ILLINOIS BIRDS: Turdidae

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Biological Notes No. 75
ILLINOIS NATURAL HISTORY SURVEY
Urbana, Illinois – November, 1971

State of Illinois
Department of Registration and Education
NATURAL HISTORY SURVEY DIVISION

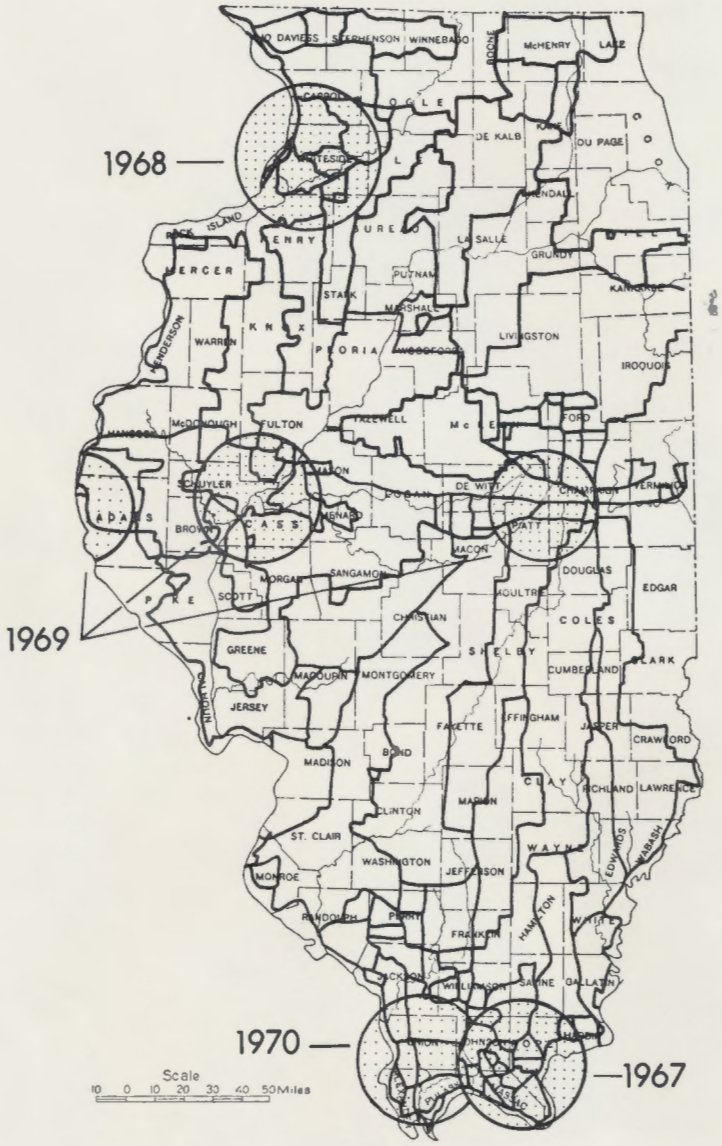

Fig. 1.—Routes travelled (1957–1970) to study breeding distribution of Illinois birds. The encircled areas were special study areas where daily censuses of migrants and nesting populations of birds were carried out, 1967–1970.

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THIS IS THE SECOND of a series of papers intended to summarize the available data on the birds of Illinois. The introduction to the entire work was presented in the first paper, entitled Illinois Birds: Mimidae (Graber et al. 1970), and the policies and procedures for the series were outlined therein. This paper deals with the thrushes, and here we need mention only a few problems of interpretation not encountered in the family covered by the earlier paper.

Our censuses from 1967 to 1970 inclusive were made entirely in nonurban habitats, i.e., they represent the countryside away from towns. Thus, our summer counts for the robin, which shows a strong preference for human residential areas, are unrealistically low.

In discussing the robin we are also confronted with the problem of large aggregations of birds. Our censuses of the migration for each species are intended to show the numbers of birds in their diurnal or foraging distribution among many habitats in the study areas we selected (Fig. 1). We were interested in the quantitative relationship between migrant and breeding populations. We avoided censusing in the vicinity of roosts where birds from hundreds of square miles may be aggregated in a small area. At certain seasons, robins do form massive roosts, and counts made in such areas could be expected to differ greatly from our daily censuses. Robins are also greatly aggregated during their diurnal migrations, and in graphing our counts of migrants (Fig. 4) we have sometimes shown two counts for a given day, one representing the foraging distribution of the population and the other the number of birds in active migration. Thus, for example, our maximum count of robins for April 1 in southern Illinois was only about 400 birds seen during the day, but during the late afternoon migration nearly 1,600 birds flew over in 1 hour.

Though we tend to be conservative about nomenclatural changes, we believe that Dilger's (1956) reclassification of *Hylocichla* much better represents the relationships of the northern thrushes, and have, therefore, included the hermit thrush, Swainson's thrush, gray-cheeked thrush, and veery under the genus *Catharus*.

In the preparation of this paper, we received help from many persons. We want especially to acknowledge W. Earl Godfrey of the National Museum of Canada, for examining a series of our Swainson's thrushes and advising on taxonomic problems in this species, and Donald F. Hoffmeister of the University of Illinois Natural History Museum for the use of the University collections. We wish to emphasize our gratitude also to the staffs of the State Museum at Springfield, and the Chicago Museum of Natural History Bird Department.

We owe a special debt to Laurence C. Binford of the California Academy of Sciences, who has loaned us his notes on Illinois specimens in the University of Michigan Museum of Zoology and Kansas University Museum of Natural History, plus other notes on Illinois Birds.

To the list of persons who have made contributions of field data on a number of species we need to add the names of Dale E. Birkenholz of Illinois State University, Lawrence G. Balch of Chicago, Mrs. William Carroll, Jr., of Woodstock, Peter Dring of Willow Springs, Everard C. Hall of Chicago Heights, William R. Hawkins, formerly of Carbondale, Marilyn Campbell of the Vermilion County Conservation District, and Natalia Belting of the University of Illinois. For valuable information on one or more species of thrushes, we are grateful to Don Varner of Morrisonville, Paul Heye of Southeast Missouri State College, Robert Russell of Wilmette, Charles Clark of Des Plaines, Alfred Reuss and Karl Bartel of Blue Island, Lee Johnson and Jack Armstrong of Rockford, Mrs. Harry A. Shaw of Sterling, and Elton Fawks of Moline. Elton Fawks also loaned us the notes of John J. Schafer who lived at Port Byron, Illinois, and published many notes on the birds of that area.

We should also mention our colleagues and associates of the Natural History Survey for help with many phases of the project.

Finally, we should point out that much of what is known about the bluebird in Illinois represents the work of one man, the renowned Illinois naturalist, T. E. Musselman. We have depended greatly on his published works for our account of that species.

ROBIN (*Turdus migratorius*)

(Fig. 2 and 3)

Spring Migration

Though one may see robins at any season in Illinois, there are clearly defined migrations in spring and fall (Fig. 4). There is little in the literature to indicate whether the migration is diurnal, nocturnal, or both. Cooke & Widmann (1883) recorded one instance of nocturnal migration. We have seen robins migrating in late afternoon (4:15–6:15 PM CST) in March and April, but whether these flights were sustained into the night, we do not know. We have also observed definite diurnal migrations of robins throughout the morning hours, though more often in fall

This paper is published by authority of the State of Illinois, IRS Ch. 127, Par. 58.12, and is a contribution from the Section of Wildlife Research of the Illinois Natural History Survey. Dr. Richard R. Graber is a Wildlife Specialist at the Survey. Dr. Jean W. Graber is a Research Assistant Professor of Animal Science at the University of Illinois. The late Miss Ethelyn Kirk served as Technical Assistant in the Section of Wildlife Research at the Survey.

Fig. 2.—Robins still largely in juvenal plumage in September.

than spring. There are surprisingly few references to these dramatic migrations in the Illinois literature (Armstrong 1920, Cooke 1883, Fawks 1967, and Musselman 1921), and most of them lack precise data on numbers, timing, and flight directions.

The arrival dates most often given are: February 1–15 for southern Illinois, February 6–25 for central Illinois, and February 20–March 10 for the north. The earliest arrivals are likely to be males, but within very few days birds of both sexes are present (Speirs 1946). Our censuses indicated the presence of high migrant populations in southern Illinois from February 10 to April 10, and from about March 10 to April 20 in central and northern Illinois (Fig. 4). Robins banded in Illinois have been recovered on the southern wintering grounds as late as April 5 (South Carolina), and March 30–31 (Georgia and Mississippi). In addition to the regular spring migration from the South, there are winter (December and January) movements of unknown origin (see under Winter Records, below).

Ballou (1880) believed that northward movements of robins began after a period of 60 hours of warm temperatures (up to 70° F.) and southerly winds. Eifrig (1922, 1924) theorized that photoperiod was a more important stimulus than temperature. Our censuses showed the robin's spring migration to be prolonged in the south, as if the birds tended to loiter at that latitude during February (Fig. 4). This was also Cooke's (1883) impression. The late February exodus of robins from southern Illinois in 1967 occurred overnight when winds shifted from northwest to southwest.

In general, our spring counts of robins were lower in western Illinois than for the eastern side and migrant populations in northwestern Illinois were especially poor (Fig. 4).

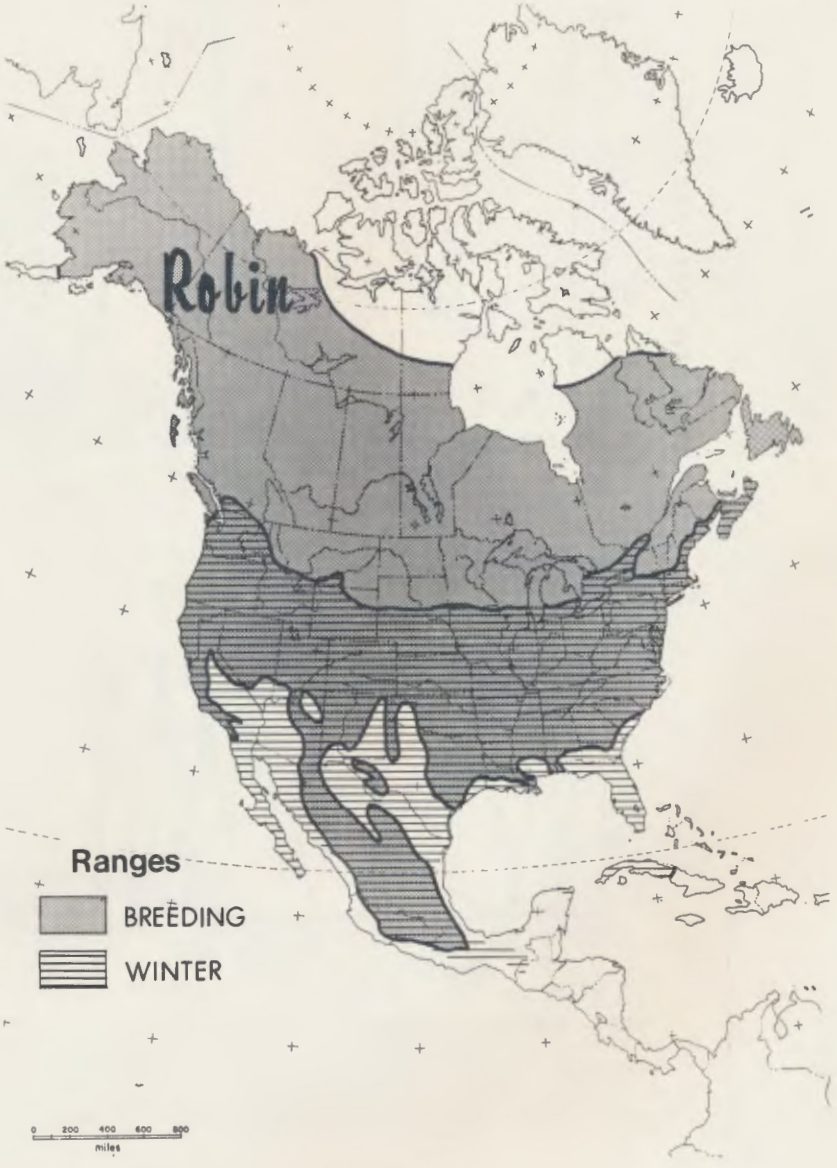


Fig. 3.—General distribution of the robin.

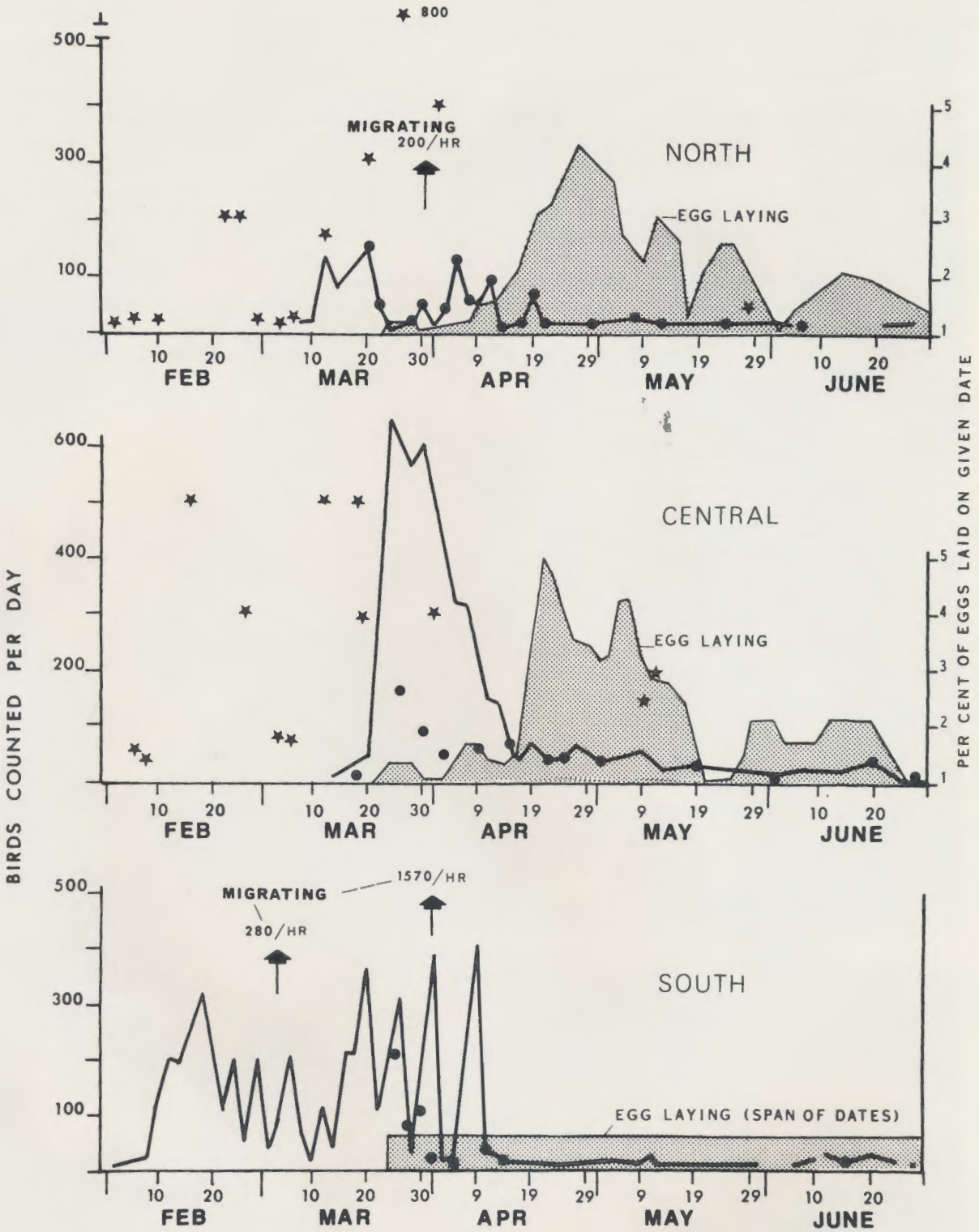
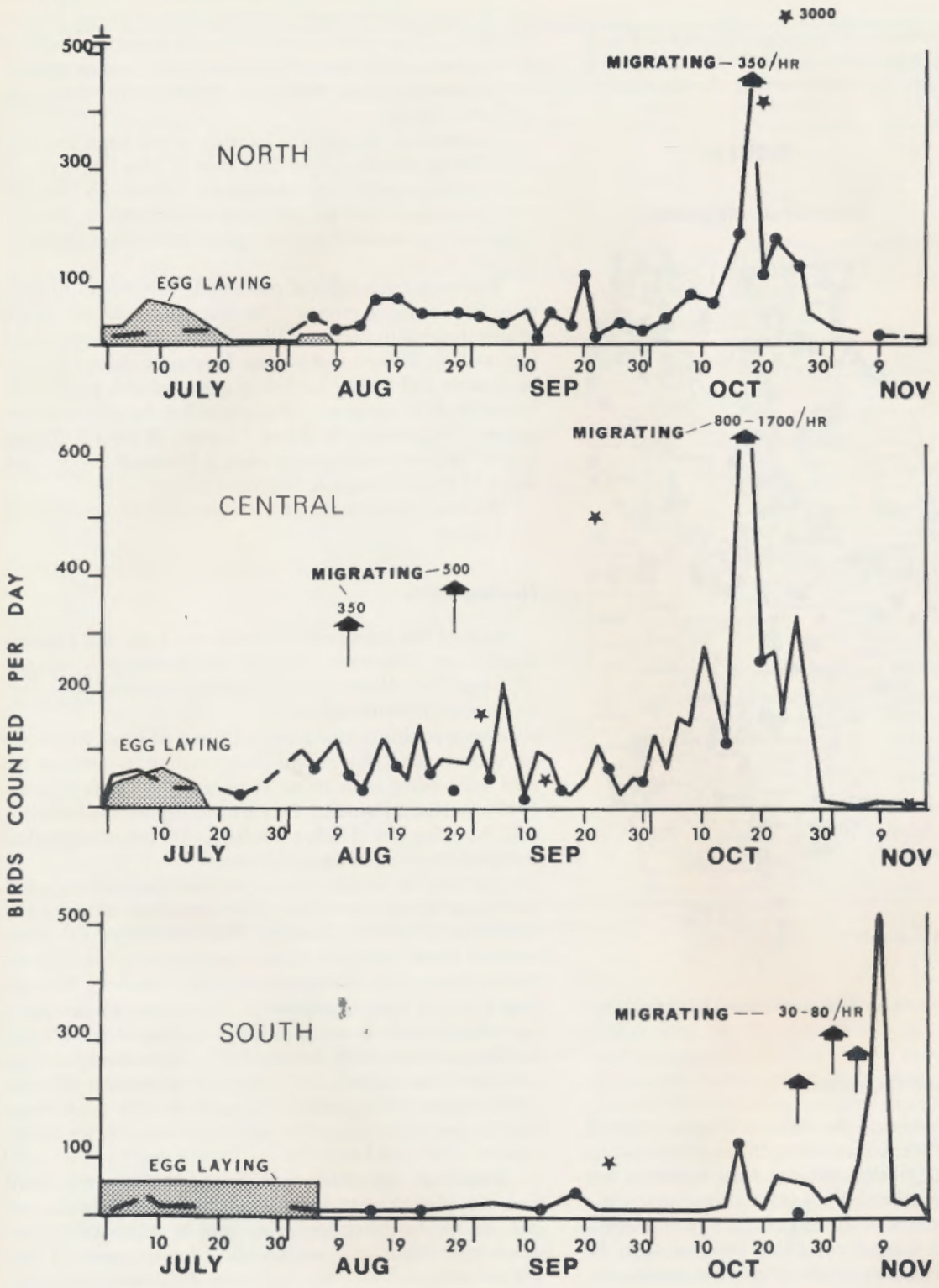


Fig. 4.—Egg-laying and migration seasons of the robin in different areas of the state (see Fig. 1). Spring and fall graph lines (1967–1970) show the highest daily count of each 2 days (left scale). The lines are interrupted where data have not been collected. Star symbols represent counts made in other years or by other observers. Shaded areas show the percent of eggs laid on a given date (right scale) or the span of dates during which egg laying has been recorded. Dot symbols represent counts made on the western side of the state; lines without dots represent the eastern side. Arrow symbols indicate dates of actual migration flights and the number of birds seen per hour.


BIRDS COUNTED PER DAY
NORTH
MIGRATING — 350/HR
3000
EGG LAYING
500
300
100
CENTRAL
MIGRATING — 800 – 1700/HR
MIGRATING — 500
350
EGG LAYING
600
400
200
SOUTH
MIGRATING — 30 – 80/HR
EGG LAYING
500
300
100
10 20 30 9 19 29 10 20 30 10 20 30 9
JULY AUG SEP OCT NOV

Distribution

The general distribution of the robin is shown in Fig. 3. Robins surely nest in every township in the State, but as yet the literature does not accurately reveal the distribution (Fig. 5).

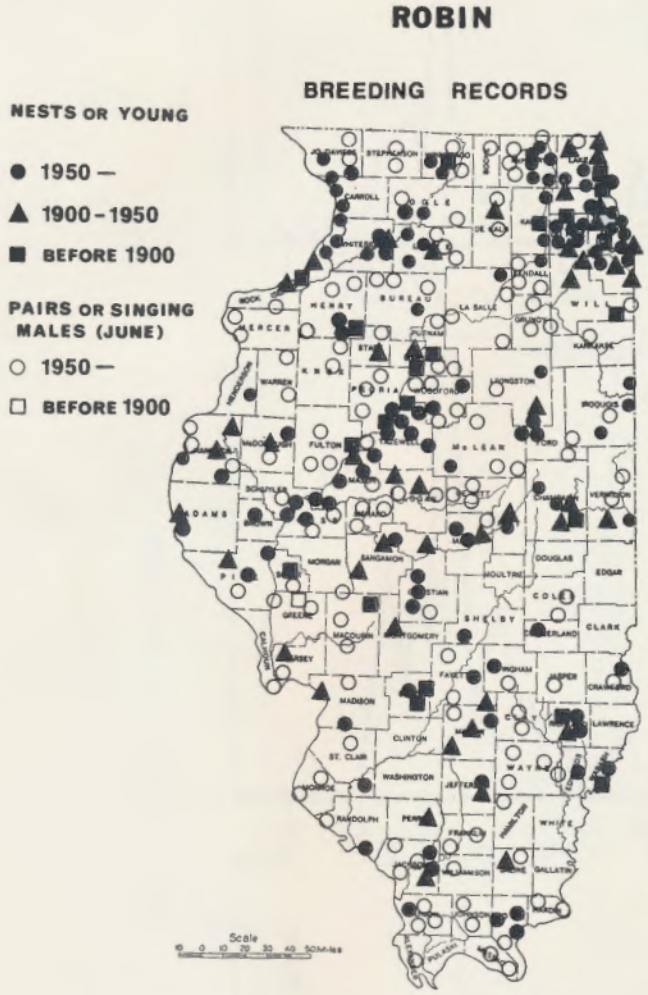


Fig. 5.—Breeding records for the robin in Illinois. Singing male records are for June only.

Nesting Habitats and Populations

The earliest references to the robin in Illinois comment on its domestic nature (Kennicott 1853–1854), and its affinity for human residential areas as nesting habitat has probably increased (Table 1). Ford (1919) noted that while many species disappeared as the city of Chicago developed, the robin remained. Carpenter (1935) believed that the robin had a major influence on the forest edge community at all seasons but winter. Gates' (1911) classification of the robin as a dominant species of mixed forest and of secondary abundance in hedges and orchards is surprising, and the available census data do not bear him out (Table 1). However, there are no census figures available for any sandy-soil areas in the state. A difference in nesting habitats is apparent between northern and southern Illinois (Table 1). There is relatively less use of nonurban habitats in the south, where nearly 80 percent of the nesting population is found in towns, versus 60–70 percent in central and northern Illinois.

Information on nest-site location in northern and central Illinois is summarized in Table 2. The list of plants used is undoubtedly very incomplete. Klimstra & Stieglitz (1957) provided data on nest sites in Carbondale, Illinois. There are no studies that relate plant use to plant availability.

The recorded heights of robin nests vary from 1 to more than 50 feet above ground. The literature indicates modes of nest heights in northern Illinois around 4–6 feet, 10–15 feet, and 20–25 feet, and average heights of about 7 feet for rural nests and 10 feet for urban nests. In both places nest height tends to increase by as much as 3–4 feet as the season passes. The average height of 73 nests in central Illinois was 10 feet, and early-season nests at Carbondale averaged about 15 feet (Klimstra & Stieglitz 1957).

We have found no data on territory size for the robin in any habitat.

Nesting Cycle

Singing has been recorded in Illinois from late January (south) and February (central) to November (Silloway 1899 and 1902, Ridgway 1915, and Musselman 1939), and rarely at night (Musselman 1931).

For populations in northern Illinois at least, the banding records show that robins have a strong tendency to return as breeding birds to the vicinity of their birth (Farner 1945). Published banding data are lacking for southern Illinois, but Ridgway (1925) recorded a club-footed robin that returned to nest each year at Olney.

The nesting season (onset of nest building to fledging of last young for the population) lasts from about March 18 to September 2 with surprisingly little difference apparent between south and north. Single nesting cycles for a pair of robins required 36–37 days in the north (Charles 1909, and Leach 1927). Time requirements for different phases of the cycle have been recorded as follows: 3–10 days for nest building (Charles 1909, Scherer 1924, Klimstra & Stieglitz 1957, and Davis 1969), 11–13 days for incubation (Charles 1909, Scherer 1924, Leach, 1927, Labisky 1966, and Davis 1969), and 13–15 days for nestling life (Charles 1909, Scherer 1924, and Leach 1927).

Maximum egg production occurs between mid-April and mid-May in central and northern Illinois (Fig. 4), and data on the hatching peak presented by Klimstra & Stieglitz (1957) indicate a similar curve for the south. There are no adequate data on clutch size for southern Illinois, but in a sample of 188 nests found in northern and central Illinois we see little regional variation. Clutches of six and seven eggs are rare, representing less than 1 percent of all sets. Five-egg clutches are uncommon, representing 3–4 percent of the sets (see also Blocher 1933, and Hess 1907)

TABLE 1.—Breeding populations of robins in various Illinois habitats.

Habitat	Acres	Birds Per[a] 100 Acres	Years	Type of Census	Region or County	Reference
Residential	8	14	1916	Nest	Richland (S)	Cooke 1916
	20	30	1907–1909	Strip	North & Central	Graber & Graber 1963
	33	36			South	
Urban residential	160	132	1957–1958	Strip	North	Graber & Graber 1963
	75	109			Central	
	98	102			South	
Parkland estate	100	16	1915	Nest	Cook (N)	Eifrig 1915
Edge shrub (including hedge)	15	34	1957–1958	Strip	North	Graber & Graber 1963
	21	56			Central	
	22	9			South	
Thicket	13	4	1950	Nest	Jackson (S)	Brewer & Hardy 1950
Orchard	45	29	1907–1909	Strip	South	Graber & Graber 1963
	36	5	1957–1958		North	
	78	5			South	
Late shrub	..	28	1966	Nest	Vermilion (C)	Karr 1968
Shrub areas	50	4	1907–1909	Strip	South	Graber & Graber 1963
	32	3	1957–1958		North	
	49	2			Central	
	126	2			South	
Forest (all types including edge)	16	6	1907–1909	Strip	Central	Graber & Graber 1963
	60	15			South	
	177	6	1957–1958		North	
	213	6			Central	
	337	+[b]			South	
Bottomland forest	..	12	1966	Nest	Vermilion (C)	Karr 1968
Forest edge	64	8	1943	Nest	Champaign (C)	Johnston 1947
	55	0–4	1927–1948		Champaign (C)	Kendeigh 1944, 1948
	55	(0–20 per mile)	1949–1970		Champaign (C)	Kendeigh, et al. 1950, Kendeigh & Barnett 1968, Kendeigh & Clemans 1970
Upland oak-hickory forest	24	1	1967	Nest	Hancock (C)	Franks & Martin 1967
Second growth or cut-over woods	25	14	1937–1938	Nest	Rock Island (N)	Fawks 1937, 1938
	56	8–12	1941–1944		Sangamon (C)	Robertson, 1941, 1942, 1944
Grazed bottomland	93	6	1955	Nest	Macon (C)	Chaniot & Kirby 1955

[a] All figures were converted to read birds per 100 acres or birds per mile of edge (number of territorial males or nests x 2).
[b] Less than one.

Most nests receive either four eggs or three eggs. In April and May, 74 percent of the nests have four-egg clutches, and 23 percent have three eggs. In June and July only 46 percent of the nests have four-egg clutches, and 48 percent have three eggs. In the south Klimstra & Stieglitz (1957) found clutch size to average 3.4 eggs. Data on egg weights are given by Davis (1969).

It is a widely held view that robins raise two, and sometimes three broods per year. Though population studies of marked birds are lacking for Illinois, Young's (1955) data for Wisconsin support this view. The egg-laying curves have several peaks (Fig. 4).

Robins are rarely parasitized by the cowbird (Friedmann 1966). We have but one record, in a sample of over 400 nests, of a single cowbird egg in a nest with three host eggs. The host was successful in fledging young, but the cowbird egg disappeared.

There are few Illinois data on robin nesting success and productivity. In the nonurban population we studied in northwestern Illinois (Fig. 1), 58 percent of the nests and 50 percent of the eggs fledged young in April and May (sample: 43 nests with complete histories), but in June and July (23 nests with complete histories) nesting success declined to 48 percent of the nests and 37 percent of the eggs. On a school campus in west-central Illinois, Finley (1917) found that only 39 percent of the eggs fledged young in a sample of 64 nests. There are no data on fledging success for the south, nor are there quantitative data on the causes of nest failures. The causes most often mentioned in the literature or observed by us are weather (death of young from cold, or dislodgment of nests by wind and rain storms), and predation by gray squirrels *(Sciurus carolinensis)*, grackles *(Quiscalus quiscula)*, blue jays *(Cyanocitta cristata)*, house cats *(Felis catus)*, and snakes, but the population signifi-

cance of any of these predators is unknown. Lyon (1922) noted particularly heavy predation on robin nests by grackles in 1922, when nearly all observed nests failed.

Finley (1912) and Davis (1969) have described the growth and development of nestlings.

TABLE 2.—Plants and structures used by robins as nest sites in Illinois (mainly nonurban areas).

Nest Site	Percent of Total Nests	
	North (228 Nests)	Central (84 Nests)
Man-made structures (shed, house porch, etc.)	16	12
Osage orange *(Maclura pomifera)*	10	24
Apple and crabapple (*Malus* sp.)	8	10
Elm (*Ulmus americana, U. pumila,* and sp.)	7	10
Oak (*Quercus velutina, Q. borealis, macrocarpa,* and sp.)	8	4
Pine (*Pinus strobus, P. sylvestris, P. nigra,* and sp.)	7	4
Mulberry (*Morus* sp.)	9	1
Box-elder *(Acer negundo)*	4	6
Other maples (*Acer* spp.)	3	6
Cedar (*Juniperus virginiana, J. chinensis,* and sp.)	5	2
Cherry, Plum, etc. (*Prunus serotina,* and spp.)	2	4
Hawthorn (*Crataegus* spp.)	3	2
Spruce (*Picea* sp.)	2	2
Hackberry *(Celtis occidentalis)*	2	1
Willow (*Salix* spp.)	1	2
Honey locust *(Gleditsia triacanthos)*	3	..
Lilac *(Syringa vulgaris)*	3	..
Honeysuckle (*Lonicera* spp.)	+[a]	2
Birch (*Betula nigra,* and sp.)	2	..
Rose (*Rosa multiflora,* and sp.)	1	1
Sycamore *(Platanus occidentalis)*	..	2
Pear *(Pyrus communis)*	+	1
Ash (*Fraxinus* sp.)	1	..
Grape (*Vitis* sp.)	1	..
Catalpa (*Catalpa* sp.)	..	1
Tree of heaven *(Ailanthus altissima)*	..	1
Magnolia (*Magnolia* sp.)	..	1
Pignut hickory *(Carya glabra)*	+	..
Golden bell (*Forsythia* sp.)	+	..
Virginia creeper *(Parthenocissus quinquefolia)*	+	..
Black locust *(Robinia pseudoacacia)*	+	..

[a] Plus symbols (+) = less than one.

Fall Migration

In early September most robins in central Illinois are still in molt, and we have seen young still largely in juvenal plumage as late as mid-October.

Smith (1941) reported that young robins were in full migration in northern Illinois by July 21. We have seen robins flocking in early July wherever there were good food supplies, but whether there is any real migration this early we do not know. Robins banded in Illinois have appeared in the Gulf States at least as early as October 8 (Louisiana) and October 20 (Mississippi). Our censuses show marked day-to-day population changes in July and August in central and northern Illinois, but very little change in southern Illinois until September (Fig. 4). We have not witnessed active migrations of robins in any part of the state until September, but Robert D. Crompton (personal communication) has seen diurnal southward migration as early as August 11 in Mason County. The most massive migrations we have seen occurred in October in northern and central Illinois near major waterways. Though all of the fall robin migrations we have seen were oriented either near south (180°) or west of south, the recoveries of banded birds show great dispersal (Fig. 6). We have seen more morning migrations of robins in the fall, and more evening flights in the spring. The robin is a rare casualty at television towers. We have found only one specimen (on October 6, 1967) among thousands of night migrants (of other species) picked up at towers in central Illinois.

Highest fall populations occurred in September and October in central and northern Illinois, and in October and November in the south (Fig. 4). Fall counts of robins were three to four times higher in east-central Illinois than in the west.

In the north we saw about four robins in the fall (August–October, inclusive) to one in the spring (March and April). In the central sections, both east and west, we saw only about 1.5 in the fall to one in the spring. In the south the ratio was, inexplicably, reversed: three in spring (February through April) to one in fall (August–November, inclusive). These data represent only "grounded" robins, and not birds in active migration.

A notable ecological change occurs in the robin between spring, when most birds are found foraging in open grassland, and fall and winter when the population frequents woody habitats much more.

Roosting

We have no records of Illinois robin roosts that even approach the dimensions of those found in eastern Missouri, where as many as 3½ million birds have been reported (Petersen 1965, and Widmann 1895). James (1957) studied local roosts in Champaign County, and roosts have also been recorded in Cook County (Back 1934–1935, and Bailey 1932), and in Fulton County where the population peaked at 22,500 birds on October 23. Roosting aggregations occur in spring from March into May, and in late summer and fall from July through October (James 1957). Large winter roosts should be looked for especially in southern Illinois.

Winter Records

Robins have been found in winter throughout most of the state (Fig. 7), but generally only in small numbers north of the southern zone (Fig. 8), and the bulk of the eastern robin population winters south of latitude 35° north, i.e., south of Illinois (Speirs 1953). Though there are December and January records for the Chicago area in all but 3 of the past 40 years (1930–1969), our statewide censuses

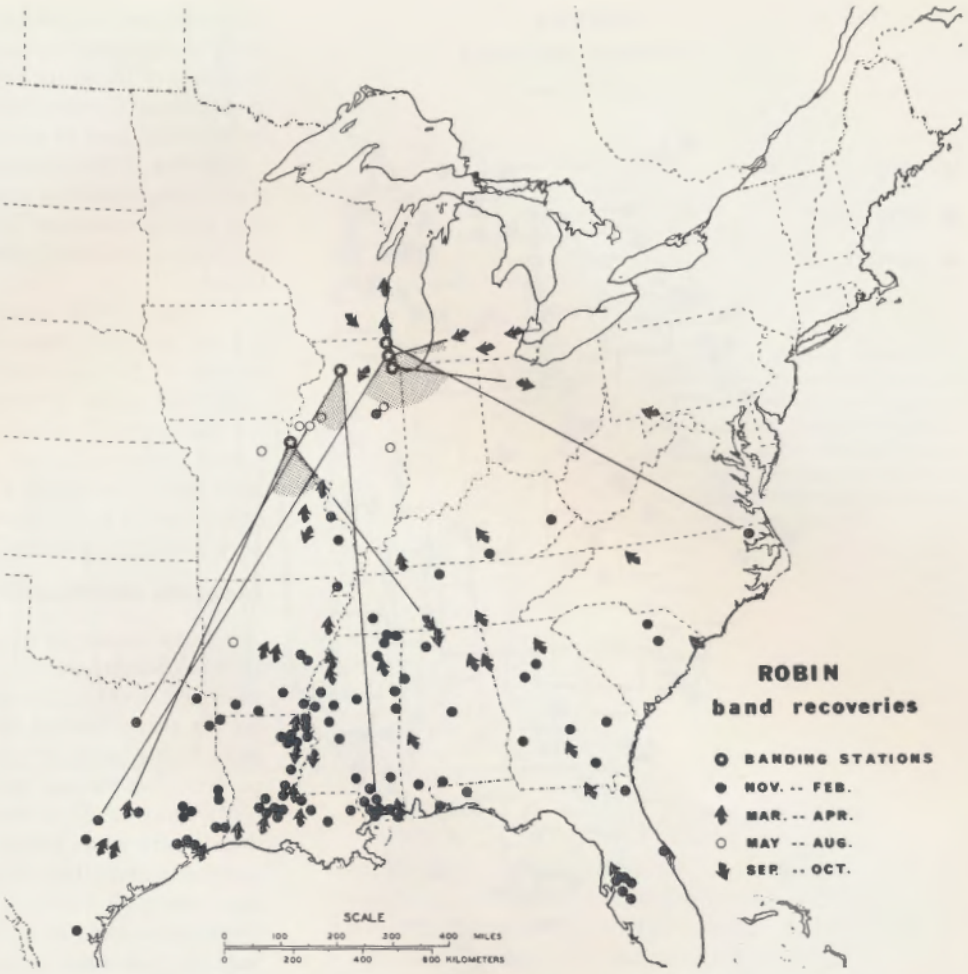


Fig. 6.—Distribution of recoveries of robins banded in Illinois. Lines and shaded areas indicate the spread of recoveries from five banding stations.

showed that 99 percent of the state's winter robin population was in the southern region (Graber & Graber 1963).

Some winters (note especially 1955–1956, 1964–1965 in Fig. 8) large numbers of robins appear even in northern and central Illinois. In such high years hundreds or even thousands of robins may be seen per day in central and northern Illinois (Fawks 1967, Musselman 1963, Link 1948, Mayfield 1951, and Rice 1946). Various explanations have been offered for these high populations, and there are some data to support the following hypotheses: (1) unusually high productivity in the preceding breeding season, productivity that increased population pressure everywhere in the eastern United States; (2) exceptionally good winter food reserves in the north; and (3) exceptionally early northward migration, reflecting an unusually mild winter (Robbins 1956, and Nolan 1956).

Cooke (1885) believed that bottomland forest was the robin's primary winter habitat (note also the winter distribution, Fig. 7), but there are few population measurements available for any habitat. Between 1927 and 1970, Kendeigh and his students reported populations in forest edge in central Illinois ranging from none in most years (Kendeigh 1948) to eight birds per mile of edge (Kendeigh & West 1958). In southern Illinois, Shaw et al. (1961, 1965) recorded populations in a shrubby field ranging from none (1961) to 13 robins per 100 acres (1965).

Food Habits

Forbes' (1903) studies were based almost entirely on specimens from central and northern Illinois. In the spring robins fed almost exclusively on animal matter (Fig. 9). The items most frequently mentioned in the literature are earthworms and larvae of March flies, especially *Bibio albipennis* (LeBaron 1853–1854, Thomas 1920, Rice 1946, and Twomey 1945). Forbes' studies showed the *Bibio* larvae to be important, but did not show the expected prevalence of earthworms (Fig. 9). He related the low tally of worms to their quick digestibility. Cutworms (Noctuidae), and even the egg masses of tussock moths (Liparidae) are prominent in the diet (Hulsberg 1917–1918, and Schantz 1933), as are ground beetles (Carabidae) and wireworms (Elateridae) later in the spring. At a Tazewell County orchard that was heavily infested with canker worms (Geometridae), Forbes (1883) found that robins increased their intake of the pest, but kept many other items of their usual diet. Cleveland (1923) found robins feeding 17-year cicadas to their young.

Fig. 7.—Winter records for the robin in Illinois. The three regions of the state discussed in the text are shown by heavy lines.

In June a change to a primarily fruit diet occurs, and fruit (much of it wild) is very important through the rest of the summer and fall (Fig. 9). In late summer and fall (particularly October) we have observed robins feeding heavily on wild grape (*Vitis* sp.), black cherry (*Prunus serotina*), *Parthenocissus,* hackberry (*Celtis* sp.), dogwoods (notably *Cornus racemosa, C. rugosa,* and *C. stolonifera*), multiflora rose, pokeberry *(Phytolacca americana)*, elderberry (*Sambucus canadensis*), persimmon (*Diospyrus virginiana*), and red cedar (see also Hulse 1912, Bell 1956, and Cone 1963). Other fruits commonly recorded as robin food are: mountain ash (*Sorbus* sp.), sumac (*Rhus* sp.), barberry (*Berberis* sp.), bittersweet (*Celastrus scandens*), holly (*Ilex decidua*), snowberry (*Symphoricarpos* sp.), pear (*Pyrus* sp.), apple (*Malus* sp.), and greenbrier (*Smilax* sp.) (Cooke 1885, Musselman 1934–1935 and 1963, Holcombe 1936, and Pitelka 1936). At least one instance of robin intoxication from fermented hackberries has been recorded (Buck 1936). Forbes' (1903) only winter specimen (from Cairo) contained fruit of mistletoe (*Phoradendron flavescens*) exclusively, but local observers felt that winter robin populations in that area depended mainly on wild grapes and that a failure of the grape crop was reflected in reduced winter populations. Cooke (1885) also noted that robins fed heavily on wild grapes in southern Illinois.

Forbes (1900) believed the robin to be functional in controlling cutworm numbers, and Rice (1946) estimated that robins consumed about five-sixths of the invertebrate population in leaf litter at a forest edge in Champaign County.

Charles (1909) recorded that both adults fed the young, putting in a 15½-hour day in late May, and bringing an average of 356 pieces of food per day. Lepidoptera larvae comprised about 50 percent of the total food, with earthworms (about 29 percent), ants (about 7 percent), Diptera (about 6 percent), and small percentages of Coleoptera, Myriapoda, and adult Lepidoptera making up most of the other half. Earthworms as food for the young have also been recorded by Mann (1908) and Scherer (1924).

Longevity and Mortality

Based in part on northern Illinois banding data, Farner (1945*a*) determined the average natural longevity for a robin to be 1.7 years. He estimated the age group composition for the population as follows: first-year birds, 53 percent; second-year birds, 25 percent; third-year birds, less than 14 percent; fourth-year birds, less than 6 percent; fifth-year birds, less than 2 percent; and sixth-year or older birds, less than 1 percent. A sample of 28 returns of robins banded in northeastern Illinois produced six birds past 3 years of age, one past 4 years, and one past 6 years (Downing 1949). A robin, recognizable because it had white wing feathers, was seen regularly in the breeding season at Hinsdale in 6 successive years (Tuttle 1927), and Bartel's (1968) oldest banded robin was nearly 5 years old.

As to the causes of robin mortality in Illinois, the literature has dealt in detail with only one type—insecticide poisoning. Bartel's studies in Cook County (1960, 1962, 1965) are particularly valuable because he studied a banded population for which he had a long-term population record. He established that 85–90 percent of the robin population was eliminated following application of 2 pounds of heptachlor per acre for Japanese beetle (*Popillia japonica*) control. A year after treatment the robin population had recovered only 5 percent, but 2 years after treatment it was back to 75 percent of the pretreatment level (Bartel *fide* Mumford 1960 and Graber 1962).

A robin population was eliminated (as evidenced by the recovery of dead birds and the disappearance of robins from established nests) in an area of Iroquois County by the application of 3 pounds of technical dieldrin per acre, again for Japanese beetle control (Scott et al. 1959). Large numbers of dead earthworms were seen following the treatment, and this was believed to be the route-source of the toxicant in robins (see also Barker 1958). Very high robin mortality from DDT application has also been recorded (Montgomery 1956).

Severe weather in late winter or spring may be a signif-

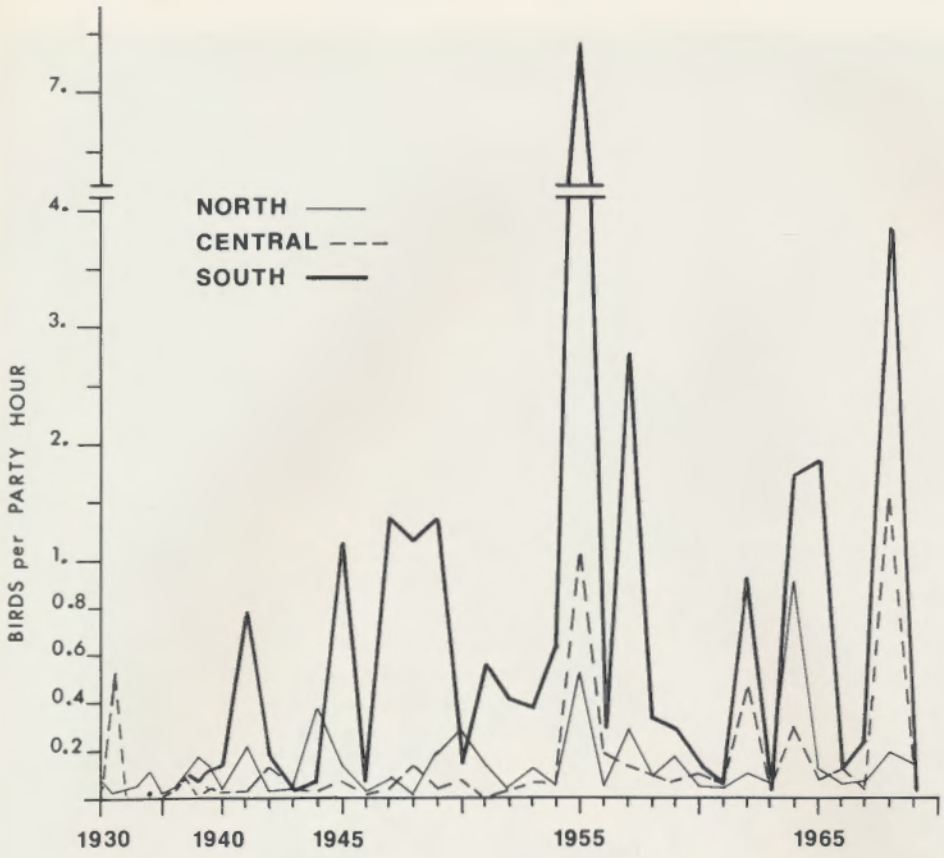


Fig. 8.—Annual variation in winter robin populations, based on Audubon Christmas counts in three regions of the state. Graph line shows the number of robins seen per party hour. (For information about the Audubon Christmas counts, see Cruickshank 1970.)

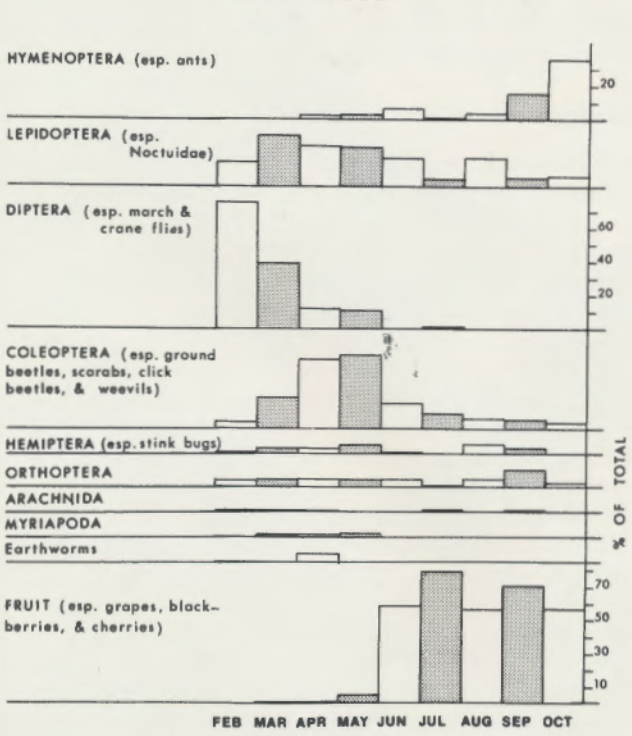


Fig. 9.—Food habits data on the robin from the study of Forbes, 1903 (1880). Percentages represent the part of the total food identified in the stomachs of several robins examined each month.

icant mortality factor in robin populations, as it is in bluebird populations. Dead robins and reduced populations have been recorded in northern Illinois following severe wind, cold, or snow, especially in April (Butler 1896, Blocher 1921, Schafer 1921, and Segal 1960). Roseberry (1962) found robins among the dead birds picked up near Carbondale following prolonged snow and cold in February and March.

VARIED THRUSH (*Ixoreus naevius*)

(Fig. 10)

Because there are at least 16 records of this species from 14 different localities in the state, its occurrence cannot be considered accidental. Only one record was found in the literature before 1950 (Fig. 11) and there were four in 1970 (Armstrong 1970). All records are from northern Illinois with the exception of one wintering at Decatur (Lobik 1957). All dates given fall between mid-December and March 30 with one exception (April 26, 1929 at Blue Island, Bartel 1932).

The usual pattern of behavior is that a single bird, most often a male, will appear at a feeder (or area providing food such as crab apples) around Christmas time and remain for several weeks. This far northwestern breeder seems to be a habitual winter wanderer, occurring fairly regularly in northeastern United States and spottily as far southeast as the Gulf Coast (Keith 1968).

Fig. 10.—Male varied thrush photographed near Rockford, Illinois in January, 1970 by Jack Armstrong. This is a valuable photographic record of a species rare in Illinois. The bird is actually about the size of the robin.

Fig. 11.—Winter records for the varied thrush in Illinois.

WOOD THRUSH (*Hylocichla mustelina*)

(Fig. 12 and 13)

Spring Migration

The available evidence, notably fall kills at television towers, indicates that wood thrushes are night migrants, but we have never heard a recognizable wood thrush call among the many *Catharus* calls we detect every migration season in Illinois.

March records for this species (George 1968) must be accidental even in southern Illinois, and should be carefully documented with full details. We are skeptical even of early April records (Ford 1956, and Sparks 1905), especially in northern and central Illinois. In most years the first wood thrushes reach southern Illinois about April 15, central Illinois about April 22, and northern Illinois about April 29. Within a week the species becomes common, and peak numbers may be seen in all parts of the state about May 6–20 (Fig. 14).

We saw the largest numbers in the south and fewest in the north, and our counts in southern and central Illinois were consistently higher on the western side of the state than on the eastern side (Fig. 14).

There are no published band recoveries of Illinois wood thrushes for any season.

Distribution

The general distribution of the wood thrush is shown in Fig. 13. The breeding distribution in Illinois is very poorly known, especially in any quantitative detail (Fig. 15).

Nesting Habitats and Populations

The favorite nesting habitat of the wood thrush appears to be lowland forest (Ridgway 1887, Loucks 1891, and Fawver 1947). Ridgway (1915) was concerned about the thrush because of the clearing of the lowland forests, and this problem is much more critical now. Cahn & Hyde (1929) mentioned that wood thrushes breed in cypress swamps.

The species also nests in upland forest, and even in residential habitat and shrub areas (Table 3). Riis (1917), Gault (1933), and Musselman (1921*a*) reported good nesting populations in northern and western cities, but more recently we found measurable urban populations only in the south (Graber & Graber 1963).

Wood thrush territories in central Illinois forest measured by Twomey (1945), Fawver (1947*a*), and Calef (1953) varied from about 2 to 7 acres. The most detailed data are those of Calef who found extremes of 1.7 to 4.3 acres, with an average of about 3 acres.

There are nest site data on only 29 nests. The trees most favored were elms (31 percent of nests) and maples (17 percent). Although heights of nests ranged from 2 to 35 feet, most of the nests (71 percent) were 5–10 feet high.

Fig. 12.—Wood thrush, the most heavily spotted of Illinois thrushes.

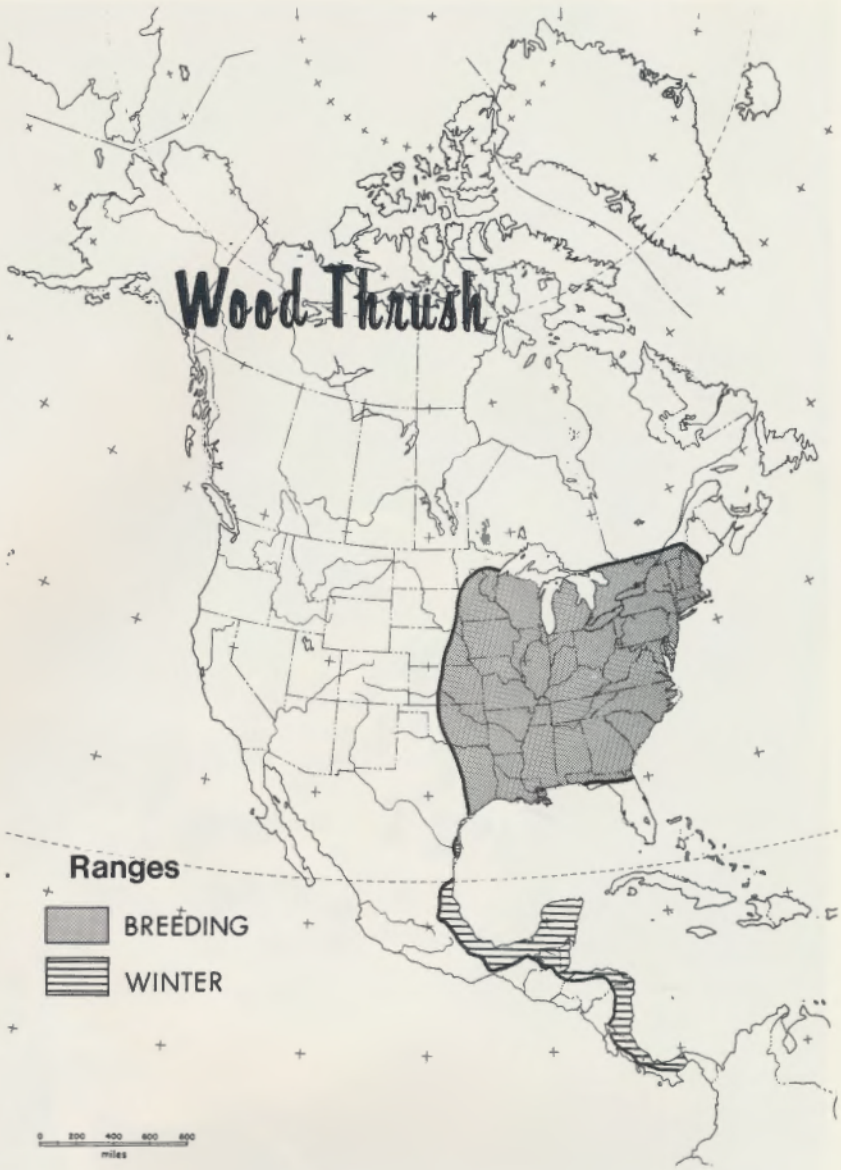


Fig. 13.—General distribution of the wood thrush.

Nesting Cycle

The Illinois literature is essentially devoid of quantitative data on the nesting cycle of the wood thrush and we can add little. Singing has been recorded from April 19 in southern Illinois to August 3 in the north. Our records on the span of dates for egg laying, from April 26 in the south to July 19 in the northern and central regions, are very incomplete, particularly for the south. A record of young leaving the nest May 30 in the Chicago region (Ford 1956) must be exceptional as an early nesting record for that latitude.

There is a very high incidence of cowbird parasitism. From our records and the literature, we have egg data on only 69 wood thrush nests in Illinois, of which 33 (48 percent) were parasitized. Most of the nests had 1 or 2 cowbird eggs, but 6 nests had 3 or more (up to 5). Though the sample is small it represented all three regions of the state, and the incidence of parasitism was near 50 percent in each region. This high parasitism has been reported over many years. Mundt (1883) found nearly half of the nests along the Vermilion river bottoms parasitized. Twomey (1945) recorded fledging success of 78 percent for 23 thrush eggs (6 nests), and 33 percent for 3 cowbird eggs (3 nests).

In the sample of 36 nonparasitized nests, clutch sizes were as follows: 5-egg, 9 percent; 4-egg, 76 percent; 3-egg, 15 percent.

There are no data on longevity or on mortality factors. Montgomery (1956) felt that wood thrushes survived better than robins following DDT applications for elm disease, because the wood thrushes arrived later after the insecticide treatment.

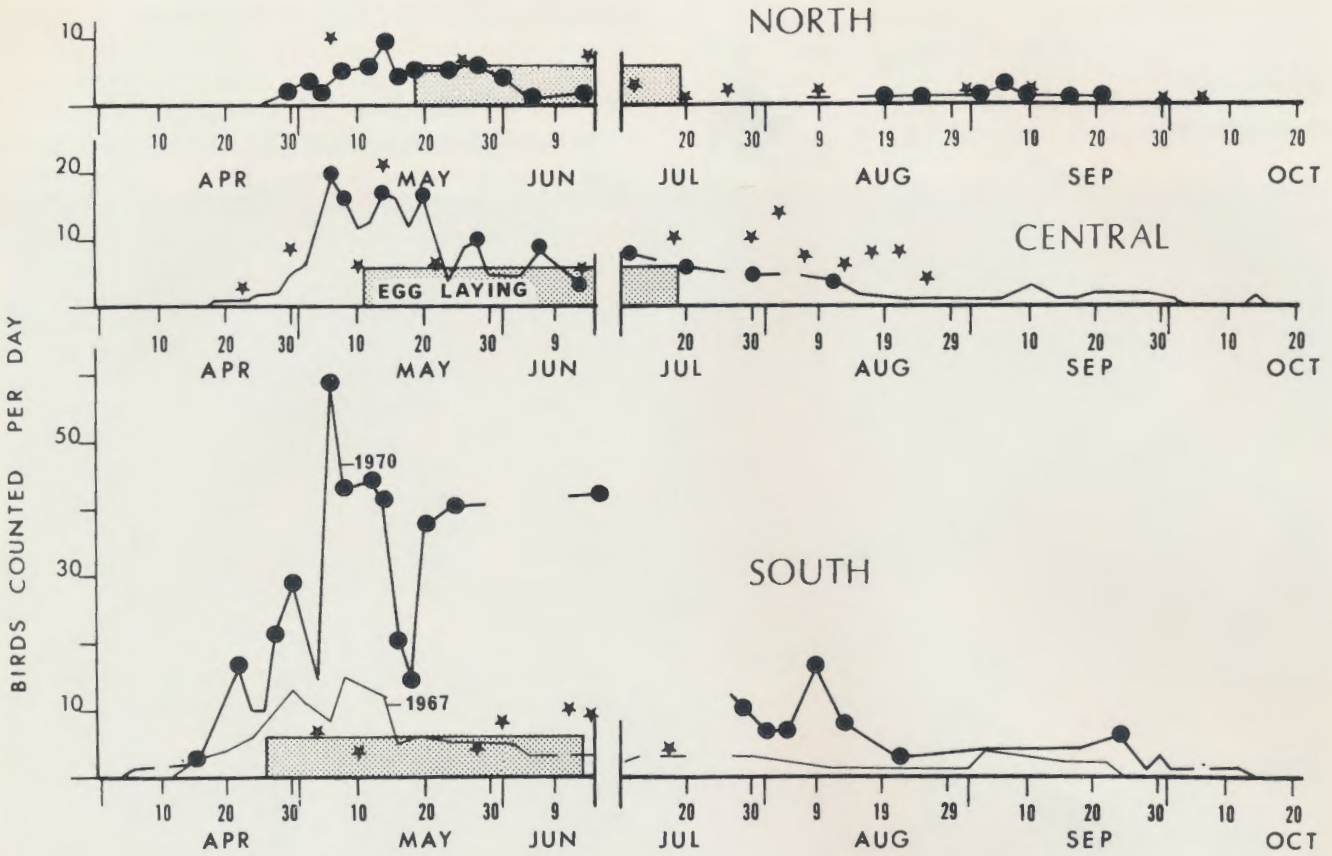


Fig. 14.—Egg-laying and migration seasons of the wood thrush in different regions of the state (see Fig. 1). Spring and fall graph lines (1967–1970) show highest daily count of each 2 days. The lines are interrupted where data have not been collected. Star symbols represent counts made in other years or by other observers. Shaded areas show the span of dates of egg laying. Dot symbols represent counts made on the western side of the state; lines without dots represent the eastern side.

Fall Migration

We have seen wood thrushes still in molt as late as September 20 in central Illinois, and specimens killed at television towers often show a few pin feathers in the body plumage in late September.

When silent, wood thrushes are difficult to find, and their silence probably has much to do with the relative lack of fall records (Fig. 14). We have recorded only 1 in the fall for every 15–20 in the spring. After the singing ends, in early August, one occasionally hears the thrush's distinctive scold notes, but generally the species goes undetected.

Relatively few wood thrushes are killed at Illinois television towers. In a sample of several thousand specimens picked up in central Illinois, this species comprised only about 0.5 percent. They have been killed in migration at least as early as September 12 and as late as October 14.

Our censuses indicate that the migration is largely through by the end of September (Fig. 14). There are records for the wood thrush in northern Illinois in mid-November and late November (Fawks 1970, and Holcombe 1936), but these must be considered accidental. A winter record for southern Illinois (Harlow 1921) is of doubtful validity.

Food Habits

Forbes (1903) examined the stomach contents of 22 wood thrushes taken from April to September, probably in central Illinois or central and northern Illinois. He found that among the thrushes and mimids, the wood thrush was near the top in the amount of insects taken (71 percent of the diet), and low in fruit consumption (19–21 percent). In the spring, the wood thrush was exceptional in the amount of millipeds it consumed (13 percent), and it also fed heavily on ants (15 percent). Coleoptera (18 percent of the diet) were important, consisting mainly of ground beetles, scarabs, click beetles, wireworms, and weevils. Forbes believed the wood thrush consumed fewer predaceous beetles than other thrushes. Flies, notably larvae of crane flies and *Bibio,* made up 12 percent of the food. Spiders and harvestmen made up about 1 percent of the diet, and molluscs about 1 percent. Rice's data (1946) on food habits of the wood thrush are roughly comparable to Forbes' data, though Rice indicated larger numbers of Hemiptera (10–20 percent) in the diet than did Forbes (only 1 percent).

In September we have seen wood thrushes feeding on the fruit of spicebush (*Lindera benzoin*), and pokeweed.

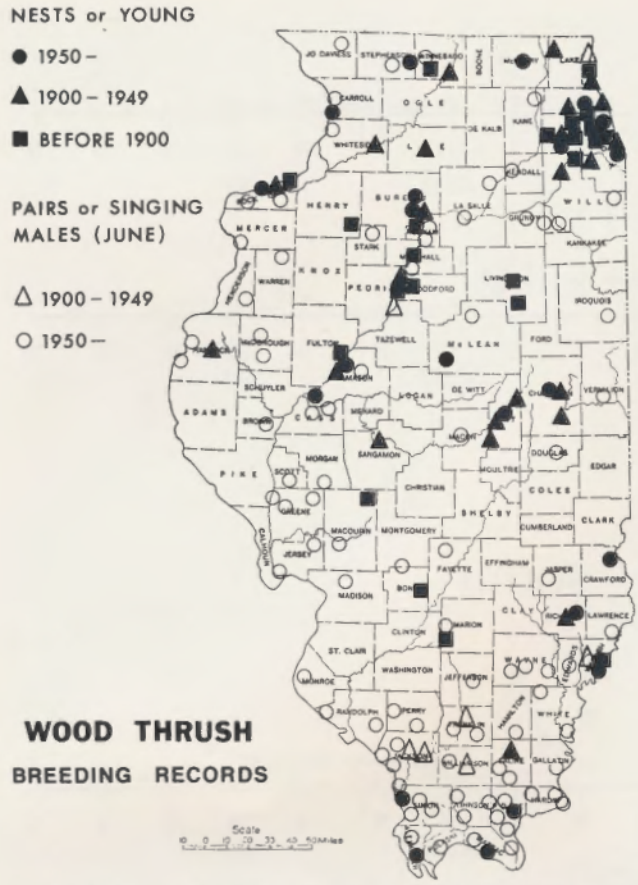


Fig. 15.—Breeding records for the wood thrush in Illinois. Singing male records are for June only.

HERMIT THRUSH (*Catharus guttatus*)

(Fig. 16 and 17)

Spring Migration

Though the hermit thrush has been recorded in winter at localities throughout the state, the winter population is so generally thin that the onset of the spring migration in late March is conspicuous (Fig. 18). The hermit is the most cold tolerant of the *Catharus* thrushes, and arrives in spring nearly a month in advance of the other three species (Annan 1962), passing through the state before the other species reach peak populations. Most of the hermit thrush population is north of Illinois by the end of April, and there are very few spring records later than May 12 even in northern Illinois (Fig. 18). The peak numbers of hermits probably occur in southern Illinois April 1–15, and in the central and northern regions April 10–30.

The hermit is the quietest of the four *Catharus* thrushes. In contrast to the loud calls of the other species, the hermit's note is soft and low. Our phonetics for the call are "tock" "tuck," or "trock," and the call is not heard nearly so often as the calls of the other species. We have never heard the hermit's call from night migrants, and our only indicators of the timing of migration are the few hermits killed at night on television towers in the fall. We have never heard a hermit thrush sing in Illinois, though they do sing occasionally in the northern region of the state (Farwell 1919, and Craigmile 1945).

Views as to the abundance of the hermit thrush differ markedly. Nelson (1876–1877) noted that the species was

TABLE 3.—Breeding populations of wood thrushes in various Illinois habitats.

Habitat	Acres	Birds Per 100 Acres[a]	Years	Type of Census	Region or County	Reference
Virgin bottomland forest	77	21	1948	Nest	Sangamon (C)	Snyder, et al. 1948
Bottomland forest	..	20	1966	Nest	Vermilion (C)	Karr 1968
	..	12–24	1946–1951	Nest	Piatt (C)	Weise 1951
Upland forest	..	6–10	1946–1951	Nest	Piatt (C)	Weise 1951
Forest edge	60	0–2	1959–1962	Nest	Piatt (C)	Balda 1963
Oak-maple forest	55	0–14	1927–1948	Nest	Champaign (C)	Kendeigh 1944, 1948
	55	0–10	1949–1970		Champaign (C)	Kendeigh & Brooks 1965, Barnett & Balda 1966
	64	12	1943	Nest	Champaign (C)	Johnston 1947
Upland oak-hickory forest	24	5	1967	Nest	Hancock (C)	Franks & Martin 1967
Forest (all types including edge)	79–98	1	1957–1958	Strip	North	Graber & Graber 1963
	97–117	0–1			Central	
	166–174	3–6			South	
Second growth or cut-over woods	15	40–93	1937–1938	Nest	Rock Island (N)	Fawks 1937, 1938
Late shrub	..	14	1966	Nest	Vermilion (C)	Karr 1968
Shrub areas	62–67	3–6	1957–1958	Strip	South	Graber & Graber 1963
Grazed bottomland	93	1	1955	Nest	Macon (C)	Chaniot & Kirby 1955
Swamp and thicket	13	2	1950	Nest	Jackson (S)	Brewer & Hardy 1950
Urban residential	98	2	1958	Strip	South	Graber & Graber 1963

[a] All figures were converted to read birds per 100 acres (number of territorial males or nests x 2).

very abundant in northeastern Illinois, and Nehrling (1880) found it not very common in the north. Judging from the counts of other observers (Annan 1962, Eiseman & Shank 1962, Clark & Nice 1950, and Labahn 1941), hermit thrushes appear to be more common along the lake in northeastern Illinois than in any other section of the state. A large kill of hermit thrushes by a storm at the south end of Lake Michigan on April 16, 1960 (Segal 1960) also tends to support the view that hermit thrushes become concentrated at the lake. We found the hermit thrush least

Fig. 16.—Hermit thrush, generally the most heavily spotted of the Illinois *Catharus* thrushes. (It also has a conspicuously reddish tail.)

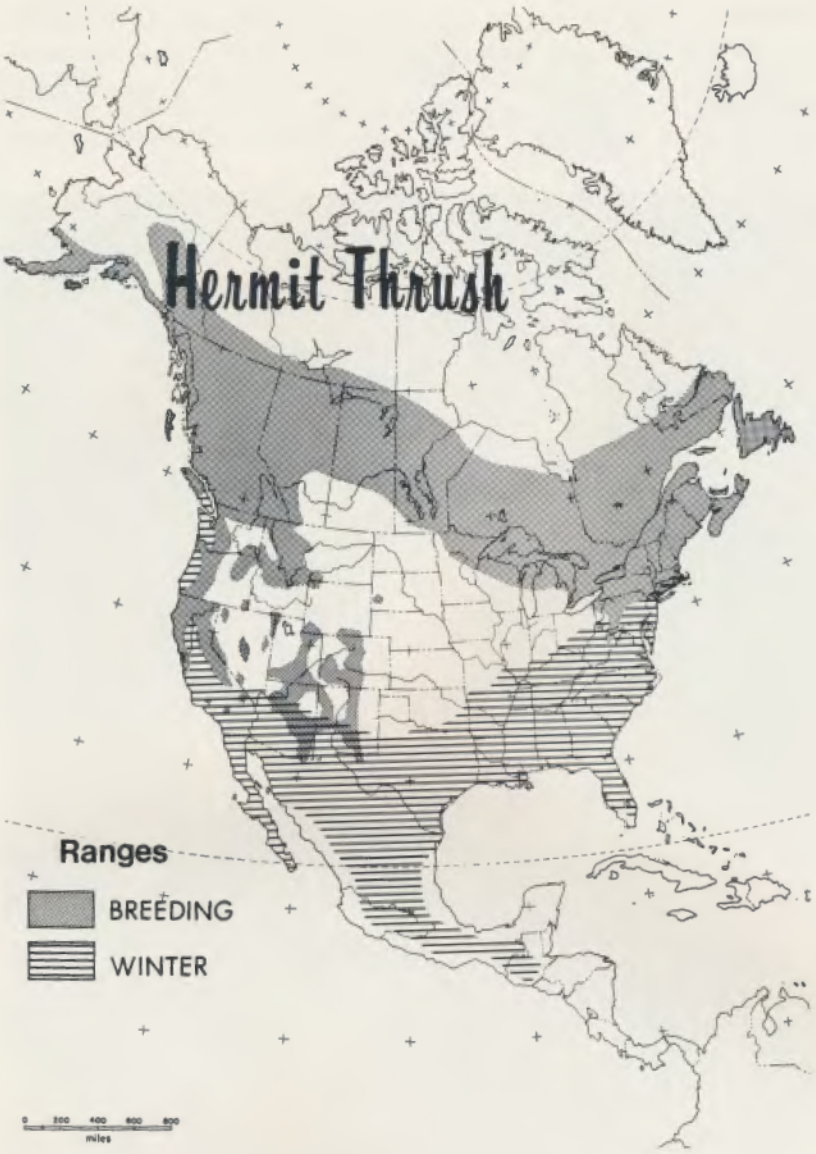


Fig. 17.—General distribution of the hermit thrush.

common in southern Illinois, possibly because of the large amount of concealing cover.

Fall Migration

After the spring migration hermit thrushes are generally not seen in Illinois again until mid-September or late September (Fig. 18). Though there are a few August records (Ford 1956), we are inclined to discount them either as accidental records or misidentifications. Most of the hermit thrushes pass through Illinois in October, and nearly all are gone by November 15. Bennett (1952) has shown that the strong October cold fronts often bring large numbers of hermits to the lakeshore of northeastern Illinois (see also Jung 1925). The largest numbers are seen on the first two days after the cold front passes. As in the spring, the numbers of hermit thrushes are low in southern Illinois (Fig. 18).

Though the other species of *Catharus* thrushes are frequently killed at television towers, hermits escape with very few casualties, about .02 percent of the thousands of birds we have observed as tower victims.

Recoveries of hermit thrushes banded in northeastern Illinois during fall passage (Fig. 19) have been widely spread in the Gulf States (Bartel 1935, Downing 1941, Jurica et al. 1959). Reuss (1953) recorded an individual hermit thrush staying as long as 2 weeks in the same area of northeastern Illinois during October.

Winter Records

There are scattered winter records of the hermit thrush for all sections of the state (Fig. 20), but there are no precise measurements of winter populations. Our own censuses (Graber & Graber 1963) showed measurable populations only one year out of two, and then only in the south, where

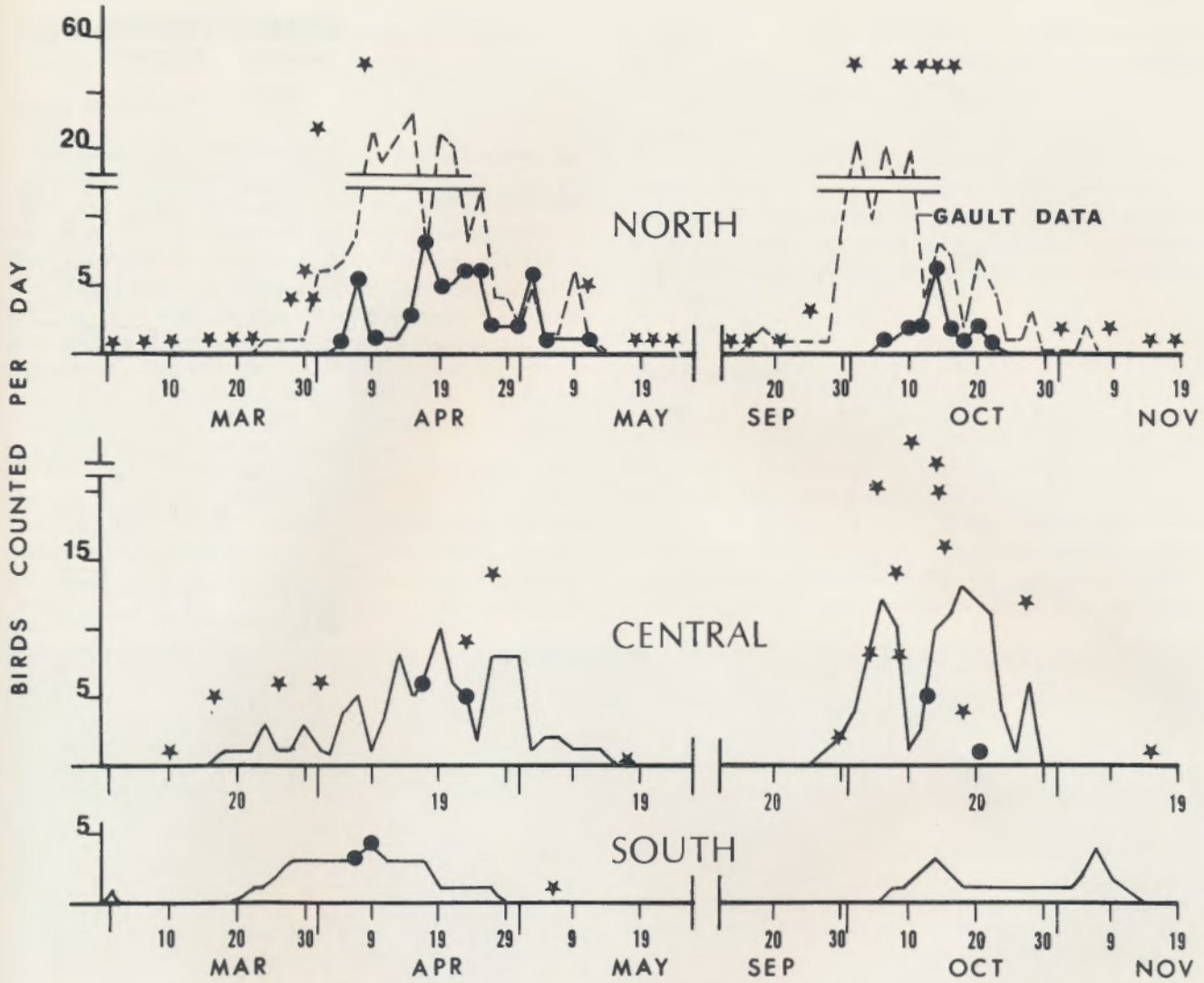


Fig. 18.—Migration seasons of the hermit thrush in different areas of the state (see Fig. 1). Spring and fall graph lines (1967–1970) show the highest daily count of each 2 days. Star symbols represent counts made in other years or by other observers. Dot symbols represent counts made in west-central Illinois; lines without dots represent the east. Dashed graph line (north) represents the cumulative counts of birds made by Benjamin T. Gault between 1875 and 1927 mainly in Du Page County, and shows the long-term peaks and range of migration dates.

we found one to two hermit thrushes per 100 acres in forest and shrub areas. The Christmas counts also show great annual variation in the hermit thrush population (Fig. 21). In some years more hermits have been found in northern Illinois than in the southern region, but such records were probably more a reflection on the distribution of observers than distribution of the birds. Cooke (1885) reported high winter populations (5–20 hermits seen per day) in thickets along the Mississippi River, but no recent observer has recorded comparable numbers. In a 3-day census at Grafton, Link (1940) found only two hermit thrushes. Bartel (1954) recorded three in a day near Lisle (January 17, 1954), in a year when the Christmas counts indicated high populations in the south (Fig. 21).

Butler (1896) suggested that hermit thrushes suffer the same type of cold mortality in the winter and spring that is so notable in bluebird populations, and James' (1961) studies support this view. The low populations in 1958, 1959, and 1960 probably reflect such mortality.

Food Habits

In his studies, Forbes (1903) examined 21 specimens of hermit thrushes, which were nearly all taken in the spring in northeastern Illinois. Even for a thrush, the amount of insects eaten by hermits was high (84 percent of all food). Coleoptera (29–30 percent) were of major importance, especially predaceous ground beetles. Forbes noted that the spring migration of the hermit thrush is timed with the emergence of many beetles. Gault (1884–1889, unpublished notes) also found beetles to be the principal food. Lepidoptera (18–19 percent), and ants (13–15 percent) formed much of the rest of the diet. Like the wood thrush, hermits ate more millipeds (12 percent) than most birds.

Fig. 19.—Winter and early spring recoveries of hermit thrushes banded in northeastern Illinois during fall migration.

Grasshoppers (7–8 percent), Hemiptera (7–8 percent), and spiders (4 percent) made up most of the remainder.

Forbes found no fruit in the diet, but he examined only two fall specimens. We have found hermit thrushes to be very found of pokeberries, and have also seen them feeding on wild grapes in October. Nothing has been recorded on the winter food.

Fig. 20.—Winter records for the hermit thrush in Illinois. The three regions of the state discussed in the text are shown by heavy lines.

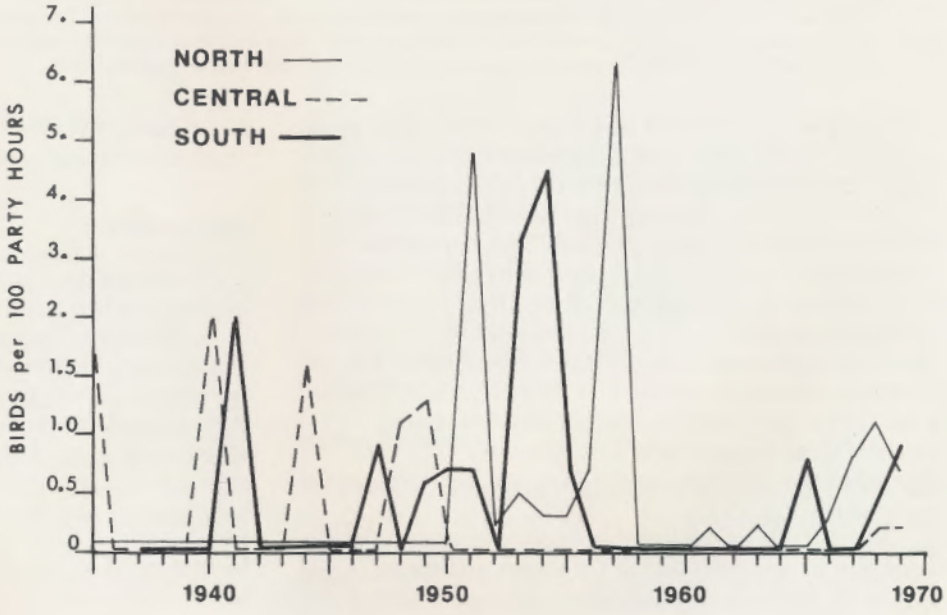


Fig. 21.—Annual variation in winter hermit thrush populations, based on Audubon Christmas counts in three regions of the state. Graph lines show the number of hermit thrushes seen per 100 party hours. (For information about the Audubon Christmas counts, see Cruickshank 1970.)

SWAINSON'S THRUSH (*Catharus ustulatus*)

(Fig. 22 and 23)

Spring Migration

Swainson's thrushes generally begin to appear in Illinois in small numbers about April 20, with not more than a week to 10 days difference in arrival between south and north (Fig. 24). Though there are records for the north as early as March 31 and early April (Ford 1956 and Abbott et al. 1933) we suspect that these are based on misidentifications of hermit thrushes. Most Swainson's thrushes pass through Illinois during May, with peak populations passing the south in early and mid-May and the central and north in mid-May and late May (Fig. 24). A few Swainson's thrushes regularly linger in central and northern Illinois through the first week in June.

The migrations are probably strictly nocturnal, sometimes lasting all night (Cochran et al. 1967, and Kjos & Cochran 1970). The migrations are often audible because of the birds' loud calls, which are uttered during the day also. We translate the calls most frequently given as "pweek" and "whit." More rarely the calls sound like "sweeur" or "peeur," which are much more characteristic of gray-cheeked thrushes and veeries. Swainson's thrushes are also strong singers during migration.

We saw the largest numbers of Swainson's thrushes in east-central Illinois, and the fewest in the south (Fig. 24). The pattern of high populations in the east is, in our experience, consistent from year to year. There are no absolute measurements of migrant thrush populations for any locality in Illinois, nor has anyone attempted a precise definition of thrush habitat. We see them in a wide variety of woody habitats.

Fall Migration

There are a few July records for the Swainson's thrush in northern Illinois (Nelson 1876–1877, Ford 1956, and Eiseman & Shank 1962), but generally the first indication of the fall migration comes in mid-August or late August (Fig. 24). At Glen Ellyn, Gault (unpublished notes 1884–1915) fairly regularly detected the first fall Swainson's thrushes around August 20. One specimen he collected on August 21, 1895 was in heavy molt. The first birds to

Fig. 22.—Swainson's thrush. (The thrush with buffy "spectacles.")

Fig. 23.—General distribution of the Swainson's thrush.

reach southern Illinois in the fall are almost 2 weeks later, in early September (Fig. 24).

Most of the Swainson's thrush population passes through Illinois in September, with peak numbers in the north probably in early September, and in central and southern Illinois in mid-September to late September. Small numbers are found until mid-October throughout the state. A few may linger into November (Ford 1956), but winter records (Ford 1956, Ridgway 1889, and Norton & Spitzer 1965) are accidental or erroneous.

During their night migrations, Swainson's thrushes are among the most common casualties at television towers. There is good correlation of dates between our highest census counts and the highest kills in central Illinois (Fig. 24 and 25). As in the spring, the lowest counts of Swainson's thrushes in the fall were in the south. The tower kill data for Cape Girardeau, Missouri on the Mississippi River also indicate that fewer thrushes migrate through southern Illinois. Paul Heye (mimeographed report) found the September kills of migrants there to be generally lower than those in central Illinois, and the percentage of thrushes to be much lower (1 percent, versus 14 percent in central Illinois).

In our censuses, the fall counts of Swainson's and other *Catharus* thrushes were consistently much below those for spring. This is contradictory to expectations, and also to the findings of Annan (1962) whose graphs for northeastern Illinois just as consistently show much higher populations in the fall. His data show a ratio of 1 bird in the spring to 11 in the fall, versus our counts for the north, which show 4 birds in the spring to 1 in the fall. This very serious discrepancy cannot be resolved without better census methods.

Our censuses showed the same spring to fall ratio (4 to 1) of Swainson's thrushes for east-central Illinois and northern Illinois, but very different ratios for west-central

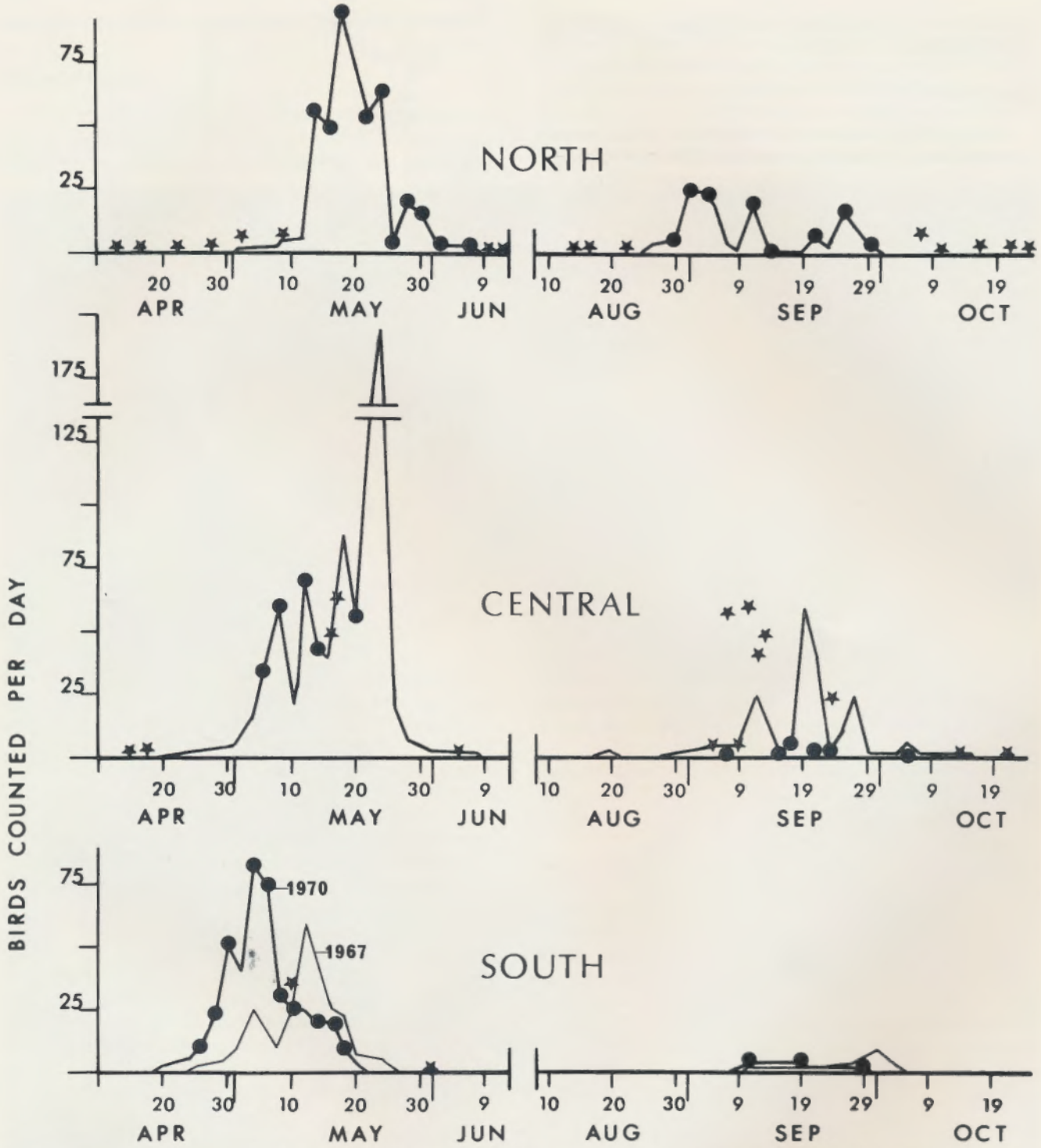


Fig. 24.—Migration seasons of Swainson's thrush in different areas of the state (see Fig. 1). Spring and fall graph lines (1967–1970) show the highest daily count of each 2 days. Star symbols represent counts made in other years or by other observers. Dot symbols represent counts made on the western side of the state; lines without dots represent the eastern side.

Illinois (34 in the spring to 1 in the fall) and southern Illinois (14 in the spring to 1 in the fall). The paucity of fall migrants in west-central Illinois is a phenomenon which we see in many species.

There are no published banding data to show destinations of Swainson's thrushes that pass through Illinois. Our only record was a bird banded at Almirante, Panama about 2,000 miles south-southeast of Illinois on October 13, 1965

and killed at a television tower near Monticello, Illinois the night of September 20–21, 1966.

Food Habits

Forbes (1903) examined six specimens of Swainson's thrushes taken in central and northern Illinois in April and May, and five taken in September in extreme southern Illinois. He found the Swainson's thrush to have the highest consumption of insects (98 percent of the diet) of any of the thrushes in the spring. Hymenoptera (31 percent of all food, mainly ants) were a primary food, and the intake of Coleoptera (30 percent) was typically high for thrushes. Caterpillars (22 percent) were also very important.

In the fall the diet was changed greatly, with wild fruit (grapes especially, plus cherries, elderberries, and blackberries) making up 60 percent of the food. Gault (unpublished notes, 1906–1918) frequently observed Swainson's thrushes eating elderberries in the north, as we have also in all parts of the state, but if they have a choice the birds will take pokeberries before elderberries. We have also seen these thrushes feeding on the fruit of Virginia creeper (*Parthenocissus quinquefolia*).

Specimen Data

From the large September and October kills of Swainson's thrushes at television towers in central Illinois, we measured and closely examined nearly 300 specimens and saved 93 as study skins. Most of the birds can be placed into three fairly distinct color types with no size differences. About 16 percent cannot be thus segregated. Each type is represented in all sex and age groups.

About 26 percent of all specimens are definitely gray backed (versus reddish) with gray (versus buffy) faces, indistinct spectacles, and dark lead-gray flanks. We believe these birds represent the western race, *incana*.

Another 24 percent of the specimens are gray backed but less gray than *incana*, with very rich buff faces and dark olive-gray flanks. In face and ventral coloration these specimens match birds from the range of the nominate race, but they are much too gray backed. If the group does represent a distinct population we cannot identify it. Dr. Earl Godfrey of the National Museum of Canada examined a few specimens of each of the color types and felt that this group was best considered a color variant of the eastern population *swainsoni*.

Specimens in the third group (34 percent) are definitely *swainsoni*, with reddish backs, distinct spectacles, clear buff faces, and pale gray flanks.

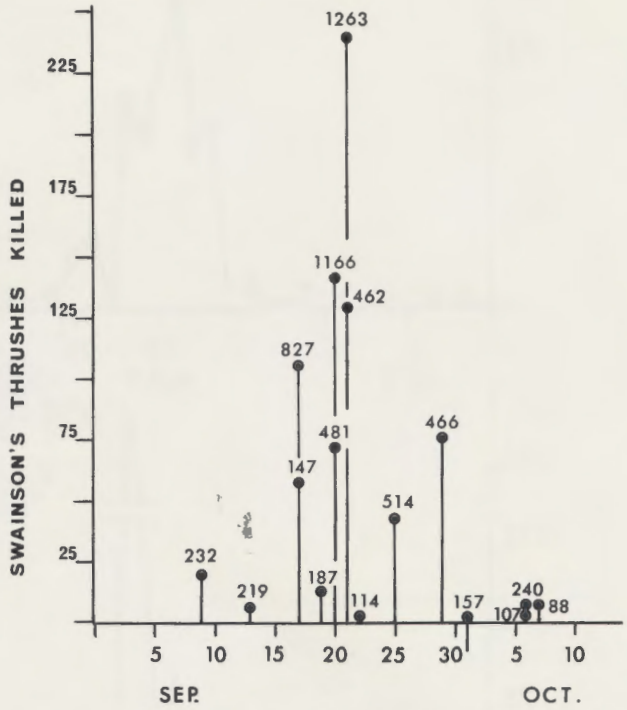


Fig. 25.—Numbers of Swainson's thrushes killed at central Illinois television towers during night migration. The numbers on the graph lines indicate the total numbers of specimens of all species picked up.

Bond (1963) also believed there was a strong migration of western birds (which he identified as *almae*) through Illinois. For the present, precise allocation of specimens to one population or the other is less important than the need for further corroboration, particularly through banding, that some western population is an important constituent of the Illinois fauna. The definite westward flights of telemetered Swainson's thrushes in the spring (Cochran et al. 1967) is further indication of the presence of western birds.

The sex ratio in the sample of specimens was about even for adults (Table 4), but immature males outnumbered immature females about two to one. The age ratios (three adult males to one immature male, and six adult females to one immature female) do not indicate high productivity. Annan (1962) said that immatures greatly outnumbered adults, but gave no precise figures. Table 4 also gives weights and measurements of the specimens.

TABLE 4.—Weights and measurements of Swainson's thrushes killed at television towers in central Illinois in September and October, mainly since 1966.

Age and Sex	Number of Specimens	Gross Weight (grams)		Wing Length (mm)		Tail Length (mm)	
		Range	Mean	Range	Mean	Range	Mean
Adult male	119	27.8–42.0	32.7	95–105	100.1	66–77	71.0
Immature male	41	28.4–43.0	33.5	93–102	97.7	63–73	67.7
Adult female	118	26.0–36.8	30.3	91–99	95.3	63–74	66.9
Immature female	19	27.8–35.9	31.6	90–99	93.4	60–68	64.5

GRAY-CHEEKED THRUSH (*Catharus minimus*)

(Fig. 26 and 27)

Spring Migration

The spring migration of the gray cheek is similar to that of Swainson's thrush (Fig. 24 and 28). Both species generally begin to appear in late April and become common in early May. Records for northern Illinois on April 2 (Bartel & Reuss 1932, and Bartel 1935*a*) are abnormal. Even records prior to April 20 are exceptional. By May 30 nearly all of the gray-cheek population has passed north of the state (Fig. 28). In the south, arrivals around April 20 are expected, and the population is virtually through the south by May 20. A specimen (Southern Illinois University

Fig. 26.—Gray-cheeked thrush. (Similar in color to the Swainson's thrush, but without "spectacles" or buffy face.)

Fig. 27.—General distribution of the gray-cheeked thrush.

collections) taken June 10 in southern Illinois must be considered accidental.

Spring numbers of gray-cheeked thrushes show a fairly uniform distribution through the state (Fig. 28), but phenomenal aggregations have been recorded in northeastern Illinois especially (Eifrig 1913, and Lewis 1923). Eifrig saw hundreds of gray cheeks in late May and felt that Du Page County was on a major "highway" for the species.

Gray-cheeked thrushes sing as they pass through Illinois, but their song is much more subdued than the song of Swainson's thrushes, and in general gray cheeks appear to be less vociferous. Nelson (1876–1877) noticed that gray-cheeked thrushes are more likely to sing at times of misty weather. We translate the call notes most often given as "peeeur" and "peee-oort," but occasionally gray cheeks also call "whit," a note much more characteristic of the Swainson's thrush. We cannot differentiate, with certainty, the migration calls of gray cheeks and veeries. The loud, piercing calls are uttered both at night, during active migration, and during the day, when the birds are grounded.

There are no published band recoveries of Illinois transients, but telemetered gray cheeks have tended to fly slightly east of north from Champaign (Cochran et al. 1967).

Fall Migration

In nearly 50 years of observations, Benjamin Gault's earliest fall record for the gray cheek in northeastern Illinois was August 11, an abnormal arrival date. Usually the first gray cheeks do not reach northern Illinois until after August 20, and most of the population has passed central Illinois by the end of September, though a few may be found almost every year until mid-October (Fig. 28). In extreme southern Illinois the species is consistently uncommon in fall. We have no records of more than one seen per

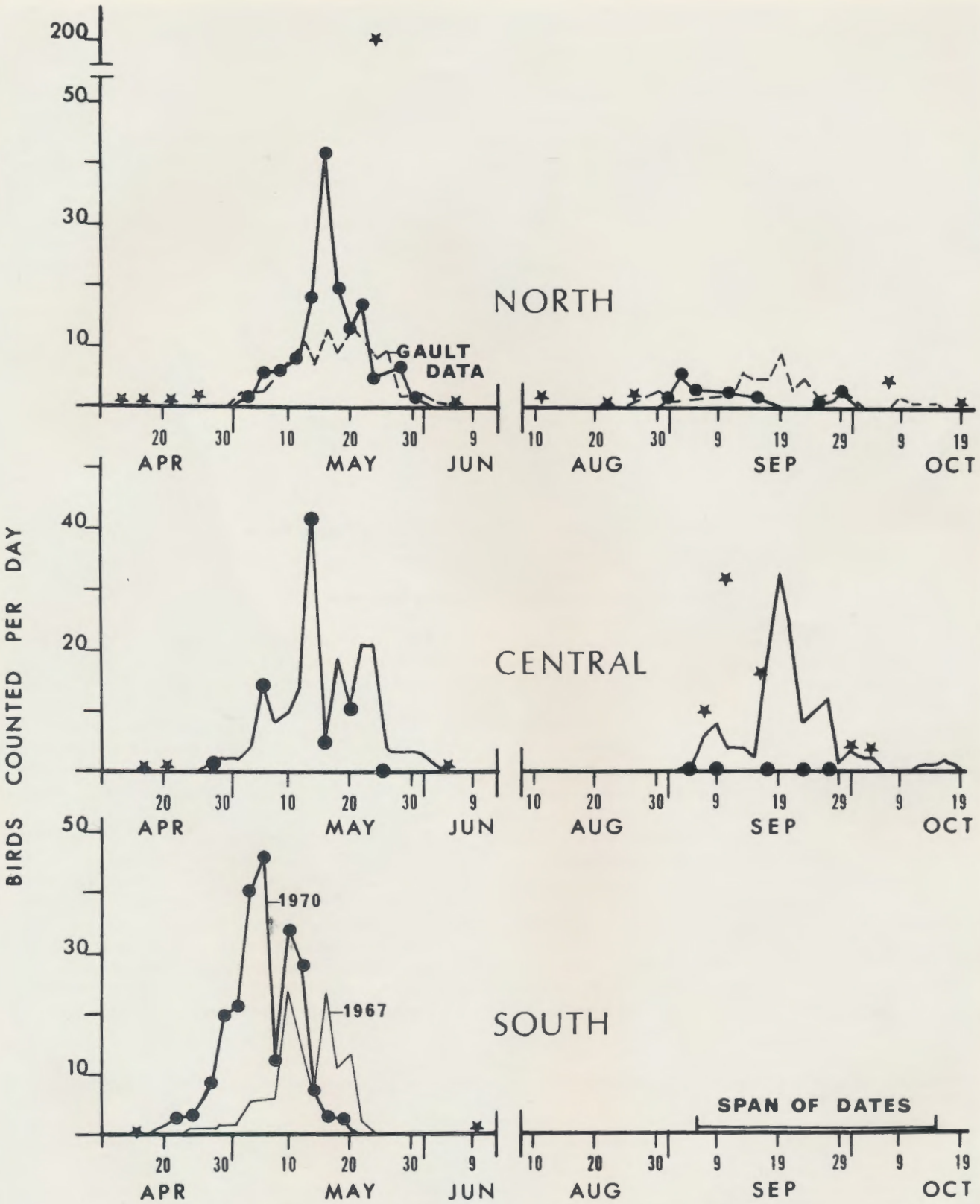


Fig. 28.—Migration seasons of gray-cheeked thrush in different areas of the state (see Fig. 1). Spring and fall graph lines (1967–1970) show the highest daily count of each 2 days. Star symbols represent counts made in other years, or by other observers. Dot symbols represent counts made in west-central Illinois; lines without dots represent the east. Dashed graph line (north) represents the cumulative counts of birds made by Benjamin T. Gault between 1875 and 1927 mainly in Du Page County, and shows the long-term peaks and range of migration dates.

day, but gray cheeks have been recorded from September 6 to October 15 in the south (George 1968, and U.S. National Museum specimen).

We have found the fall population to be generally thin, except in east-central Illinois, where we regularly see gray-cheeked thrushes in numbers (Fig. 28). Our data on spring-fall ratios of this species, as in the case of the Swainson's thrush, contrast with those of Annan (1962). Burtis Wilson (Hodges 1954) also noted that gray-cheek populations were much smaller in the fall than in the spring. In the north, we saw 12 gray cheeks in the spring for every 1 seen in the fall. In east-central Illinois the ratio was 2 to 1, in west-central Illinois it was a remarkable 125 to 1, and in the south it was even more lopsided—more than 400 in the spring to 1 in the fall.

Gray-cheeked thrushes, like Swainson's thrushes, are common fall victims of television towers. About 11 percent of all birds killed at central Illinois towers have been gray cheeks. The largest kills occurred between September 16 and 25, which is also the period of our highest fall counts (Fig. 28).

Food Habits

Forbes (1903) examined 10 gray-cheek specimens taken in May. The locality was not given. In its spring insect consumption (93 percent of the diet), the gray-cheeked thrush was second only to the Swainson's thrush, but the most distinctive feature of the gray cheek's diet was that ants constituted almost half the food. No other thrush approached that intake. Caterpillars (15 percent) were typically prominent in the diet as were crane flies and their larvae (9 percent), but gray cheeks took fewer Coleoptera (18 percent), especially Carabidae, than other thrushes. Grasshoppers (3 percent), Myriapoda (2 percent), and molluscs (5 percent) made up the rest of the food. The intake of molluscs, notably *Succinea* and *Helix*, was high for a thrush.

There have been no studies of the food in fall. Gault (unpublished notes, 1917) saw gray cheeks eating elderberries in October, and we have often seen them eating pokeberries in September and October.

Specimen Data

From the kills of gray-cheeked thrushes at television towers we preserved 265 as study skins. As described by Wallace (1939), two color phases are apparent. Our series shows complete gradation from brownish to grayish extremes.

In size the gray cheeks vary according to sex and age (Table 5). One adult male and one adult female fell within the size range of the smaller southeastern form, *bicknelli* (Wallace 1939), but statistically both were near the possible extreme limits of normal distribution for our sample. There is also the possibility that both specimens were actually immatures which had lost all marks of immaturity. Because of these considerations, we assigned all of the Illinois specimens we have examined to the northern race, *minima*. Thus although the alleged occurrence of *bicknelli* in Illinois (see Ford 1956) is doubtful, the final answer depends upon other types of investigations such as banding operations, telemetry observations, and biochemical studies.

The age ratios in our specimens, less than one-third immatures, (Table 5) do not indicate high productivity, but the sample may not be representative of the species.

VEERY (*Catharus fuscescens*)

(Fig. 29 and 30)

Spring Migration

The veery's spring migration coincides very closely with the migration of the gray-cheek and Swainson's thrushes (Fig. 24, 28, and 31). The first veeries usually appear around April 20 in southern Illinois and April 30 in the north. Arrivals earlier than April 18 are unusual, especially in central and northern Illinois, and records for March and early April (Sanborn 1935, Abbott et al. 1933, Sparks 1905, and Walter & Walter 1904) are accidental or erroneous.

Most of the veery population has passed southern Illinois by May 20, and the north by May 30 (Fig. 31), but a thin population remains in certain areas of northern Illinois to nest. The spring veery populations appear to be fairly uniformly distributed in the state.

The migration calls of the veery are very much like those of the gray-cheeked thrush. Our phonetics for the calls are "peee-oort" or "wheee-ur" with emphasis on the first syllable. The calls are uttered both night and day.

TABLE 5.—Weights and measurements of gray-cheeked thrush specimens killed at television towers in central Illinois in September and October, mainly since 1966.

Age and Sex	Number of Specimens	Gross Weight (grams)		Wing Length (mm)		Tail Length	
		Range	Mean	Range	Mean	Range	Mean
Adult male	97	29.2–39.3	33.8	96–108	102.8	66–78	71.7
Immature male	38	29.5–39.9	34.3	95–105	100.6	63–75	68.4
Adult female	86	25.3–38.3	31.4	94–105	98.1	61–72	67.4
Immature female	44	28.3–40.3	32.8	92–102	96.2	56–71	64.6

Fig. 29.—Veery, the least heavily spotted of the Illinois *Catharus* thrushes. (With reddish back).

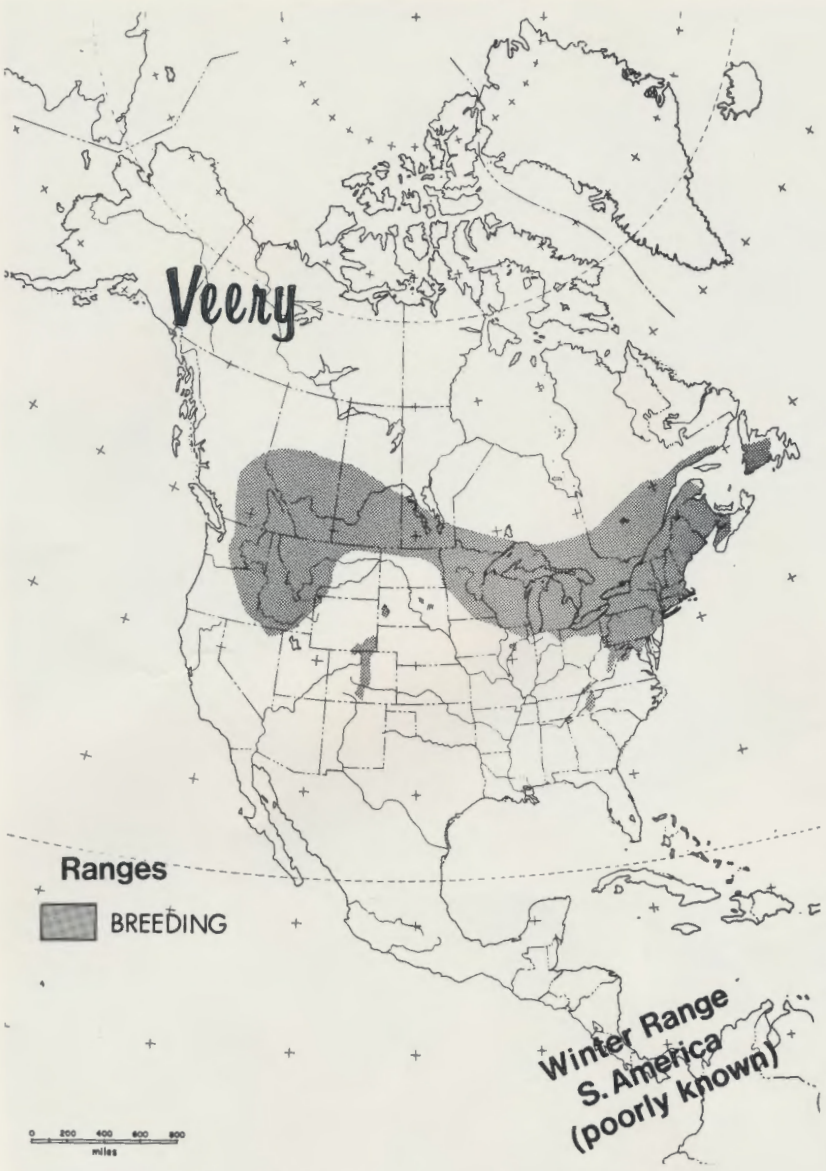


Fig. 30.—General distribution of the veery.

Transient veeries also sing, but the song is not heard as often as the songs of Swainson's or gray-cheeked thrushes.

Distribution

The general distribution of the veery is shown in Fig. 30. The nesting distribution in Illinois (Fig. 32) is still poorly known, and only a few students have actually found nests (Cooke 1888, Pratt 1890, Ford 1956, and Thompson 1958). The two central Illinois records (Fig. 32), one an alleged dropped egg (Barnes 1890), and the other a singing male in Peoria in late June (Silloway 1922), are questionable as actual breeding records. Observers should look for the species in the summer throughout northern and central Illinois.

Two types of habitat have been recorded in Illinois. In areas of Winnebago county, Lee Johnson (personal communication) has found nesting veeries in mature bottomland forest. The species has also been recorded in urban residential habitat (Pratt 1890, and Farwell 1919). Mayfield (1951) reported the best nesting habitat in Indiana and Ohio to be sandy hillocks interspersed with bogs, and nesting veeries should be looked for in the Illinois dunes areas also.

Fall Migration

Alfred Reuss (personal communication) has noted that the breeding population of veeries in northeastern Illinois becomes very inconspicuous in August, following the general pattern of other nesting species. The definite increase in veeries in late August is indicative of migration as the species also appears then in central and southern Illinois (Fig. 31). An August 13 record for extreme southern Illinois (Gower 1933) is probably erroneous. The veery's fall migration is less prolonged than the migration periods of the

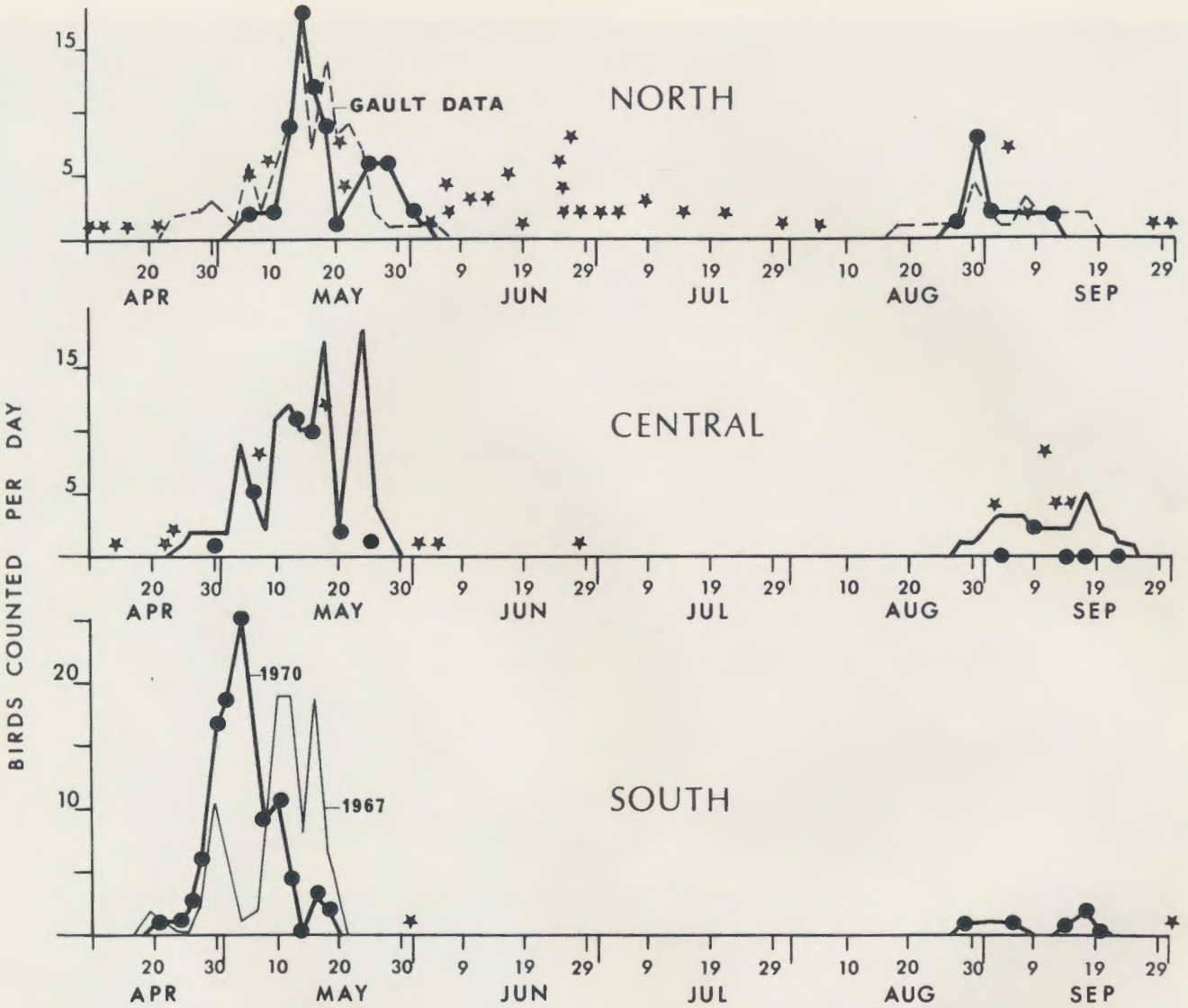


Fig. 31.—Migration seasons of the veery in different areas of the state (see Fig. 1). Spring and fall graph lines (1967–1970) show the highest daily count of each 2 days. Star symbols represent counts made in other years or by other observers. Dot symbols represent counts made in west-central Illinois; lines without dots represent the east. Dashed graph line (north) represents the cumulative counts of birds made by Benjamin T. Gault between 1875 and 1927 mainly in Du Page County, and shows the long-term peaks and range of migration dates.

gray-cheek and Swainson's thrushes. Most of the veery population is through Illinois by September 20. There are a few October records, the latest being October 13 for the north (Ford 1956), and our specimen from a central Illinois television tower, killed the night of October 8–9, 1968.

As with the gray-cheeked thrush, we saw few veeries in the fall in comparison with spring (Fig. 31). This was also the experience of William Dreuth (Clark & Nice 1950), and Benjamin Gault (Fig. 31). In northern and central Illinois we saw 6–7 veeries in the spring to every 1 in the fall, but in the south the ratio was about 20 to 1.

Veeries are less common than Swainson's and gray-cheeked thrushes in Illinois, and this population difference is reflected in the tower kills (Graber 1968). Only about 1 percent of the birds killed at central Illinois television towers in September were veeries.

Specimen Data

We have examined 41 fall and 34 spring specimens of veeries from Illinois, but no Illinois breeding specimens. Among the migrants there are two color extremes, red and grayish, with virtually complete color intergradation and no consistent size difference between the two. The gray specimens well match even the extreme gray specimens from the range of the western race *Catharus fuscescens salicicola,* and the red specimens are similar to specimens from the range of the eastern race *C. f. fuscescens.* There are few specimens of the eastern race from Illinois, while *salicicola* is well represented. In the fall probably all specimens are best ascribed to *salicicola,* with about 5 percent showing intermediacy towards *fuscescens.* In the spring most of the birds are *salicicola,* but about one-third are of the eastern form.

Fig. 32.—Breeding records for the veery in Illinois. Singing male records are for June only.

EASTERN BLUEBIRD *(Sialia sialis)*

(Fig. 33 and 34)

Spring Migration

Though there are winter records of the bluebird for all regions of the state, and there is a sizable winter population in southern Illinois, the migrations are conspicuous (Fig. 35). The arrival dates most often given are around February 20 for central Illinois and February 26 for the north. Arrivals in early February are apparently infrequent in both regions, but in some years bluebirds are common in central Illinois even in January (Musselman 1933, 1934–1935, and 1939), with groups of 30 or more being seen.

The largest numbers of bluebirds in the spring have been recorded in March, and most of the migration probably occurs in that month (Fig. 35). Zimmer (1922) observed "hundreds" near Rock Island on February 22, but noted that such aggregations were unusual. Populations in the spring, as well as in other seasons, are highest in southern Illinois.

Judging from the literature, the actual migration flights are rarely witnessed. Van Duzer (1922) and Schafer (1923) recorded diurnal flights, possibly migrations, in northern Illinois in late February and in March. We have seen definite diurnal migrations of bluebirds only in the fall (Fig. 35). There is no evidence of nocturnal migration, such as nightcalls and television tower kills, as there is for other thrushes.

Distribution

The general distribution of the bluebird is shown in Fig. 34. The available breeding records for Illinois (Fig. 36) do not truly indicate the state distribution. Large areas in the state, especially intensively cultivated tracts, are essentially devoid of bluebirds. We estimated that 80 percent of the Illinois bluebird population was in the southern third of the state (Graber & Graber 1963).

Nesting Habitats and Populations

The bluebird's usual habitat includes woody vegetation in or adjacent to open fields, especially grasslands. Flat, treeless areas, even where nesting boxes have been provided, are unlikely to have significant bluebird populations. Large blocks of forest are also poor for the species (Varner 1964), though forest edge supports low population levels (Table 6). Residential habitat was more important to the bluebird prior to 1900, but the species has been displaced by house sparrows and wrens (Nehrling 1880, Ridgway 1915).

The earliest successional stages of forest are not suitable for bluebirds (Brewer 1958, and Karr 1968). In southern Illinois Brewer found no bluebirds in strip-mined areas that had been abandoned about 14 years.

Bluebird habitats must have suitable nesting cavities, and the elimination of rail fences and wooden fence posts has had a detrimental effect on the bluebird population (Musselman 1940). Bluebirds seem to have undergone two transitions with regard to nesting sites in the past 150 years. Many of the early references (before 1900) record nests in cavities of dead trees, stumps, or the dead branches of cottonwoods (*Populus*), willows (*Salix*), or orchard trees (Gault, unpublished notes, 1876–1889; and Loucks, unpublished notes, 1888). From dead trees to fence posts was a natural transition, and most of the nests recorded in the literature were in fence posts until recent years, especially since 1950, when most of the records have been from nest boxes. Bluebird nesting box routes like those established by Musselman (1944), and Varner (1964) are now probably important to the species. There are no data on the availability of natural cavities.

Bluebird nests in natural cavities have been recorded as low as 1 ½ feet above ground and as high as 11 feet. There have undoubtedly been much higher nests, but most records, even for natural sites, are below 7 feet.

The only territory measurement we have seen for the

Fig. 33.—Bluebird carrying food near a nest box, in Pope County, Illinois.

bluebird in Illinois is that of Fawver (1947*a*), 3.5 acres. Musselman (1935) noted that bluebirds did not nest closer together than one-fourth of a mile in west-central Illinois, but Bartel (Smith & DuMont 1944) effected a 40 percent increase in a bluebird population near Blue Island when he increased the number of nest boxes from 10 to 27 in a one-half mile square area. In the south we have found contemporaneous nests as close together as 380 feet.

Major periodic crashes in the bluebird population (Fig. 37) is a phenomenon of long standing. Butler (1896) noted a sharp decline in northern Illinois and Indiana in 1895 and attributed it to severe cold in April. Later studies have also indicated that such crashes are, to a large degree, correlated with adverse weather, especially in the winter and spring (Barnes 1912, Musselman 1941, and James 1960). Musselman (1941*a*) estimated that 50 percent of the blue-

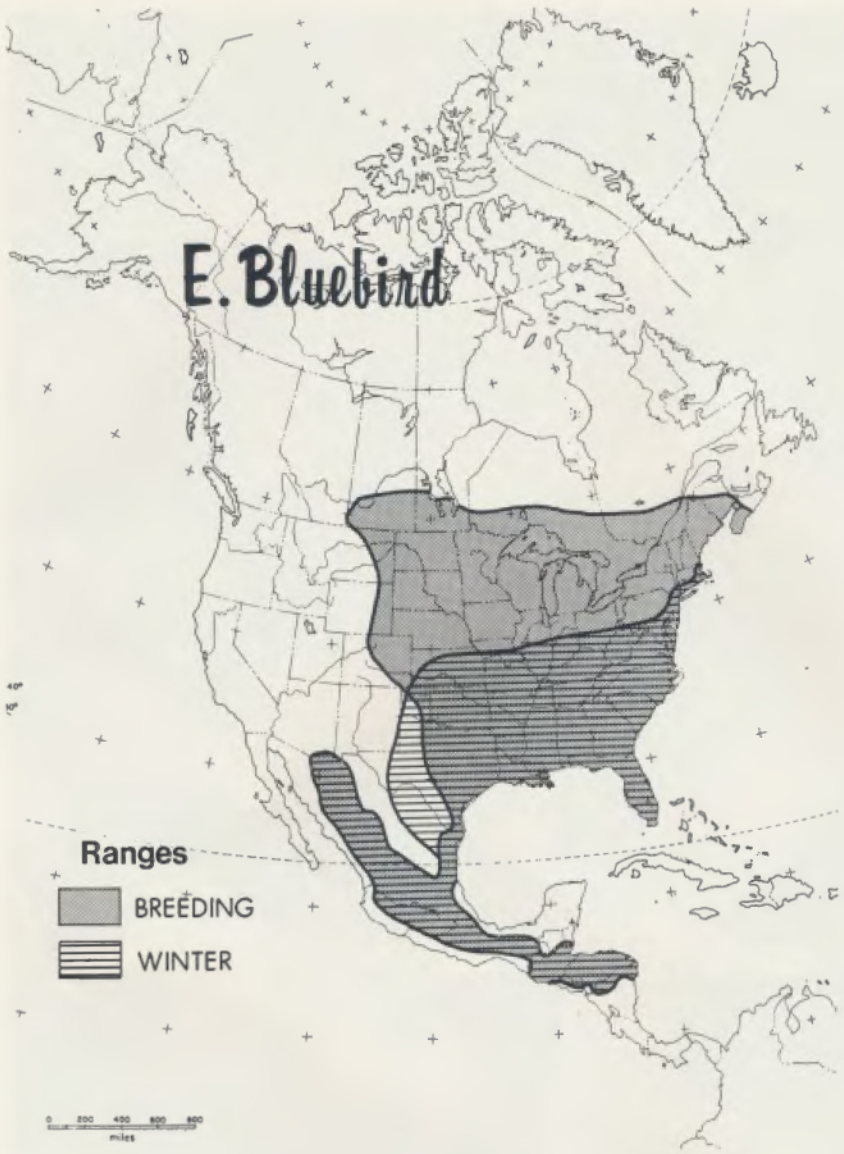


Fig. 34.—General distribution of the eastern bluebird.

bird population in west-central Illinois succumbed to cold and snow one spring. In Tennessee, which is part of the bluebird's winter range, Laskey (1958) found many dead bluebirds that had been roosting in nest boxes (as many as 12 dead in one box) after severe cold and snow in mid-February. We have also found dead bluebirds in roosting cavities in February in southern Illinois, and Musselman (Peterson 1965) found dead birds in his nest boxes in April.

Nesting Cycle

Banding returns reported by Bartel (1950, 1952), Holcombe (1930, 1932), and Musselman (1934) show that some young bluebirds as well as adults return to the areas of their birth and the adults sometimes return to the same box. However, no quantitative data have been published to show what part of the population returns. Musselman (1934) felt that young birds tended to scatter more.

There is little reference to the bluebird's song in the Illinois literature, and nearly every mention of the song refers to the month of March as the time of singing. Ridgway (1889) indicated that there was a resurgence of subdued song in August, but the periodicity of singing has not been recorded in any systematic way.

The earliest nest with eggs for Illinois was recorded March 20 by Musselman (1937) in central Illinois. There is no indication that nesting begins earlier in the south (Fig. 35). The laying curves for the bluebird have several peaks. The first peak occurs in April throughout the state, with about a 12-day lag in the north (Fig. 35). There are also laying peaks in May and June, and though a few nests are established as late as mid-August, laying is largely over by the end of June.

Musselman's work with banded birds showed that bluebirds tend to have two broods in one season. Though a pair of bluebirds may use the same box for two consecutive

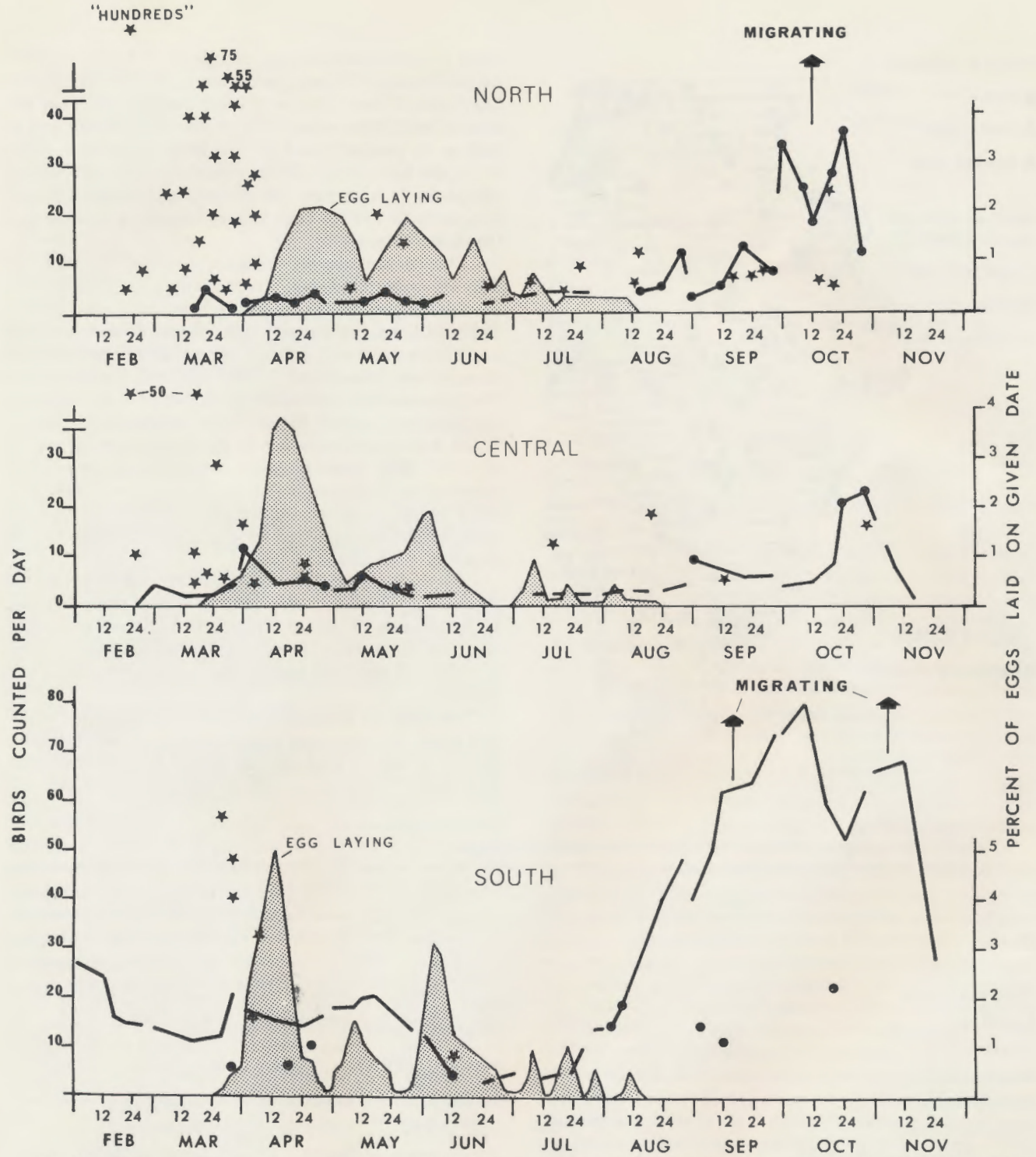


Fig. 35.—Egg-laying and migration seasons of the bluebird in different areas of the state (see Fig. 1). Spring and fall graph lines (1967–1970) show the highest daily count of each 4 days (left scale). The lines are interrupted where data have not been collected. Star symbols represent counts made in other years or by other observers, mainly before 1930. Dot symbols represent counts made on the western side of the state; lines without dots represent the eastern side. Shaded areas show the percent of eggs laid on a given date (right scale). Arrow symbols indicate dates of actual migration flights.

broods (Holcombe 1930), females also often change houses between nestings, sometimes moving miles away (Musselman 1946). Some boxes have four sets of eggs in a season (DuMont & Smith 1945), but not necessarily from the same pair. References to three broods by the same pair have apparently not been substantiated by observations of banded birds.

The April laying peaks are much higher than the subsequent peaks (Fig. 35), and data on nest-box occupancy show the same trend. During several years and in different

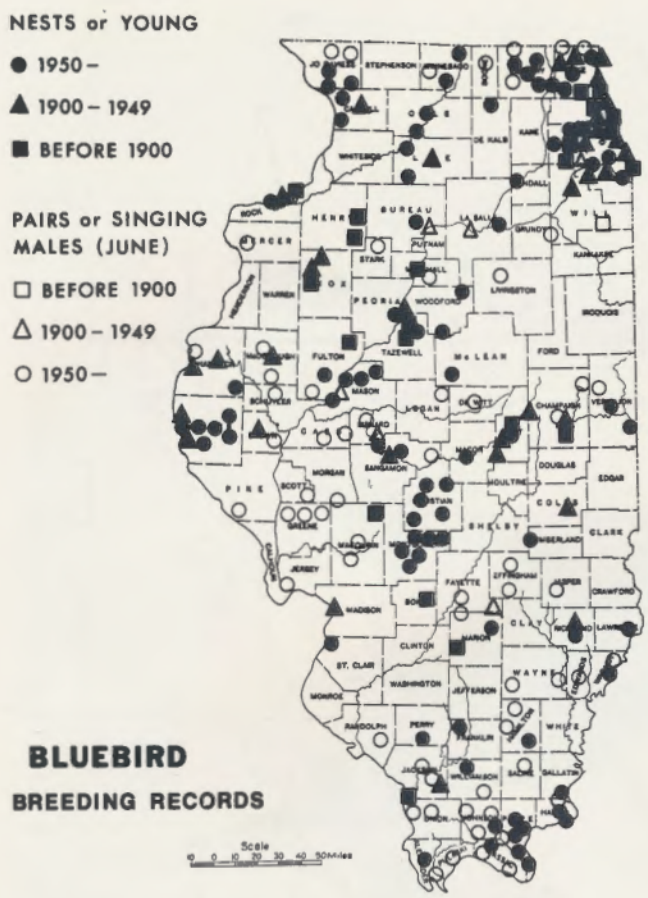


Fig. 36.—Breeding records for the eastern bluebird in Illinois. Singing male records are for June only.

areas in west-central Illinois, occupancy of houses by bluebirds fell about 23 percent between the first (April and May) and second (June and July) nestings, with the extremes in different years being as low as 8 percent and as high as 66 percent (based on data from Musselman 1935, 1936, and Evers 1937). Bartel (DuMont 1947) recorded an exceptionally high rate (90 percent) of "second-nesting" occupancy in 1947 at Blue Island. There are no comparative data for the south.

The bluebird appears to have a prolonged nesting cycle. The full cycle for one nest observed in central Illinois, from nest-building to fledging of young, required 47 days (Smith 1939), but this was an early nest, started April 5, and nest building was slow (12 days). Nests have been built in 4 days or less (Musselman 1934–1935, and Varner 1970). We have recorded nest-building periods of 6 and 7 days in southern and central Illinois, with incubation periods of 13–15 days (most frequently 14 days), and nestling periods of 15–17 days (most often 16 days). Holcombe's (1930) observations in the north also indicated an incubation period of 14 days, and nestling period of 16 days. Thus, a full cycle, including egg laying for a nest with five eggs may be expected to take about 40 days.

Throughout the state, most nests receive 5 eggs for the first nesting, but clutch size declines in later nests, especially in the south (Table 7). Among the hundreds of nests he observed Musselman (1946*a*) once recorded a clutch of seven eggs, and once nine eggs in one nest, contributed by two females.

The eggs are generally pale blue, but sometimes white, and rarely are both types found in the same nest. In his extensive studies in west-central Illinois Musselman (1935, 1946) found about 5–6 percent of the eggs to be white.

TABLE 6.—Breeding populations of bluebirds in various Illinois habitats.

Habitat	Acres	Birds Per 100 Acres[a]	Years	Type of Census	Region or County	Reference
Orchard	5	80	1936	Nest	Lake (N)	Beecher 1942
Edge shrubbery	9	34	1957	Strip	South	Graber & Graber 1963
Block shrub areas	67	1	1957	Strip	South	Graber & Graber 1963
Late shrub	..	10	1966	Nest	Vermilion (C)	Karr 1968
Thicket	13	1	1950	Nest	Jackson (S)	Brewer & Hardy 1950
Residential	8	25	1916	Nest	Richland (S)	Cooke 1916
Parkland estate	100	12	1915	Nest	Cook (N)	Eifrig 1915
Unmodified woods	27	15	1936	Nest	Lake (N)	Beecher 1942
Forest (all types including edge)	79 174	1 2	1957	Strip	North South	Graber & Graber 1963
Forest edge	55	(0–2 per mile)	1927–1970	Nest	Champaign (C)	Kendeigh 1948, Kendeigh & Clemans, 1970
Second growth or cut-over woods	15	13	1937–1938	Nest	Rock Island (N)	Fawks 1937, 1938
Grazed bottomland	93	4	1955	Nest	Macon (C)	Chaniot & Kirby 1955
Pastureland	147 54 72	3 2 8	1957	Strip	North Central South	Graber & Graber 1963

[a] All figures were converted to read birds per 100 acres or birds per mile of edge (number of territorial males or nests x 2).

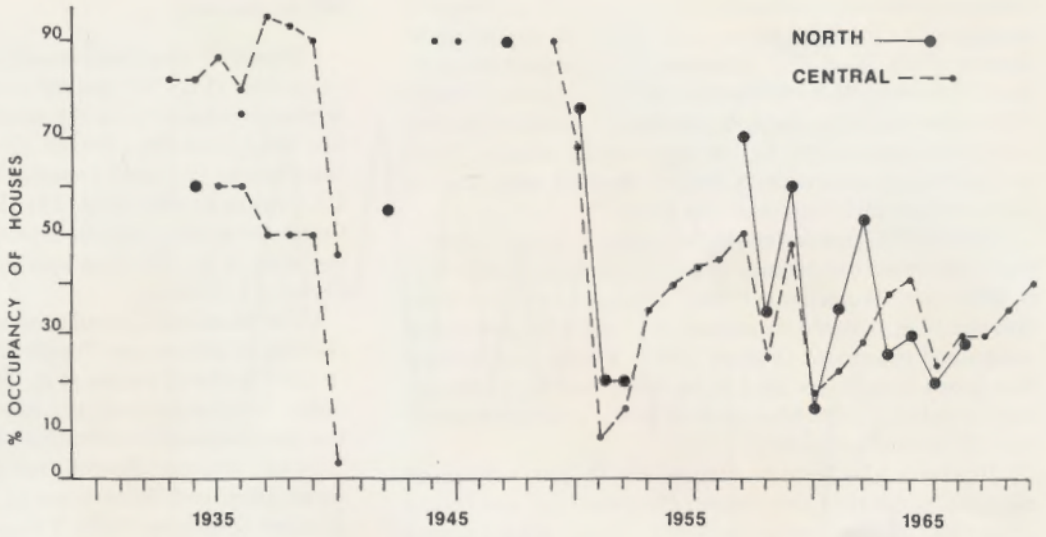


Fig. 37.—Annual variation in nest box occupancy by bluebirds for several routes in central and northern Illinois. Two central Illinois routes showed the same population crash in 1940, and there was a general similarity in the population trends in northern and central Illinois.

The incidence of cowbird parasitism of bluebird nests is low (Musselman 1942). The rate was exceptionally high for the species in 1945, 7 nests parasitized out of 268, or about 3 percent (Musselman 1946).

There are no extensive data on nesting success for populations in either the north or south. Duncan's (1934–1935) small sample of nests in Cook County indicated fledging success of 50 percent of the eggs. Our data for the south, representing 51 nests, showed fledging success of 24 percent in April and May, and 54 percent for June to August eggs.

Nesting success for the bluebird seems to depend a great deal on weather factors. Evers (1937), in west-central Illinois, found fledging success of about 90 percent of the eggs for the first nesting (April and May), but success of second nestings was down to 50 percent. He attributed the reduced success to very high late-summer temperatures (114° F. in the shade). In a 7-year period Musselman (1939*a*) recorded three severe April freezes that froze many eggs. He has recorded nesting success rates as low as 38 percent and as high as 95 percent of the eggs (Musselman 1935). In general, second nestings were less successful than those in April and May. Infertility varied from 1 percent to 23 percent, with an average of 9 percent, and low hatchability was again correlated with severe heat (26 days over 100° F.) and drouth.

Other frequently mentioned sources of nest mortality relate to competition with other species for nesting cavities. Hodges (1953) noted that bluebird populations on Credit Island near Rock Island declined coincidentally with an increase of house wrens (*Troglodytes aedon*) in the area. In other areas of northern and central Illinois bluebirds also fared poorly in competition with wrens for housing (Bartel *fide* Smith & DuMont 1944, and Musselman 1946). Wrens occupied from 2 to about 7 percent of Musselman's nest boxes, and perforated as many as 7 percent of the bluebird eggs some seasons (Musselman 1935). When the bluebird's first nesting was delayed, the population was thrown more directly into competition with the generally later-nesting wren (Musselman 1939).

In extreme southern Illinois we have not observed any interference from house wrens, but wren populations are low there. In northwestern Illinois, on the other hand, in a sample of 33 nest boxes we found 76 percent occupied by wrens in June, versus only 9 percent occupied by bluebirds. In east-central Illinois, Campbell (1970, and personal communication) recorded 9 percent of 23 boxes occupied by wrens, versus 35 percent occupied by bluebirds in 1970, but in 1971 wrens took over most of the boxes.

In human residential areas, bluebirds cannot compete with house sparrows (*Passer domesticus*), and there is competition even in rural areas. In western Illinois house sparrows utilized more nest boxes than did wrens. From data provided by Musselman (1934, 1934*a*, 1935, and personal communication) we calculated the incidence of occupancy for sparrows in rural areas to vary from 1 to 14 percent, with an average of 6 percent. For redheaded woodpeckers (*Melanerpes erythrocephalus*), tufted titmice (*Parus bicolor*), and black-capped chickadees (*Parus atricapillus*), the incidence of occupancy averaged about 5 percent each. Nest boxes in woods and forest edge are more likely to attract chickadees and titmice (Musselman 1935).

In southern Illinois we found Carolina chickadees

TABLE 7.—Clutch sizes of bluebirds in different regions of Illinois.

Region	Months	Number of Nests	Average Clutch	Percent of Nests by Clutch Size			
				6 Eggs	5 Eggs	4 Eggs	3 Eggs
North	April–May	64[a]	5.0	16	72	12	0
	June–August	57[a]	4.4	2	53	26	19
Central	April–May	169[a]	4.9	15	64	16	4
	June–August	127[a]	4.3	2	43	39	16
South	April–May	15	5.1	13	80	7	0
	June–August	18	4.2	0	28	61	11

[a] Includes records from the literature where complete data were provided.

(*Parus carolinensis*) occupying from about 10 to about 40 percent of the bluebird boxes, with bluebirds occupying 60 percent of the boxes. We witnessed no aggressive competition. However, in northwestern Illinois Wilson (Hodges 1954) observed that bluebirds and black-capped chickadees were keen competitors. In the same region Schafer (1920) saw redheaded woodpeckers destroy bluebird nests, and we have seen one such incident in the south.

Eifrig (1937) suspected that starlings (*Sturnus vulgaris*) were important competitors of the bluebird (see also Schafer 1932, and Musselman 1934*a*, 1942), but this competition can be eliminated on nesting box routes by proper box design and placement (Varner 1964). Varner also warned that boxes near water tend to be taken over by prothonotary warblers (*Protonotaria citrea*), and tree swallows (*Iridoprocne bicolor*).

Bluebirds also have to compete for cavities with small mammals, notably deer mice (*Peromyscus*) and flying squirrels (*Glaucomys volans*), and with wasps (Musselman 1934, 1947).

There is little information on other causes of nest loss. Musselman (1946) considered loss from snake predation to be small, but cautioned (1935, 1940) that boxes in brushy or weedy places are particularly susceptible to black snake, shrike, and mouse predation.

Persons who wish to establish bluebird nest-box routes should read Musselman (1941, 1944), Varner (1964), and Kibler (1969) for valuable instructions.

Fall Migration

Our data indicate that most of the fall migration occurs from September into early November in central and southern Illinois (Fig. 35). Our earliest observation of actual migration flights in southern Illinois was September 17 and the latest was November 6, but both these dates probably fall short of the true extremes.

In our experience, bluebird migration was never the massive steady flow of birds as in the case of robins, blue jays, and other diurnal migrants. Bluebirds flew in the morning in small, loose flocks going south and southeast.

Nelson (1876–1877) dated the fall migration in northeastern Illinois from September 12 to October 25, and this closely coincides with the timing of our high census figures for the north (Fig. 35). Schafer (1922) recorded exceptionally large migrations in the north in 1922 nearly every day in September and early October.

The numbers of bluebirds seen in the fall (September into November) consistently exceeded the spring (February through May 10) counts throughout the state. The ratios were one bird in the spring to three in the fall for central Illinois, one to six in the south, and one to eight in the north.

There are very few published band recoveries to indicate destinations of migrating Illinois bluebirds. Birds banded in the spring and summer in northeastern and west-central Illinois have been recovered in the winter from southeastern Texas to southern Louisiana and southern Georgia (Bent 1949, and Musselman 1937).

Winter Records

Bluebirds have been found in all regions of the state in the winter (Fig. 38), but 90 percent or more of the state's winter population is in the southern zone (Graber & Graber 1963, and Fig. 39). In about one-third of the years there are no bluebirds recorded in the northern and central Christmas counts (Fig. 39). They are most likely to be found along major rivers, especially in the northern half of the state (Fig. 38). The species is usually found in small flocks of 3–20 birds.

The bluebird's population crashes, as discussed under Nesting Habitats and Populations above, show up clearly in the Christmas counts (Fig. 39), and there is good correlation in time between the low breeding populations and low populations in winter (Fig. 37 and 39).

Our censuses showed pastures and other grasslands, forest edge, and shrub areas to be favored winter habitats (Graber & Graber 1963). The only absolute measurements of winter populations are by Shaw & Scherer (1960), and Shaw et al. (1964), who censused a shrubby field area in southern Illinois and found densities ranging from less than one bluebird per 100 acres to seven per 100 acres in a 9-year census period.

Fig. 38.—Winter records for the eastern bluebird in Illinois. The three regions of the state discussed in the text are shown by heavy lines.

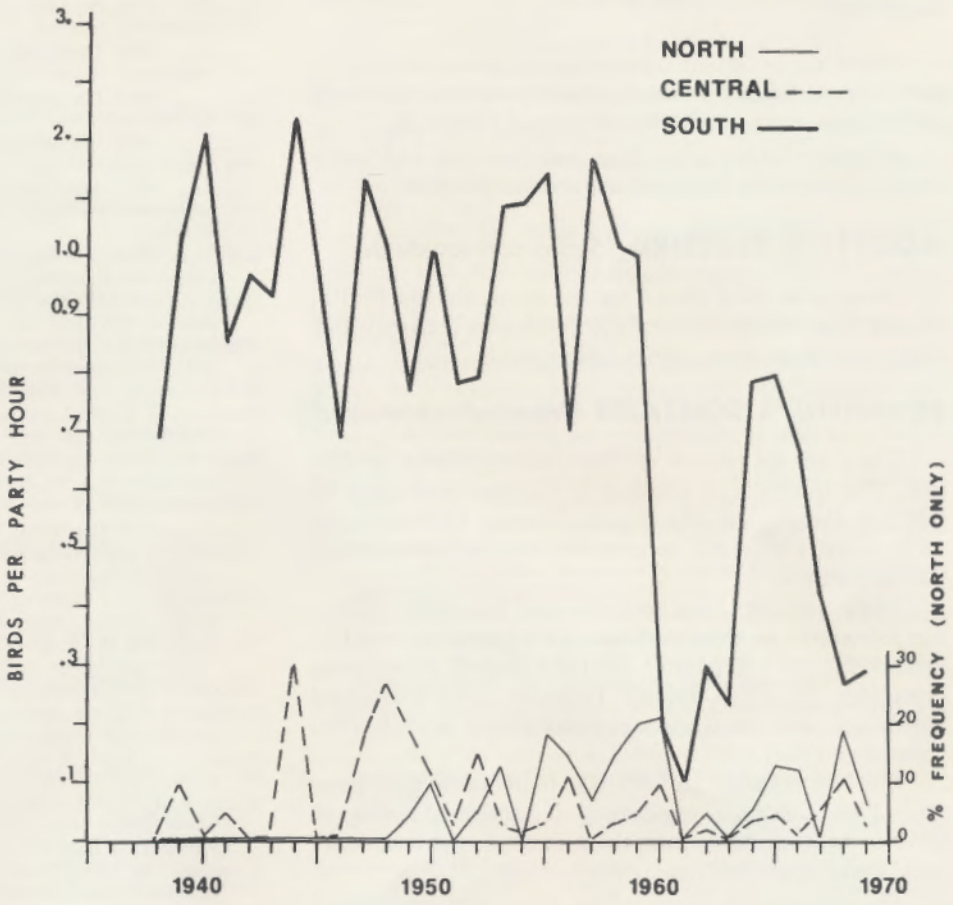


Fig. 39.—Annual variation in winter bluebird populations, based on Audubon Christmas counts in three regions of the state. The calculation for the north (right scale) is frequency of occurrence of bluebirds (percentage of all counts on which bluebirds were seen). The calculation for the central and southern regions is number of bluebirds seen per party hour in the field (left scale). (For information about the Audubon Christmas counts, see Cruickshank 1970.)

Food Habits

Forbes' papers (1903) are the only systematic studies on the food of bluebirds in Illinois (Fig. 40). His specimens were taken in central and northwestern Illinois, except for a December sample taken in extreme southern Illinois. Insects comprised a very large part of the diet except in the winter.

Although bluebirds take much of their food from the ground, they often look for prey from an elevated perch. The observation of Cooke (1885) that many bluebirds forage in meadows, picking around the roots of grass, is in keeping with the stomach analyses of Forbes, who found that grass-eating cutworms were important in the bluebird's diet. In the spring, cutworms, predaceous beetles, and dung beetles were the principal prey. Surprisingly, bluebirds did not show the marked change to fruit in June as observed for the robin and the mimids. In late summer and fall crickets and grasshoppers became very important in the diet as the intake of beetles declined.

In the winter, the diet consisted almost entirely of fruit. Mistletoe was especially prominent, but grapes, sumac, haws, and holly were also important. Link (1940*a*) also recorded holly berries in the December diet, and Cooke (1885) also recorded sumac. In northeastern Illinois Nelson (1876–1877) observed bluebirds eating the fruit of Virginia creeper.

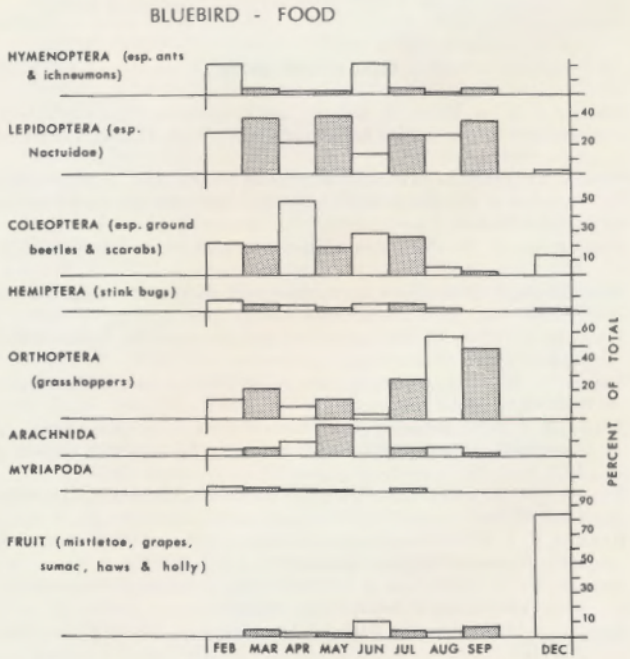


Fig. 40.—Food habits data on the eastern bluebird based on the study of Forbes, 1903 (1880). Percentages represent the part of the total food identified in the stomachs of a number of bluebirds examined each month.

Longevity

There are no quantitative data on life expectancy or survival rates for any bluebird population in Illinois. Bartel (1950) recovered a banded female at least 5 years old.

Mortality factors other than nest mortality and severe weather, as already discussed, are also unrecorded.

MOUNTAIN BLUEBIRD *(Sialia currucoides)*

There is no valid record for the mountain bluebird in Illinois (Cory 1909). Princen's (1970) report is based on an inadequate observation, and is unacceptable.

TOWNSEND'S SOLITAIRE *(Myadestes townsendi)*

There are six records of Townsend's solitaire for Illinois. The species is represented by one specimen taken by Charles Douglas at Waukegan, Illinois, December 16, 1875 (Ford 1956). All occurrences were in the northern part of the state.

Single solitaires have been observed to winter at Morton Arboretum on three occasions, being present from December 27, 1953 to March 28, 1954 (Bartel 1954); from November 23, 1958 through February 1959 (Mumford 1959); and after the Christmas count period of 1959–1960 (Mumford 1960).

The bird collected in 1875 was found feeding on hawthorn fruit *(Crataegus tomentosa)* in a sheltered ravine. In 1954 in Morton Arboretum the solitaire found food in an area of crab apple and hawthorn plantings.

The latest record, in the spring, was a bird seen about 7 miles south of Rock Falls on April 6, 1969 by Max and Ann Hagans (Shaw 1969; and Hagans, personal note).

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