

The species prevails in large numbers all along the south coast during early spring and then in most sections vanishes completely late in May or early in June, to nest in more northern or western localities. However, the Eskimos state that a few colonies breed on islands in Gabriel Strait and Frobisher Bay. During the nesting season, this length of coastline from the Lower Savage Islands west to Cape Dorset appears to be held almost exclusively by the Northern Eider, which nests here in enormous numbers. Thus it is seen that the two species may observe a meticulous segregation at this period, not only locally but to such lengths that one or the other may be utterly excluded over extensive coastal areas. At the same time, overlapping of local breeding ranges takes place in some localities. A few scattered individuals and small flocks occur in the vicinity of Lake Harbour during the summer but are not known to nest there. The writer never positively identified this species in Baffin Island during the winter, as was the case with the Northern Eider, but a few may winter in the open sea off the ice-bound coasts of Hudson and Davis Straits.

19. *Mergus serrator* Linnaeus, RED-BREASTED Merganser. Eskimo: *Pjle* or *Pie*.—Though far from common, this species is observed occasionally in bays and inlets along the south coast of Foxe Peninsula. Only widely scattered individuals and family groups were met with along the coasts and on interior waters during the late summer and fall of 1928. In 1929, the first pair of spring migrants was observed flying northeastward over Camp Kungovik on June 14. A single bird was noted on Blue Goose River, June 18, and a pair in the same locality a week later. The species was not again observed during the season.

In August and September, 1930, a few scattered examples were noted from Lake Harbour to White Strait, and a solitary individual in Pleasant Inlet on September 20. This was the latest date the species was seen. In 1931, it was first noted at Lake Harbour on June 4. Throughout the summer it was sparingly observed on various lakes of the district, far inland along Soper River, and in coastal waters from White Strait to Philpot Bay. No nests were found, but the birds breed throughout the region.

(To be continued)

MOURNING DOVES IN NEBRASKA AND THE WEST

BY H. ELLIOTT McCLURE

THE life-history study of the Mourning Dove, *Zenaidura macroura* (L.), which was begun in Iowa in 1938, has been continued as opportunities presented themselves over a period of seven years. The most intensive investigation concerning their habits was carried on at Lewis, Iowa, through 1940 (McClure 1942, 1943). From 1941 through 1943, nesting habits and population movements were observed in central Nebraska in the vicinity of Ord. Enlistment in the Navy interrupted this work, but the bird has been watched during a tour of duty extending over several months in California.

METHODS

Full time was given to the nesting studies at Lewis. Each nest was observed every other day until it was no longer in use. Loca-

tions of all nests were closely watched as they often served for the sites of new nests.

At Ord, only spare moments could be given to dove watching, mainly evenings and week ends. Not quite four hundred nestings were observed at three widely separated localities. Whereas the bulk of the nests under observation at Lewis were built in town, the three nesting localities in Nebraska were all rural.

Finally, while the writer was stationed at San Diego, California, ten dove nests came under observation and data concerning them are included here.

COMPARISON OF NESTINGS AT LEWIS AND ORD

This report covers 4,273 separate nesting attempts and data from these are shown in Table 1. There was only one per cent difference between Iowa and Nebraska in the number of eggs that hatched, 54.6% and 53.6%, respectively. The limited studies at San Diego showed a higher hatch and a very high nesting success. Average nesting success in Iowa was 47.9%, in Nebraska 47.0%, while seven of the ten nests at San Diego were successful. There was very little variability in the success of rearing young and the seven-year average was 85.3%.

The dove is preeminently an adaptable bird and its choice of a nesting site reflects this. Within Lewis the trees were old and tall and the average trunk diameter of those chosen for nest locations was 19.0 inches. In the country in Iowa, mainly smaller trees were available and the average trunk diameter was 14.6 inches. In Nebraska, trees are smaller from lack of moisture so the average size of those used was 10.2 inches. Heights of nests were determined by the same phenomenon. In Lewis the average nest height was 22.7 feet, in the Iowa rural locations it was 15.1 feet, while at Nebraska sites it was 9.3 feet. The average height of nests determines the average distance from the center of the tree, since higher nests are placed farther out on the limbs. In Lewis, this distance was 13 feet; at Iowa country locations it was 9.5 feet; and in central Nebraska it was 5.0 feet.

In Iowa there is a more equitable distribution of strong winds throughout the nesting months, predominantly northwest in spring and fall and southwest in summer, with occasional storms from the northeast and southeast. Because of this the average nest position as related to the wind was not conspicuously on one side or another. During any given month of strong winds, the bulk of the nests would be built to the leeward. In central Nebraska, wind is a daily event,

TABLE 1
TOTAL MOURNING DOVE NESTING ACTIVITIES OBSERVED OVER A SEVEN-YEAR PERIOD

Year	Number nests	Number nestings	Number eggs	Number eggs hatched	Per cent hatch	Number young raised	Per cent young raised	Number nesting successes	Per cent success	Number young per nest	Number young per nesting
Vicinity of Lewis, Iowa											
1938	1108	1464	2870	1722	60.1	1502	87.3	810	55.5	1.355	1.02
1939	1443	1975	3595	1858	51.7	1583	85.2	877	44.9	1.097	0.80
1940	326	439	799	392	49.0	309	78.6	168	38.3	0.85	0.70
Total	2877	3878	7264	3972	54.6	3394	85.4	1855	47.9	1.18	0.87
Vicinity of Ord, Nebraska											
1941	27	27	54	22	40.7	17	77.2	9	33.3	0.63	0.63
1942	86	103	210	110	52.4	89	80.9	50	48.5	1.03	0.86
1943	212	255	470	262	55.7	221	84.3	122	48.0	1.04	0.86
Total	325	385	734	394	53.6	327	83.0	181	47.0	1.00	0.85
San Diego, California											
1944	10	10	20	13	65.0	13	100.0	7	70.0	1.30	1.30
Grand total	3212	4273	8018	4379	54.6	3734	85.3	2043	47.9	1.16	0.87

with many strong blows predominantly west and northwest. The birds responded to this, since it is easier to build on the leeward than windward side of a tree. Twenty-four per cent of the nests were on the north, 30% on the east, 31% on the south, and 15% on the west.

In Iowa, all of the trees of an area totaling more than 200 acres were closely watched and the average usage by doves determined. In Nebraska, such an intensive method was not possible and data concerning relative use by the species are not at hand. Tables 2 and 3 list the species of trees used in the vicinity of Ord. The list varies between 1942 and 1943 in relation to the localities and intensity of observation.

At Lewis (Table 4), the American elm was the most abundant tree, constituting 32.5%, and similarly it supported the most nests, 45%. Other trees bore the same relationship to their usage, but red pine and Norway spruce were preferred and were sought out by doves. At the rural locations the situation was somewhat different. Here the deciduous trees were in use inversely proportional to their numerical status, while the introduced red pine was the preferred species for dove nesting. In Nebraska, the relationship between tree numbers and dove nesting was obscured by the type of locality selected for study. Elms supported 26% of the nests, but the elm is not the most common tree. Elms at the Aagaard farm bore enough nests to distort the picture. The same is true of white and blue spruce. Both were present as a windbreak at the Koupal Garden, a much preferred nesting place for doves. The fact that cottonwoods supported nine per cent of the nests in Nebraska and less than one per cent in Iowa is more closely related to availability. The bulk of Nebraska's windbreaks or groves are made up of cottonwoods. Nests in artificial positions such as eavestroughs or man-made structures made up hardly one per cent of the total in Iowa, but in Nebraska nests beneath bridges on the supporting girders constituted five per cent of the total.

The Mourning Dove is prone to use its old nest repeatedly, especially if it has been a satisfactory site for the previous attempt. In Iowa, 25.7% of all nests were used more than once, while in Nebraska this figure was 19.1%. Multiple usage of nests went to greater heights in Iowa than in Nebraska, probably because large numbers of nests were under observation. During the Iowa study, 74.3% of the nests were used once, 18.8% twice, 5.3% three times, 1.3% four times and 0.3% five times. In Nebraska, 80.9% were used once,

TABLE 2
MOURNING DOVE NESTING IN THE VICINITY OF ORD, 1942

Nest site	Species	Number trees	Number nests	Number nestings	Number successful	Average height	Average distance from center of tree	Average diameter of tree
Elm	<i>Ulmus</i> spp.	27	28	36	21	9 ft.	5.5 ft.	9.5 in.
Blue Spruce	<i>Picea pungens</i>	16	18	19	7	8	3	8
White Spruce	<i>Picea</i> spp.	12	12	13	4	9	4.5	10
Box elder	<i>Acer negundo</i>	8	8	9	5	9	8	11
Cottonwood	<i>Populus deltoides</i>	3	3	3	0	11	1	16
Hawthorn	<i>Crataegus</i> sp.	2	2	3	0	5	3	9
Austrian pine	<i>Pinus</i> sp.	2	2	2	0	8	6	9
Scotch pine	<i>Pinus sylvestris</i>	2	2	2	1	9	9	12
Apple	<i>Pyrus malus</i>	1	1	2	2	9	10	14
Mulberry	<i>Morus rubra</i>	1	1	2	2	3	3	10
Willow	<i>Salix</i> sp.	1	1	1	0	6	3	3
Chinese elm	<i>Ulmus parvifolia</i>	1	1	1	1	6	1	3
Soft maple	<i>Acer saccharinum</i>	1	1	1	0	40	10	30
Bridges (4 bridges)			4	7	5			
Ground			1	1	0			
Grapevine	<i>Vulpina</i> sp.		1	1	1			
Total		77	86	103	50	9.0	4.8	9.8

TABLE 3
DOVE NESTING IN THE VICINITY OF ORD, 1943

Nest site	Species	Number trees	Number nests	Number nestings	Number successful	Average Height	Average distance from center of tree	Average diameter of tree
White spruce	<i>Picea</i> spp.	41	47	56	21	9.0 ft.	4.5 ft.	8.5 in.
Elm	<i>Ulmus</i> sp.	33	41	62	33	10.8	5.0	9.0
Cottonwood	<i>Populus deltoides</i>	31	31	31	18	13.0	5.0	17.0
Blue spruce	<i>Picea pungens</i>	14	23	28	12	9.0	4.0	11.0
Box elder	<i>Acer negundo</i>	9	11	16	10	10.7	7.0	10.0
Apple	<i>Pyrus malus</i>	9	9	12	7	9.0	9.0	13.5
Bridge	(6 bridges)		8	12	9			
Plum	<i>Prunus</i> sp.	7	7	9	3	4.0	1.0	1.7
Hawthorn	<i>Crataegus</i> sp.	4	4	6	0	7.0	9.5	3.5
Honeysuckle	<i>Lonicera</i> sp.		2	2	2	5.0		
Mulberry	<i>Morus rubra</i>	1	2	2	0	4.0	1.5	
Ash	<i>Fraxinus</i> sp.	1	1	2	2	10.0		4.0
Honey locust	<i>Gleditsia tricanthos</i>	2	2	2	1	11.0	4.0	6.0
Willow	<i>Salix</i> sp.	2	2	2	1	4.0	5.0	8.0
Scotch pine	<i>Pinus sylvestris</i>	1	1	1	0	8.0	12.0	12.0
Cherry	<i>Prunus avium</i>	1	1	2	2	6.0		8.0
Juniper	<i>Juniperus</i> sp.	2	2	1	2	4.5	1.0	5.0
Chinese elm	<i>Ulmus parvifolia</i>	1	1	1	0	5.0		3.0
Austrian pine	<i>Pinus</i> sp.	1	1	1	0	4.0	5.0	10.0
Ground			1	1	0			
Total		160	197	250	122	9.6	5.1	10.6

15.7% twice and 3.4% thrice. None was noted in use more than three times.

The nests of other birds did not play as important a part in the economy of doves in Nebraska as they did in Iowa. Not was the dove-robin relationship as evident. Only 11 of 325 nests, 3.7%, in Nebraska were built in those of other birds while 10.3% of Iowa's nests were in other avian structures. Nests used in Nebraska were Brown Thrasher (*Toxostoma rufum*), 2; Yellow-billed Cuckoo (*Coccyzus americanus*), 1; Bronzed Grackle (*Quiscalus versicolor*), 2; Eng-

TABLE 4

A COMPARISON OF TREE AVAILABILITY AND USE FOR NESTING BY DOVES

Trees	IOWA				NEBRASKA
	In town		In country		In country
	Per cent of trees	Per cent of nestings	Per cent of trees	Per cent of nestings	Per cent of nestings
Elm	32.5	45.0	10.0	5.5	26.0
Box elder	15.3	12.9	8.0	5.1	6.5
Silver maple (<i>Acer saccharinum</i>)	7.0	7.6	11.0	9.8	
Red Pine (<i>Pinus resinosa</i>)	1.0	6.6	11.0	27.7	
Apple	10.0	5.6	14.0	11.0	3.6
Norway spruce (<i>Picea abies</i>)	0.8	4.1	3.0	7.0	
Plum	5.0	1.6	12.0	7.5	2.4
Red mulberry	1.2	1.1	3.0	4.6	0.6
Scotch pine	0.6	1.0	9.0	4.1	0.8
White spruce	0.2	0.4	0.7	0.6	15.0
Blue spruce	0.4	1.0	0.2	0.1	12.0
Willow	1.1	0.0	1.0	0.2	3.6
Cottonwood	0.4	0.4	3.0	0.0	9.0

lish Sparrow (*Passer domesticus*), 1; Robin (*Turdus migratorius*), 4; and Migrant Shrike (*Lanius ludovicianus*), 1.

NESTING AT KOUPAL GARDEN

The Koupal Garden was a favorite nesting place for doves at Ord. It was at the edge of town, had an area of about three acres, and had originally been planted as landscaping for a country home which was never built. A border of elms on three sides, overlooking a small creek to the west, enclosed small apple orchards at the northern and southern ends. These were separated from the central flower garden by several rows of densely planted blue and white spruces. Other ornamental deciduous and evergreen trees were included and to the west of the formal flower garden was a pool.

Proximity to water and grain fields, and dense trees served to make this an ideal bird haven, except that it also supplied needs for marauding feral cats, Blue Jays (*Cyanocitta cristata*) and Crows (*Corvus brachyrhynchos*). Fox squirrels (*Sciurus niger*) were present,

but did not appear detrimental to the nesting efforts of Robins, Yellow-billed Cuckoos, Catbirds (*Dumetella carolinensis*), Brown Thrashers, Red-winged Blackbirds (*Agelaius phoeniceus*), Bronzed Grackles, Crows (*Corvus brachyrhynchos*), Cardinals (*Richmondia cardinalis*), Arkansas Kingbirds (*Tyrannus verticalis*), Mourning Doves and others. Forty-two dove nestings in 1942 and 110 in 1943 were observed to have a success of only 38%. In the presence of many evergreens, elms were not frequently chosen as nest sites (Table 5). The average size of the trees used and the location of nests did not vary much during the two years, as would be expected in a small area (Table 6). Because of the location of the garden, beneath protecting hills, a majority of daily winds blew from the north and 45% of the nests were built on the south side of trees. Aside from weather, feral cats and Blue Jays appeared to be the worst enemies of the dove. Multiple nesting reflected this poor success. Only one nest in two years was used three times and only 22, or 17%, were used twice.

NESTING AT THE AAGAARD FARM

Situated five miles north of Ord, in the upland dryland-farming region, the nesting habitat at Aagaard's farmyard was very different from that at Koupal's, amid valley, irrigated-farm conditions. Here the expanse of rolling treeless hills was broken only by an occasional clump of elms, box elders or cottonwoods about a farm house or in a gully. At Aagaard's, an east-exposed slope above a dry-run creek supported a sparse growth of elms, box elders, soft maples and ash. The planting was about two hundred yards long by 25 yards deep. The only water available was in a near-by duck pond, filled several times each summer by heavy rains. The surrounding clay hills were cultivated to corn and small grains.

Mourning Doves, Arkansas Kingbirds, Migrant Shrikes, English Sparrows, Robins, and other birds sought this bit of cover as well as others about similar farmyards. Here the predator factor was greatly reduced as all stray cats were shot and Blue Jays were not common. As Table 7 indicates, dove production responded to this protection and 60% of 107 nesting attempts over two years were successful. As the largest trees, with the most desirable nesting sites, were elms, they were used most extensively. Nearly 80% of the dove nests were built in them. Since nearly all of the trees were used each year, the average nest location did not vary greatly (Table 6). Because of the exposed location of the grove, west winds swept it and 37% of the nests were built on the east side of the trees.

TABLE 5

RECORDS OF NESTING FOR 1942 AND 1943 AT KOU PAL GARDEN, ORD, NEBRASKA

Site	Number nests		Number nestings		Number successful nestings		Two-year percentage of success
	1942	1943	1942	1943	1942	1943	
Blue spruce	18	23	19	28	7	12	40
White spruce	12	47	13	56	4	21	36
Scotch pine	2	1	2	1	1	0	33
Austrian pine	2	0	2	0	0	0	0
Hawthorn	2	4	3	6	1	0	14
Apple	1	7	2	10	2	6	66
Grapevine	1	0	1	0	1	0	100
Elm	0	5	0	5	0	1	20
Honeysuckle	0	2	0	2	0	2	100
Cherry	0	1	0	2	0	2	100
<i>Total</i>	<u>38</u>	<u>90</u>	<u>42</u>	<u>110</u>	<u>16</u>	<u>44</u>	<u>38</u>

TABLE 6

AVERAGE LOCATIONS OF NESTS UNDER OBSERVATION AT ORD

Year	Diameter of tree	Height of nest	Distance from center of tree	Percentage of Nests on:			
				North	East	South	West
<i>KOUPAL GARDEN</i>							
1942	9.0 in.	8.3 ft.	4.1 ft.	14	30	50	6
1943	9.5	8.9	5.0	19	20	42	20
<i>AAGAARD FARMYARD</i>							
1942	10.0 in.	9.4 ft.	6.2 ft.	20	37	13	30
1943	9.0	10.7	4.2	31	37	18	14
<i>MISCELLANEOUS</i>							
1942	12.0 in.	10.5 ft.	3.5 ft.	37	45	9	9
1943	11.8	8.5	6.4	21	14	58	9

TABLE 7

RECORDS OF NESTING FOR 1942 AND 1943 AT AAGAARD FARMYARD, ORD, NEBRASKA

Site	Number nests		Number nestings		Number successful nestings		Two-year percentage of success
	1942	1943	1942	1943	1942	1943	
Elm	25	31	34	50	20	28	57
Box Elder	5	6	6	10	4	8	75
Mulberry	1	2	2	2	2	0	50
Juniper	0	1	0	1	0	0	0
Ash	0	1	0	2	0	2	100
<i>Total</i>	<u>31</u>	<u>41</u>	<u>42</u>	<u>65</u>	<u>26</u>	<u>38</u>	<u>60</u>

There appeared to be little competition between doves and Arkansas Kingbirds. At least six pairs of these raucous tyrants nested each year in the same trees as did the doves and no conflicts were noted. In 1943, Migrant Shrikes built their nest in a favored dove

TABLE 8

RECORDS FROM NESTS AT THE DUNNE RANCH, LOUP CO., NEBRASKA, FOR 1942 AND 1943

Site	Number nests		Number nestings			Number successful nestings		Two-year percentage of success
	1942	1943	1942	1943	1942	1943		
Chinese elm	1	1	1	1	1	0	50	
Elm	1	4	1	6	0	3	43	
Ground	1	0	1	0	0	0	0	
Cottonwood	1	28	1	28	0	17	58	
Plum		7		9		3	33	
Apple		2		2		1	50	
Box elder		1		1		0	0	
Honey locust		2		2		1	50	
Austrian Pine		1		1		0	0	
<i>Total</i>	<u>4</u>	<u>46</u>	<u>4</u>	<u>50</u>	<u>1</u>	<u>25</u>	<u>48</u>	

site. They raised four young and moved to an adjoining elm for the second brood. Doves took up their first nest and raised a pair of young. The dove's second clutch of eggs at this site was eaten by a wandering fox squirrel. In the meantime another pair of doves built a nest within five feet of the shrike nest containing three ravenous youngsters. The young doves hatched but disappeared in a day, it was suspected down the throats of the shrikes, but we saw no direct evidence of this. At no other time were the shrikes suspected

TABLE 9

RECORDS FROM NESTS IN MISCELLANEOUS SITES IN THE VICINITY OF ORD, NEBRASKA

Site	Number nests			Number nestings			Number successful nestings			Three-year percentage of success
	1941	1942	1943	1941	1942	1943	1941	1942	1943	
Willow	10	1	2	10	1	2	4	0	1	38
Ash	7	0	0	7	0	0	2	0	0	30
Elm	3	2	1	3	2	1	2	1	1	66
Juniper	2	0	1	2	0	1	1	0	1	66
Grapevine	2	0	0	2	0	0	0	0	0	0
Ground	2	1	1	2	1	1	0	0	0	0
Cottonwood	1	2	2	1	2	2	1	0	1	40
Box elder	0	3	4	0	3	5	0	1	2	38
Soft maple	0	1	0	0	1	0	0	0	0	0
Bridge	0	4	7	0	7	12	0	5	9	73
<i>Total</i>	<u>27</u>	<u>14</u>	<u>18</u>	<u>27</u>	<u>17</u>	<u>24</u>	<u>10</u>	<u>7</u>	<u>15</u>	<u>47</u>

of attack on doves and following the flight of their second brood this nest, too, was used by doves.

As desirable nest locations were at a premium and nesting success was high, a large percentage, 37.5%, were used more than once. Seven, or nearly 10% in two years, were used three times.

NESTING AT THE DUNNE RANCH

A third study area was situated 65 miles northwest of Ord, at the Will Dunne Ranch on the Calamus River, amidst sandhill range country in Loup County. Here a windbreak of young and aging cottonwoods protected a small plum orchard and the ranch buildings. A dense undergrowth of wild plum grew beneath these trees which enclosed an area of approximately ten acres. Except for another windbreak, this was the only woody cover for ten or twenty thousand acres of unbroken sandhill grassland. The Calamus River, bordered by occasional low willow thickets, flowed within a few rods of the grove and abundant sunflower (*Helianthus* spp.), wild sweet pea (*Lathyrus* sp.), and other native plants furnished a readily available food supply.

Abundant wildlife used this oasis-habitat including doves, Crows, Sparrow Hawks (*Falco sparverius*), Pheasants (*Phasianus colchicus*), Prairie Chickens (*Tympanuchus cupido americanus*), Sharp-tailed Grouse (*Pedioecetes phasianellus*), Brown Thrashers, grackles, Red-headed Woodpeckers (*Melanerpes erythrocephalus*), Bell's Vireos (*Vireo belli*), Blue Grosbeaks (*Guiraca caerulea*), and many others. (A discussion of this island habitat is to be prepared later.) No systematic search for dove nests was made in 1942 as in 1943. Table 8 lists information concerning nesting here and it will be noted that just half of the 1943 attempts were successful. Cottonwood, which was the most abundant large tree, was most used. Plum trees were uniformly too low to be desirable as nesting sites and success in them was low. Cottonwood groves in Iowa were rarely used by doves, because more desirable types of trees were nearby. In this region of Nebraska, doves must choose between cottonwoods or the ground, and so select the trees. Ground nesting was not common, even out here. Multiple use of nests did not occur and only one nest was used more than once (three times) in the two years.

BRIDGE NESTING

Table 9 lists information concerning nests observed at miscellaneous locations near Ord for the three-year period.

In 1942, while I was examining the supporting stringers of bridges for phoebe (*Sayornis* spp.) nests, it was found that doves, too, were using the upper surfaces of girders and ledges as nesting sites. Dove nests are not commonly found associated with man-made structures. In Iowa, one was located in a bird shelter, one on a transformer attached to a light pole, and one was in an abandoned, broken electric sign.

However, eaves troughs were attractive to birds in town and 0.6% of all nests were built in them. The peak year for nesting in eaves troughs was 1940 (McClure 1944) and they supported 4.3% of the 439 nestings. A direct comparison of this type of nest selection with the use of bridges in Nebraska is hardly warranted as bridges were sought out and searched for dove nests. Of 385 nestings observed through the three years, 5% were on the under surfaces of bridges. Since the same positions in the same four bridges came into use for two consecutive years, it appears that the same pairs of birds were involved. Success of nestings in eaves troughs was 54% in spite of the drowning hazards involved. Bridge locations appeared very desirable, for 73% of the nesting attempts were successful.

NESTING AT SAN DIEGO, CALIFORNIA

Upon being stationed at the Naval Hospital Corps School in Balboa Park at San Diego, in July, 1944, I was immediately attracted by the numbers of doves present. We were restricted to an area of not more than thirty acres and this was ornamented with queen palms (*Areca* sp.), date palms (*Phoenix* sp.), monkey-puzzle trees (*Araucaria* spp.), banana trees (*Musa sapientum*), and numerous other exotics. In typical dove fashion the birds were utilizing what was available. Five of the ten nests found were in palms and the remainder in California pepper trees (*Schinus molle*), on the roofs of a herbarium, in banana trees, and in other trees. The tops of waving fronds were very satisfactory nesting sites until the frond began to wilt. One nest was pitched out this way. Mild weather and lack of predators permitted the doves to complete seven of their ten nestings. The average diameter of tree chosen was 13 inches; the average nest height was 18.6 feet; and the average distance from the trunk was 9.5 feet. Probably 20 eggs were laid, from which 13 young hatched and flew when fully fledged.

The numbers of doves flying about the grounds were counted each day from July 23 through October 9. The population appeared

TABLE 10

AVERAGE NUMBER OF DOVES COUNTED EACH DAY AT BALBOA PARK, SAN DIEGO, CALIFORNIA IN 1944

<i>Week of:</i>	<i>Number doves</i>	<i>Week of:</i>	<i>Number doves</i>
July 29	52	Sept. 9	43
Aug. 5	60	Sept. 16	23
Aug. 12	70	Sept. 23	47
Aug. 19	71	Sept. 30	16
Aug. 26	49	Oct. 7	38
Sept. 2	22	—	—
		<i>Average</i>	44

somewhat erratic as the birds would come and go from the park, but the average number seen each day increased through the week of August 19. The figures in Table 10 seem to indicate that the birds passed through the park in waves—each wave, possibly a migration wave, followed by an ebb. The average daily count was 44, and was as high as 71 during the week of August 19 and as low as 16 during the week of September 30.

SEASONAL ABUNDANCE IN NEBRASKA

Between March, 1941, and April, 1944, I drove over 77,000 miles along the highways and trails of central Nebraska. Other sections of the state were periodically covered, but the bulk of driving was

TABLE 11

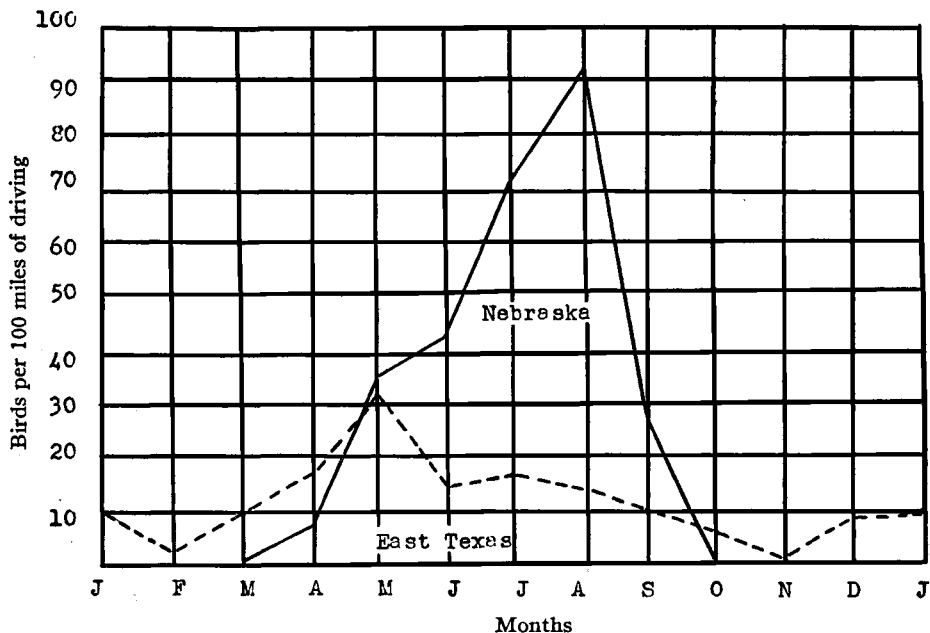
A COMPARISON OF MOURNING DOVE ABUNDANCE AS INDICATED BY ROADSIDE COUNTS IN TEXAS AND NEBRASKA. FIGURES INDICATE THE NUMBERS SEEN PER HUNDRED MILES OF DRIVING

Month	EAST TEXAS (FROM SIEGLER)				CENTRAL NEBRASKA				
	1939	1940	1941	Average	1941	1942	1943	1944	Average
Jan.		7.8	11.7	9.8					
Feb.		3.9	1.0	2.4					
Mar.		3.9	15.6	9.7		.06		.06	.03
April		18.6	15.6	17.1	.05	4.8	21.5	6.6	8.24
May		29.0	35.3	32.1	6.5	45.5	50.5		34.2
June		4.9	25.5	15.2	1.3	60.7	69.1		43.7
July		7.8	26.4	17.1	28.5	91.1	96.2		71.9
Aug.			13.3	14.7	14.0	51.0	91.7	130.7	91.1
Sept.	11.7	9.8		10.6	20.0	33.0	31.6		28.2
Oct.	5.8	5.8		5.8	0.3	0.5	0.6		0.5
Nov.	1.0	1.0		1.0					
Dec.	1.0	17.6		9.3					
Average		8.6	13.8	11.2	18.0	46.0	58.6		33.5

done in this area. All doves seen from the car to a distance of approximately 100 feet on either side of the road were tallied. The three-year total included 19,259 birds.

Roadside counts have been conducted by Nice (1921 and 1922), Sieglar and Newman (1944), and others. Sieglar and Newman reported on two years of roadside counting in east Texas. Their tally averaged 510 per month. Sieglar concluded that roadside counts "during only two years will not reveal relative population densities from one season of the year to the next. Such counts provide general impressions as to the relative abundance of doves between two major plant zones." I am not in complete agreement with him on the first statement, for similar counts in Nebraska do seem to me to reveal not only actual seasonal fluctuations and densities, but total population trends. It may be that the difference in count, 500 per

month for him and 2,000 per month for me, would alter the data. If roadside tallies over a long period and many repeated miles will provide "general impressions as to the relative abundance of doves between two major plant zones" (which Nebraskan data substantiate), then it seems reasonable to assume that they would reveal population trends. Table 11 compares data from the two sections of the country. Thus it is evident that the average number of birds seen



TEXT-FIGURE 1. Comparison of Mourning Dove populations in east Texas and Nebraska as reflected in roadside counts.

during one hundred miles of driving in Texas was below 15. Peak populations occurred during May when it would be expected that the mass of doves wintering in Mexico would filter through the state. This migration moves on into the north as is reflected in the Nebraska figures. Text-figure 1 demonstrates this. Heavy breeding in the north increases the population, and migration back through Nebraska brings the peak for the year in August. But this movement was not reflected in Siegler's data and it should have been, as banding records show that the birds pass through Texas in their journey to Mexico. Judging from his records, the breeding and resident population was surprisingly uniform for the year. The low population

of November was probably brought on by a general southward shift of the birds from hunting pressure.

The Mourning Dove was present in Nebraska from March through October. A few individuals wintered in small flocks in the southeastern counties. In other parts of the state the first birds appeared during the last ten days of March. Nesting began in April and continued until about the 25th of September. Nesting in southwestern Iowa began in March and continued for at least fifteen days longer than in Nebraska.

As rapidly as the young became full-fledged and self-sustaining they congregated in small flocks. Peak numbers left the nests during June and July and the roadside counts reflected this. Although nesting continued into September, the peak migration of accumulated young and adults occurred in August. These large flocks probably included migrants from South Dakota, North Dakota, and Canada. During August, fields of small grain were harvested and the residue was attractive to them. Any clump of trees bordered by grain fields or in the vicinity of them would be the focal point of a band of doves. As August progressed, the numbers in the flocks gradually lessened and roadside counts dropped. Table 11 shows the progressive change in numbers of doves from month to month for three years. There was an apparent increase in population from 1941 through 1943.

Dove densities varied with the locality, habitat, and land use. Several routes 15 to 33 miles long were traveled at least once each week during the first hour following sunrise. Counts along these standard routes followed the same pattern as general all-day tallies. Records for 1943 will illustrate this. Along a route following the North Loup River valley for 33 miles, an irrigated corn, alfalfa, and sugar-beet area, the dove population remained uniform for three months. During June it averaged 1.9 birds per mile; July, 1.8 birds; and August, 1.9 birds per mile. Migration during August and September brought the September count down to 0.2 birds per mile. Dove populations along a thirty-mile route through sandhills were smaller, averaging 0.7 birds per mile in June, 1.6 per mile in July, and dropping rapidly to zero per mile by September.

Ord is situated in the North Loup River valley and to the north and south of it are dry-land farming regions of corn, small grain, and grazing. Along a fifteen-mile route to the north, the dove-per-mile counts were: July, 3.0; August, 1.6; and September, 0.2. This route traversed more grazing than farming land. A route fifteen

miles long, south of Ord, went through farming country with a higher percentage of small grain than on that north of town. Here the dove-per-mile count was: July, 4.7; August, 4.8; and September, 1.1.

USE OF THE NEST CENSUS METHOD

Following the 1938-1940 study, an attempt was made to develop a census method based upon the number of active nests which an observer could find in a given area. The total number of nesting attempts for the year was divided by the average number of active nests counted each day of the month. For example, if we assume that the average yearly number of nesting attempts was 1,000 and the average number of active nests each day for June was 200, then the nesting factor for June would be $1,000 \div 200$ or 5. Table 12 gives these nesting factors as they were determined from Iowa and Nebraska data.

In compiling data from Nebraska, a similar method was used to compute these factors. The similarity in factors for each month over a five-year period in two states is striking. That data from 4,000

TABLE 12

RELATIONSHIP BETWEEN THE AVERAGE DAILY ACTIVE NESTS AND THE SEASON'S TOTAL NESTING ATTEMPTS. THESE FACTORS MULTIPLIED BY THE NUMBER OF ACTIVE NESTS INDICATE THE ESTIMATED SEASON'S PRODUCTION

Month	Lewis, Iowa	Ord, Nebraska	Average
April	75.0	119.3	97.2
May	10.8	11.5	11.1
June	6.6	7.0	6.8
July	7.2	7.3	7.2
August	8.6	6.3	7.5
September	14.5	20.0	17.2

nestings in Iowa and 400 in Nebraska should show factor differences of only 6% or less, certainly would lead one to believe that we have here a fundamental relationship between the number of nests in use on any day and the total number of nesting attempts. There was a difference of 6% between the two studies for May and June and only 1% for July. Apparently we may assume that nest censusing for this species can best be accomplished during these months.

If the factors involved have wide application, and we know from observation that they do at this latitude and for an area with a radius of at least five hundred miles, the population estimates of doves become relatively simple. The steps involve a simple count of all of the active dove nests in a sample area during May, June, or July, preferably the last two, and the use of the factor for that month. Determination of total nest production from year to year

can serve as an index of the dove population. If the numerical status of the bird is desired, the number of nestings determined may be multiplied by 0.87 to give the total young produced. Adults involved are more difficult to calculate since our data are less accurate here. However, the average number of nesting attempts per pair is conservatively placed at six; therefore, dividing the total number of nestings by three and adding the result to the number of young will give a usable estimate of the population from the sample area. Each additional figure involved increases the range of error, so the use of the total numbers of nestings would be the most accurate tally method from year to year.

Very few cautions need to be observed with this method. First, avoid making nest counts after storms. It is advisable to tally nests after a week or so of calm or mild weather. Second, if time permits, continue the tally in one area for several counts over a period of days or weeks. An average of these will smooth the irregularities from year to year. Third, make the sample area large enough to obtain an overall picture of the dove population. This should involve a large acreage of diverse habitats or a number of small plots including samples of each habitat in ratio to its importance in the region.

In 1941 we moved from Lewis to Ord. We returned to Lewis in May and on May 11 I checked nearly all of the trees in the 160 acres of town site for dove nests. A total of 55 was counted and I allowed five more for small areas not surveyed. Using the factor for May, 10.8, the total nestings indicated by this count amounted to 648. The three-year average for Lewis had been 1,320 nestings. Apparently the method was inaccurate. It was known that May had been cold and wet and that dove nesting was late. Obviously, a single day's count early in May was not sufficient to estimate the season's yield, or the dove population was far below par.

We returned in June, and on the ninth I had only a few minutes available for a quick survey. I selected four acres in the part of town where I knew nesting to be greatest. Thirteen nests were counted. To this was applied the factor for June, 6.6, and the estimated total was 85.8. The average per acre was 21.4. The three-year average for this locality had been 27 nestings. Hence, the estimate was well within range of this. Upon closer examination of the data we see that the count was made on June 9, and June is a month of increasing dove nesting. As this date is as close to May as to the middle of June, the error would be toward too few nests,

so it would be advisable to add the May and June factors and divide by two; *i.e.*, 10.8 plus 6.6 divided by 2 equals 8.7. Thirteen nests multiplied by 8.7 equals 113.1, which, in turn, divided by 4 gives a figure of 28.2, the average number of nestings per acre for 1941; a figure very close to the three-year average. In other words, the method is usable if it is tempered by a knowledge of the Mourning Dove nesting habits. That the four acres was too small is shown by the fact that the average number of nestings per acre for all of Lewis was 8.

On May 6, 1945, a brief survey of Koupal's Garden at Ord revealed eight nests. Using the average factor for May, 11.1, the estimated number of nestings would be 88.8, within range of the 110 found in 1943.

SUMMARY

1. A study of Mourning Dove habits was continued in central Nebraska, 1941 through 1943. As spare time was used for this study, only 385 nestings were observed.

2. This report covers records on 4,273 nestings. Average success was 47.9%; 85.3% of the young flew from their nests.

3. In central Nebraska, the average diameter of trunks of trees used was 10.2 inches at breast height, the average height of nests was 9.3 feet, and the average distance from the center of the tree was five feet. Of the nests, 24% were on the north, 30% on the east, 31% on the south, and 15% on the west side of the trees.

4. In Nebraska, 19.1% of all nests were used more than once; 80.9% were used once, 15.7% twice, and 3.4% three times.

5. At Ord, a favorite nesting place was in Koupal's Garden where blue spruce and white spruce were the most popular trees. Nesting success here was 38%.

6. At the Aagaard farm north of Ord, elms were the predominant tree and were most heavily used. Of the nestings, 60% were successful. Strong west winds forced doves to build 37% of their nests on the east.

7. At Dunne's Ranch in the sandhills, a cottonwood grove furnished nesting places for many birds. Nesting success here was 50%.

8. In the three-year study, 5% of the nests found were beneath bridges on supporting girders. These nests had a success of 73%.

9. Ten nests observed in Balboa Park at San Diego, California, were built in palms and other trees and were 70% successful. One hundred per cent of the young reached fledgling age.

10. Daily counts of doves on 30 acres at Balboa Park for 11 weeks showed an ebb and flow of birds which may have been correlated with migration during August and September.

11. Seasonal abundance of doves in Nebraska as determined by roadside counts is compared with that reported by Siegler and Newman in Texas.

12. In Nebraska, the doves showed an increase each year. Dove flocking and movements were correlated with harvesting of grain and with land use. A greater number was found in irrigated valleys than in dry uplands.

13. A method of determining dove population indices by use of the number of nests counted in sample areas is discussed. Factors showing the ratio of active nests to the season's total nest production proved to be similar for Iowa and Nebraska.

14. Throughout the report, data from Iowa and Nebraska are compared and contrasted.

REFERENCES CITED

McCLURE, H. ELLIOTT

1942. Mourning Dove production in southwest Iowa. *Auk*, 59: 64-75.

1943. Ecology and management of the Mourning Dove, *Zenaidura macroura*, in Cass County, Iowa. *Iowa Exp. Sta. Research Bull.*, 310.

1944. The effect of tree removal on a Mourning Dove population. *Auk*, 61: 561-564.

NICE, M. M., AND NICE, L. B.

1921. The roadside census. *Wilson Bull.*, 33: 113-123.

1922. Further roadside censuses in Oklahoma. *Wilson Bull.*, 34: 238-239.

SIEGLER, H. R., AND NEWMAN, C. C.

1944. The value and practicability of wildlife censuses along highways. *Jour. Wildlife Managem.*, 8: 93-99.

Ord

Nebraska

ADRENAL AND THYROID WEIGHTS IN BIRDS

BY FRANK A. HARTMAN

MANY studies have been made of the weights of certain endocrines in mammals, but relatively little has been reported on birds, especially wild birds. Crile and Quiring have published weights from more than fifty species of birds, most of them being from one or two individuals.

Our report deals with 143 species in 38 families, many of which are represented by a sufficient number of individuals to make statistical comparison of the various data. These data have been obtained in the course of collecting material for histological study. Most of the water birds, and some land birds, were obtained on or near Grand Isle, Louisiana. The remainder came from two regions, Kezar Lake in Maine, and central Ohio.