Lust and Domain: The Nature of Birdsong

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The most magical time of day, in regard to sound, in late spring and early summer begins in the black of night, an hour or so before sunrise. Then, for a period of several hours forests, fields, and even urban backyards ignite in a blaze of birdsong. The exuberant serenade can be more varied than a symphony, filled with pure, plaintive, and nasal whistles, tinkling and accelerating trills, liquid phrases both short and rambling, and a myriad assortment of accompanying chirps, chips, buzzes, warbles, and twitters. At a first listening, the dawn chorus might seem like sonic chaos. But avian music is anything but a state of aural confusion; each song is eons old, forged and refined by intense evolutionary selection.

Vocal communication is used by all bird species and is perhaps the most complex of all avian behaviors. Males, females, and young birds use distinct calls—brief, simple vocalizations—throughout the year to warn of danger, to scold intruders, to establish contact between individuals, or to serve other specific functions.[1] Calls are innate, and a species might have a dozen or more distinct ones in its vocabulary.[2] In contrast, songs—more elaborate and more musical than calls—likely evolved for reasons of mate attraction and territory establishment, and are generally delivered only by males in the breeding season.[3]

Throughout that season, most birds sing more fervently in the early morning, during the so-called dawn chorus, than at any other time of the day. The dawn chorus is a world-wide avian phenomenon.[4] Several hypotheses have been advanced as to why birdsong is delivered all across the planet so

[1] Paul Ehrlich, David Dobkin, and Darryl Wheye, *The Birder's Handbook: A Field Guide to the Natural History of North American Birds* (New York: Simon and Schuster, 1988), 471.
[2] Chris Elphick, John Dunning, and David Sibley, eds., *The Sibley Guide to Bird Life and Behavior* (New York: Alfred A. Knopf, 2001), 68.
[3] Phil Hockley, "Singing in the Brain," *Wild*, Autumn 2011, 56.
[4] Donald Kroodsma, *The Singing Life of Birds: The Art and Science of Listening to Birdsong* (Boston: Houghton Mifflin, 2007), 304.

Sound in the Land – Music and the Environment, ed. Carol Ann Weaver, Doreen Helen Klassen, and Judith Klassen, special issue, *The Conrad Grebel Review 33,* no. 2 (Spring 2015): 228-237.

intensely at this particular time. It may be that atmospheric conditions are then especially conducive to transmitting sound over longer distances, or to preserving its tonal quality, or to a combination of the two.[5] A theory gaining currency among biologists is that the early morning is the best time to gauge a singer's true worth, because it is often the most stressful time of the day.[6] The dawn temperature is cool and birds have just completed a period of overnight fasting. Birds that broadcast well in such trying conditions are conveying crucial information about their fitness. The quality of the song—its volume, consistency, complexity, and variation—advertises the quality of the singer.

Humans enjoy avian song for its beauty, but for the birds themselves, singing is serious business. Male birds sing to impress their audience. Listeners could include other males who may be prospecting for a territory or looking to improve on an existing one, but may be deterred from making aggressive advances upon hearing a powerful song delivery from an existing territory holder. Males of some species, like Chestnut-sided Warblers,[7] have separate songs intended only for other males; the message of these songs might be loosely interpreted to mean "Get lost!"

Another equally important listening group is the females. Males of many species often develop bright or gaudy plumage during the breeding season that functions as a sexual stimulant during their courtship rites. But for many females, a male's voice may be an even more powerful aphrodisiac than his colors. A female is choosy about selecting a partner; her nesting season is short, and making the right selection is critical to raising young successfully. By listening carefully to a male's song, she might be discerning something about his age, health, experience, and even the quality of his territory.[8] These clues allow her to discriminate among the various songsters and identify who among them might be the best defender and provider for her family.

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[5] Ibid., 226.

[6] Bridget Stutchbury, *The Bird Detective: Investigating the Secret Lives of Birds* (Toronto: Harper Collins, 2010), 74.

[7] Bruce Byers, Michael Richardson, and Daniel W. Brauning, "Chestnut-sided Warbler," *The Birds of North America Online* (2013), www.bna.birds.cornell.edu/bna/species/190/articles/sounds, accessed July 21, 2014.

[8] Kroodsma, *The Singing Life of Birds*, 193.

The repertoire of many male birds is more varied and delivered at a much faster rate during the dawn chorus than later in the day. The song rate of Wood Thrushes is three times greater a half-hour before sunrise than three hours later.[9] An hour before sunrise, Eastern Wood-Pewees whistle a three-song repertoire at a rate of one song every two seconds; later in the day, they sing only two songs and reduce the tempo to one song every ten seconds.[10] Before dawn, Chipping Sparrows unleash staccato bursts of song at a pace of one per second. After sunrise, their song becomes longer and is sung just four times a minute.[11] What might explain the accelerated and altered song output in the pre-dawn hour? With some species, perhaps the explanation lies with female choice; studies of Hooded Warblers showed that males who sang more often were more likely to attract females than those who sang less frequently.[12] For other species, the pre-dawn songs are essentially battle cries aimed at rival males, and the rapid pace of delivery signals vigor and resolve.[13]

In North America, the task of singing is usually the exclusive domain of male birds. There are exceptions to the rule, including female Scarlet Tanagers, Northern Cardinals, Rose-breasted Grosbeaks, White-throated Sparrows, Baltimore Orioles, and Red-winged Blackbirds, all of which engage in song but typically in a less effusive manner than their male partners.[14] In the tropics, however, females are much more inclined to sing, and some participate in complex, synchronized duets with their mates that rank amongst the most intricate of all bird vocalizations. These antiphonal duets are often so rapid and finely coordinated that it seems as if they could emanate only from a single bird. Female song may be more common in the tropics than in temperate latitudes because many species are year-round residents, and duets may provide important territorial and mate-guarding functions.[15]

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[9] Melissa Evans, Elizabeth Gow, R.R. Roth, M.S. Johnson, and T.J. Underwood, "Wood Thrush," *The Birds of North America Online* (2011), www.bna.birds.cornell.edu/bna/species/246/articles/sounds, accessed July 21, 2014.
[10] Kroodsma, *The Singing Life of Birds*, 396.
[11] Ibid., 396-97.
[12] Stutchbury, *The Bird Detective*, 76.
[13] Kroodsma, *The Singing Life of Birds*, 382.
[14] Don Stap, *Birdsong* (New York: Scribner, 2005), 86.
[15] Adrian Forsyth, *The Nature of Birds* (Rochester, NY: Camden House Publishing, 1988), 52.

The principal apparatus for producing avian sound is the syrinx, an organ unique to birds.[16] The syrinx is located deep in the throat at the base of the trachea, where two bronchial tubes branch off to the lungs. It is unusually efficient at converting the air that passes through it into sound, doing so at a rate of 95 percent, which greatly affects its volume and pitch. The high air-to-sound conversion rate allows even tiny birds such as the Ruby-crowned Kinglet, weighing a mere six grams, to generate remarkable volume. Some birds can produce independent sound at each side of the syrinx, allowing for the emission of two sounds simultaneously. This permits thrushes, for example, to produce rich, ethereal songs that have profoundly moved human listeners.

Not all birds possess a syrinx; the organ is absent in storks, vultures, and ostriches, a lack which explains their limited vocal repertoire and range. By contrast, the syrinx, along with the song-control area of the brain, is most highly developed among passerines (perching birds), perhaps the most familiar group of birds to humans. Passerines are but one of the 30 orders of birds but account for 60 percent of the world's 10,000 avian species.[17] Many of the finest songsters—thrushes, thrashers, larks, warblers, orioles, finches, sparrows—belong to the passerine order.

Passerines are divided into two groups, the oscines and the sub-oscines, based on the structure of the vocal apparatus.[18] Oscine is a Latin term for "singing bird"; sub-oscines, as the name suggests, are the less specialized of the passerine singers. The vast majority of sub-oscine species are found in the New World tropics. In North America, they are represented by the flycatcher family, which in southern Ontario includes common and widespread species such as the Eastern Phoebe, Eastern Kingbird, and Great Crested Flycatcher. Flycatchers have simpler voice boxes and less developed neural song centers than their oscine cousins, and consequently sing simpler and less complex songs. Moreover, their songs are genetically fixed.[19] A young Willow Flycatcher, for example, does not need to hear another of its kind sing in order to learn its characteristic *fitz-bew* song. Like all flycatchers, Willow

[16] Elphick et al., *The Sibley Guide*, 35.
[17] Stap, *Birdsong*, 9.
[18] Kroodsma, *The Singing Life of Birds*, 79.
[19] Ibid., 87.

Flycatchers are born with their song innately imprinted in their DNA. All individuals of a flycatcher species thus sing their songs in the same way no matter where they live, with no geographic variation in their expression and hence no distinct dialects.

The oscines are the 'true' songbirds whose songs are more musical and complex than those of flycatchers. An added distinction is that oscine songs are not instinctive but must be learned.[20] Because the songs are learned, initially from listening to fathers (and sometimes mothers) but then later to other adults, there is potential for geographic differences and the development of distinct variants. Not all songbirds develop dialects; Black-capped Chickadees across the continent, except for a few small populations, sing an almost identical, pure whistled *fee-bee*.[21] But among other species such as Chestnut-sided Warblers, birds just a few kilometers apart may sing very different songs.[22] Most songbird dialects are acquired when a young bird disperses from its natal territory and learns its final song dialect after listening to its new neighbors.

Oscine songbirds deprived from listening to adults of their own species are unable to acquire their species' normal song. Chickadees raised in the lab and allowed to hear songs only of other species were unable to master their proper *fee-bee* song.[23] Similarly for Wood Thrushes; individuals hand-reared from eggs and isolated from conspecifics (organisms belonging to the same species as another) failed to acquire their species' general song, and the songs they produced were not recognized by other individuals of their kind.[24] Oscine birds learn to sing just as humans learn to speak, needing to hear and practice the sounds expressed by adults of their kind in order to master the songs. Beginning at about two weeks of age, songbirds start to copy the songs of their adult tutors, babbling incoherently at first but gradually making improvements. For some species, learning takes place in a relatively brief but critical period during the first fifty days of the individual's life. For other

[20] Stap, *Birdsong*, 84-86.
[21] Jennifer Foote, Daniel Mennill, Laurene Ratcliffe, and Susan Smith, "Black-capped Chickadee," *The Birds of North America Online* (2010), www.bna.birds.cornell.edu/bna/species/039/articles/sounds, accessed July 22, 2014.
[22] Byers, "Chestnut-sided Warbler."
[23] Kroodsma, *The Singing Life of Birds*, 137.
[24] Evans et al., "Wood Thrush."

species, learning occurs in stages that may last a full year or more, and for yet other species new songs are added continuously throughout life.

Some songbirds, like Common Yellowthroats and White-throated Sparrows, learn but a single song, although neighboring individuals may each sing a slightly different version of it.[25] Other songbirds, such as Gray Catbirds, are more creative and may learn a repertoire consisting of hundreds of different songs.[26] The virtuoso of improvisation is the Brown Thrasher, estimated to sing up to 3,000 different songs, which might be a world record for any bird species.[27] The thrasher's close relative, the Northern Mockingbird, is an equally impressive singer but offers a slightly different twist; it is a persistent mimic, copying calls and songs of other avian species, sounds of other mockingbirds, vocalizations of non-avian species, and mechanical sounds.

It is a mystery why some species sing only a single song while others muster up hundreds or more. The answer does not seem related to species-versus-species success, because single-song species are apt to be just as abundant and occupy equally large ranges as multi-song species. Rather, the answer probably lies with how a prolific repertoire benefits individuals within a species that uses multiple songs.

Red-eyed Vireos hold the North American title for the number of songs delivered in a day: 22,197 renderings over a 14-hour period.[28] Their prodigious vocal output has earned them the name "preacher bird" because of their propensity to drone on hour after hour.[29] Recent studies have shown that each male vireo has up to forty songs in his repertoire, and neighboring males have different songs.[30] Eastern Whip-poor-wills sing almost as

[25] Kroodsma, *The Singing Life of Birds*, 368-69.
[26] Robert Smith, Margret Hatch, David Cimprich, and Frank Moore, "Gray Catbird," *The Birds of North America Online* (2011), www.bna.birds.cornell.edu/bna/species/167/articles/sounds, accessed July 22, 2014).
[27] Kroodsma, *The Singing Life of Birds*, 196.
[28] L.K. Lawrence, "Nesting Life and Behavior of the Red-eyed Vireo," *Canadian Field Naturalist* 67 (1953): 47-77.
[29] Alexander Wetmore, *Song and Garden Birds of North America* (Washington, DC: National Geographic Society, 1964), 253.
[30] David Cimprich, Frank Moore, and Michael Guilfoyle, "Red-eyed Vireo," *The Birds of North America Online* (2000), www.bna.birds.cornell.edu/bna/species/527/articles/sounds, accessed July 22, 2014.

much—20,000 times—during a single night as Red-eyed Vireos sing during the day.[31] Whip-poor-wills, however, have fewer hours than vireos in which to work and therefore have a faster singing rate than not only vireos but perhaps every other bird in the world. They sing only one song, a loud, clear, and simple *WHIP poor WILL*, and repeat it feverishly from dusk to dawn. Careful analysis reveals that the last song of this marathon broadcast is delivered as forcefully and accurately as the first one of the night. Perhaps males are revealing something of their suitability as a mate, or of the quality of their territory, through long and rapid repetition of a single song without any dissolution of tonal quality.

Bird vocalizations are almost universally regarded as the highest and most pleasing natural expression of song.[32] The kind of birdsong that is heard, however, is profoundly influenced by humans whose presence and activities change and shape the land and its wildlife. In Waterloo Region, for example, the avian soundscape in 2014 is radically unlike the one that existed in 1800. Then, mature forests covered 80 percent of the countryside[33] and the rich voices of forest birds would have been among its quintessential aural features. By 1900, 85 percent of the once-vast forest had been obliterated to make room for human settlement and agriculture. As the forest dwindled down to small, isolated remnants, so too was its avian choir diminished. Owls, hawks, thrushes, warblers, tanagers, and other species needing deep forests for breeding and foraging became ever more uncommon or disappeared. The Passenger Pigeon, a "living wind"[34] that had flown through southern Ontario in flocks massed 100 meters (more than 300 feet) deep and stretching out as far as the eye could see, did not survive the settlers' onslaught.[35] In the place of the forest denizens, the landscape now carried the melodies of open-country birds—kingbirds, bluebirds, bobolinks, meadowlarks, and sparrows—that rapidly colonized the newly created fields

[31] Kroodsma, *The Singing Life of Birds*, 296.
[32] R. Murray Schafer, *The Soundscape: Our Sonic Environment and the Tuning of the World* (Rochester, VT: Destiny Books, 1977), 29.
[33] Regional Municipality of Waterloo, *State of Environment Report* (Waterloo, ON: Planning and Development Department, 1991), 5-17.
[34] Aldo Leopold, *A Sand County Almanac, and Sketches Here and There* (London: Oxford Univ. Press, 1949), 109.
[35] J. B. MacKinnon, *The Once and Future World* (Toronto: Random House Canada, 2013), 53.

and pastures.

More changes followed. Alien bird species brought to North America in the 1800s—Rock Pigeons, European Starlings and House Sparrows—had a simple formula for success, and that was to associate with humans. Soon they were the most abundant species in cities, towns, and farms, becoming so prolific that they were often reviled as pests. As farming practice intensified in the 20th century, pastures, hayfields, and scrubby margins suddenly became vulnerable themselves. These habitats gave way to broad expanses of monoculture crops, and the open country bird community lost diversity, typically becoming as bland as its cropland environment.

Final Thoughts

It is not just changes to local or regional landscapes that mold the composition of the local bird community. Events thousands of miles away can have equally dramatic effects. Consider the current plight of the Wood Thrush, whose abundance has declined in Canada by 85 percent since 1970.[36] The attrition of this species is seemingly at odds with the fact that it is more willing than most other forest birds to accept small, fragmented forests as breeding habitat.[37] Forest cover in southern Ontario, where most of Canada's Wood Thrushes breed, has remained stable or even increased slightly in the past 40 years. The problems for thrushes may lie on the wintering grounds—Nicaragua, Honduras, and Costa Rica—where deforestation rates are relentless and accelerating.[38] The loss of primary forests there may explain the precipitous drop in the thrush's population size, and underlines the far-reaching, interconnected effects that human activities have on the planet. If the rich, fluting *eo-o-lay* of the Wood Thrush is to be heard in Ontario's forests, efforts must be made to protect and enhance vital habitats in Central America.

There is a simple, easy way for every coffee-drinking North American

[36] "A Mixed Report Card for Canada's Species at Risk," Committee on the Status of Endangered Wildlife in Canada [COSEWIC], Ottawa, Canada, www.cosewic.gc.ca, accessed July 22, 2014.
[37] L.E. Friesen, M.D. Cadman, and R.J. MacKay, "Nesting Success of Neotropical Migrant Songbirds in a Highly Fragmented Landscape," *Conservation Biology* 13 (1999): 338-46.
[38] Calandra Stanley, Emily McKinnon, Kevin Fraser, Maggie MacPherson, Garth Casbourn, Lyle Friesen, Peter Marra, Colin Studds, T. Brandt Ryder, Nora Diggs, and Bridget Stutchbury, "Creating Species-level and Regional Migratory Connectivity Networks by Tracking a Declining Forest Songbird over the Annual Cycle," *Conservation Biology* 29 (2014): 164-74.

to do just that: namely to buy shade-grown coffee. Coffee, one of the most important agricultural crops in Central and South America, can be grown in ways that either support or undermine wildlife.[39] Sun-grown coffee is grown in open conditions with liberal applications of herbicides, pesticides, and fertilizers; yields are high but the fields are sterile monocultures devoid of birds, insects, and other wildlife. Certified, shade-grown coffee, by contrast, is grown under a full canopy of native trees and shrubs, and boasts an impressive diversity of wildlife including migratory and resident birds found in number and variety comparable to those in primary forests. Purchasing shade-grown coffee directly supports organic, sustainably grown coffee that provides an economic livelihood for many small landowners while maintaining vital habitat for forest-dependent wildlife.

The magic of birdsong is all around us, and freely available for listening. Indeed, tuning in to the songs of birds is for many humans their most immediate and frequent connection to the natural world. Bird vocalizations, such as the sublime, whistled tones of the White-throated Sparrow or the extravagant cadences of the Hermit Thrush, can have a deep emotional and aesthetic impact on human listeners. For the birds themselves, their songs are part of an exceptionally complex communication system aimed at furthering their reproduction and survival. Humans have made world-wide, sweeping changes to the natural environment that have profoundly influenced the sorts of bird songs that can be heard. The diversity of avian song that will be heard in the future will depend on the sensitivity and concern that we demonstrate for the habitat needs of our co-inhabitants on planet Earth.

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[39] S.M. Philpott and P. Bichier, "Effects of Shade Tree Removal on Birds in Coffee Agroecosystems in Chiapas, Mexico," *Agriculture, Ecosystems & Environment* 149 (2012): 171-80.

Brown Thrasher. Carden Plain, Ontario, May 28, 2014. Photo credit: Lyle Friesen