'Team of rivals' approach works for sparrows defending territories

February 25 2014

A new study of territorial songs used by chipping sparrows to defend their turf reveals that males sometimes will form a "dear enemy" alliance with a weaker neighbor to prevent a stronger rival from moving in. University of Massachusetts Amherst graduate student Sarah Goodwin and her advisor, behavioral ecologist Professor Jeffrey Podos, report their findings in the current issue of *Biology Letters*.

They say that Goodwin's playback studies, funded by the National Science Foundation, for the first time demonstrate the birds' use of a stereotyped, specialized signal, in this case chipping sparrow trills, to establish brief periods of cooperation among neighbor birds who are otherwise rivals.

Playback studies involve placing a loudspeaker and a species-appropriate taxidermic bird model on one male bird's territory and playing the song, creating a simulated rival. Goodwin conducted 48 playback trials, 24 of each fast or slow trill-rate condition, in two western Massachusetts counties over two breeding seasons from May 2011 through July 2012.

As Podos explains, "Typically we see birds respond aggressively to song playback, because they perceive an intruder. This kind of experiment has been done with many, many species, but in this case Sarah found a surprise."

Chipping sparrows, Spizella passerina, are small, cinnamon-capped, clear-breasted grey and brown birds that favor habitats such as

cemeteries, college campuses and Christmas tree farms for mating and breeding. Goodwin says the males start each day with a ritual song directed at their neighbors, making it easy to map their territories.

For this study, she presented each male bird with the two conditions of a simulated rival and found that males responded more vigorously to stimuli with a fast trill rate. That is, they approached closer to the loudspeaker and spent more time near it or attacking the taxidermic model when trills were faster. The researchers thus used trill rate as a measure of a bird's territorial threat level to his neighbors.

What she discovered next was unexpected, Goodwin recalls. About one time out of five, a neighboring male flew into the territory of the male she was focusing on, and helped him repel the simulated intruder. In a typical playback experiment, with such an intrusion the trial would be scrapped and the researcher must start over. But Goodwin became curious about how often this was happening.

"What was really noticeable was that neighbors were also displaying aggressively towards the simulated intruder, and the resident tolerated the helpful neighbor's intrusion," she says. "This behavior, the formation of territorial defense coalitions, has been very rarely documented in birds."

The next step, Goodwin reasoned, was to examine the circumstances under which coalitions formed. She returned to the song feature, trill rate, that signaled threat level and analyzed it among residents, neighbor-turned-allies and simulated intruders. Here she found a consistent pattern: Neighbors become allies when they have a faster trill rate than the resident they are assisting, and when the simulated intruder is faster than the resident.

In further trials to follow up on the the discovery of territorial dynamics

and signaling among the sparrows, Goodwin found that the neighbors almost exclusively help when the simulated intruder sounds "more studly" in Podos' words, than the neighbor.

He adds, "We interpret this to mean that the ally not only prefers having a lousy neighbor, but also specifically does not want that lousy neighbor replaced by a more serious competitor." He adds, "What's really neat is that there are specific vocal relationships that predict when and with whom the birds will form these coalitions."

Goodwin, who is particularly interested in communication networks and how individual birds assess and compare signals from others, plans to turn her attention next to female chipping sparrow behavior. She will analyze communication variables such as trill rate, song complexity, frequency bandwidth and note structure as cues female birds may use to choose a mate. This future work will include DNA testing to establish paternity of offspring.

Both she and Podos feel a new affection for the often-overlooked little sparrow that many might call "nondescript." Podos says, "Here we have a case of hidden diversity that was under our noses all along but that we didn't see. Here is a supposedly ordinary species that is truly not ordinary. I can't wait to see what more Sarah will discover about these surprising little birds."

Provided by University of Massachusetts Amherst