



## ScienceWatch – Song Sparrows Shuffle Songs

**“Song sparrows cycle through their repertoires significantly more efficiently than would be expected from random sequencing.” – Searcy et al.**

When a disc jockey shuffles, he isn't dragging his feet or mixing cards. Instead, each time he shuffles a set of musical tracks he is playing them in a new order. In a list with dozens of tracks, shuffling by hand is not easily done and musical streaming services offer that option with the tap of a button.

New research now shows that the brains of male song sparrows (*Melospiza melodia*) can perform this complex task, which rivals human communication.

The study by a team led by ornithologists William Searcy and Stephen Nowicki, University of Miami, Coral Gables FL, and Duke University, Durham, NC, respectively, appears in the January 26, 2022 issue of the *Proceedings of the Royal Society B*.

Male song sparrows have a repertoire of up to 12 different two-second songs. They usually repeat the same song several times before moving on to the next one. So it can take up to 30 minutes to sing a complete cycle. According to Dr. Searcy, it would be easy for male song sparrows to sing their songs in a particular order and then repeat that order. “But that’s not what song sparrows are doing. They’re not going through in a set order. They’re varying the order from cycle to cycle, and that’s more complicated,” he said. In other words, singing males can keep track of the order of their songs during a cycle, singing the next one in the new cycle based on when it was last sung.

That conclusion comes from analyzing recordings of birds’ songs obtained by Searcy who spent hours in the Pennsylvania woods holding a parabolic microphone in the air. He recorded the full repertoire of sparrow songs from more than 30 birds, and produced spectrographs, which the team then pored over, looking for patterns.

Two pieces of evidence convinced the team that the song shuffling doesn’t occur by accident. The first clue was that in any given cycle, males generally sang their entire repertoire before going back to a song. Second, the more often a male repeated a song in a cycle, the longer it took for him to return to it in the next cycle, possibly to create novelty. Consequently, song sparrows are able to decide which song to sing in the next cycle based on when and how often they sang it during the previous cycle.

The researchers found that on average a cycle contained 9.5 two-second songs, and that during a cycle males repeated practically all the songs an average of 14 times. Thus, the typical playlist consisted of about 130 songs. Since the birds sing at a rate of four to six songs per minute, a cycle could last as long as 30 minutes. Therefore, what song sparrows sing in any given moment depends on what they sang as much as 30 minutes ago.

"What we're arguing is what they do is keep in memory the whole past cycle so they know what to sing next," Searcy said. Former studies have shown that other songbirds can only shuffle the previous one or two songs, and the prior record holder, the canary, can shuffle only 5-10 seconds of his songs this way. Apparently, song sparrows have as much as 360 times the memory capacity of the canary.

Why the sparrows avoid repeating the playlist for that long is unclear. Earlier studies showed that female song sparrows prefer a wider range of tunes, thus males that create more novelty may be more attractive to females. But it could be that the males just become bored when repeating the same tunes in the same order. "You know that these 10 songs are going to keep you motivated, but if you are going to run for 20 songs long, why not shuffle it so the next time you don't hear the same songs in the same order," said Dr. Nowicki.

Whatever the reason, the ability to remember a 30-minute conversation requires considerable brainpower in both birds and people. You may have friends who begin to repeat themselves during a 30-minute conversation. Song sparrows don't.

Saul Scheinbach