

search under sandy water for feed than taking it from a dish. Water also helped to break up the food.

When they were able to walk about and feed, the birds were kept in an open-air run (ordinary black-soil ground) through which a small stream of water ran from a hose. Feed bowls were placed along this miniature water course, where the birds spent much time probing. They appeared not to like to probe in dry sand whereas feed bowls sunk in wet sand were accepted readily. They would probe along the wet sand, and then coming to the feed bowl and poking about in the sandy water therein, would consume the feed.

Only small amounts of feed were kept before the birds at any one time. Immediately after the bowl became nearly empty, a fresh meal was supplied. This involved changing feed bowls at 2-hour intervals. When sufficiently strong, each bird was taken at least once per week to the river foreshore, to bathe and forage for a few hours. During this time a large bowl of wet sand from the shore line was gathered and transported back to their run. For the rest of the day the birds were allowed to probe in this, and Sharp-tails were often observed pulling out 2-5 centimeter worms and earwigs and thrashing them on the ground to kill them before eating them. The Sharp-tails were also extraordinarily adept in catching fast moving sandhoppers.

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SEQUENCE OF MIGRATION, BY SEX, AGE, AND SPECIES, OF THRUSHES OF THE GENUS *HYLOCICHLA*, THROUGH CHIGAGO

By ORMSBY ANNAN

INTRODUCTION

The avian genus *Hylocichla* (family Turdidae) is regarded as composed of five species (A.O.U., 1957), although there are some ornithologists who favor transferring four of the species to the closely related genus *Catharus* (Ripley, 1952; Dilger, 1956). The five species are the wood thrush (*Hylocichla mustelina*), the hermit thrush (*H. guttata*), the Swainson's thrush (*H. ustulata*), the gray-cheeked thrush (*H. minima*), and the veery (*H. fuscescens*). Birds of each of these species migrate to or through the Chicago area. As part of a study of the regulation of timing

¹The investigation, of which this paper is a product, of regulation of migration in thrushes of the genus *Hylocichla* was carried out at Northwestern University under the direction of Dr. Albert Wolfson, to whom grateful acknowledgement is made for his patient supervision and criticism, as well as for his assistance in making collections. For assistance in collecting I am also indebted to John T. Newell, III; Jack Palmer; Betty Annan; and Tom Kemper. Banding data were supplied in great quantity by Mr. Karl Bartel and Mr. Alfred Reuss, Jr., to whom I am deeply indebted.

of migration in this genus (Annan, 1959), data were obtained on the sequence of migration, by sex, age, and species, of these birds in north-eastern Illinois. This information, based on unpublished banding and collection records, is presented here in comparison with recently published observations (Ford, 1956) for the region.

METHODS

Collecting.

In 1957 collecting began with the first noted arrival of hermit thrushes on April 13, and continued until the third week of May. In 1958, collecting again began with the arrival of hermit thrushes, and continued until the first of June. The thrushes arrived each year in "waves" — overnight increases in number — followed by a gradual decline for several days and then by another overnight increase. Collecting was most intense at the beginning of each wave. There were three collecting areas, all in Lake County. Two were adjacent to the Des Plaines River, and one was near the shore of Lake Michigan.

Trapping.

Trapping by the author in northeastern Cook County made use primarily of the All-Purpose Trap, described in the 1953 Fish and Wildlife Service Bander's Manual. This trap is a modification of one developed at the Austin Ornithological Research Station in Massachusetts and described by Low (1935). It was erected on a permanent concrete foundation, and provided with a drip pool as well as a bait area. The dripping water was an important feature in attracting thrushes, especially in autumn.

Banding.

Data obtained from local banders include 345 records from Highwood, Lake County, covering a 22-year period, mostly of late fall birds, and 3418 records from Blue Island, Cook County, Illinois, gathered over a 26-year period. The Blue Island data provide the most complete and accurate picture of the movement of thrushes through the Chicago area. The period covered — 1933 through 1956 — is long enough to minimize fluctuations brought about by weather, banders' habits, or birds' habits. Of equal importance, the traps were in operation daily throughout the seasons of migration.

Use of trapping and banding records as a means of determining movement into an area raises the question of how soon after arrival the birds may be trapped. It has been the author's experience over a five year period that as soon as thrushes are observed in the area, they will enter water traps. Thus, banding data appear reasonably reliable as a means of dating the arrival of waves of thrushes. They are not reliable for determining the extent of the period the thrushes remain, since very few thrushes are re-trapped. Data from Blue Island show re-trapping only to the extent of 0.1 percent.

Sex and age.

Neither sex nor age of hylcichlid thrushes can be reliably determined by observation in the field. Consequently, data on these subjects are reported only for birds collected, or for birds that were used in experimental studies. Sex was determined at the time of autopsy by examination of the gonads.

An attempt was made to distinguish immature birds from adults by examination of the skull, using a modification of the method described by A. H. Miller (1946) and illustrated by J. P. Chapin (1946) and Robert

Nero (1951). This method depends on the development of a two-layered bony cranium, the layers separated by numerous tiny pillars. The immature cranium consists of but one layer, and appears almost transparent. The cranium may be easily examined if a short slit is made in the freely movable skin of the scalp, without plucking. It was also found possible to differentiate ossified from unossified crania by examination under a strong light, without slitting the skin. A method similar to this has recently been reported by Norris (1961).

On the basis of cranial ossification, almost all of the gray-cheeked thrushes examined were adult as early as October 5, whereas almost all of the members of other hylocichlid species were immature at this date and later. It is improbable that such a difference would occur, over two years, purely by chance. Perhaps ossification occurs earlier in the gray-cheeked thrush than in other hylocichlids, or perhaps immatures and adults of this species follow different routes in fall migration.

RESULTS

Figure 1 shows the duration of occurrence of hylocichlid species in the Chicago area, based on trapping data. Figures 2-5 indicate the actual frequency by species, on each date, summarized for the trapping period of 1933-1956. These figures are based on the data presented in Table 1.

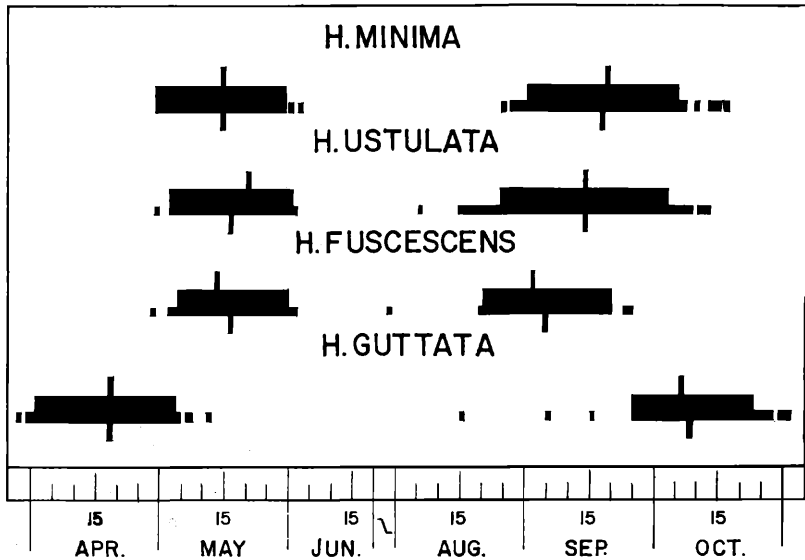


Figure 1

SEQUENCE AND DURATION OF MIGRATION IN CHICAGO AREA,
BASED ON BLUE ISLAND DATA.

The thick horizontal bar represents the period during which 95% of the birds were trapped. The thin extensions or squares represent the 2½% of the birds at each end of the main period.

The vertical bar rising above the heavy bar represents the day on which half of the birds trapped had been trapped. The vertical bar below the horizontal bar represents the temporal midpoint of the migratory period. Only the 95% central data are considered in establishing these midpoints.

The figure under each bar shows the number of individual records on which the season's migratory period is based.

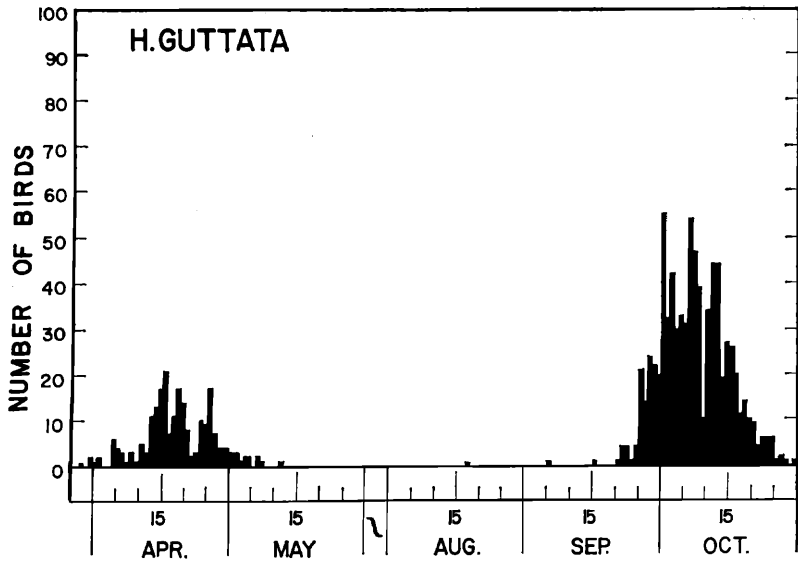


Figure 2
FREQUENCY DISTRIBUTION OF HERMIT THRUSHES TRAPPED AT
BLUE ISLAND, ILLINOIS, 1933-1956.

The hermit thrush arrives in the Chicago area in spring a month before the other three species, and most hermit thrushes have departed before the first of any of the others appear. In the fall, all of the veeries and well over half of the Swainson's thrushes and gray-cheeked thrushes are out of the area before the first hermit thrush arrives.

Table 1
OCCURRENCE OF HYLOCICHLID THRUSHES DURING MIGRATION
AT BLUE ISLAND, ILLINOIS
MUSTELINA GUTTATA USTULATA MINIMA FUSCESCENS

	SPRING				
Number of Birds	25	227	170	87	101
Earliest	May 4	Mar. 29	Apr. 30	Apr. 30	Apr. 29
Midpoint-F	May 13	Apr. 19	May 21	May 15	May 20
Midpoint-T	—	Apr. 19	May 17	May 15	May 17
Range	—	Apr. 2- May 4	May 3- May 31	Apr. 30- May 29	May 5 - May 30
Latest		May 12	June 1	June 2	June 1
	AUTUMN				
Number of Birds	29	779	1429	450	119
Earliest	Aug. 15	Aug. 17	Aug. 17	Aug. 26	Aug. 21
Midpoint-F	Sep. 13	Oct. 7	Sep. 14	Sep. 19	Sep. 2
Midpoint-T	—	Oct. 9	Sep. 14	Sep. 13	Sep. 3
Range	—	Sep. 26- Oct. 23	Aug. 26- Oct. 3	Sep. 1- Oct. 5	Aug. 22- Sep. 20
Latest	Oct. 10	Nov. 12	Oct. 13	Nov. 7	Sep. 25

Midpoint F = frequency midpoint, and midpoint T = temporal midpoint. These, and range, were computed after omitting 2½% of the occurrences from each end of the migratory period.

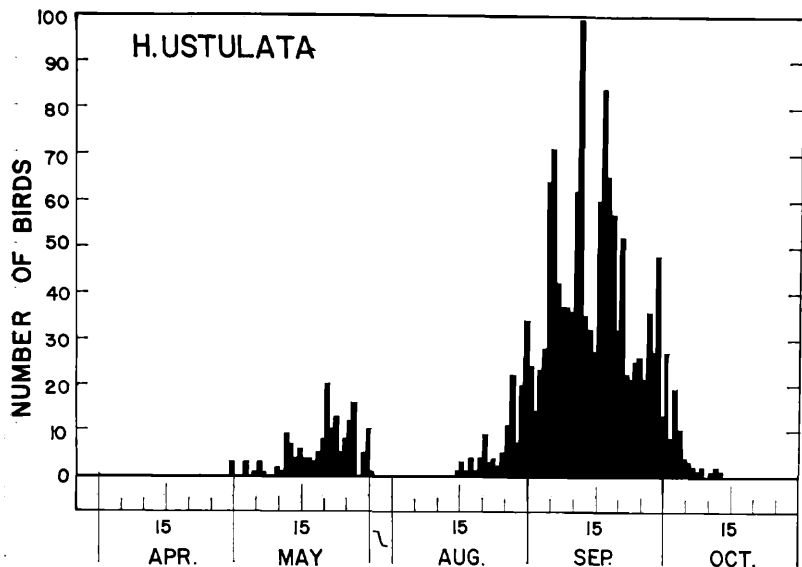


Figure 3

FREQUENCY DISTRIBUTION OF SWAINSON'S THRUSHES TRAPPED AT BLUE ISLAND, ILLINOIS, 1933-1956.

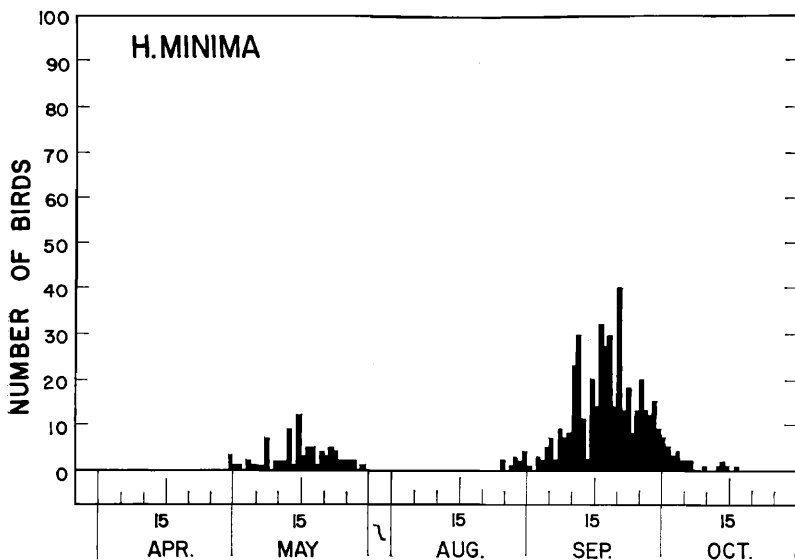


Figure 4

FREQUENCY DISTRIBUTION OF GRAY-CHEEKED THRUSHES TRAPPED AT BLUE ISLAND, ILLINOIS, 1933-1956.

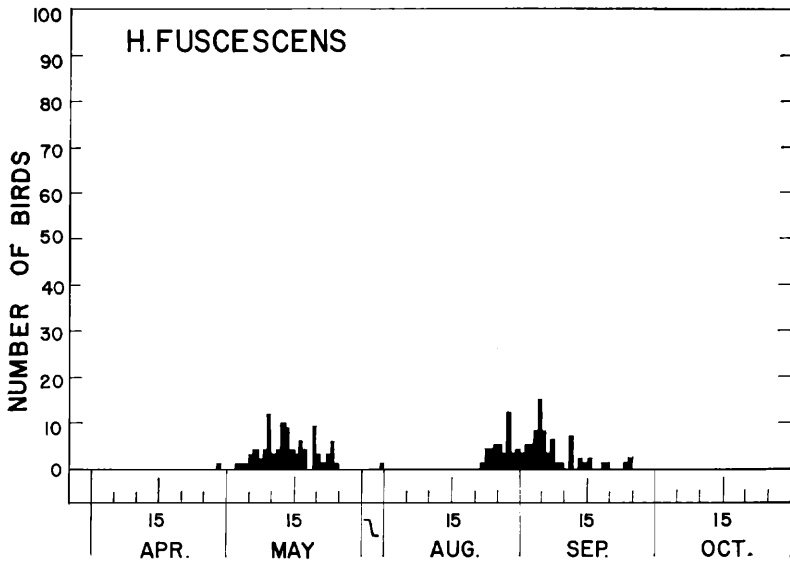


Figure 5
FREQUENCY DISTRIBUTION OF VEERYS TRAPPED AT
BLUE ISLAND, ILLINOIS, 1933-1956.

Hylocichlids are present, spring and fall, for 26 to 39 days. The veery, Swainson's thrush, and gray-cheeked thrush do not occur during precisely the same calendar period, but during both spring and fall migration there is a twenty day period when all three are present. There is greater overlap in their occurrence in the spring than there is in the fall. In autumn, the veery arrives four days before the Swainson's thrush, and ten days before the gray-cheeked thrush. The veery is out of the area in the fall by the time half of the gray-cheeked thrushes have arrived.

In Table 2 the dates of occurrence derived from the trapping records at Blue Island are compared with the visual records from Ford's report (1956). They are in close agreement, indicating the reliability of extensive field observations gathered by experienced observers.

Table 2
COMPARISON OF BLUE ISLAND BANDING DATES WITH THE MOST
RECENT PUBLISHED RECORDS FOR THE CHICAGO AREA

	BLUE ISLAND	FORD (1956)
SPRING		
<i>H. guttata</i>	Apr. 2 - May 4	Apr. 1 - May 9
<i>H. ustulata</i>	May 3 - May 31	Apr. 28 - May 24
<i>H. minima</i>	Apr. 30 - May 29	May 4 - May 25
<i>H. fuscescens</i>	May 5 - May 30	Apr. 29 - May 25
FALL		
<i>H. guttata</i>	Sept. 26 - Oct. 23	Sept. 21 - Oct. 28
<i>H. ustulata</i>	Aug. 26 - Oct. 3	Aug. 26 - Oct. 7
<i>H. minima</i>	Sept. 1 - Oct. 5	Sept. 4 - Oct. 5
<i>H. fuscescens</i>	Aug. 22 - Sept. 20	Aug. 26 - Sept. 16

This table indicates the average duration of migration for each species. The Blue Island dates represent the 95% group, and the Ford dates exclude all "early" and "late" records.

Table 3

SEX OF HYLOCICHLIDS IN RELATION TO
PHASE OF SPRING MIGRATION

SPECIES	SEX	DAYS							TOTAL	
		1	2	3	4	5	6	7 Over Seven		
Hg.	M	5	13	5			2		8	33
	F	0	1	1			1		12	15
Hu.	M	1		1	2	7	5	13	2	39
	F	0		0	0	1	1	4	3	9
Hm.	M	1		5			1			7
	F	0		2			0			2
Hf.	M	3	2	0	3		2	0	2	12
	F	0	0	1	1		3	2	1	8

The number of birds collected of each sex of each species is shown for the first seven days of the presence of the species in the Chicago region. In addition, the numbers collected after the first week, and the total numbers collected, are presented. The species abbreviations are: Hg — hermit thrush; Hu — Swainson's thrush; Hm — gray-cheeked thrush; Hf — veery.

Sex and age.

In the spring first year birds could not be distinguished from older birds, since cranial ossification was complete. In the four species collected, males arrived before the females, and were obtained in larger numbers at least through the fifth day of migration for each species. (Table 3).

In the fall, all species except the hermit thrush were present in the area before trapping commenced. Immature birds greatly outnumbered adult birds in the Swainson's thrush and the hermit thrush, and adults outnumbered immatures in the gray-cheeked thrush. It should be recalled that the validity of aging by cranial ossification is questioned for this species. The sexes were trapped in approximately equal numbers. The hermit thrush, the only species trapped throughout its period of occurrence, showed no sexual pattern of time of arrival.

DISCUSSION AND CONCLUSIONS

The data from the spring collections reveal that in the hermit thrush, the Swainson's thrush, the gray-cheeked thrush, and the veery, some males arrive in Chicago before any females, and predominate during the first week of occurrence. This is not surprising, since the robin (*Turdus migratorius*) and the bluebird (*Sialia sialis*), which are also thrushes, show the same pattern.

During the fall migration the only thrush for which adequate data are available is the hermit thrush. In contrast to the early arrival of males in spring, male and female hermit thrushes were obtained in approximately equal numbers at all periods of the fall migration. Only three of these were adults, while 45 were immature, but the adults showed up at the beginning, the middle, and the end of the migration. The one in the middle was a male. Thus, on the basis of an admittedly inadequate sample of adults, there appeared to be no sexual sequence of migration. There was none among the immatures.

There are several possible answers to the question raised by the disproportionate ratio (45 to 3) of young birds to adults. It is possible that the population was in a period of rapid growth or replacement in 1956 and 1957 as a result of any of a variety of speculative factors. Perhaps adult hermit thrushes move south faster, either in longer flights between stopovers, or with shorter stopovers. Or, it may be that adults follow different

routes from those taken by the young. Without information on the population size of the hermit thrush and additional data from other localities, no one answer can be selected.

SUMMARY

1. In Chicago the hermit thrush arrives first in the spring and last in the fall. It is usually not present at the same time as the other hylocichlids.
2. The veery, Swainson's thrush, the gray-cheeked thrush are usually present at the same time during spring migration. In the fall they are spread out more but are still present together over a twenty day period (September 1 to September 20).
3. In the spring some male hylocichlid thrushes reach Chicago earlier than any females.
4. In the fall there is no discernible sequence of arrival of sexes.
5. Immature birds were trapped in the fall in much greater numbers than adult birds, except in the gray-cheeked thrush.

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A HALF-CENTURY'S CHANGES IN THE BIRD-LIFE AROUND SPRINGFIELD, MASSACHUSETTS

ELIZABETH M. BOYD

At mid-century it is appropriate to compare the bird fauna of today with the past 50-60 year period. The comparison is confined to the area of Western Massachusetts, in particular to Springfield and its vicinity. A bird count made in the early 1900's would differ in several respects from one compiled today, and this would hold true whether it was recorded on a winter's or a summer's day. A daily check list then would have shown probably fewer species of birds and a marked contrast in numbers of individual birds, far more of some and a great scarcity of others. Bird-banding data substantiates some of these changes. In addition, a difference would have been observed in the habits of certain birds.

The trend towards an invasion into new territory in the Connecticut Valley by some species and an altered status of others already established in the area, was ably described over twenty years ago by Bagg and Eliot (1937) and has been brought up-to-date by information gleaned from *Audubon Field Notes* (1947-). Since most of the data in the present