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THE TIMING OF FALL MIGRATION IN YELLOW-BELLIED FLYCATCHERS

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During studies of the migration of several species in the genus *Empidonax* in southern Ontario (Hussell 1981, 1982), it became evident that adults and immatures of the Yellow-bellied Flycatcher (*E. flaviventris*) differed in the timing of their fall migrations, with adults preceding immatures. This situation is similar to that in the Least Flycatcher (*E. minimus*) and is probably related to the timing of the postnuptial molt of the flight feathers, which takes place after the southward migration in both species (Dwight 1900, Johnson 1963). To confirm the differential timing between adults and immatures and to elucidate further the temporal and geographical patterns of their migrations, I previously presented results of a study of museum specimens of the Least Flycatcher (Hussell 1980) and here present results of a similar study of Yellow-bellied Flycatcher specimens.

METHODS

Yellow-bellied Flycatchers taken between 3 July and 30 October were included in the analysis. Specimens were examined in 7 of the 8 museum collections used in Hussell (1980) and in the James Ford Bell Museum of Natural History, University of Minnesota (specimens in the Field Museum of Natural History were not examined).

Methods were similar to those described for the Least Flycatcher (Hussell 1980). Immatures are birds with completely grown flight feathers and hatched in the year they were collected, whereas adults include all older birds. Although the age class distinctions are often less clear-cut than in the Least Flycatcher, I determined age of Yellow-bellied Flycatchers on the basis of color and wear of the greater wing coverts and wear of the remiges and rectrices. Prior to the molt of the flight feathers, which takes place in late September and October (Johnson 1963, this paper), adults have more or less narrow whitish or yellowish-white wing bars formed by the tips of the greater coverts, and sometimes have moderate to heavy wear on the tips of the flight feathers. Immatures have broad buffy-yellow wing bars and show little or no wear of the flight feathers. As with the Least Flycatcher, I was uncertain of the age of a few specimens and called them "probable" adults or immatures.

TABLE 1. Numbers and localities of adult and immature Yellow-bellied Flycatcher specimens.

Region ¹	No. of specimens of age ² :		% adult	Specimen localities ³
	Adult	Immature		
NE ⁴	98 (4)	183 (3)	35	Conn. 0-1, Ill. 1-2, Ind. 0-1, Maine 1-1, Mass. 0-2, Mich. 3-20, New Brunswick 4-5, Newfoundland 27-12, N.H. 1-1, N.J. 0-23, N.Y. 5-17, Nova Scotia 10-15, Ontario 13-45, Penn. 0-26, Quebec 33-15, Vt. 0-3, Wisc. 0-4.
NW	20	20	50	Alberta 2-2, Br. Columbia 5-0, Iowa 1-8, Manitoba 6-3, Minn. 4-5, Northwest Territories 2-0, Saskatchewan 0-2.
SE	5 (3)	43 (1)	10	Bermuda 0-1, D.C. 3-9, Ga. 0-3, Ky. 0-3, Md. 1-9, Miss. 1-5, N.C. 0-5, Va. 0-8.
SW	23 (1)	8	74	Ark. 1-2, Okla. 0-1, Tex. 22-5.
MEX	9	18 (1)	33	Chiapas 2-2, Tamaulipas 1-1, Veracruz 6-15.
CENT	12	9	57	Costa Rica 7-6, Guatemala 3-3, Honduras 1-0, Panama 1-0.

¹ Regional boundaries as in Figure 1 in Hussell (1980). NE = northeastern, NW = northwestern, SE = southeastern, SW = southwestern North America; MEX = Mexico; CENT = Central America.

² Adult = adult or probable adult. Immature = immature or probable immature. The number of "probables" in any total is given in parentheses.

³ Number of adult and probable adult followed by number of immature and probable immature specimens for each state, province, territory, or country.

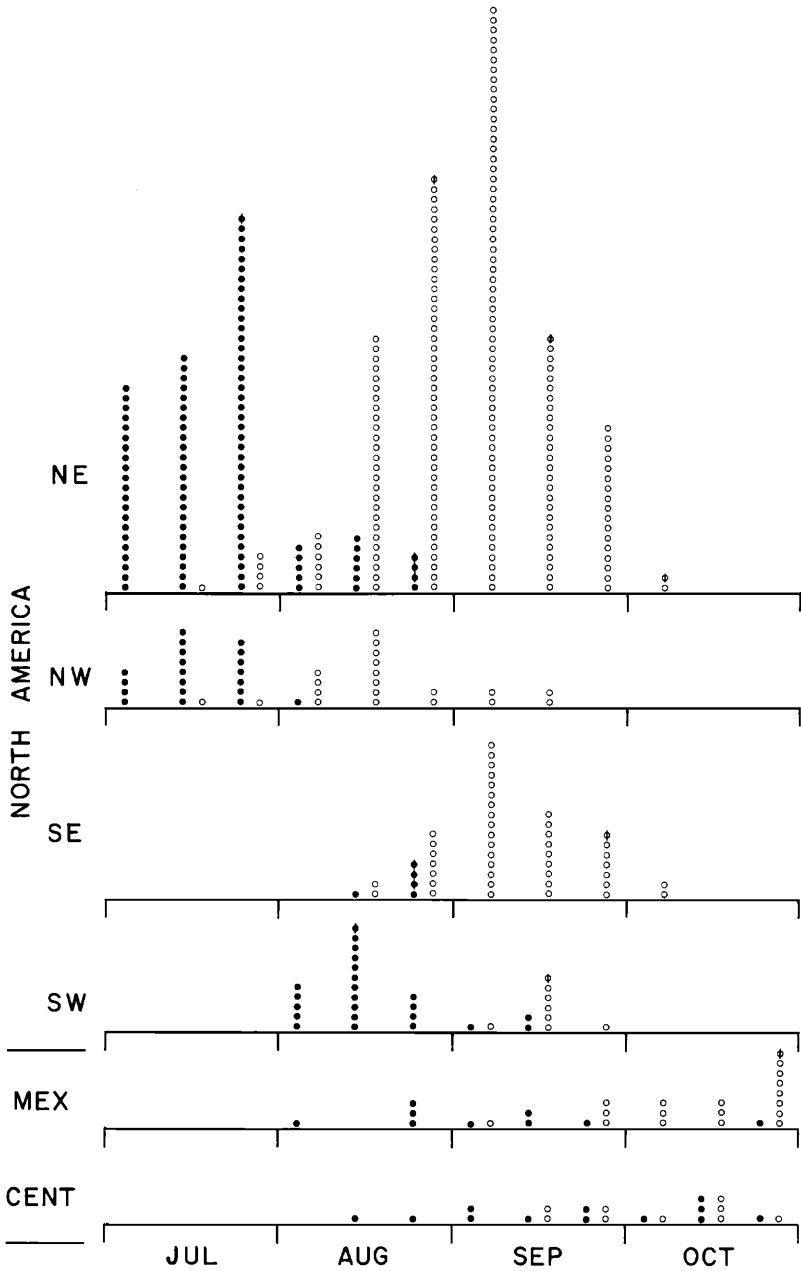
⁴ Specimens from Labrador and the islands of St. Pierre and Miquelon are included with Newfoundland.

Of the 448 specimens whose ages I determined, 167 were judged to be adults or probable adults and 281 were immatures or probable immatures. They were tabulated according to age, geographic region, and date of collection (Table 1, Fig. 1). The breeding range is entirely within the east-central portions of regions NW and NE (northwestern and northeastern North America), whereas the wintering area is mainly in Central America (see Fig. 1 in Hussell 1980).

The last primary molted on each wing was recorded for adult specimens molting remiges and rectrices.

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FIGURE 1. Timing of occurrence of adult and immature Yellow-bellied Flycatchers in six regions (see footnote 1, Table 1). Solid circle = adult; open circle = immature; solid circle with vertical line = probable adult; open circle with vertical line = probable



immature. Columns represent consecutive 10-day periods, 3 July through 30 October, all years combined. For each period data for immatures are placed immediately to the right of those for adults.

RESULTS

The timing of occurrence of Yellow-bellied Flycatchers in the six geographic regions is shown in Fig. 1. Many adults were taken in the NE and NW regions of North America in July. Undoubtedly many of these were on their breeding grounds although some were at localities which suggest that they were migrants. In August adults appear in the SE and especially in the SW regions, while numbers in the NE and NW have declined. By 31 August, adults have disappeared from the breeding range in the NE and NW regions and only 3 were collected elsewhere in North America in September (all in the SW region). Adults were taken far south of the breeding range in Texas as early as 5 August and in Mexico, Guatemala, and Costa Rica by 7 August, 15 August, and 5 September, respectively. Immatures were collected in the NW and NE regions mostly from mid-August to mid-September. The majority of these birds were probably migrants as their pattern of occurrence is similar to that of migrants in southern Ontario (Hussell 1982). In the SE and SW regions, immature specimens were taken mainly in September. The first immatures in Mexico, Guatemala, and Costa Rica were collected on 3, 18, and 16 September, respectively.

Median dates for adult and immature specimens south of the breeding grounds in the SE and SW regions combined are 16 August and 9 September, respectively. Thus adults precede immatures by 24 days.

As in Least Flycatchers (Hussell 1980), adults make up a considerably greater proportion of the totals in the NW and SW regions than in the NE and SE (Table 1). Although the proportions in the NW and NE may be biased by the presence of non-migrants, those for the SW and SE strongly suggest that the usual migration route for adults lies to the west of that of immatures.

Seven of the 21 adult specimens from Mexico and Central America were molting the flight feathers. Specimens that had not commenced flight feather molt were taken on dates ranging from 7 August to 2 October. The molting specimens, 2 from Veracruz (Mexico) and 5 from Costa Rica, were collected on 19 and 29 September, 18, 20, 20, 24, and 29 October, and the last primaries molted (left wing/right wing) were 2/3, 4/4, 5/5, 7/7, 8/9, 8/8, and 4/4, respectively.

DISCUSSION

Specimen data presented here indicate that adult Yellow-bellied Flycatchers precede the immatures in fall migration by about 24 days. This confirms the pattern observed at Long Point, Ontario (Hussell 1982) where the median dates average 10 days earlier than in the southern U.S.

In the Least Flycatcher the median date for immature specimens in the SW and SE regions is the same as for immature Yellow-bellied Flycatchers (9 September) but adult Least precede them by 37 days (median 3 August, from data of Hussell 1980). The later migration of adult Yellow-bellied Flycatchers (median 16 August) is probably related to

their later spring migration and a later breeding season (Hussell 1982). Specimens of 14 young with incompletely grown flight feathers, however, were taken 6 July to 3 August, with a median date of 24 July, a pattern that differs little from that for 15 young Least Flycatchers reported in Hussell (1980). Nevertheless, as with Least Flycatchers, adult Yellow-bellied Flycatchers must depart the breeding grounds almost immediately after the young become independent.

Another similarity between the fall migrations of Least Flycatchers and Yellow-bellied Flycatchers is that in both species adults apparently follow a more westerly route than immatures. Unfortunately, there is little information available from other sources to lend support to this conclusion; age ratios from banding stations distributed throughout the migratory path would be of interest.

Johnson (1963) indicated the relationship of fall migration to postnuptial molt and stated that the only specimens that he examined in active molt were taken in early October. These results, together with the condition of the molting specimens I examined, indicate a somewhat later start to flight feather molt in adult Yellow-bellied Flycatchers than in adult Least Flycatchers (see Fig. 3 in Hussell 1980). This is consistent with the later timing of fall migration in adult Yellow-bellied Flycatchers.

SUMMARY

An analysis of 448 Yellow-bellied Flycatcher specimens taken between 3 July and 30 October indicates that adults start their southward migration by early August. Peak numbers of adults migrate in mid-August and arrive on the wintering grounds in Central America in late August and early September. Immatures migrate about 24 days later than adults, with peak departures in late August and early September and arrivals in the wintering areas after mid-September. The fall migration of immature Least Flycatchers is simultaneous with that of immature Yellow-bellied Flycatchers, but adult Least Flycatchers precede the immatures by about 37 days. Adult Least Flycatchers and Yellow-bellied Flycatchers both appear to follow a more westerly route than immatures and their postnuptial flight-feather molt occurs in the wintering areas immediately following fall migration.

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