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Conspecific attraction during establishment of Least Flycatcher clusters

Alexander M. Mills,[1] James D. Rising, and Donald A. Jackson

Department of Zoology, University of Toronto, 25 Harbord Street, Toronto, Ontario M5S 3G5, Canada

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ABSTRACT. Some birds exhibit clustered breeding in which all-purpose territories are densely packed, leaving intervening but apparently suitable habitat unoccupied. Clustering could be ecologically driven by material resource patterns or socially driven by social or sexual benefits. Least Flycatchers (*Empidonax minimus*) breed in clusters in forests over much of North America. In 2003, we mapped all Least Flycatcher clusters along 18.7 km of secondary roads in central Ontario. In May 2004, we broadcast recorded territorial song in five areas not used by Least Flycatchers in 2003, but in the same study area. During settlement, we found Least Flycatchers in the established clusters, in three of five treatment sites, and in one nontreatment site. However, no pairs were noted at the treatment sites, and no males ultimately remained. One male did, however, defend a territory at a treatment site for 6 d. Despite limited success at attracting Least Flycatchers to new locations, manipulating settlement using social cues could be a useful management tool for some species.

SINOPSIS. **Atracción conespecifica durante el establecimiento de agregaciones en *Empidonax minimus***

Algunas aves muestran agregaciones reproductivas en donde el territorio de todo propósito, está densamente conglomerado, aparentemente, dejando hábitat adecuado sin ocupar. Las agregaciones pueden ser ecológicamente dirigidas en el sentido de usar mejores recursos materiales o socialmente dirigidas en el sentido de beneficios sociales o sexuales. El papamoscas *Empidonax minimus* se congrega para reproducirse en bosques, virtualmente a todo lo largo de Norte América. En el 2003, marcamos en mapas todas las agregaciones de estas aves que se encontraron a lo largo de 18.7 km de caminos secundarios en la parte central de Ontario, Canadá. En mayo de 2004 transmitimos canciones territoriales que habíamos grabado en cinco áreas que no habían sido utilizados por los papamoscas durante el 2003, pero contenidas dentro de la misma área de estudio. Durante el asentamiento, encontramos papamoscas establecidos en agregaciones, en tres de las cinco localidades tratadas (totalizando 10 días), y en una localidad no-tratada. Sin embargo, no se encontraron parejas en las áreas tratadas y no se quedaron en la localidad machos cortejando. Una sola ave defendió un territorio en una de las áreas tratadas por seis días. No obstante al éxito limitado en atraer aves para formar grupos, utilizando pistas sociales, este pudiera ser de utilidad como herramienta de manejo.

Key words: clustered breeding, conspecific attraction, *Empidonax minimus*, Least Flycatcher, territoriality

All-purpose territories are sometimes aggregated, leaving intervening but apparently suitable habitat unoccupied (Stamps 1988, 1994). This has been observed in numerous taxa, and is referred to as clustered breeding. Tarof and Ratcliffe (2004) summarized eight hypotheses offered to explain clustered breeding in territorial animals. Among the traditional explanations are those driven by ecological factors, particularly patchiness in material resources (Kiester and Slatkin 1974, Getty 1981, Wittenberger and Hunt 1985). Other explanations are driven by sexual factors, most recently the hidden lek hypothesis whereby clustering results from female pursuit of extrapair copulations (Wagner 1997).

A problem in testing whether settlement patterns are driven by social factors rather than resources is controlling for resource or habitat quality. Even if social attraction can be demonstrated, it remains to be tested whether the attraction is used as a cue for resource opportunities, for sexual opportunities, or for some other social benefit. Stamps (1988) was able to control for resources when she demonstrated social attraction among juvenile *Anolis* lizards, but bird systems are more intractable. Alatalo et al. (1982), noting that Pied Flycatcher (*Ficedula hypoleuca*) territories occur in clusters, used recorded song near nest boxes placed in apparently homogeneous habitat to test whether settlement was more likely in the presence of conspecific song. Their data suggested a tendency for new arrivals to preferentially settle in nest boxes where song was

[1]Corresponding author. Email: amills@zoo.utoronto.ca

played back, although the nest boxes were an independent and prevailing attractant.

Among North American species, Least Flycatchers (*Empidonax minimus*) are territorial birds known to exhibit clustered breeding (MacQueen 1950, Davis 1959, Perry and Andersen 2003). Unlike the cavity-nesting Pied Flycatcher, Least Flycatchers build open cup nests placed in tree crotches or branches, a much less limiting resource. Tarof and Ratcliffe (2004) tested two ecological selection hypotheses using Least Flycatchers and concluded that neither habitat characteristic nor nest predation hypotheses explain clustered breeding. Perry and Andersen (2003) evaluated four possible factors and, while rejecting habitat variability as an explanation for clustering, found some support for predation deterrence. Other studies demonstrating extrapair mating and differential male success suggest that sexual factors may generate Least Flycatcher clustering (Tarof and Ratcliffe 2000), although these characteristics can be found among species that are not so highly clustered.

Here we report the results of an experiment designed to test whether conspecific attraction can determine the location of Least Flycatcher clusters. We sought to evaluate whether the presence of territorial males, as simulated by recorded song and models, influenced patterns of settlement among returning birds. If resources are the attractant, such models and taped song should not influence settlement. If, however, conspecifics are the attractant, models and taped song might induce settlement in unoccupied, but apparently suitable habitat.

METHODS

We studied Least Flycatchers in a forested area of Parry Sound District, Ontario (79°W, 46°N). During 2003, we systematically surveyed census routes along secondary roads through wooded habitat to determine the locations of territorial clusters. We recorded the presence or absence of Least Flycatchers along each 100-m section of road to a distance of 100 m from the road on each side (2-ha grid blocks). We surveyed each of six routes (total length = 18.7 km) five times from 30 May to 30 June 2003 and located three clusters of Least Flycatcher territories (with 3, 7, and 10 territories, respectively) separated from each other by at least 1.6 km. Only one Least Flycatcher was located away from these clusters (a single, evidently itinerant, male on 29 June 2003). In 2004, we surveyed the same routes as in 2003.

The three clusters of Least Flycatcher territories occupied 12 blocks (two, five, and five, respectively). A block was considered part of a cluster if a singing Least Flycatcher was present on at least two occasions in 2003, or if it was adjacent to such a block. Including adjacent blocks, the three clusters occupied 18 blocks.

We characterized vegetation along survey routes by noting species composition at three heights above ground (2 m, 8 m, and 14 m). By comparing unused sites ($N = 169$ blocks) and those where Least Flycatcher territory clusters were located ($N = 8$, including five not on our survey routes), we determined that 41 blocks did not have a suitable habitat. These areas consisted of herbaceous vegetation only, lowland alder swamp, pure spruce forest, or tamarack-spruce bog. Thus, our study area included 128 blocks of apparently suitable but unoccupied habitat.

Prior to the return of Least Flycatchers in 2004, we selected five locations (treatment sites A–E) from among the 128 blocks of apparently suitable habitat. These treatment sites were at least 1 km from any of the three clusters of Least Flycatcher territories located in 2003 and at least 1 km from each other. At each site, the presence of three males, located 50–100 m apart, was simulated. At two positions, a taxidermic model and playback of songs and calls (using a speaker attached to a tree trunk at a height of 2 m and a camouflaged compact disk player) were used to simulate the presence of males. Because we had just 10 models, only playback was used to simulate the presence of a male at the third position. Each treatment site occupied four grid blocks, including two blocks with simulated males and two adjacent blocks. Thus, the five treatment sites covered 20 of the 128 unoccupied, but apparently suitable blocks.

Least Flycatchers typically return to our study area in early May. Accordingly, every dawn ($\bar{x} = 05 : 22$) beginning on 4 May 2004, Least Flycatcher vocalizations were played back continuously at volumes comparable to natural male song until late afternoon or early evening ($\bar{x} = 15 : 51$). The vocalizations (Stokes Field Guide to Bird Songs: Eastern Region, Time Warner Book Group, New York, NY, USA),

included substantial periods of "chebeck" song, as well as brief periods of "whit" calls and silence. Although females occasionally sing the "chebeck" song (Kasumovic et al. 2003), it is primarily associated with male territoriality (Davis 1959). The geographical source of the recorded vocalizations is unknown, but, to our ears, they did not differ from those of local birds. Playbacks ended on 18 May when most pairs were involved in nest building and no flycatchers could be located outside the active clusters. The mean daily duration of treatments was 10.48 h per simulated male and, in total, treatments were run for 1,572 h.

Beginning on 4 May, the three clusters occupied in 2003 were visited daily to determine when Least Flycatchers returned. We recorded the presence of Least Flycatchers in two ways. Because we visited treatment sites two or three times daily for a total of 15–30 min, we noted whether Least Flycatchers were present at those times (incidental observations) and, if so, about how long they remained. In addition, from 10 May to 23 May 2004, we surveyed each census route four times by watching and listening from the midpoint of each grid block for 3 min during early morning hours, and then compared treatment and nontreatment sites (systematic surveys).

RESULTS

Because of exceptionally warm weather, the settlement period for Least Flycatchers in 2004 was brief. On 9 May, two males were first noted singing at one of the sites where a cluster of territories was located in 2003, and a third male was singing at treatment site C. By 11 May, multiple males were singing at all three of the sites where clusters were located in 2003, and at least 10 males were singing at one of those sites on 12 May. On 17 May, three females were observed building nests at two of the 2003 cluster sites, and one nest was almost complete. In 2004, as in 2003, three clusters of Least Flycatcher territories were located, and all were in the same locations as in 2003.

Incidental observations. Outside the established clusters, we observed Least Flycatchers on 10 occasions during the treatment period. Nine of these were at treatment sites, and involved four or five birds. None were ever seen at treatment sites B and E. At treatment site C, a single male sang for at least 4 h on 9 May and it or another male sang there for at least 2.5 h on 13 May. At treatment site D, a single singing male was present on 12 May. Finally, at treatment site A, a singing male was present from 11 May to 16 May, but was not observed thereafter. No pairs were observed at the treatment sites and, after 16 May, no other Least Flycatchers were noted at the treatment sites. On 11 May, we found a single Least Flycatcher singing at a nontreatment site.

Because we visited treatment sites more than control areas, we are unable to conclude that Least Flycatchers were more likely to be found at treatment sites. However, because 9 of the 10 sightings of birds that were found singing outside of established clusters were in the treatment sites (20 grid blocks) and only one individual was briefly observed in the control areas (108 grid blocks) and, further, that singing birds remained at treatment sites for hours (or days in one case), we think it likely that our treatments did influence where Least Flycatchers were seen during the settlement period.

Systematic surveys. During four surveys conducted between 10 May (the day after the first males arrived) and 23 May (6 d after three nests were found and 5 d after treatments were discontinued), we found one Least Flycatcher outside established clusters. This sighting was of the bird that had been present at treatment site A from 11 May to 16 May.

DISCUSSION

Clearly, the treatments captured the attention of newly arrived males because males were present for varying lengths of time at three of the five treatment sites. As found by Alatalo et al. (1982), this suggests conspecific attraction. However, our treatments failed to induce permanent settlement of Least Flycatcher pairs. This leaves unresolved the question of social versus resource attractants.

Over 1,500 h of recorded song during the 10-d treatment period is a substantial potential stimulus. However, Least Flycatchers normally sing from a number of perches at heights above 2 m, and boundaries are defended with much display and chasing (Tarof and Ratcliffe 2000). Obviously, such behavior cannot be replicated with models and playback. Adult fidelity to breeding sites (Walkinshaw 1966) is also likely

to confound the establishment of new territory clusters. The first male Least Flycatchers to arrive on our study site in 2004 were in areas occupied in 2003. Although first-year male passerines tend to be philopatric (Greenwood 1980), they generally do not return to their specific natal site (Walkinshaw 1966, Briskie 1994). As such, first-year birds would likely be the ones to establish new clusters.

Juvenile male Least Flycatchers may also decide during the previous postbreeding season where they intend to settle the following spring. Some spring-breeding lekking species engage in lekking behavior in the autumn (Rintamaki et al. 1999), and territorial species, both migrants (Weggler 2000) and residents (Logan and Hyatt 1991), may engage in territorial behavior during late summer (Brewer and Harrison 1975). If Least Flycatchers do so as well, treatments like those in our study might be more likely to induce settlement if presented in late summer or during both spring and late summer.

Finally, although social attraction may be important in the establishment of territory clusters by Least Flycatchers, we are not suggesting that resources may not be a factor as well. In choosing treatment sites, we may not have selected locations with habitat suitable for Least Flycatchers. We think this unlikely, however, because sites with territory clusters in and near our study area ($N = 8$) varied in both vegetation and structure. Parts of two clusters consisted largely of conifers (eastern hemlock, *Tsuga canadensis*; and balsam fir, *Abies balsamea*), and another territory cluster was located in a red pine (*Pinus resinosa*) plantation. Hardwoods dominated the rest of the clusters, and some had no conifers.

The use of models and playback to influence settlement may be worth pursuing for both theoretical and management reasons. Recorded vocalizations are known to attract seabirds, and have been used to encourage settlement in non-degraded and restored habitats (Podolsky and Kress 1992). For passerines of special conservation concern that aggregate during breeding, the use of models and recordings during territory establishment might help establish breeding clusters on protected lands. For example, breeding clusters of Henslow's Sparrows (*Ammodramus henslowii*; Knapton 1987, Pruitt 1996) tend to be ephemeral, making management through land procurement difficult. The ability to attract these sparrows to certain locations would make such management more effective.

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