85% of the nests were found in evergreens with red pine and norway spruce receiving the greatest use. Blue spruce and norway spruce were relatively the most preferred plant species for both attempted and successful dove nests. The C_1 and S_2 cover types were most important, receiving the greatest use, however, C_1 and S_3 were relatively the more preferred cover types for nest sites. The number of cooing doves heard was not correlated with the number of active nests. The peak of cooing activity on the 514-acre area was about 54 days later than the nesting peak. Nest success was slightly higher during the last part of the season.

Nest trapping of adults had no significant effect on the breeding success of doves despite deaths among nestlings under eight days old. Four pairs of marked doves renested one to two times with their original mates. Testors' model airplane dope was better than dye for marking doves for individual field identification.

Statistical comparisons of coo counts on the 514-acre area with the 20-mile route showed the 514-acre cooing population to be similar to the 20-mile cooing population. Apparently there was no unusual concentration of doves on the study area.

Sex and age ratios of 75 September-shot doves were about even. 3.4%

of the study areas' fledgling production was in September whereas 41.7% of the 36 adults in the shot sample had pigeon milk in their crops (supposedly indicating the adults were with dependant young). Some juvenile testes were as large as those of adult males.

Regulated hunting of the dove in Michigan is theoretically possible. A hunting season in Michigan should be between September 8 and 23 to insure few losses of nesting adults and to avoid missing all of the migrants. Experimental open seasons in selected areas would provide much information on the possibilities of the mourning dove as a game bird in Michigan

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A NESTING STUDY OF THE MOURNING DOVE IN KALAMAZOO COUNTY, MICHIGAN

Cooperative studies of the mourning dove (Zenaidura macroura) are now underway in many areas of the United States (Peters, 1950 and 1952). In Michigan, population investigations have been undertaken only within the last few years (Davey, 1954; Lund, 1951). The present study is an effort to contribute to the knowledge of the life history of the species and especially to learn something of its potential value as a game bird in Michigan. Field work extended from April 1 to September 30, 1954.

ACKNOWLEDGEMENTS

I wish to express my gratitude to Dr. George A. Petrides of the Department of Fisheries and Wildlife at Michigan State College for suggestions in analyzing the data and for critical review of the manuscript. Aelred D. Geis, instructor in Fisheries and Wildlife at Michigan State College, suggested the study and provided helpful advice during the period that Dr. Petrides was on leave. Dr. Arthur E. Staebler, then director, made available the facilities of Michigan State College's Kellogg Bird Sanctuary and C. M. McCrary, superintendent, cooperated on Kellogg Farm properties and on the Michigan State College Biological Station. Harold S. Peters, U. S. Fish and Wildlife Service biologist coordinating dove studies, provided helpful suggestions and information. Dr. Don W. Hayne, Department of Zoology, helped in the statistical analysis. Dr. Leslie W. Gysel, Department of Fisheries and Wildlife, assisted by lending photographic equipment.

LOCATION AND DESCRIPTION OF THE STUDY AREAS

The study areas were the Michigan State College Kellogg Bird Sanctuary and Farm (514 acres including the roadside) and the nearby Michigan State College Kellogg Biological Station (32 acres). Both are in Kalamazoo County in southern Michigan (Fig. 1). The Sanctuary-Farm area is located in T1S, R9W, Sec. 8, and the Biological Station is located nearby in Sec. 7. The land in this area is of low relief with lakes, bogs, marshes, swamps and occasional streams. Basins and winding valley depressions are common.

The study areas were mapped and the vegetation categorized into 15 cover types according to vegetative growth and species composition. The data were taken from the Ph.D. thesis of Aelred Geis which is in preparation at Michigan State College. All vegetation types were scattered over the study areas. 34 samples 8 millacres in size were taken from each of the 15 cover types in numbers proportional to the areas covered by each type. Plants less than five feet high were not considered since no doves were observed nesting in plants this small.

Descriptions are given below of the 15 cover classifications used. Plant cover is listed by the percentage of ground covered in an average quadrat by the canopies of plants of each species. In situations where plant canopies overlapped one another (including canopies whose stems were not found in the sample areas), it was possible for plant cover to total more than 100%. The plant species in the 15 cover types are listed in descending order according to the amount of ground they covered. The percentage of ground covered by the plants and the number of plants contributing cover to an eight millacre quadrat follow the species name and are

given in that order. Plants that covered less than .5% of the ground are listed as trace (t) items.

Descriptions of the cover classifications:

O - Cultivated land or areas vegetated by low grasses, herbs or prostrate shrubs. Trees and bushes covered less than 10% of the area.

K - Open water

S_1 - Overgrown land with a woody plant cover which ranged from 10% to 35% and averaged 28% of the ground cover, the remainder being open or with plants less than five feet tall. The vegetation was 5 to 40 feet tall and stems were 1/2 to 10 inches in diameter at breast height (d.b.h.). Staghorn sumac (Rhus typhina *) 15-3, gray dogwood (Cornus racemosa) 14-6, flowering crabapple (Malus sp.) 3-1, silky dogwood (Cornus amomum) 1-4, tartarian honeysuckle (Lonicera tatarica) 1-1, red osier dogwood (Cornus stolonifera) 1-2, morrow honeysuckle (Lonicera morrowi) 1-1, choke cherry (Prunus virginiana) t-2, large-toothed aspen (Populus grandidentata) t-1 and sassafras (Sassafras albidum) t-1.

S_2 - Overgrown land with a woody plant cover which ranged from 35% to 60% and averaged 40% of the ground cover. The vegetation was 5 to 15 feet tall and stems were 1/2 to 4 inches d.b.h. Staghorn sumac 20-4, smooth sumac (Rhus glabra) 7-2 tartarian honeysuckle 5-1, silky dogwood 4-1, quaking aspen (Populus tremuloides) 5-1, sassafras 2-1, large-toothed

* The authority for the plant binomials used is Muenscher (1950).

aspen 1-1 and black locust (Robinia Pseudo-acacia) 1-1.

S_3 - Overgrown land which had 75% woody plant cover (one quadrat). The vegetation was 5 to 27 feet tall and stems were 1/2 to 5 inches d.b.h. Staghorn sumac 50-4 and white spruce (Picea glauca) 25-1.

T - Stands of tall shrubs or small trees which had an average of 95% ground cover. The vegetation was 5 to 49 feet tall and stems were 1/2 to 11 inches d.b.h. Tartarian honeysuckle 30-15, gray dogwood 25-15, red osier dogwood 15-4, silky dogwood 10-2, common elder (Sambucus canadensis) 9-1, small pignut hickory (Carya ovalis) 7-1, willows (Salix sp.) 7-2, black cherry (Prunus serotina) 5-1, pin oak (Quercus palustris) 4-1, large-toothed aspen 3-1, white cedar (Thuja occidentalis) 2-1 and choke cherry 1-2.

W_1 - Young deciduous woods which had an average of 96% woody plant cover. The vegetation was 5 to 70 feet tall and stems were 1/2 to 14 inches d.b.h. Red maple (Acer rubrum) 35-1, black oak (Quercus velutina) 21-1, gray dogwood 18-2, sassafras 10-3, white oak (Quercus alba) 10-1, willows 10-2, black cherry 8-1, staghorn sumac 8-1, tamarack (Larix laricina) 7-1, serviceberry (Amelanchier sp.) 1-1, and small pignut hickory 1-1.

W_2 - Old deciduous woods which had an average of 95% woody plant cover. The vegetation was 6 to 78 feet tall and stems were 1/2 to 21 inches d.b.h. Black oak 35-2, white oak 35-1, small pignut hickory 30-1, black cherry 20-2, tartarian honeysuckle 10-2 and hawthorn (Crataegus sp.) 2-1.

R - Residences, including lawns, shade trees and surrounding buildings.

C_1 - Even-age red pine plantings which had an average of 90% woody plant cover. The vegetation was 19 to 41 feet tall and stems were 4 to 9 inches d.b.h. Red pine (Pinus resinosa) 92-5.

C_2 - Even-age white and jack pine plantings which had an average of 95% woody plant cover. The vegetation was 49 to 58 feet tall and stems were 3 to 8 inches d.b.h. White pine (Pinus strobus) 55-5 and jack pine (Pinus banksiana) 45-3.

C_3 - Even-age scotch pine plantings which had an average of 95% woody plant cover. The pine trees averaged 35 feet tall and were 9 inches d.b.h. Five foot honeysuckle shrubs with 1/2 inch d.b.h. occurred locally throughout the stand. Scotch pine (Pinus sylvestris) 90-6 and tartarian honeysuckle 5-1.

C_4 - Even age white and western yellow pine plantings which had an average of 95% woody plant cover. The vegetation was 34 to 42 feet tall and stems were 4 to 8 inches d.b.h. White pine 65-5 and western yellow pine (Pinus ponderosa) 35-2.

C_5 - Even age white pine plantings which had an average of 90% woody plant cover. The vegetation was 30 to 37 feet tall and stems were 6 to 8 inches d.b.h. White pine 90-6.

C_6 - Open, even age norway spruce plantings which had an average of 75% woody plant cover. The vegetation was 6 to 43 feet tall and stems were 1/2 to 9 inches d.b.h. Norway spruce (Picea abies) 75-3, black cherry 1-1 and tartarian honeysuckle 1-1.

The fifteen categories described above were intermixed as mapped in Figure 2. Some details were sacrificed for clarity.

TRAPPING AND MARKING METHODS

On the Sanctuary-Farm area, adult doves were trapped on the nest, banded with U.S. Fish and Wildlife Service aluminum leg bands and color marked. Nest trapping was not carried on at the Biological Station so that comparisons could be made with nesting success at the Sanctuary-Farm where trapping was undertaken. Attempts to bait doves for trapping were not successful.

A number of four to seven-day old nestlings died while their parents were being trapped (Table I), so after July 20 trapping was delayed until nestling were eight days old. Exposure was assumed to be the cause of these deaths. There were fewer deaths after this procedure was adopted. The lower rate of nesting success for the population during the early part of the summer (Fig. 3) may have been affected by the earlier nest trapping but statistical comparisons of nesting success on the two areas (see beyond) failed to disclose significant differences.

From April 1 to May 22, 22 adults were marked with red, yellow, and white Testors' model airplane dope (Swank, 1952b) applied in transverse bands to the flight feathers over an application of clear dope (Fig. 4). This operation took about 25 minutes per dove. 21 adults were identified a total of 46 times (Table II). The longest time interval between marking and field identification was 108 days. After 71 days, however, the paint scheme became unreliable because the mark was partially missing (two observations).

57 adults from 36 nests (pairs were marked alike) were dyed with picric acid and Dupont crocein scarlet and milking blue. The shoulder, breast, primary, belly and tail feathers were dyed in various combinations (tail feathers were always included in a marking scheme). Dye disappeared from the breast within 63 days (two recaptures), but remained for a longer (but undetermined) time on the tail. 71 dyed doves seen in the field had dyed tails. 22 of these also showed dye marks on other regions. Just three pairs of doves were marked on the tail only so it is probable that some of the 49 doves seen with only a dyed tail had been previously marked in some other body region. Apparently dye was a better mark for the tail than for other regions. It is not known whether or not all doves retained their tail marks..

Testors' dope seemed to be the more reliable of the two marking methods. A simpler marking scheme for fewer birds would have made the application and field identification of the mark easier.

NEST ABUNDANCE

Doves have an incubation and brooding period of about 14 days each and are considered to be continuous breeders during the mating season. (Moore, 1940; McClure, 1942; Quay, 1951; Swank, 1952a; and Fig. 5). The study areas were divided into units and each was systematically covered once every two weeks. Each successful nest therefore had two chances of being discovered while it was being used.

A second clutch of eggs may be laid about four days after a previous effort (McClure, 1942; Swank, 1952a; and Fig. 5). So to avoid counting one pair of doves at successive nestings as two pairs, the number of active

nests on the study areas were tallied in four-day periods (Fig. 3). From these data, most ~~of the~~ nests (53.4%) were active between April 21 and June 7, a period of 46 days. Peak activity was reached rapidly and was followed by 110 days of gradually diminishing activity. It is interesting to note that the percentage of successful nests gradually increased as the density of nests decreased. Webb (1950) observed a similar increase in nest success toward the end of the Ohio nesting season.

Investigators in several states have reported similar observations on the peak of dove nestings (Table III) except for early August peaks observed in North Dakota (Boldt and Hendrickson, 1952; Randall, 1955). No consistent differences can be found between the dates at the start and close of nesting seasons recorded in Michigan as compared with elsewhere. Data for the same year from several states should be used in comparisons of this type to avoid differences in successive nesting seasons but such information is not available.

A total of 83 adult doves were trapped and banded on the Sanctuary-Farm area. These included 27 pairs and and 29 singles. Of the latter, 24 were color marked. It is possible that each of these 24 represented a pair, since it is possible that if both individuals of a pair had been marked this would have been evident. While 41 nests were the highest number found at any one time on the area (Fig. 3, May 11-12), it is likely that as many as 51 (27 known plus 24 possible) pairs of doves nested on the Sanctuary-Farm area sometime during the study period. Four additional pairs were observed nesting at the Biological Station.

NEST SITE SELECTION

Numbers of nests attempted and numbers of successes are shown in

tables IV and V for each species of plant and for each cover type. Also shown is an index of relative nesting value of each category computed on the basis of area.

Evergreens contained 85% (131) of the nests although they covered only 5.9% (32.3 acres) of the study area (Table IV). Red pine and Norway spruce, as species, were most important, containing more than half of the nests attempted (98) and successful nests (31). However, blue spruce and norway spruce were relatively the most preferred plant species for both attempted and successful dove nests. Red pine ranked fourth in relative preference while it ranked first where its area was not considered.

Chi-square tests of homogeneity indicated no statistical differences in nest success among the plant species: red cedar, red pine, norway apruce, white spruce and "all others combined".

In blue spruce, however, the six nests attempted resulted in five successes, a fact concealed above. Considered by itself, this degree of success seems unlikely to have been only an event of chance. With the overall average nest success of .354 (see Table IV), the probability (by binomial expansion) of 5 successes and 1 failure in 6 attempts is only .025. Blue spruce apparently is a far better than average site for dove nests.

The C_1 and S_2 cover types contained over half of the attempted nests (94) and successful nests (34) however C_1 and S_3 were relatively the more preferred cover types for nest sites (Table V). The chi-square tests applied to the plant species above were also used for cover types. With cover

types the categories used were: types' C_1, C_5, S_1, S_2, S_3, T and all others. These comparisons indicated no statistical differences in nest success among cover types.

In Iowa, McClure (1941) found that doves selected nest sites in trees in relation to the abundance of the tree species. This did not seem to be the case in the present study, however, since doves nested more in some species such as red pine and norway spruce which made up a small percentage of woody vegetation.

RENESTING AND MOVEMENTS

Nine pairs of marked doves were observed renesting (Fig. 5). Four pairs were trapped at two nests each. No doves were observed renesting with other than their original mates. It was possible for one of these pairs to have been mated for 130 days (from egg-laying at the first observed mating to fledging the young at the last observed mating). Time intervals between four pairs of successive nests ranged from four to six days and averaged 4.8 days. For any one pair, 53 days (two nests) was the shortest and 131 days (three nests) was the longest time between the start of the first observed nest and the completion of the last. The average distance between new and old nests for these nine pairs was 29 yards. The observed distance between nests probably was not the true average since some other doves not so closely observed could have moved long distances off the area to renest.

Three bands were recovered: a 17-day old fledgling recovered locally three days after fledging, an adult male collected 1 1/2 miles from its banding site after 15 weeks and an adult male shot in Alabama four months after

banding.

NEST SUCCESS

Disturbances by the observer were important causes of egg and nestling losses (Table I). Trapping losses of 24 nestlings were caused by exposure to weather and predators, and five when adults tried to escape from the traps. Flushed adults tended either to knock eggs and young from their nests, to leave their nests exposed to predators, or sometimes to desert. Nestling losses probably could have been lowered considerably had emphasis not been placed on trapping all of the adults.

Although a number of nestling losses were attributed to nest trapping (Table I and see beyond under mortality causes), chi-square tests between nestings attempted, successful nestings and nestlings fledged (Table VI) on the Sanctuary-Farm area as compared with similar data from the Biological Station indicated no significant differences. Since the effect of nest trapping on the mourning doves' breeding success was not important statistically, the data for the two areas were combined (Table VI).

Quay (1954) states that in North Carolina each nesting female must produce 4.6 young per year to maintain the species. Nesting success of this order is necessary to balance a 70% yearly population turnover which he calculated from dove band returns of mixed age classes. The present Michigan study areas had less than three young fledged per adult pair. Apparently neither breeding population was successful enough during 1954 to maintain its status if Michigan populations have as short an average length of life as those in North Carolina. Davey (1953) also in Michigan, similarly found a lower nesting success than commonly observed elsewhere (Table VII).

Of the 164 nests observed 21 (12.8%) were missed on the first search.

These 21 nests contained nestlings when discovered. Since these were overlooked once then it is probable that some nests were overlooked a second time. If the above error is assumed to be true for the second search, then three nests may have been missed entirely and it is possible that 167 nestings were made on the study area rather than the 164 observed.

Cooing activity on the Sanctuary-Farm area reached its peak July 23 (see beyond and Fig. 6) although the nesting peak occurred from April 21 to June 7 (Fig. 3). The cooing peak was at least 54 days later than the middle of the nesting peak. Apparently cooing activity during this study was not a reflection of nesting intensity and the numbers of cooing doves cannot be used as an index to the number of active nests on an area.

NESTING MORTALITY

Nine nestlings and 20 eggs were lost to predators (Table I) as evidenced by signs at the nest sites. Proportionately more eggs were lost on the Biological Station by flushing the adults than on the Sanctuary-Farm area. A small proportion of the predation losses on the Biological Station were nestlings as compared with the Sanctuary-Farm area. The disturbances in nest trapping could have enabled predators to kill the Sanctuary-Farm nestlings.

A blue jay (Cyanocitta cristata) was observed eating two eggs, and in another instance a blue jay was seen decapitating two nestlings. Successful kills of adults and fledglings were found (Table VIII). The identities of the latter predators were not determined.

Bronzed grackles (Quiscalus versicolor) once chased a crow (Corvus brachyrhynchos) from its perch in a tall elm causing it to drop an adult

male dove. The dove's crop and 30% of its feathers were missing. Many bloody feathers were scattered about an active dove nest 40 yards away. Apparently, the nest belonged to the adult. The crow may have killed the dove on or near the nest.

From June 15-22, two camera traps (Gysel, in press) were used to photograph egg predators. The traps were placed by old dove nests with dove eggs as bait. The eggs were attached to the tripping mechanism by a piece of thread. The traps were in operation 723 hours at three nest sites. The eggs were disturbed eight times, but only three exposures were made because of mechanical difficulties. One picture showed a red squirrel (Tamiasciurus hudsonicus) and another a blue jay. A third was of a small bird which could not be identified. The pictures labeled the first two species as probable egg predators.

Three doves (two fledglings and an adult) with injured wings were handled during the summer. None of the three was able to fly. The injuries could have been caused by flying into obstructions.

Six nestlings were found whose throats were swollen. All died but their bodies were not discovered in time to determine the presence or absence of trichomonads (Stabler, 1951). An adult male was found on the Sanctuary, however, just a few hours after death. The presence of trichomonads in the crop was confirmed by Dorothy Hitchcock, instructor of parasitology at the Biological Station. The left half of the crop was filled with lesions and the blood vessels of the neck region were enlarged.

The observed accidents and diseases apparently did not seriously affect the abundance of the doves of this study.

ROADSIDE STUDIES

Coo Counts

It was desirable to know whether the dove population on the study area was typical. Roadside counts of cooing doves on two areas at similar times, wherein 20 three-minute counts are made at early morning stops one mile apart, give reliable indexes to breeding populations (Gresh, 1954). A 20-mile cooing-dove route was established outside the Sanctuary in typical farmlands (Fig. 1). Counts along this route and other which covered the entire Sanctuary-Farm area were made at biweekly intervals from May 15 throughout September 24.

Dove calling activities along the 20-mile route remained rather constant during the early weeks when Sanctuary-Farm cooing intensity was gradually increasing (Fig. 6). Cooing activity in both populations declined after July 23. This could mean that nesting activity on the 20-mile route declined at the same time as on the Sanctuary-Farm area but as previously shown, no direct correlation between numbers of nests and cooing activity prevailed on the Sanctuary-Farm area. Paired Comparisons of the average number of doves heard per stop between the first nine observation days (Fig. 6) indicated that the number of cooing doves did not differ significantly between areas.

As indicated in Figure 7, cooing intensity varied from time to time along both the Sanctuary-Farm and 20-mile route since intervals of two to five days elapsed between counts on the two routes, differences in weather or sampling may be accountable. Paired comparisons of the average coos/ dove/ stop between the first nine observation days (Fig. 7) indicated that cooing intensity did not differ significantly between areas.

With respect to comparisons of cooing doves between the two routes,

the Sanctuary-Farm area was similar to the 20-mile route. Numerical comparisons of nesting population differences on the two cooing-dove routes could not be made since no nesting data were available on the 20-mile route.

Sex and Age Ratios

75 doves were collected in September in the vicinity of the 20-mile cooing dove route and the study areas (Fig. 1). Chi-square tests of the sex ratio of these doves (Table IX) indicated that both adults and juveniles (age was determined by the presence or absence of the bursa of Fabricius) were probably taken from populations with 50-50 sex ratios. The observed age ratio also was even: 36 adults to 39 juveniles.

Hatching Dates by Primary Molt

39 juveniles were among those collected (Table IX). The degree of molt of the primary feathers was compared with that of known age pen-raised birds (Jenkins, 1950) using a 17-day correction factor for wild birds (Swank, 1952) to give their approximate ages (Table X). From these data shot doves apparently had a nesting peak between July 28 and August 8. This was somewhat later than that of the Sanctuary-Farm doves whose peak was April 21 to June 7 (Fig. 3). The cause of the difference is unknown but could be due to errors in aging technique, to the earlier hatched birds having already migrated or to the early young having been exposed to mortality for a longer period of time.

Pigeon Milk

It is generally accepted that the presence of pigeon milk indicates dependent nestlings, but Peters and Wolfe (1954) state that the relationship between glandular crop thickness and nestling dependency has not been satisfactorily determined. Pigeon milk is present only during a part of the brood cycle (Quay, 1951). Thus adults may be nesting and not be producing pigeon milk.

Of the 36 adults collected in September 41.7% had thickened crop walls, four others showed a trace of the thickening. Hamm (1947) reported that 17.8 per cent of 1187 adult doves shot in eastern Tennessee in September possessed pigeon milk. Korschgen (1955) reported that 6.0% to 6.8% of 1369 September doves examined in Missouri in 1951-1953 had pigeon milk. Quay (1951) stated that 20.5% of 278 adult doves examined in North Carolina in September 1939-1941 were still feeding young. Other workers report similar results but all have observed a much lower incidence of pigeon milk in September adults than that observed in the 36 adults of this study.

Only four (10%) of the observed 41 pairs of Sanctuary-Farm doves were nesting in September and could be expected to have pigeon milk in their crops. Since the occurrence of pigeon milk in the shot sample was so high, it seems that either the shot sample was unconsciously biased in favor of doves with pigeon milk or, as seems more likely, the presence of pigeon milk does not necessarily mean that a dove is nesting.

Gonads

Small testes in September adult males seemed to be related to the absence of pigeon milk. A similar correlation seemed to exist for ovaries

in the female but they were difficult to measure (Table XI).

Comparisons between the increase in length of juvenile gonads and the disappearance of juvenile primary coverts did not show consistent differences (Table XII). Data of Tables XI and XII indicate that by September there is a considerable overlap of juvenile and adult gonad lengths.

HUNTING SEASON POSSIBILITIES

Theoretically, doves could be hunted in Michigan, just as any species could, if hunting removed no more than that which could be replaced by reproduction. Were doves to be hunted in Michigan, one problem would be to determine what percentage to harvest. If the September shot doves of this study (36 adults and 39 juveniles) were representative of the fall age ratios of southern Michigan doves for all years than apparently it would be possible to harvest about 50% of the September population since this age ratio indicated an increase of about 100% above the adult population. Much more widespread information is desirable however, before these data can be accepted as representative of southern Michigan dove populations.

On the Sanctuary-Farm area, two (4.9%) of the 49 breeding pairs were nesting after September 7 (Fig. 3). Both nestings were successful, together producing three fledglings (3.3% of the area's total production). If the late nesting pattern on this study area was typical of that throughout southern Michigan then only 3.3% of the 1954 fledglings could possibly have been lost due to the death of a parent after September 7.

At the Sanctuary, flocking was first noticed on July 29. The first large flock on the 20-mile route was 35 birds seen on August 8 (Fig. 8). After September 22 all of the larger flocks (six or more birds) seemed to

have migrated.

From these data, a hunting season in Michigan before September 8 would find some doves still nesting while one established after September 22 would come after most flocks had migrated. More information is needed on the manner in which these dates vary from year to year.

Data from this study and Davey (1952) indicate that fledgling production / adult pair is lower in Michigan than in other states (table VII). Hunting might have to be curbed a little more than in southern states if this is true for all doves in Michigan. Further, Michigan does not receive the benefits of large migrations from the north such as southern states do. This also would tend to limit the harvest of doves. It is probable than that a dove season in Michigan, set within the narrow time and bag limit implied above, would provide some limited hunting but would not be as productive as in the south. Experimental open seasons in selected townships or counties would provide much information on the possibilities of the mourning dove as a game bird in Michigan. This study indicates some limitations on hunting practices which could serve as a basis for such experiments.

SUMMARY

A study was made of mourning doves nesting on adjacent 514 acre and 32 acre study areas in Kalamazoo County, Michigan during 1954. Nesting on the larger area lasted from April 9 to September 23 with an April 21-June 7 peak. 45 adult pairs on both areas nested 165 different times and fledged 101 young. 85% of the nests were found in evergreens with red pine and norway spruce receiving the greatest usage. Nesting success was

slightly higher during the last part of the season. Nest trapping had no significant effect on the breeding success of doves despite deaths among nestlings under eight days old. All renesting doves observed (four pairs) were with their original mates. Testors' model airplane dope was better than dye for marking doves for individual field identification.

Coo counts did not seem to be indicative of the abundance of active nests. Sex ratios of 75 shot doves were about even in both adults and juvenals. In September, juvenile testes were as large as those of adult males and pigeon milk was found in 41.7% of 36 adults.

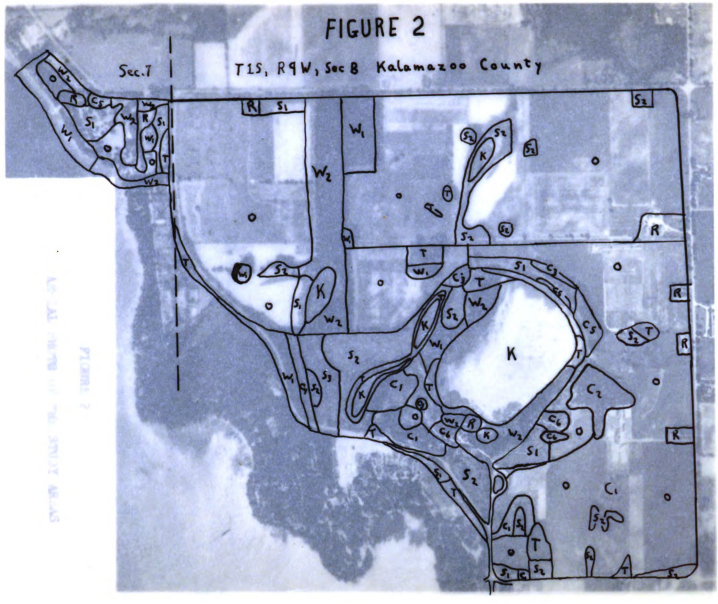
Regulated hunting of the dove in Michigan is theoretically possible. A hunting season in Michigan should be between September 8 and 23 to insure few losses of nesting adults and to avoid missing all of the migrants. Experimental open seasons in selected areas would provide much information on the possibilities of the mourning dove as a game bird in Michigan.

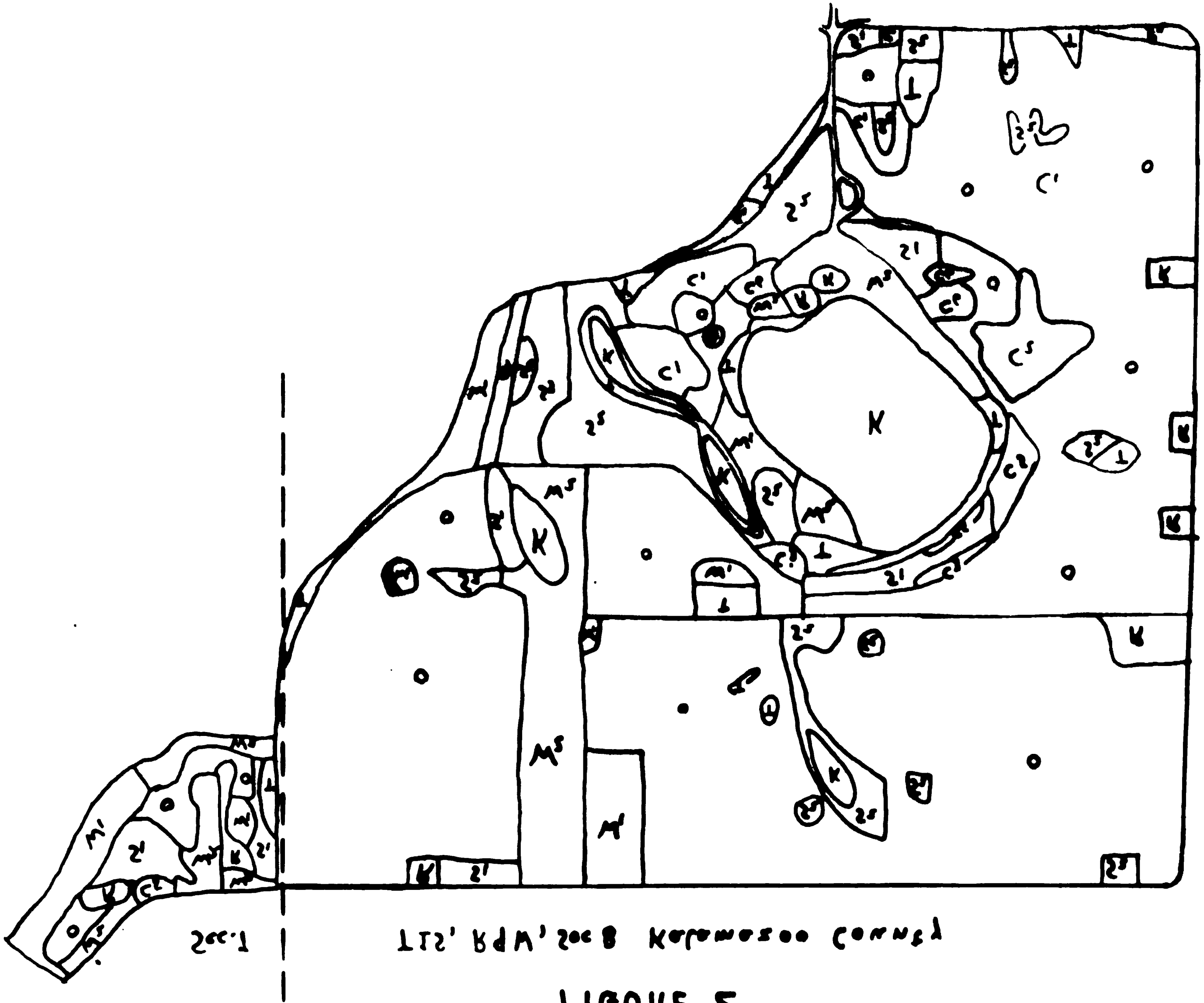
FIGURES

FIGURE 1

ROAD MAP OF THE STUDY AREAS AND
THE 20 MILE CENSUS ROUTE

FIGURE 2





T1S, R9W, Sec 8 Kalamazoo County

FIGURE 5

FIGURE 2

AERIAL PHOTO OF THE STUDY AREAS

FIGURE 3

ACTIVE NEST DISTRIBUTION ON TEE FARM-SANCTUARY AREA AT FOUR DAY INTERVALS

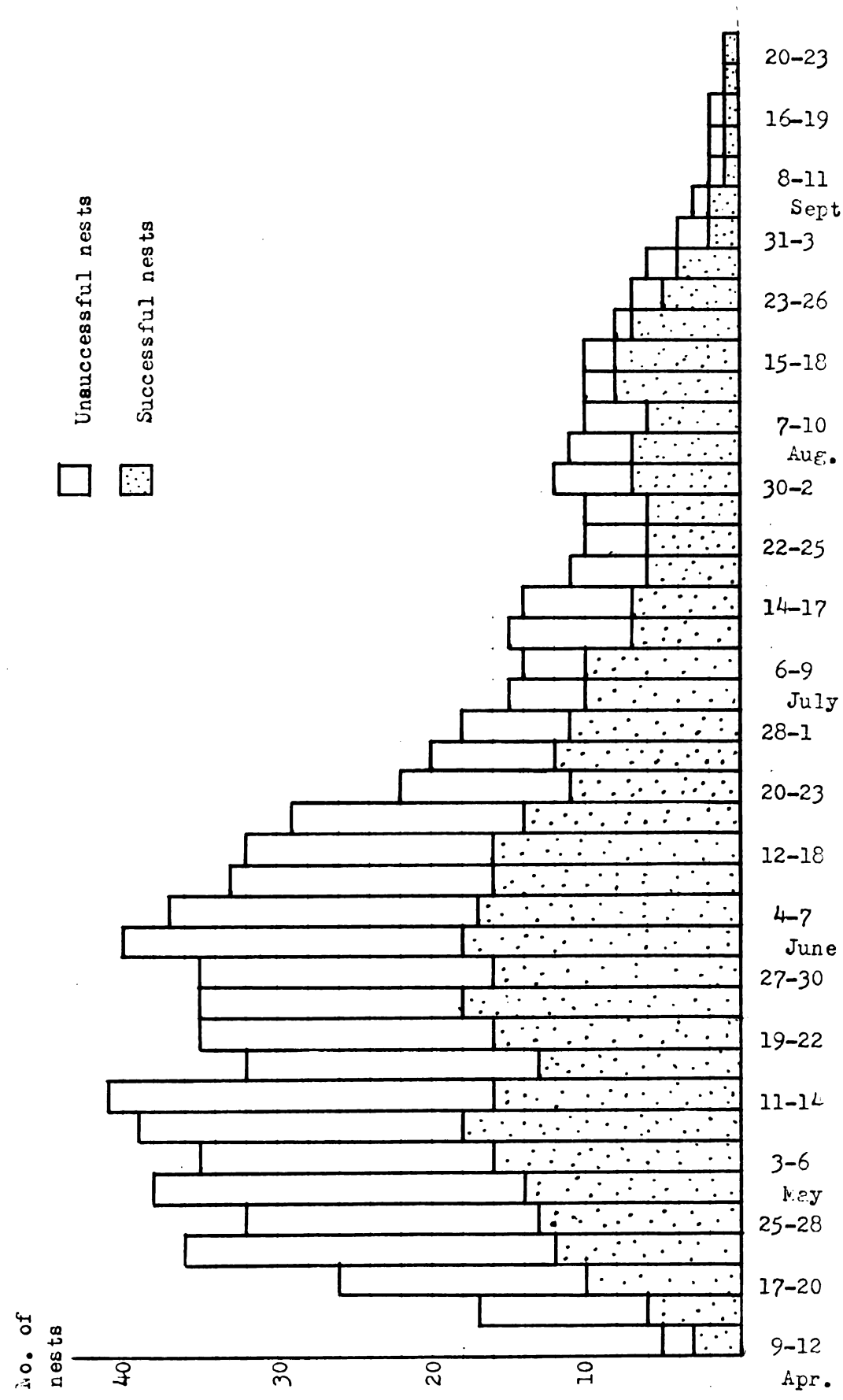


FIGURE 4

SCHEME FOR APPLYING COLORED PAINT TO THE PRIMARIES AND RECTRICES OF A MOURNING DOVE

R - red

W - white

Y - yellow

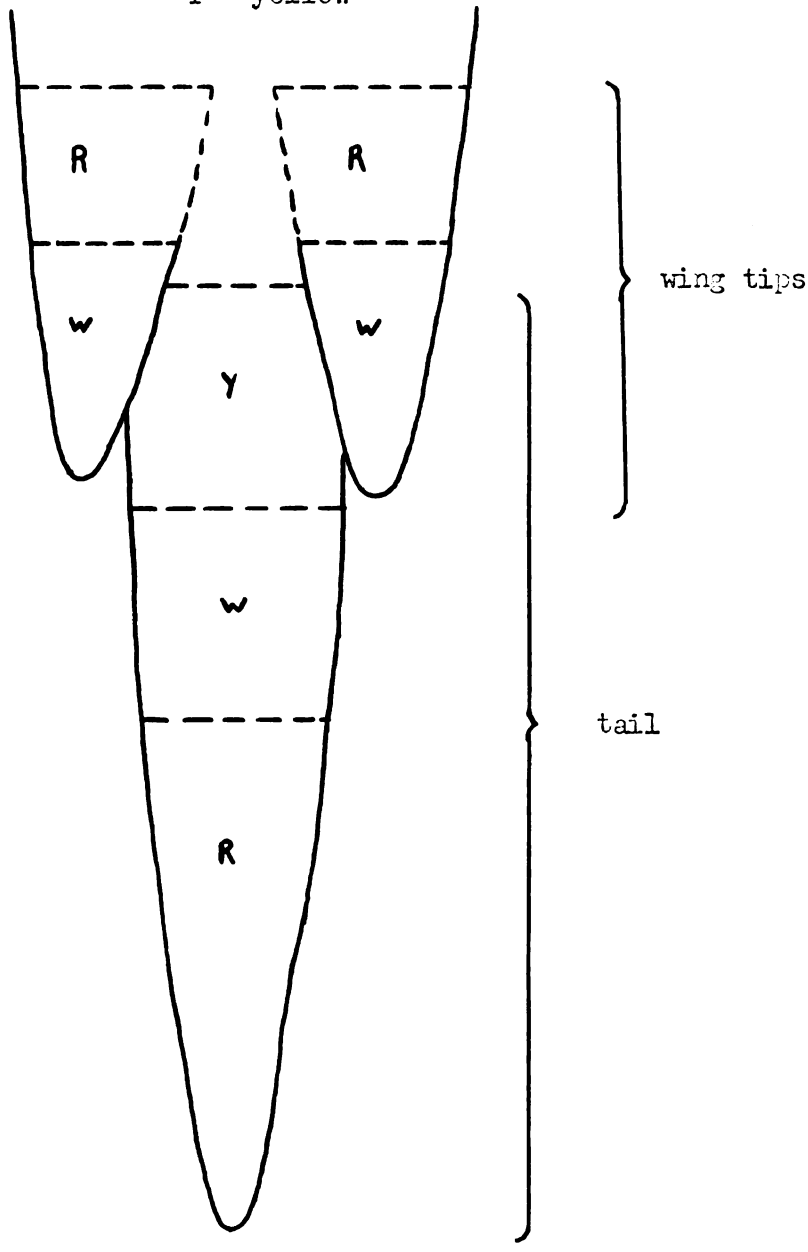
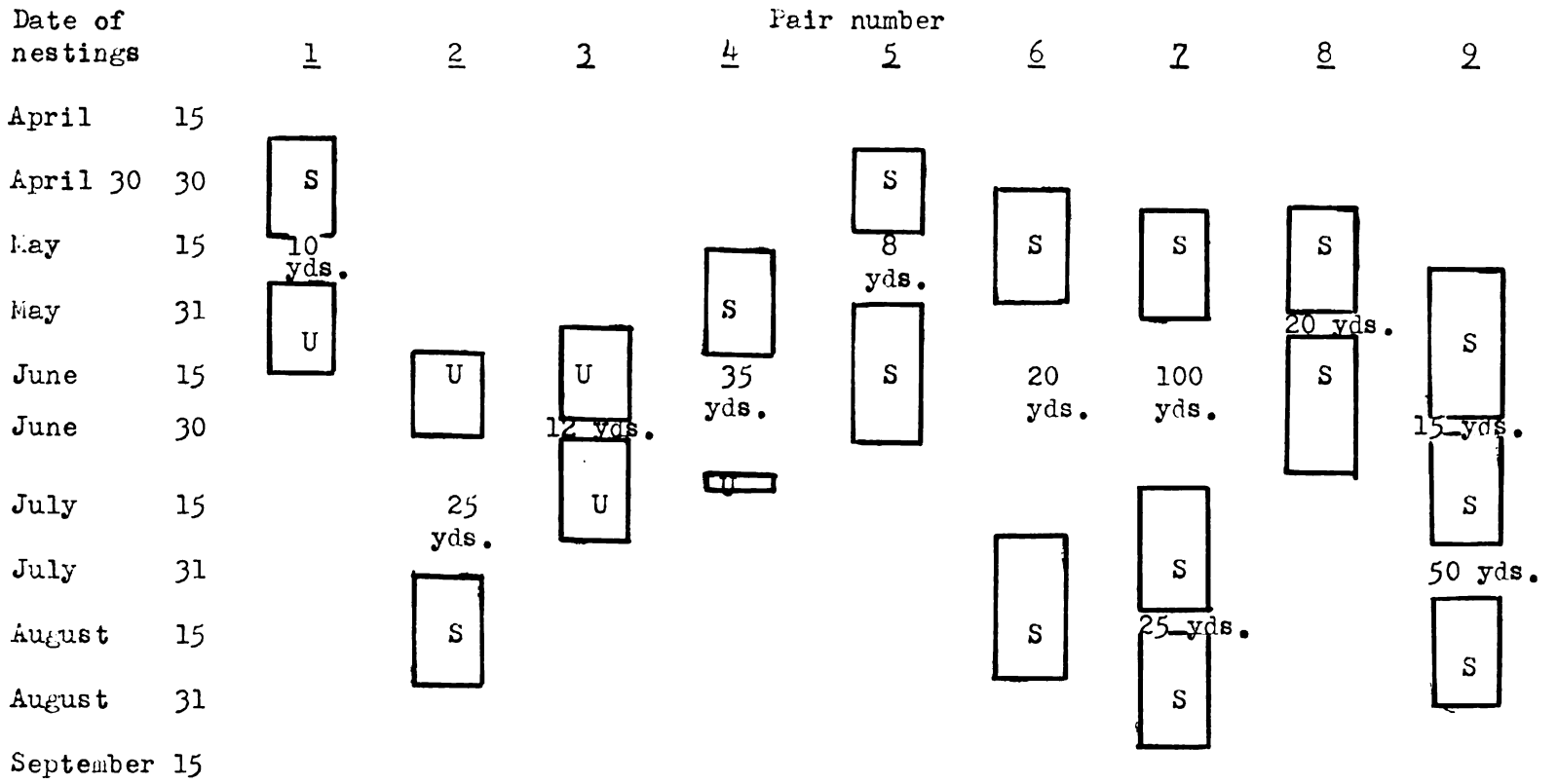


FIGURE 5

RENESTINGS OF MARKED DOVES IN KALAMAZOO COUNTY, MICHIGAN

Distances Between Successive Nestings Are Given in Yards



S - successful

U - unsuccessful

FIGURE 6

NUMBER OF DOVES HEARD ON TWO CENSUS ROUTES FROM MAY 15 TO SEPTEMBER 24

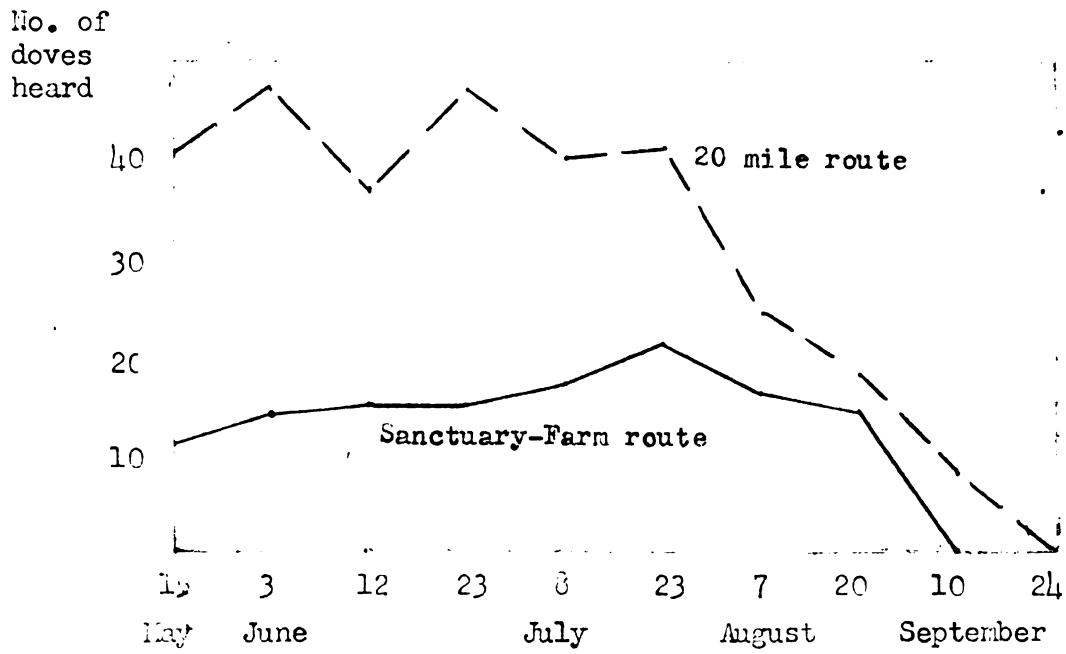


FIGURE 7

COOS HEARD PER DOVE ON TWO CENSUS ROUTES FROM MAY 15 TO SEPTEMBER 24

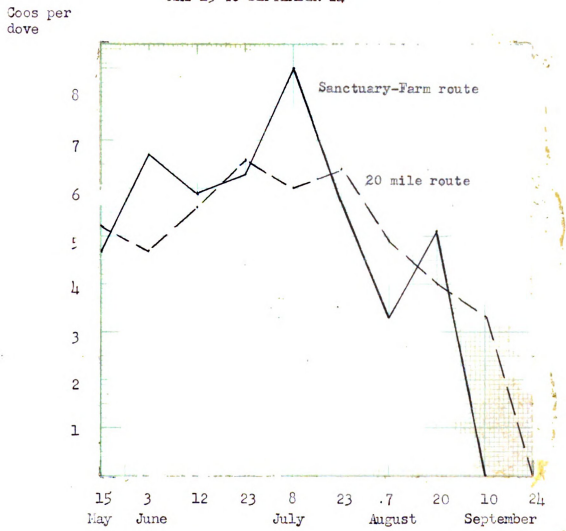
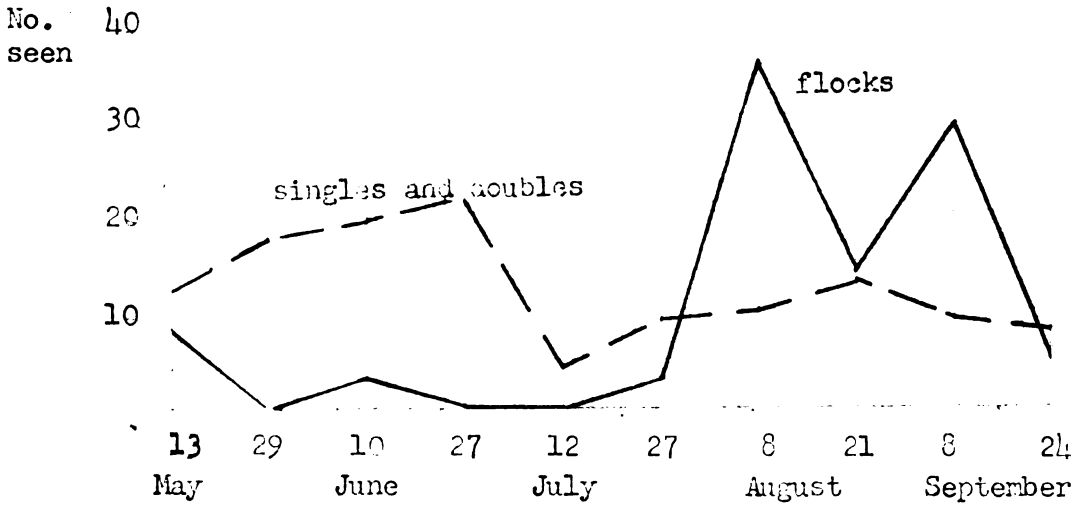


FIGURE 8

DOVES SEEN ON THE 20 MILE CENSUS ROUTE



TABLES

TABLE 1

EGG AND NESTLING LOSSES ON THE STUDY AREAS

Causes	Human Disturbance			Predation		Unknown	
	Trapping	Flushing					
	nestlings	nestlings	eggs	nestlings	eggs	nestlings	eggs
Sanctuary-Farm	29	10	7	8	13	49	55
Biological Station	—	—	7	1	7	—	12

Miscellaneous Egg and Nestling Losses on the Study Areas

grazing cows	2 eggs
wind	4 eggs
embryo did not develop	4 eggs
crowded off nest	1 nestling
nest discovered with dead nestlings	7 nestlings

TABLE 11

OBSERVATIONS ON DOVES MARKED WITH TESTORS' DOPE

Marked on	Time interval in days between marking and each observation
May 1	17, 19, 19, 20, 22, 22, 25, 29, 47
May 9	14
May 11	23
May 11	108
May 13	5
May 13	28, 35
May 13	28, 71
May 14	19, 22, 81
May 16	38, 47
May 16	11 (killed by a predator)
May 22	9
June 5	17, 18, 33
June 7	6, 10, 14, 17, 28
June 10	3
June 14	13, 21, 35
June 15	3
June 21	17, 24
June 26	9
July 5	3, 11
July 25	1, 5, 13
August 27	27

TABLE III

DOVE NESTING SEASON COMPARISONS FOR SEVERAL STATES

State	Year	First Active Nest	Nesting Peak	Last Active Nest	Authority
Texas	1950	Jan. 25	June-July	Oct. 5	Swank (1952a)
Texas	1949	------	-------	Oct. 23	Swank (1952a)
Louisiana	1949	Mar. 10-12	-------	Sept.-21	Gresham (1950)
Louisiana	1950	Mar. 10-12	-------	-----	Gresham (1950)
North Carolina	1940	Mar.	May	Oct.	Taylor (1941)
Iowa	1938	Apr. 16	July 14	Oct. 15	McClure (1941)
Iowa	1939	Mar. 23	June 5	Oct. 11	McClure (1941)
Iowa	1940	Apr. 5	-----	Oct. 6	McClure (1941)
Ohio	1947	Mar. 30	Apr. 27-May 10	Oct. 19	Webb (1950)
Ohio	1948	Mar. 20	Apr. 27-May 10	Oct. 3	Webb (1950)
Michigan	1952	-----	June	Sept. 8	Davey (1953)
Michigan	1954	Apr. 9	Apr. 21-June 7	Sept. 23	This study
North Dakota	1950	May 15	Aug. 13-19	Sept. 25	Boldt and Hendrickson (1952)
North Dakota	1952	-----	July-Aug.	Sept. 21	Randall (1955)

TABLE 1Va

DOVE NEST SITE PLANTS AND NESTING SUCCESS ON TWO STUDY AREAS IN KALAMAZOO COUNTY, MICHIGAN

Plant species	No. succ. nests	Total nests	% of tot. area	Rel. nest site pref. (tot. nests ÷ % tot. area)	Rel. nest site pref. value (no. succ. nests ÷ % tot. area)
Red pine (Pinus resinosa)	21	65	2.0	32.5	10.5
Norway spruce (Picea abies)	10	33	.5	66.0	20.0
Red Cedar (Juniperus virginiana)	9	18	.6	30.0	15.0
White spruce (Picea glauca)	5	11	.9	12.2	5.6
Blue spruce (Picea pungens)	5	6	.1	60.0	50.0
Morrow honeysuckle (Lonicera morrowi)	1	5	.2	25.0	5.0
White cedar (Thuja occidentalis)	1	4	.1	40.0	10.0
Sassafras (Sassafras albidum)	1	2	.1	20.0	10.0
Red mulberry (Morus rubra)	1	2	.1	20.0	10.0
Russian olive (Elaeagnus angustifolia)	1	2	.1	20.0	10.0
Jack pine (Pinus banksiana)	-	2	.4	5.0	00.0
Black locust (Robinia pseudo-acacia)	-	2	.3	6.7	00.0
Flowering crab apple (Malus sp.)	-	2	.1	20.0	00.0

TABLE 1Vb

DOVE NEST SITE PLANTS AND NESTING SUCCESS ON TWO STUDY AREAS IN KALAMAZOO COUNTY, MICHIGAN

Plant species	No. succ. nests	Tot. nests	% of tot. area	Rel. nest site pref. (tot. nests ÷ % tot. area)	Rel. nest site pref. value (no. succ. nests ÷ % tot. area)
Hackberry (*Celtis occidentalis*)	1	2	.2	10.0	5.0
Highbush cranberry (*Viburnum opulus*)	1	1	.1	10.0	10.0
Black cherry (*Prunus serotina*)	1	1	.5	00.2	2.0
Amelanchier (*Amelanchier* sp.)	-	1	.1	10.0	00.0
Virginia creeper (*Parthenocissus* sp.)	-	1	.1	10.0	00.0
Box elder (*Acer negundo*)	-	1	.1	10.0	00.0
Chestnut (*Castanea* sp.)	-	1	.1	10.0	00.0
Tamarack (*Larix laricina*)	-	1	.1	10.0	00.0
Austrian pine (*Pinus nigra*)	-	1	.1	10.0	00.0
Total	58	164			

TABLE V

COVER TYPES AND THEIR VALUE FOR DOVE NEST SITES ON TWO STUDY AREAS IN KALAMAZOO COUNTY, MICHIGAN

Cover type	Area in acres	% of tot. area	No. succ. nests	Tot. nests	Rel. nest site pref. (tot. nests ÷ % tot. area)	Rel. nest site pref. value (no. succ. nests ÷ % tot. area)
O	312.7	57.1	1.0	1.0	0.02	0.02
K	45.8	8.4	0.0	0.0	0.0	0.0
S_2	41.6	7.6	13.0	29.0	3.8	1.7
W_2	32.6	6.0	1.0	2.0	0.3	0.2
S_1	25.8	4.7	2.0	9.0	1.9	0.4
W_1	22.6	4.1	0.0	1.0	0.2	0.0
T	18.8	3.4	3.0	11.0	3.2	0.9
R	17.1	3.1	2.0	2.0	0.6	0.6
C_1	10.9	2.0	21.0	65.0	32.5	10.5
S_3	4.9	0.9	5.0	11.0	12.2	5.6
C_2	4.4	0.8	0.0	0.0	0.0	0.0
C_3	3.8	0.7	0.0	0.0	0.0	0.0
C_4	1.4	0.3	0.0	0.0	0.0	0.0
C_5	1.9	0.4	0.0	0.0	0.0	0.0
C_6	2.8	0.5	10.0	33.0	66.0	19.6
Total	547.1		58.0	164.0		

TABLE VI

COMPARISONS OF NESTING SUCCESS ON TWO STUDY AREAS

	Sanctuary-Farm	Biological Station	Total
observed pairs of breeding adults	41.	4.	45.
attempted nestings	146.	18.	164.
successful nestings	52. (35.6%)	6. (33.3%)	58. (34.8%)
nestlings fledged	91.	10.	101.
nestings attempted per adult pair	3.56	4.50	3.64
successful nestings per adult pair	1.27	1.50	1.29
fledglings per adult pair	2.22	2.50	2.24
fledglings per successful nest	1.75	1.67	1.74

TABLE V11

COMPARISONS OF DOVE PRODUCTION PER ADULT PAIR USING DATA FROM OTHER INVESTIGATORS

Based on Study Area Population Estimates

State	Year	Authority	Production from data by the cited sources
Iowa	1938	McClure	6.0 fledglings/adult pair
Iowa	1939	McClure	3.8 fledglings/adult pair
Mich.	1953	Davy	1.3 fledglings/adult pair
Mich.	1955	This study	2.2 fledglings/adult pair
North Dakota	1950	Boldt and Hendrickson	3.3 fledglings/adult pair
North Dakota	1952	Randall	4.5 fledglings/adult pair

Based on Observations of Marked Doves

State	Year	Authority	Production from data by the cited sources
Texas	1950	Swank	6.7 fledglings/adult pair for seven pairs
Ohio	1947-48	Webb	5.0 fledglings/adult pair for seven pairs
Mich.	1955	This study	2.6 fledglings/adult pair for nine pairs

TABLE V111

PREDATION ON ADULT AND FLEDGLING DOVES

Sanctuary-Farm

	Adults		Fledglings	
	certain	possible	certain	possible
on the nest	1	5	2	1
elsewhere	3	2	-	-

Biological Station

	Adults		Fledglings	
	certain	possible	certain	possible
on the nest	1	2	-	-
elsewhere	-	-	-	-

TABLE IX

DATA FROM 75 DOVES SHOT DURING SEPTEMBER 1954

	Adults		Juveniles	
	Milk Pres.	Milk Absent	Milk Pres.	Milk Absent
Condition of crop	15	21[t]	0	39
How shot	flock 17*	sing. or double 19**	flock 25	sing. or double 13
Sex	males 23	females 13	males 19	females 20

t- four of these had a trace of a thickened crop wall

*- six had pigeon milk in their crops

**- nine had pigeon milk in their crops

TABLE X

AVERAGE HATCHING DATES OF MICHIGAN DOVES SHOT DURING SEPTEMBER 1954

Primary number being replaced	0	1	2	3	4	5	6	7	8	9	10
Average age in days	14	20	28	39	51	61	73	81	98	113	133
Mean hatching dates	Sept. 6	Aug. 28	Aug. 20	Aug. 8	July 28	July 18	July 5	June 28	June 10	June 1	May 12
Number of specimens	1	1	1	6	9	2	3	7	2	6	1

TABLE XI

ADULT GONAD LENGTHS COMPARED WITH THE PRESENCE OR ABSENCE OF PIGEON MILK

gonad length (mm.)	Males		Females	
	milk absent	milk present	milk absent	milk present
4.0 - 4.9	1	-	-	-
5.0 - 5.9	-	-	-	-
6.0 - 6.9	3	-	-	-
7.0 - 7.9	1	-	-	-
8.0 - 8.9	-	1	-	-
9.0 - 9.9	3	1	4	-
10.0 - 10.9	2	2	2	-
11.0 - 11.9	1	2	3	2
12.0 - 12.9	-	2	-	1
13.0 - 13.9	-	1	-	-
14.0 - 14.9	-	1	-	-
Totals	11	10	9	3

TABLE XLI

JUVENILE GONAD LENGTHS COMPARED WITH THE DISAPPEARANCE OF THE JUVENILE PRIMARY COVERTS

Gonad length (mm.)	Males		Females	
	Juvenile buff coverts	Adult plain coverts	Juvenile buff coverts	Adult plain coverts
2.0 - 2.9	-	-	1	-
3.0 - 3.9	7	-	3	-
4.0 - 4.9	4	1	4	-
5.0 - 5.9	1	-	3	-
6.0 - 6.9	-	-	1	-
7.0 - 7.9	-	1	-	1
8.0 - 8.9	-	-	1	-
9.0 - 9.9	-	1	2	2
10.0 - 10.9	-	2	-	1

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