

## DIFFERENTIAL FALL MIGRATION OF ADULT AND IMMATURE LEAST FLYCATCHERS<sup>1</sup>

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Although much has been written about differences in the timing of fall migration among the various age and sex classes of passerine birds, the details remain obscure for most species, as has been pointed out by Tordoff and Mengel (1956). They advocate the analysis of samples of migrating birds obtained from television tower kills, as a means of solving this problem. However, birds trapped during migration, and accurately aged or sexed, may also give valuable information on the period of occurrence of different age and sex classes, provided that conditions indicate that a reasonably representative sample of migrants passing through the area is being obtained.

In this paper we will present data, obtained from birds trapped at Long Point, Ontario, which indicate a clear difference between the fall migration periods of adult and immature Least Flycatchers, *Empidonax minimus*.

### LOCATION AND METHODS

The Long Point Bird Observatory was operating continuously at the eastern end of Long Point (42° 33' N., 80° 03' W.) on the north shore of Lake Erie from 1 April to 31 October, 1965. This paper is concerned mainly with data obtained from Least Flycatchers trapped during the months of July to October, 1965. Flycatchers, together with many other species, were trapped for banding in three Heligoland traps which were in use every day during this period.

Least Flycatchers were identified on the basis of information supplied to Operation Recovery stations by C. S. Robbins. The main difficulty lies in distinguishing the Least Flycatcher from the Traill's Flycatcher, *Empidonax traillii*, which is the only other brown-backed *Empidonax* occurring regularly in eastern North America. Stein (1963) considers the two song types of Traill's Flycatcher to represent two separate species, but, as they are morphologically very similar, we have not attempted to distinguish them. Measurements of wing chord (from the bend to the tip of the folded, unflattened wing) and bill length (from inside the nostril to the tip) were used to separate all Traill's Flycatchers from Least Flycatchers, as follows:

	Wing chord	Bill from nostril
Least Flycatcher	58 - 67 mm.	6.5 - 8.6 mm.
Traill's Flycatcher	65 - 76 mm.	8.0 - 9.6 mm.

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On this basis a small percentage of birds could not be definitely identified as either species. Our records show that during the period concerned 222 Least Flycatchers and 36 Traill's Flycatchers were identified, while only 10 birds remained unidentified.

The extent of ossification of the skull was determined by the method described by Baird (in Norris, 1961). It was assumed that birds with fully ossified skulls were adults, while those with incompletely ossified skulls were assumed to be immatures. Although Johnson (1963a) found that it may take more than a year for the skull to ossify completely in some individuals of Hammond's Flycatcher, *Empidonax hammondi*, we have no evidence to suggest that our ageing of Least Flycatchers was not substantially correct.

On some days we did not examine the skulls of all birds trapped and identified as Least Flycatchers, but we do not think that we exercised any selection which could have resulted in a bias in favor of one or other of the age classes.

## RESULTS

Table 1 shows the number of Least Flycatchers trapped (excluding retraps), the number for which the skulls were examined, and the number of adults and immatures, for five-day periods from 8 July to 15 October, 1965. Only four birds were retrapped after the day of banding. An unaged bird banded on 9 July and immatures banded on 11 August, 27 August and 8 September were retrapped one day, two days, one day and one day respectively, after banding.

TABLE 1. NUMBERS OF ADULT AND IMMATURE LEAST FLYCATCHERS

Dates		Total trapped	No. aged by skull	No. adult	No. immature
Jul	8-12	5	0		
	13-17	6	0		
	18-22	6	0		
	23-27	14	10	10	
	28-1	19	18	18	
Aug	2- 6	7	6	5	1
	7-11	21	21	12	9
	12-16	11	11	1	10
	17-21	19	17		17
	22-26	6	6	2	4
	27-31	44	38		38
Sep	1- 5	8	8		8
	6-10	33	24		24
	11-15	4	4		4
	16-20	3	3		3
	21-25	8	8		8
	26-30	3	3		3
Oct	1- 5	1	1		1
	6-10	3	3		3
	11-15	1	1		1
Totals:		222	182	48	134

The first two "fall" Least Flycatchers were trapped on 8 July, and small numbers continued to appear during the next two weeks. Skulls were first examined on 25 July. Thirty-one birds were examined from 25 July to 2 August and all proved to be adults. The first immature was recorded on 4 August, and from then until 12 August, 15 adults and 15 immatures were examined. Of 66 birds aged during the remainder of August, 64 were immatures and only two, both trapped on 22 August, were adults. All 55 birds aged in September and October were immatures. Thus the number of adults decreased from 100% in July to 0% in late August, September and October.

These results are supported by some very incomplete data obtained at Long Point in 1964. Two Least Flycatchers examined on 26 July and one on 22 August were adults, while all 27 examined from 23 August to 26 September were immatures.

#### DISCUSSION

The last spring migrant handled in 1965 was trapped on 6 June, and, as noted above, the first fall bird was taken on 8 July. Possibly, the birds which appeared during the following two weeks were not engaged in migration, but had only wandered a short distance from their breeding areas. However, our observations and those of Snyder (1931) indicate that Least Flycatchers are absent from Long Point during the breeding season; and, since the eastern end of Long Point is about twenty miles from the mainland, it seems probable that these birds were migrating. Furthermore, the small number of retraps obtained, both in July and later in the season, indicates a rapid movement through the area. It is unfortunate that we did not examine the skulls of these early birds, but, in view of the distribution of adults and immatures obtained later, we think that it is probable that the large majority would have proved to have been adults. We do know that the largest numbers of adult Least Flycatchers occurred on 27 and 28 July, a full week before any immatures were detected. The U. S. Weather Bureau daily weather maps show that a cold front passed southward over Lake Erie late on 24 July, and that from 25 to 30 July there was a northerly flow of cool air over southern Ontario due to the presence of a ridge of high pressure to the west. This weather pattern is typical of those normally producing large concentrations of migrants at Long Point in the fall. Thus it is clear that the bulk of the adults migrate through Long Point in the second half of July and first half of August, while most of the immature migrants occur from the second week of August to the end of September.

Early migration of adult Least Flycatchers is consistent with the late postnuptial molt, which takes place after the birds have gone south, as noted by Dwight (1900) and confirmed by Dickey and Van Rossem (1938) and Johnson (1963b). This allows them to migrate as soon as they are free of nesting activities.

The timing of the migration is also in agreement with available data on termination of the nesting cycle. MacQueen (1950) says

that among 44 nests found in Michigan the latest date for a nest under construction was 24 June. She estimates the length of the nesting cycle from the start of nest building to independence of the young to be about 50 days, so the young from this nest would have been independent about 13 August. But this was a late, repeat nesting; the earliest nest was estimated to have been built in the last part of May. Davis (1959) gave data on 12 nests in Virginia: in nine egg-laying started between 24 May and 12 June, while in the latest it started on 2 July. Egg dates given by Bent (1942) for Illinois, Massachusetts and New York indicate early June as the peak of the season, with few late nests. Thus it is evident that many adults are free of nesting activities by mid-July and nearly all are by the end of the month.

Arrival dates for the species in winter quarters also indicate an early migration. The fall dates given by Miller *et al.* (1957) show that the Least Flycatcher is frequently found in Mexico in August, and July dates are recorded for two localities. The earliest fall date for Guatemala is 13 August (Griscom, 1932), and for El Salvador it is 3 September (Dickey and Van Rossem, 1938).

On the other hand, the later migration of immatures is consistent with the timing of the postjuvinal molt, which occurs on the breeding grounds prior to migration, and usually involves mainly the body plumage (Johnson, 1963b). Although Johnson (1963b) points out that fall migration precedes the postnuptial molt in adult Least Flycatchers and follows the postjuvinal molt in immatures, he does not specifically mention any difference in the migration periods of the two age classes. However, in the course of a general discussion of the relationship between molt and migration in *Empidonax* he says "an early molt on the breeding grounds is correlated with a leisurely, prolonged southward migration, and an early and rapid fall migration is associated with a subsequent protracted molt." Although this statement was apparently made primarily in relation to differences between species, it is clear that it is equally applicable to the differences between adult and immature Least Flycatchers.

It is hoped that banders working elsewhere will be able to confirm the difference in the migration periods of adult and immature Least Flycatchers. In this connection it should be mentioned that we have a small amount of data which appear to indicate that a similar situation may exist in the Traill's Flycatcher and the Yellow-bellied Flycatcher, *Empidonax flaviventris*. It would be of particular interest to trace the southward movement of adults, and it should be pointed out that to do this it will be necessary to start trapping flycatchers no later than mid-July.

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#### SUMMARY

1. Least Flycatchers were trapped during banding operations which were carried out continuously during the months of July to October, 1965 at Long Point, Ontario. From 8 July to 15 October a total of 222 Least Flycatchers was trapped. The age of 182 birds was determined by examination of skull ossification during the period from 25 July to 15 October; 48 were adults and 134 were immatures.
2. All 31 birds aged from 25 July to 2 August were adults. From 3 to 12 August, 15 adults and 15 immatures were examined. Two adults were found on 22 August, but the remaining 119 birds examined from 13 August to 15 October were immatures.
3. It is concluded that most adult Least Flycatchers migrate through Long Point during the second half of July and first half of August, while the majority of the immatures migrate from the second week of August to the end of September.
4. It is pointed out that the early fall migration of adult Least Flycatchers is consistent with our knowledge of their nesting season and molt, and with arrival dates for the species in winter quarters.

#### LITERATURE CITED

- BENT, A. C. 1942. Life Histories of North American flycatchers, larks, swallows and their allies. *U. S. Natl. Mus. Bull.*, **179**: 1-555.
- DAVIS, D. E. 1959. Observations on territorial behavior of Least Flycatchers. *Wilson Bull.*, **71**: 73-85.
- DICKEY, D. R. and A. J. VAN ROSSEM. 1938. The birds of El Salvador. *Publ. Field Mus. Nat. Hist., Zool. Ser.*, **23**: 1-609.
- DWIGHT, J., JR. 1900. The sequence of plumages and moults of the passerine birds of New York. *Annals N. Y. Acad. Sci.*, **13**: 73-360.
- GRISCOM, L. 1932. The distribution of bird-life in Guatemala. *Bull. Amer. Mus. Nat. Hist.*, **64**: 1-439.
- JOHNSON, N. K. 1963a. Biosystematics of sibling species of flycatchers in the *Empidonax hammondi-oberholseri-wrightii* complex. *Univ. Cal. Publ. Zool.*, **66**: 79-238.

- JOHNSON, N. K. 1963b. Comparative molt cycles in the Tyrannid Genus *Empidonax*. *Proc. XIII Int. Ornith. Congr.*, **2**: 870-883.
- MACQUEEN, P. M. 1950. Territory and song in the Least Flycatcher. *Wilson Bull.*, **62**: 194-205.
- MILLER, A. H., H. FRIEDMANN, L. GRISCOM and R. T. MOORE. 1957. Distributional check-list of the birds of Mexico. Part II. *Pacific Coast Avifauna*, **33**: 1-436.
- NORRIS, R. A. 1961. A modification of the Miller method of ageing live passerine birds. *Bird-Banding*, **32**: 55-57.
- SNYDER, L. L. 1931. A faunal investigation of Long Point and vicinity, Norfolk County, Ontario. III. The birds of Long Point and vicinity. *Trans. Royal Canad. Inst.*, **18**: 139-227.
- STEIN, R. C. 1963. Isolating mechanisms between populations of Traill's Flycatchers. *Proc. Amer. Phil. Soc.*, **107**: 21-50.
- TORDOFF, H. B. and R. M. MENGEL. 1956. Studies of birds killed in nocturnal migration. *Univ. Kansas Publ.*, **10**: 1-44.

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## INFLUENCE OF SPRAYING WITH CARBARYL ON NESTING SUCCESS IN A SAMPLE OF BIRD-BOXES ON CAPE COD IN 1965

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### INTRODUCTION

Records have been kept for six years (1960-1965) of the nesting, laying, hatching, and fledging of birds in nesting boxes (mostly) on a ten-acre area of rolling hills in Truro, Cape Cod, Massachusetts. The total eggs known to have been laid during this time was 309; 182 young birds hatched and 157 were fledged from 71 nests. Nesting species had been mostly tree swallow (*Iridoprocne bicolor*) and Eastern bluebird (*Sialia sialis*). During the nesting season of 1965, the area on which the boxes were disposed was sprayed from aircraft with carbaryl ("Sevin") against the gypsy moth (*Ocneria dispar*). The effect of the pesticide on the birds and their progeny was recorded.