



## ScienceWatch – A Sexy Birdsong Re-Emerges During the Pandemic

**“We were shocked to find that even though they are softer, their songs are transmitting at twice the distance—almost three times.” – E. Derryberry**

Elizabeth Derryberry, associate professor of ecology and evolution at the University of Tennessee, Knoxville, TN, has been studying the songs of white-crowned sparrows (*Zonotrichia leucophrys*) for over a decade.

In 2012 Derryberry showed that over four decades male sparrows in the San Francisco Bay Area adjusted their song to overcome the increasing din of traffic noise. Unable to compete with the constant anthropogenic hum, the birds did what we do at a noisy party or restaurant; they responded by singing louder and converting lower frequency notes of their song to higher frequencies. But their top frequencies remained unchanged, limiting the band width they could use to produce the trills in their song.

Males use their song to advertise their fitness, which both repels other males and attracts females. The frequency bandwidth exudes strength, and the trilling demonstrates stamina, says Derryberry. Higher song volume and pitch could make them heard, but comes at a breeding cost. “The wider the bandwidth [of the trill], basically, the sexier they are,” Derryberry contends. This gets at a fundamental trade-off that these birds in noisy areas are facing where they can’t be both sexy and transmit their song at a great distance.”

Last spring California was in the middle of a state-wide COVID-19 shutdown. Traffic over the Golden Gate Bridge was back to levels not seen since 1954. Expecting a concomitant drop in background noise, Derryberry realized she had the perfect conditions to test whether or not white-crowned sparrows would revert to singing their earlier “sexier” song.

Derryberry couldn’t travel to the San Francisco Bay Area, but her colleague, Jenny Phillips, a behavioral ecologist at California Polytechnic State University, San Luis Obispo, CA, could, and she began recording birds there. Reporting in the October 30, 2020 issue of *Science*, Derryberry, Phillips and colleagues show that male white-crowned sparrows did indeed change their tune in response to the drop in ambient noise levels.

The team looked at birds in rural Marin County and compared their songs with those in two urban areas (San Francisco and Costa Counties). They compared background noise levels and songs recorded before (April-June of 2015 and 2016) and during (April-May 2020) the shutdown. Noise levels decreased in both areas, but the urban drop was much greater during the shutdown, approaching levels found in the rural areas.

Lacking competing background noise, urban area birds sang more softly, 30% softer, on average, yet could be heard at more than twice the distance. In addition, they sang at lower minimum frequencies, yielding songs with greater bandwidth that hadn’t been heard for decades. Birds in

the town of Richmond in Costa County began using low frequency notes not recorded there since 1971. Rural birdsong changed similarly, but much less so.

"This study shows that when you reduce noise pollution there's almost an immediate effect on wildlife behavior and that's really exciting because so many things that we do to try to help the environment take a long time to improve," said Derryberry.

Why did the birds change their tune? Lower frequency sounds travel greater distances, so male birds could sing at lower volumes and still ably advertise themselves. By doubling their communication distance males could establish clear-cut boundaries, avoiding the stress of territorial conflicts and raising their overall fitness.

Moreover, in the same way that a skilled musician can show off his talent by playing both high and low notes, male birds were now able to show females their virtuosity at both ends of their musical scale. Females thus gain more information on the fitness of their potential partner.

With a mean life span of 13 months, it's clear that the sparrows monitored before and during the shutdown were not the same, so Derryberry says it's impossible to know whether the adaptation was due to changes in gene expression (phenotypic plasticity) or that males underwent a genetic change favored by natural selection (evolution).

Even as traffic returns, Derryberry believes that the legacy of this "silent spring" will be long-lasting, and that songbirds in other cities may be experiencing similar effects. "Whether it's plasticity or selection, whatever it is, I think these birds are on a new trajectory," she said. "Their songs have entered an acoustic space they haven't been in over 30 years. I really doubt they're just going to go right back to where they were before."

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