

THE AUTUMN PASSAGE OF YELLOW-BELLIED
FLYCATCHERS IN SOUTH TEXAS¹

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The possession of a suitable spot on the wintering grounds may be important for an individual's survival in migrant species showing territoriality in the nonbreeding season (e.g., Rappole et al. 1989, Winker et al. 1990). If the earliest arrivals are favored in securing the best winter territories (e.g., Smallwood 1988), then selection might favor individuals who quickly return to wintering areas to secure suitable areas. The opposite phenomenon, the vernal "rush" to breeding grounds, is well documented, and is thought to be the result of selective pressure from competition for breeding territories (e.g., Oring and Lank 1982, Francis and Cooke 1986). Given that winter territories are defended on an individual basis (i.e., both sexes show aggressive responses to intruders; Rappole and Warner 1980, George 1987, Winker et al. 1990), a sexual bias in arrival time on the wintering grounds might not be predicted from wintering selective pressures alone (cf. Jehl 1963). The hypothesis that some selective pressure exists for early arrival on the wintering grounds suggests that the first arrivals in winter quarters might be individual adults who failed to reproduce. Although we have found no means to test this hypothesis on the wintering grounds of migrant passerines, it may be possible to examine it from another perspective. If a larger part of the adult population failed to reproduce in a breeding season, our hypothesis predicts that (at the population level) adult passage in autumn migration in this season might be earlier than during a season

with better reproductive success. If a difference in timing failed to occur, other constraints may be affecting the timing of adult autumn migration.

We captured 677 Yellow-bellied Flycatchers (*Empidonax flaviventris*) using mist nets during autumn migration on the Welder Wildlife Refuge (48 km N of Corpus Christi, Texas) in 1973, 1974 and 1988. This site represents a stopover site in the migration route of this species between its breeding grounds across northern North America and wintering grounds from southern Mexico south through most of Central America (AOU 1983). This species was chosen for analysis because it fits several criteria important in addressing the prediction of our hypothesis: (1) it is a common autumn migrant through south Texas; (2) it appears to be territorial in the nonbreeding season (Rappole and Warner 1980, Winker, unpubl. data); (3) adults do not undergo prebasic molt on the breeding grounds (Dwight 1900:145, Mengel 1952, Johnson 1963), allowing them to initiate southward migration as soon as reproductive efforts are terminated; (4) adult migrants have been found south of the breeding range as early as mid-July (Hussell 1982b) and specimen records show arrivals on the wintering grounds in August (Mengel 1952, Johnson 1963, Hussell 1982a; and Bell Museum of Natural History #37613). These records suggest that some adults move south immediately following a final (probably unsuccessful) nesting attempt, as Hussell (1980) suggested for the Least Flycatcher (*Empidonax minimus*; see also Sealy and Biermann 1983).

During three autumn seasons (15 August–15 October), standard 2.5 × 12 m (30 mm) nylon mist nets were set in the same 11.4 ha riparian woodland (Hackberry Mott). Personal experience and data from the Bird Banding Laboratory for the United States south of 31° N latitude (1960–1990) suggest that by netting from 15 August–15 October we probably missed only

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TABLE 1. Netting effort, captures, and median dates of passage of adult and immature Yellow-bellied Flycatchers at the Welder Wildlife Refuge, south Texas.

Year	Net hours	Days ^a	Adults	Immatures	Unknown	Totals	% Im. ^b	Median date	
								(Ad)	(Im)
1973	36,195	57	51	331	32	415	86.4	236	259
1974	31,110	51	39	96	15	150	71.1	235	262
1988	7,815	57	86	26	0	112	23.2	234	251

^a Number of days out of 62 day period when nets were open.

^b Calculated from birds of known age.

a very few of the earliest adult and the latest immature migrant Yellow-bellied Flycatchers in each season. In 1973 and 1974, 50 nets were open when weather permitted, and in 1988, 30 nets were opened on all suitable mornings. Capture totals and effort are given in Table 1. Age was determined in all cases by degree of skull ossification. The age structure of the migrant populations (as represented by net samples) was different between all pairs of years (Table 1: $G = 14.8$ [1973–1974], 58.3 [1974–1988], 159.2 [1973–1988]; $P < 0.001$, G test with William's correction). It is the striking difference between the age structure of 1973/1974 and 1988 that prompted this analysis. If the relatively low proportion of immatures in the 1988 migrant population signified massive reproductive failure on the breeding grounds during that summer, then the hypothesis of early arrival for unsuccessful breeders predicts that adult passage in 1988 would be earlier (on average) than adult passage in both 1973 and 1974.

Visual inspection of the manner in which captures of adults and immatures accumulated during each season (Fig. 1) did not reveal striking differences between years (within age classes). These data were analyzed for potential differences in median date of passage and temporal distribution (within age classes and between years, where Day 227 = 15 August, and Day 288 = 15 October in non-leap years; Table 2). Within each of the three years of our study, within-day sampling effort was relatively even (on days sampled), but weather variability (necessitating closing nets for entire days) caused some significant between-year differences in the distribution of net hours (temporal distribution of 100 net-hour periods examined by day, Table 2). Our analyses (Table 2) show that (1) the temporal distribution of individuals in both age classes showed high between-year variability; (2) median date of passage was remarkably constant between years, showing a significant difference only among immatures between 1973–1974; and (3) these results were probably not affected much by differences in sampling effort (examining patterns of significance among birds and net hours, Table 2).

It is apparent that the timing of adult Yellow-bellied Flycatcher migration failed to reflect differences in the age composition of the migrant populations in these years (Tables 1 and 2). Thus, these data do not support the prediction of our hypothesis. This analysis may be an inadequate test of the prediction, however. We do not know if the age structure of migrant populations in south Texas reflects breeding ground productivity, although the general pattern of age structure observed in south Texas was similar to that found over the entire United States for these three years. Data from the Bird Banding Laboratory show that 1973 had the highest percentage of immatures banded, and that 1988 had the lowest (% immature of known-aged birds [sample size]: 1973, 84.6% [690]; 1974, 79.9% [639]; 1988,

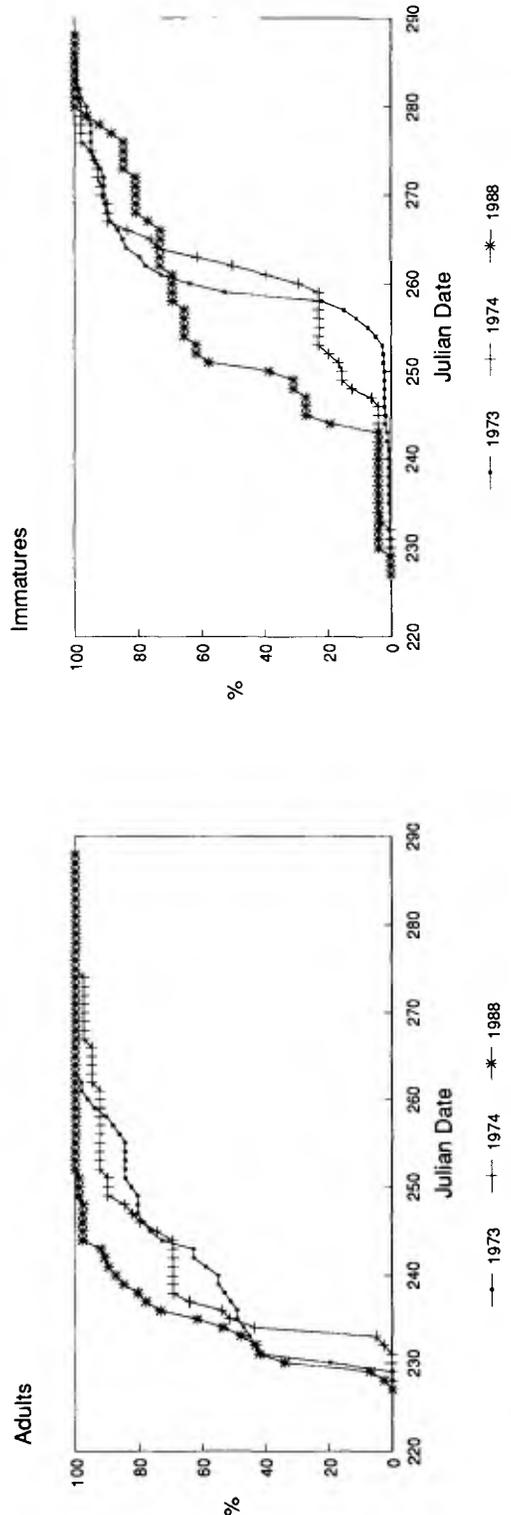


FIGURE 1. The accumulation of captures through time of adult and immature Yellow-bellied Flycatchers at the Wedler Wildlife Refuge, expressed as percentage of total capture to date (where Day 227 = 15 August, and Day 288 = 15 October in non-leap years).

TABLE 2. Results of statistical tests examining between-year differences in median dates of passage and distribution through time of Yellow-bellied Flycatchers at the Welder Wildlife Refuge (15 Aug–15 Oct). Shown for comparison are the same tests examining sample effort (Net-hr), and the pattern of timing differences predicted to be significant by our hypothesis.

Pairwise comparison	Adult timing predicted	Median passage dates ^a			Temporal distribution ^b		
		Adults	Immatures	Net-hr	Adults	Immatures	Net-hr
1973–1974	?	0.00	34.72**	1.58	1.94**	2.10**	1.73*
1973–1988	*	0.30	2.06	2.08	1.83*	2.97**	1.00
1974–1988	*	0.69	3.52	6.16*	2.20**	2.10**	1.87*

^a χ^2 -values (Median test) examining differences in median time of passage.

^b Z-values (Kolmogorov-Smirnov test) examining differences in distribution through time.

* $P < 0.05$.

** $P \leq 0.001$.

69.2% [684]). Other considerations might affect this analysis, however. Immature survival may be affected by factors occurring after adult care is terminated. Also, the majority of adults may forego opportunities for early departure and remain on the breeding grounds attempting (but failing) to reproduce. In addition, the effects of weather on the timing of migration also complicate the analysis.

Although the distribution of individuals through time is significantly different between all years in both age classes, differences in median dates of passage are much less extreme (Table 2). Thus, while individual distribution through autumn migration in south Texas shows a good deal of annual variation (perhaps due to weather), timing at the population level for both adults and immatures shows remarkable constancy. Cumulative captures (Fig. 1) and median dates of passage (Table 1) show a difference in timing between adults and immatures. The median dates of adult and immature passage occurred, on average, 22 days apart, with immatures following adults. This relationship has been examined by Hussell (1982a), and is thought to reflect the molt schedule of the species. Using museum specimens for his analysis, Hussell (1982a) found a difference between adult and immature passage of about 24 days. The similarity of the results from analyzing two very different data sets, together with our finding of highly significant differences between years in distribution vs. no differences in adult median dates of passage, suggest the possibility that autumn migration in this species might be under endogenous control, as has been experimentally determined for several Palearctic sylviid warblers (Berthold 1988). If this is the case, then it is unlikely that population level responses to environmental variability (variance in the opportunity to go south) could be detected in the timing of autumn passage in this species. Although some birds move south early, these may be atypical individuals.

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NOTES ON FOOD HABITS OF THE BLACK AND WHITE OWL¹

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Key words: Black and White Owl; *Ciccaba nigrolineata*; food habits; Venezuela.

The Black and White Owl, *Ciccaba nigrolineata*, is a neotropical wood owl whose feeding habits are little known, as is the case for most tropical owls (Clark et al. 1978). We collected the pellets produced by a pair of Black and White Owls from September 17-October 25, 1981 in Mesa de Cavacas (9°5'N, 69°48'W), a town six kilometers west of Guanare, Portuguesa state, Venezuela. This site is located at 300 m on the Andean piedmont, the transition zone between the Andes Cordillera and the plains ("llanos"), of the dry tropical forest life zone (Ewel et al. 1976). The natural vegetation has been mostly replaced by crops and pastures. We gathered pellets in a rural town made up of one-story houses surrounded by small fruit orchards, mainly mango (*Mangifera indica*), guava (*Psidium guajava*), plantain banana (*Musa paradisiaca*), and papaya (*Carica papaya*). During this period the owls regularly roosted during the day in a large mango.

We were not able to count the number of pellets, or the number of prey per pellet because some had disintegrated. We totaled the number of individuals eaten according to each taxon, generally the species, on the

basis of the largest number of parts used for identification (crania, mandibles, beaks, feet, elytra, etc.).

For bats and birds, the body mass assigned to each prey was based on comparative material collected in the study area. For insects and amphibians, we determined mass using regression equations for total length and body mass calculated by Zug and Zug (1979) and C. Ramo and B. Busto (unpubl. data), respectively.

We identified a total of 64 prey (38 vertebrates and 26 insects) (Table 1). The most frequent prey were mammals (45.3% of the total), including two commensal rodents and 27 bats belonging to 14 species and 5 feeding guilds (Bonaccorso 1979). Birds represented 9.4% of the total. Considering biomass, the importance of insects greatly diminishes (3.7%) and the importance of vertebrates except amphibians increases (Table 1). The size of the vertebrates ranged from 10 to 150 g; most (68.6%) were between 20 and 60 g. The insects were mainly tettigoniids and scarabs longer than 30 mm.

Fifty-one percent of the prey were aerial (birds and bats). Because we can add at least some of the insects and amphibians to this percentage (some species are arboreal), it is apparent that most prey were not captured on the ground and the owl can be considered primarily a canopy hunter.

Published information on the diet of *Ciccaba nigrolineata* is scarce and chiefly anecdotal. Marshall (1943) analyzed the stomach contents of a pair in El Salvador and found grasshoppers in the female, and grasshoppers and two bats in the male. In another pair captured

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