

# ADDITIONAL OBSERVATIONS ON THE FALL MIGRATION OF ADULT AND IMMATURE LEAST FLYCATCHERS

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The recent paper by D. J. T. Hussell *et al.* (1967) on differential migration of Least Flycatchers (*Empidonax minimus*) has prompted me to analyze comparable data from two other northeastern banding stations.

In 1965 at Long Point Observatory, Ontario, Hussell *et al.* found a striking difference in the timing of fall migration of adult and immature Least Flycatchers. The adults passed through from 23 July to 26 August, and the immatures from 2 August to 15 October. Less complete data from the fall of 1964 also suggested that the adults preceded the young of the year. Age was determined by examination for skull ossification.

## LOCATION AND METHODS

For the past six years, Carnegie Museum has maintained a banding station in essentially year-round operation at Powdermill Nature Reserve, in the westernmost valley of the Allegheny Mountains in Pennsylvania (three miles south of Rector, Westmoreland County: 40° 10' N., 79° 16' W.) This area lies approximately 170 air miles SSE of the Long Point Observatory.

At Powdermill, from 1962 through 1967, we banded 857 Least Flycatchers: 218 in April and May (considered spring migrants); 5 in June (either late migrants or breeding in the area); 33 in July (probably a mixture of local birds and early migrants); and 601 in August through October (considered fall migrants). An analysis of the data for July through October of 1964 through 1967 was prepared (Table 1), using the format of Hussell *et al.* In 1964 and 1965 the Powdermill flycatchers were aged by plumage characters (particularly the wing coverts), and in 1966 and 1967 by skull ossification as well. All four of the Powdermill years indicate the same pattern of migration, however, and so are included for comparison with each other and the Long Point figures.

## RESULTS

The results of the Powdermill banding show that both age classes of Least Flycatchers pass through the valley at approximately the same time. If the four-year data are pooled and graphed on arithmetic probability paper, following the migration analysis method developed by Preston (1966), they suggest that although the adult and immature migration is fairly closely synchronized at Powdermill, the young may come through slightly *earlier* than do the adults. The immature migration (Fig. 1,) plots to a straight (dashed) line, with a standard deviation ( $\sigma$ ) of 12.6 days; this indicates a steady, if protracted passage of birds, with a peak at 1 September.

TABLE 1. NUMBERS OF ADULT AND IMMATURE LEAST FLYCATCHERS CAPTURED AT POWDERMILL NATURE RESERVE

5-day periods	Number trapped			Number of adults			Number of immatures			Total					
	1964	1965	1966	1964	1965	1966	1964	1965	1966						
Jul 8-12	1	1		1	1					2					
13-17	1			1						1					
18-22															
23-27	1		2				2			2					
28-1	2														
Aug 2-6	3	2	1	1	1	1	1			3					
7-11	4	3	2	1	1	1				2					
12-16	3	5	3	6	1					1					
17-21	7	21	5	9	4	2	3	5	21	3					
22-26	8		9	20	3	2	2	4		2					
27-31	27	6	14	26	7	4	3	1		11					
Sep 1-5	44	10	22	23	9	4	2	6		12					
6-10	13	11	15	23	6	3	5	7	3	18					
11-15	7	3	2	11	2	3	1		1	5					
16-20	22	2	8	7	3	6		7		13					
21-25	7	6	3	4			3	1		4					
26-30	2	3		2			3			3					
Oct 1-5		2	1			3			2	1					
6-10															
11-15			1							1					
Totals:	146	79	87	135	447	27	20	25	10	82	107	51	26	125	309

The adults (Fig. 1, solid line) have a main migration in late August and September that is also fairly normal (straight line), and an additional small group of early birds, perhaps of comparatively local origin, in the first weeks of August. The  $\sigma$  value for the adults is 14.3 days, indicating a similarly protracted migration, with a peak at 5 September. The four-day difference between the immature and adult migration peaks does not seem significant, and the slopes of the two lines are comparable.

At both Long Point and Powdermill, the majority of the immatures pass through from mid-August to mid-September, whereas most of the adults are seen at Powdermill from the last days of August until mid-September, or almost a month later than they come through Long Point. The three early July adults banded at Powdermill were probably breeding or local birds rather than migrants; one of these (banded 14 July 1964) returned two years later on 25 May 1966, and was almost certainly breeding in the area. Being considered local birds, the three early July adults listed in Table 1 were not included in the computations for Fig. 1. Although Hussell *et al.* captured 17 Least Flycatchers between 8 and 22 July, these were not aged and so are also omitted from consideration.

Some of Powdermill's late July and early August immatures may have been of local origin, but lacking definite evidence for this, I have included them in the computations. The fact that all of the October birds thus far banded at Powdermill have been immatures is slightly suggestive of a late migration, but as it concerns only four individuals, and is the end of the protracted pattern seen in Fig. 1, I consider it to be of little significance.

#### DISCUSSION

The reasons for the different patterns observed at Long Point and at Powdermill can only be speculated upon. Although published data from Long Point are only for one year, and these from Powdermill represent four, the 1965 Long Point records apparently were not atypical, as Hussell (*in litt.*) reports that the same pattern was repeated in 1966 and 1967. It is also unlikely that the different techniques at the two stations (notably Heligoland traps vs. mist nets, and the aging methods used) would have had so marked an effect on the results. Heligoland traps are not as efficient in catching flycatchers as are mist nets (Hussell & Woodford, 1961), but we have no evidence that they are differentially efficient in catching age classes of flycatchers. We believe that the Powdermill record is internally comparable from year to year, for we have made every effort to keep our field conditions (number and location of nets, total annual net hours, personnel, etc.) as constant as possible. Thus we feel safe in pooling several years' data, especially in this case where, although different aging methods were used, the four years show the same pattern of migration.

I suspect, therefore, that the differences between the Long Point and the Powdermill data lie not in the techniques or analysis, but in the migration patterns themselves. Long Point, on the north shore

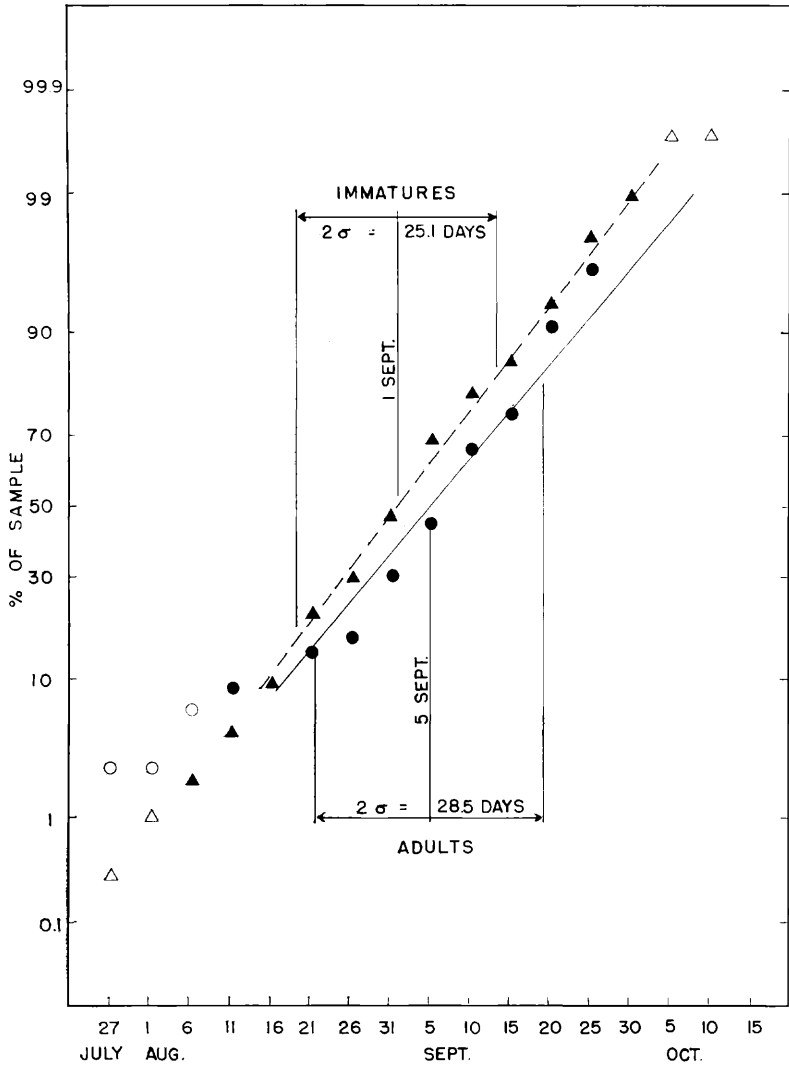


Fig. 1. Fall migration of Least Flycatchers at Powdermill. Triangles, dashed line = immatures; Circles, solid line = adults. Open symbols used to indicate cumulative sample size of less than 5 birds at both ends of time period.

of Lake Erie, is almost directly north of Powdermill, but it is *west* of the Allegheny chain; it may, therefore, lie outside of a migration route or flyway that feeds into the mountains. Possibly a few of the adults that pass through Long Point in late July and early August also appear in the Powdermill area a few days later; these

birds may make up some of the small early group in Fig. 1. The main migration, however, seen at Powdermill in late August to mid-September, may not extend westward beyond the mountains, and thus not be detected at Long Point. It seems clear that there are two distinct groups of adults involved here, with a "mountain" group moving south approximately a month later than a "Great Lakes" group. This is certainly more probable than a single group taking many weeks to move the 170 miles between Long Point and Powdermill.

Data from an east coast banding station also seem to support the concept of a montane migration route for adult Least Flycatchers. Phillips *et al.* (1966) reported that of 112 Least Flycatchers netted at the Kalbfleisch Field Research Station at Huntington, Long Island, New York, between 1960 and 1965, only two were adults and 110 were immatures. These birds were carefully aged by skull ossification, general plumage characters, and wing bar color. The two adults, captured on 10 and 16 July, were believed to be post-breeding stragglers. The immatures were netted between early August and mid-September, with the peak coming during the last week of August and the first week of September (or approximately the same time as at Long Point and Powdermill).

What significance these observations have in relation to the comments by Hussell *et al.* on the timing of the molt in adults and immatures is not yet known. Adults are thought to migrate soon after they have finished their breeding activities and before beginning their prebasic ("postnuptial") molt. Immatures, on the other hand, complete their first prebasic ("postjuvinal") molt before migrating south. In view of our generally incomplete knowledge of the timing of molt, and especially in regard to these two different groups of migrating adults, it will be important to record molt stages of the flycatchers caught on fall migration. It is possible that the later group of adults may already have begun their prebasic molt.

#### CONCLUSIONS

These data from three banding stations lend support to the suggestion first made by Dr. Wesley E. Lanyon (pers. comm. to K. C. Parkes) that migration patterns of age classes of certain species within the Allegheny Mountains may differ from those found elsewhere. It appears, at least at this first analysis, that all immature Least Flycatchers migrate through eastern North America at approximately the same time. Migration of the adults, in contrast, is concentrated inland, and may be differently timed from that of the young birds. Adults moving through the mountains appear almost a month later than those travelling down the comparatively flat lands west of the Alleghenies.

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## A MIGRATION WAVE OBSERVED BY MOON-WATCHING AND AT BANDING STATIONS\*

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#### INTRODUCTION

While studying a migration "wave" in eastern Massachusetts in 1968 we noted some striking discrepancies between migration as recorded by moonwatching and the changes in numbers of birds caught at netting stations. This sort of discrepancy has been reported before in general terms, but the events of 4th-6th October 1968 provided some unusually clear illustrations of the different types of information provided by the two techniques.

Baird *et al.* (1959) reported that in the autumn of 1958 banding stations on the Atlantic coast reported "waves" of arriving migrants immediately after the passage of cold fronts, but that a banding station 25 miles inland at Jamesburg, New Jersey, consistently reported waves one day later. They suggested that the records of the inland station may have reflected better the migration of birds overhead, and that the coastal waves may have resulted from smaller movements of birds, exaggerated by lateral drift of the birds to the coast in the strong NW winds which usually prevail

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