

POLYGYNY IN THE WILLOW FLYCATCHER¹

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North American flycatchers (Tyrannidae) are generally acknowledged to maintain monogamous pair bonds (Skutch 1960, Fitzpatrick 1985). However, records of bigamy by male Eastern Phoebe *Sayornis phoebe* (Sherman 1952), Eastern Wood-Pewees *Contopus virens* (W. J. Smith, cited in Eckhardt 1976), Western Wood-Pewees *Contopus sordidulus* (Eckhardt 1976), and Acadian Flycatchers *Empidonax virens* (Mumford 1964) suggest that opportunistic polygyny might be more prevalent among tyrant flycatchers than previously suspected (Eckhardt 1976). During a two-year study of the territorial behavior of the Willow Flycatcher (*Empidonax traillii*) near Guelph, Ontario (43°32'N, 80°13'W), I observed what is apparently the first incidence of polygyny in this species.

Male Willow Flycatcher No. 85-2 established a territory by 22 May 1985 and procured a mate (hereafter Female No. 1) by 29 May. The first nest (Nest No. 1), was found during the later stages of construction on 11 June. Three eggs were laid between 14 and 17 June, and all hatched on 30 June. On 8 July, a second flycatcher nest (No. 2) containing a single egg was found approximately 60 m from the first nest, at a location within 10 m of the territorial boundary of Male No. 85-2. The following day three adult birds were observed foraging within the territory, and the male visited both nests successively on several occasions. After the onset of incubation in Nest No. 2 (10 July, 3 eggs), both females could often simultaneously be seen from a single vantage point, brooding or incubating their respective nests while the male foraged or advertised nearby. Numerous aggressive encounters were observed between female birds, which appeared to defend exclusive areas around their nests within the male territory. Female No. 1 initiated most interactions and was clearly dominant, occupying up to 70% of the male's defended area. The eggs in Nest No. 2 hatched on 23 July. A blind was then erected approximately 4 m from the nest. Parental feeding of young Willow Flycatchers is generally divided equally between both parents (Ettinger and King 1980); however, Female No. 2 (readily distinguished from the male by an irregularity of the left wing bars) fed the young almost exclusively during the first six days of nestling life (Fig. 1). During this time, the male apparently shared the feeding of the fledglings from the first nest with Female No. 1. Following the sixth day post-hatch, male parental investment in Nest No. 2 increased substantially, corresponding to the age (approximately two weeks) at which the fledglings from Nest No. 1 should have become largely independent in their foraging (Prescott, unpubl. data).

The parent birds were banded for positive identification on 30 June 1985 (male banded on right leg, and Female No. 1 on the left leg). Subsequent observations of banded birds provided no evidence that Female No. 1 participated in the rearing of the young in the second nest. However, on one occasion Female No. 2 interrupted a brooding bout

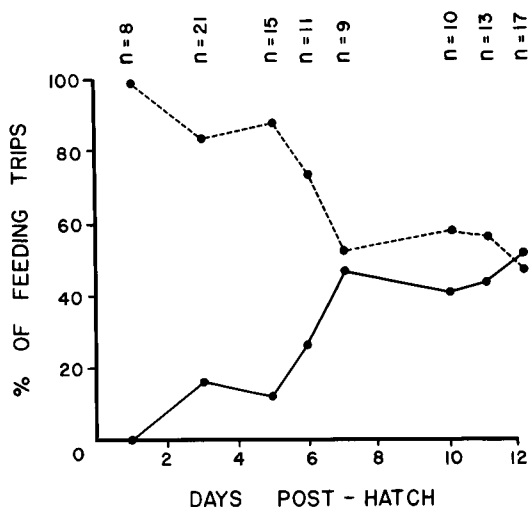


FIGURE 1. Percentage of feeding trips made by male (solid line) and female (dashed line) Willow Flycatchers to Nest No. 2. Numbers at top of figure represent number of observed feeding trips.

to feed a begging fledgling from Nest No. 1, which was perched in an adjacent shrub. Observations were terminated following successful nest departure on 4 August.

Two factors likely contributed to the successful rearing of two clutches on the same flycatcher territory (Ford 1983). First, there was minimal overlap in nest chronology, so parental feeding by the male could be partitioned between the two broods. Second, Female No. 2 was able to feed her nestlings during the early stages of growth with little help from the male. Furthermore, territory size during the period of observation ($4,279 \pm 552 \text{ m}^2$, $n = 4$) was no larger (one-tailed Mann-Whitney *U*-test, $P = 0.17$) than the two-year average for the nestling period ($4,071 \pm 1,092 \text{ m}^2$, $n = 12$). Therefore, polygyny in this Willow Flycatcher was apparently accomplished with little or no stress to the parent birds. Although intensive observations of 20 other flycatcher territories yielded no additional evidence of multiple pair bonds, polygynous matings evidently represent an energetically viable reproductive option to the Willow Flycatcher, which may prove to be more prevalent than previously suspected.

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EFFECT OF MATING STATUS AND TIME OF DAY ON KIRTLAND'S WARBLER SONG RATES¹

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Song rates of birds vary with environmental temperature, time of day, stage of reproduction, and pairing status (e.g., von Haartman 1956, Mayfield 1960, Verner 1963, Shields 1977, Best 1981, Robbins 1981, Skirvin 1981, Howes-Jones 1985). Males whose mates are removed may also increase their song output relative to controls or preremoval song output (Krebs et al. 1981, Cuthill and Hindmarsh 1985).

Knowledge of factors affecting song rates is important because biologists use song in estimating or monitoring bird populations. Perhaps for no other species have song censuses played such a major role in population assessment and management as for the Kirtland's Warbler (*Dendroica kirtlandii*). In 1951, this endangered songbird was first censused within the known nesting range, which is restricted exclusively to Michigan (Mayfield 1953). The entire population was censused again in 1961 (Mayfield 1962) and every year after 1970. This information has been used to assess the response of this species to various management techniques (e.g., Brown-headed Cowbird [*Molothrus ater*] control). Recruitment to the population has been estimated by assuming that all singing males were paired (Mayfield 1975, 1983; Walkinshaw 1983; Probst, in press) and using known or inferred values for mortality rates, number of young fledged, and other demographic variables. Recently, Probst and Hayes (unpubl.) showed that a significant percentage of these singing males were probably unmated.

If there are differences in singing rates at different times of day or between paired and unpaired males, they could alter any census or demographic analysis of the Kirtland's Warbler. For example, if mated males sang less, they might be less detectable than unmated males and more likely to be missed. This is further complicated because the distribution of mated and unmated males among habitats is quite different (Probst and Hayes, unpubl.).

We report the variation in song rates of mated and unmated Kirtland's Warblers throughout the day. We analyzed data for 52 males (29 paired and 23 unpaired) whose mating status was known. During June and early July of 1982 and 1983, the number of songs and the time during which we listened for songs were recorded for a total of 5,381 min. We started observations when a bird's identity could accurately be confirmed based on song and plumage characteristics and location on the study plot. The plots had been previously censused to determine the number of singing males, and pairing determinations were made on males in the chronological order of their discovery. Typically we obtained data on a single male at a time, while we were determining his pairing status. On a few occasions, the proximity of a male with known pairing status to a male we were currently following allowed us to obtain data for more than one bird at a time. We do not have continuous records of singing for all males, because the priority of following males closely enough to determine their pairing status sometimes prevented us from recording singing. Song data were classified into the following five time categories: 0630 to 0800, 0800 to 0930, 0930 to 1100, 1100 to 1230, and after 1230 e.s.t. No data were collected after 1430 e.s.t. We did observe males earlier than 0630, but during this time males sang so infrequently that we had difficulty establishing their locations and could not always distinguish them from neighbors. Hence we could not adequately record their song rates. For this reason these data were excluded from our analysis. In the few instances when our field notes did not permit a direct classification into a single time category (e.g., if 20 songs were recorded between 0915 and 0945) the number of songs placed in each category was in proportion to the observation time in each category. Periods of silence (non-singing) were included in our calculation of song rates, which was done on a per-bird basis. The amount of time for which song data were recorded for individual birds ranged from 30 to 210 min. As a result of our method of determining pairing status, individual paired birds were observed for less time on average than unpaired birds. Nevertheless, the greater prevalence of paired birds resulted in similar total observation times for paired and unpaired birds (2,267 minutes and 3,114 minutes, respectively, Table 1). The number of minutes of observation per bird was weakly but significantly correlated with song rate ($r = 0.329$, $P = 0.017$),

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