AOS News

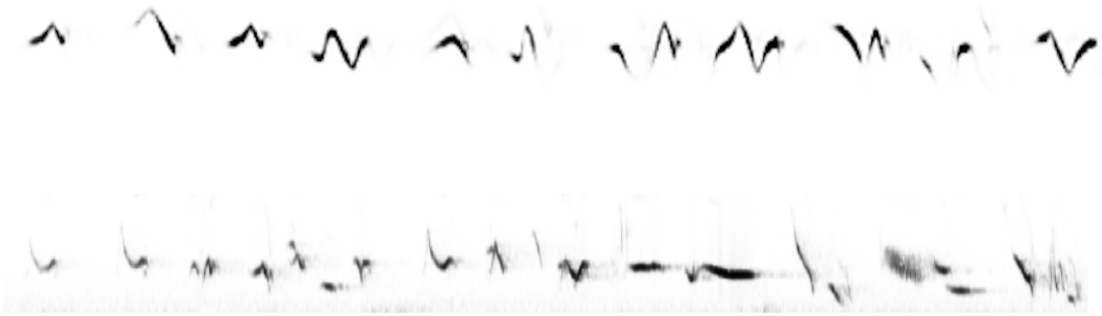
AUTHOR BLOG: Tracking cultural evolution in House Finch song, Part 1

David Lahti

Linked paper: **Four decades of cultural evolution in House Finch songs (https://academic.oup.com/auk/article/136/1/uky012/5322227)** by C. Ju, F.C. Geller, P.C. Mundinger, and D.C. Lahti, *The Auk: Ornithological Advances* 136:1, January 2019.

The first bird song I ever recorded was that of a House Finch. When I was a kid growing up in Leominster, Massachusetts, the bird that nested behind my front porch lamp would fly out to a particular birch tree or the telephone wire and belt out a complex four-second warble over and over again. That sound became emblematic of summertime for me and my siblings. One day when I was in my room holding my tape recorder against the radio speaker to record songs (human songs, that is!), I heard the little red fellow outside start doing his thing, and I promptly stuck my recorder out the window for an acoustic memento. I actually ran across this cassette tape for the first time in nearly four decades a couple of months ago, coincidentally just as my first scientific paper on House Finch song was about to be accepted for publication in *The Auk*.

Here are a couple of examples of House Finch song. Read it like sheet music, with time on the horizontal axis and pitch on the vertical—it's composed of a bunch of notes, or syllables.



The reason my research collaborators and I are interested in House Finch songs today is because these songs change over time and space—we'd like to know how and why they change the way they do. Most animals simply inherit the noises they make, and so the sounds don't change much from generation to generation. About half of the world's birds, however, learn how to "speak" as juveniles from older members of their own species, just as we humans do.

The youngsters don't always imitate perfectly the songs they learn, and so over the generations small changes in these songs can accumulate. These changes result in noticeable song differences across time and space, just as we humans diverge in our accents and languages. For this reason, bird song is an important animal model system for the study of cumulative change in socially learned traits, what's known as "cultural evolution."

Long-term changes in bird song are rarely studied, because research projects don't often last for decades. However, even as I was listening to that House Finch from my bedroom, Dr. Paul Mundinger, a professor at Queens College at the City University of New York, was recording them on western Long Island, in high quality and accompanied by meticulous field notes. Paul had just published a paper in *The Condor* showing that House Finches can have different song dialects. He had also indicated that young House Finches learn their songs by listening to a bunch of singing neighbors and assembling chunks of syllables from several of them, like an acoustic collage. The end result is two to four songs that an individual will sing consistently for the rest of its life.

Fast forward 37 years, and I, a new professor at the same college, became Paul's friend and colleague. He was pleased to hear that I wished to pick up where he had left off with House Finch song in the 1970s (after which he had moved on to research on the canary). I was excited to compare his early House Finch recordings to the songs sung by local birds today. Because birds' generations are so much shorter than those of humans, this would be like comparing our English to that used a millennium ago in the epic story *Beowulf*, which is so different from our modern language that it would be unintelligible to most English speakers today.

The main two steps in this study would be (1) to see what songs these Long Island House Finches are singing today, and (2) to find a reliable way to compare songs across time. Two doctoral students in my lab stepped up to the task. Franny Geller loves observing and recording birds, and so she recorded as many House Finches as she could find in western Long Island in 2012, and Chenghui Ju is a computational wiz who programmed software specifically to characterize and compare House Finch songs in different times and places. This study became part of Chenghui's recent doctoral dissertation.

What did we learn? Find out in **Part 2 (https://amornithnews.org/2019/02/22/author-blog-tracking-cultural-evolution-in-house-finch-song-part-2/)**!

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AUTHOR BLOG: Tracking cultural evolution in House Finch song, Part 2

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Linked paper: **Four decades of cultural evolution in House Finch songs (https://academic.oup.com/auk/article/136/1/uky012/5322227)** by C. Ju, F.C. Geller, P.C. Mundinger, and D.C. Lahti, *The Auk: Ornithological Advances* 136:1, January 2019.

(Read part one **here (https://amornithnews.org/2019/02/21/author-blog-tracking-cultural-evolution-in-house-finch-song-part-1/)**.)

So what did we learn about how House Finch songs have changed since the 1970s—the equivalent of a millennium of cultural evolution in human terms? Here are the main results, and how we interpret them. We have to be careful with interpretation, though, as we cannot be sure that the differences we observed represent consistent trends; it's possible that the birds have been fluctuating through the years and we merely caught two random points.

1. All the main features of House Finch song in 2012 (such as song length, pitch, and syntax) are within the same range as they were in 1975.

Because the basic characteristics of House Finch song have remained consistent across the decades, birds today would probably still recognize old recordings as being from their own species. We're soon going to test this to find out for sure!

2. Roughly half of the individual syllables that were around in 1975 were around in 2012, too. The more common the syllables were in 1975, the more likely they were to still be in use by 2012.
3. However, none of the particular songs (that is, sequences of syllables) that we recorded in 1975 were sung by any bird in 2012.

These results are to be expected. Since House Finch syllables are learned whole, they can be preserved from generation to generation; perhaps birds even reinvent the same syllables over time. However, young birds individually assemble syllables into songs each generation, and there are millions of combinatorial possibilities.

4. The population of songs is more diverse (there are more different syllables in use) in 2012 than there were in 1975.
5. Although birds shared songs with each other in 1975, the birds in our 2012 sample didn't share any songs with each other, despite being the same distances from their neighbors.

We know that the population of House Finches generally grew and expanded between 1975 and 2012, although a nasty outbreak of conjunctivitis was decimating the population for a while. A larger population means more neighbors to listen to and more individuals to create new syllable modifications

as they learn. Both of these factors should eventually cause greater overall song variety, which is what both of these results show.

As is typical in science, we also found results we cannot readily explain:

6. Birds in 2012 do not repeat their songs as reliably as they did in 1975—they are more likely to skip syllables, add new ones, or switch them around.
7. Individual songs in 2012 have fewer different kinds of syllables than they did in 1975 (despite there being more total syllable types in use in the population as a whole!).
8. In 2012, the syllables that are more common tend to be the ones that are more complex—they change pitch more rapidly and more often. They also tend to be higher pitched. This was not the case in 1975.

We're developing some ideas to explain these curious results—hypotheses that will inspire our next round of field and laboratory work. The House Finch researchers in our lab are taking some exciting next steps, looking at such things as song similarity over geographic distance, changes on islands, early song development, social networks, and sex differences.

Unfortunately, Paul Mundinger passed away while this study was being conducted, and he never got to see the results. But it is because of his early work that we were able to chronicle changes in these songbirds over nearly four decades, and his song recordings (which are voluminous) will continue to provide us with interesting baseline data and prompt new research for years to come.

See more about the Lahti lab at **http://lahtilab.org (http://lahtilab.org)**.

Photo by César Castillo.

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