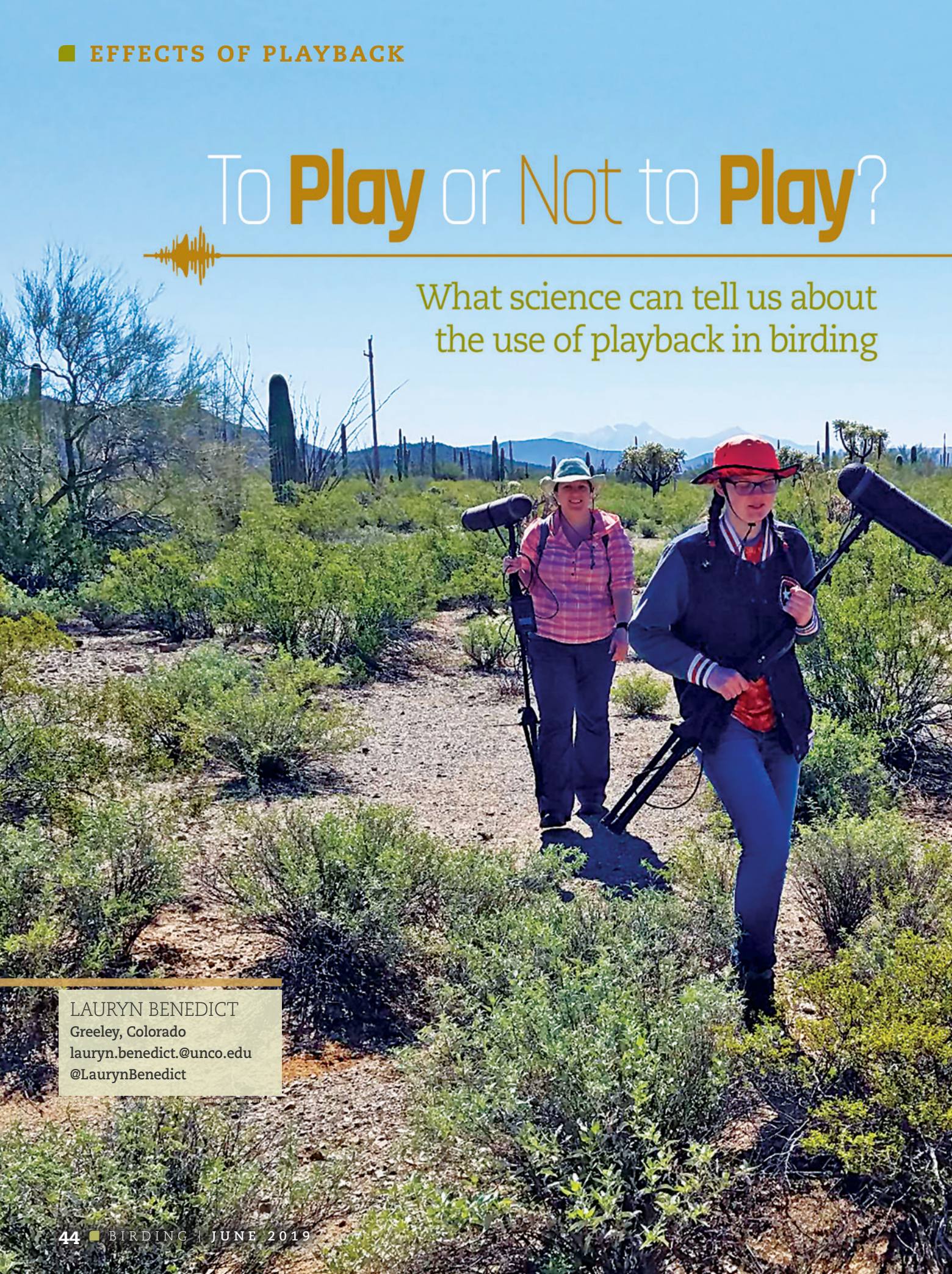
To Play or Not to Play?

What science can tell us about the use of playback in birding



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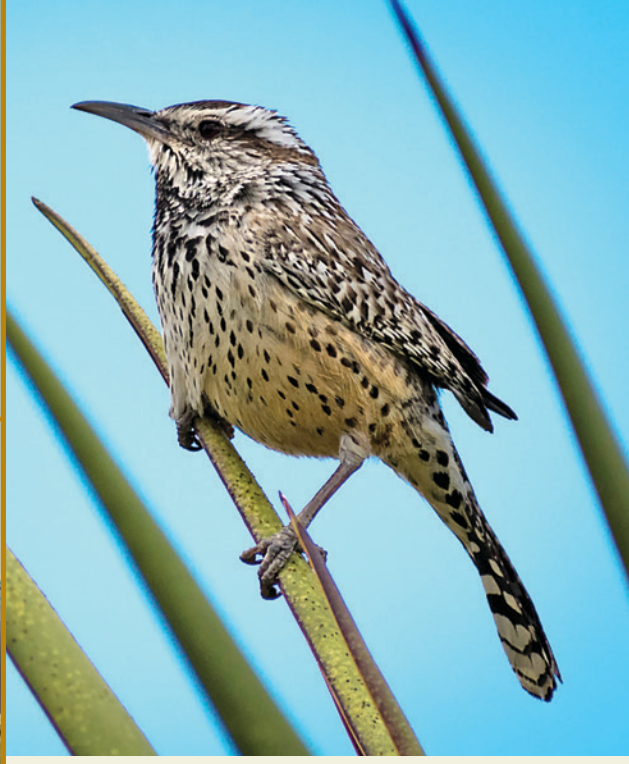
Abigail Hayes, DeAnna Philpott, and Joelle Jenkins (rear to front) search for Cactus Wrens in the Sonoran Desert of Arizona. These ornithologists' research requires the use of playback to elicit responses from the wrens. What are the consequences, both ethical and empirical, of using playback? This article takes a scientific look at that question. *Photo by © Braelei Hardt.*



A **Cactus Wren** comes in for a view. *Photo by © Braelei Hardt.*

The song of the male Canyon Wren is beloved by nearly any birder who has spent time in the western half of the U. S. or Mexico. It rings off sheer rock walls, carrying over seemingly impossible distances with incredible clarity. The song of the female is less well known and easily overlooked. Its ascending and descending buzzy sounds are seldom heard from far away and lack the mystique of the male's watery cascade. For all the male's showiness, however, my scientific colleagues and I are more interested in the songs of females these days.

Recently we were setting up a research project to study them in Arizona, and we encountered an obstacle that we hadn't come across before: The research site doesn't allow playback of bird sounds. Playback is the central technique of our planned experiments. We use it to induce and measure a range of female and male behaviors. But the policy was implemented for good reasons in response to the high numbers of birders in the area also looking to entice a bird response. An abundance of birders necessitates limiting playback, so that the local birds aren't overwhelmed and so no one mistakes a recorded sound for a live bird. Does this mean we scrapped our experiments? Of course not. It just means we'll do them elsewhere. And it also means that I've been thinking a lot lately about the intersection of birding and research relating to playback.

How do scientists and birders use playback?

What have scientists learned about playback to help us be more responsible birders?

The Scientific Approach

Like birders, scientists typically conduct playback by broadcasting recordings of the vocalizations of local bird species. Birders understandably use the term "playback" to refer only to a situation in which a bird's *own* sounds are replayed to it, but scientists use the term to represent any sounds played, no matter the source. This article uses the word playback the second way—to refer to a range of sound types. Scientists choose playback sounds to represent specific song or call types, and they play them using standardized methods from high-quality speakers in appropriate habitat. Researchers generally try to make all aspects of the playback as natural as possible, mimicking species-typical song rates, volumes, and delivery patterns.

Scores of different experiments can be constructed by varying particular sound features or the contexts in which they are played. When executing these experiments, scientists try to be as inconspicuous as possible, positioning themselves away from the speakers and sometimes literally hiding. Because birders often use whatever sound is most readily available and play that from a handheld speaker, the research and birding approaches can differ in these particulars.

Scientists use playback experiments in different contexts. Like birders, they might use playback to locate individuals of a certain species. A well-designed playback census can indicate how many birds live in an area and which habitats they use. This can be done for common species, but is more often used with nocturnal, hard-to-see, and rare birds. If we seek to understand how owl populations use habitat, then repeated, standardized playback surveys can generate those data (Borges et al. 2004).

Observation alone is unlikely to give such good estimates. We all know how hard it is to locate a Black Rail, but if we want to conserve populations of that near-threatened species, we have to know where the birds are. By testing for a playback response, we can sample large areas and make sure that we protect occupied territories. As an added bonus, we avoid trampling habitat during a walking census. In some cases, studies like these have produced exciting results; one research team used playback to determine that Black Rail populations are larger and more widespread than previously realized (Richmond et al. 2008). Although playback might sometimes be disruptive, it is a reliable way to monitor birds, and careful monitoring is essential for successful conservation.

Another reason scientists use playback—and the basis for most of my own research—is that it's the best way to decipher what different sounds "mean" to birds. Birdsong is often compared to human language because it is learned, complex, and variable. Does that imply that it contains the depth of information that a human sentence contains? Probably not. Yet avian vocalizations certainly have the potential to convey specific information. We get clues about what bird sounds mean by looking at their context and form, but those data sources only take us so far. To go the next step, we must see how birds react to them, and we can do that

The author's research on **Canyon Wrens** helps inform conservation actions to benefit birds and other wildlife. In order to conduct the research, birds and their habitats must be disturbed to some degree. *Photo by © Nathanial Warning.*

This **Canyon Wren** kept company with the author and her technicians during the 2018 summer field season. It is undeniable that birds and humans interact in many ways, with impacts that vary from neutral to drastic. *Photo by © Braelei Hardt.*

with playback. Which of two song variants is more aggressive? More attractive? Do specific syllables carry certain information? Playback studies have answered these questions.

In my own research, I and my colleagues have applied this approach in several contexts. By confronting male Canyon Wrens with the songs of other male Canyon Wrens, we have determined that the harsh *chee* sounds at the ends of their songs indicate aggression (Benedict et al. 2012). And by playing female songs to members of both sexes, we have discovered that females direct their songs toward female intruders, but not male intruders; this signal offers them a sex-specific communication channel Benedict and Hathcock (2018).

Playback studies have also shown that song length and complexity matter. Male House Finches and Aquatic Warblers that sing longer and more complex songs are more attractive to mates (Leisler and Catchpole 1996, Nolan and Hill 2004). In classic studies of Song Sparrows and Common Grackles, William Searcy showed that females prefer playback of large song repertoires over playback of small song repertoires (Searcy 1984, Searcy 1992). Apparently, the more songs a male can sing, the more attractive he is. In an anti-predator context, some jays can vocally signal not just that a predator is present, but also whether it is perched, searching, or initiating an attack (Griesser 2008). Playback research has shown that bird vocalizations contain impressively specific information.

The Birders' Debate

Let's go back to that field site in Arizona. Given all we have learned from playback studies, why would the practice be restricted? At that site, playback had become too widely used, stirring up the ongoing debate throughout the birding community. Many authors have already outlined the pros and cons of using playback while birding; in particular, David Sibley did so in a lauded 2011 post on his blog. On the pro side, playback is an effective way to locate and view birds. This provides educational opportunities and can reduce general disturbances to habitats or non-target species. On the con side, playback is believed to alter birds' natural behaviors, induce stress, and potentially put birds in danger.

Various authorities, including the ABA, offer tips for using playback responsibly. The main ideas boil down to these: Choose your playback sites and sounds carefully, be respectful of fellow birders in the area, don't use overly long or loud bouts of playback, and don't disturb high-risk birds. These are good principles to follow in both recreational and scientific contexts.

How can we really know how much we might be disturbing wild birds when we use playback? Are there contexts in which research has demonstrated either positive or negative effects? Let's investigate some of the claims one by one.

1 • Playback changes bird behavior

This is undoubtedly true. Playback wouldn't be so widely used if it didn't cause a response. Birds responding to playback typically approach the speaker and vocalize. This is convenient for birders because, of course, a noisy nearby bird is much easier to see than a quiet distant bird.

A **Canyon Wren** belts out a tune. What are some of the factors that affect its singing? Playback is one, but so are other environmental influences. *Photo by © David A. Leatherman.*

There are also more subtle ways that playback changes birds' behavior. For example, birds exposed to playback don't just sing more, they sing differently. Canyon Wren males adjust the frequency of their songs to sing at lower pitches when they think a rival is near, a result confirmed by my lab (Benedict et al. 2012). Nicole Geberzahn and colleagues (2009) have shown that female Black Coucals do the same. Interestingly, these changes in behavior can be provoked by brief bouts of playback and can have lasting effects. Our study of Canyon Wrens played just five songs over the course of one minute, but that one minute elevated male song rates for the next 20 minutes. An experiment that played Eurasian Sparrowhawk sounds intermittently over the course of several months, caused Great Tits to reduce their singing even on days when they didn't hear any playback (Abbey-Lee et al. 2016). Birds can have long memories.

Most playback research studies have the goal of testing avian response to other birds, but a couple have tested the impact of birders. One stimulated "birders' playback" with two South American bird species (Harris and Haskell 2013). As expected, the researchers found that birds reacted to playback initially by approaching the sounds and acting aggressively. With repeated playback over 20 days, however, the reactions decreased. One bird pair even built a nest close to a playback speaker. Those long memories might be helpful. Over time, birds learn to ignore a consistently repeated playback and get on with their lives. For birders, this can be good and bad. It suggests that high levels of playback in an area don't hurt birds terribly, but it also indicates that playback loses its effectiveness. If we all use playback all the time, the birds will ignore us. And it's possible that they will start to ignore each other.

Another study examined not only the effects of birder playback, but also the impact of birder presence and pishing (Johnson and

A **Rock Wren** approaches playback equipment at one of the author's research sites in northern Colorado. Note the thin black cable and white speaker. *Photo by © Stephanie Pitt.*

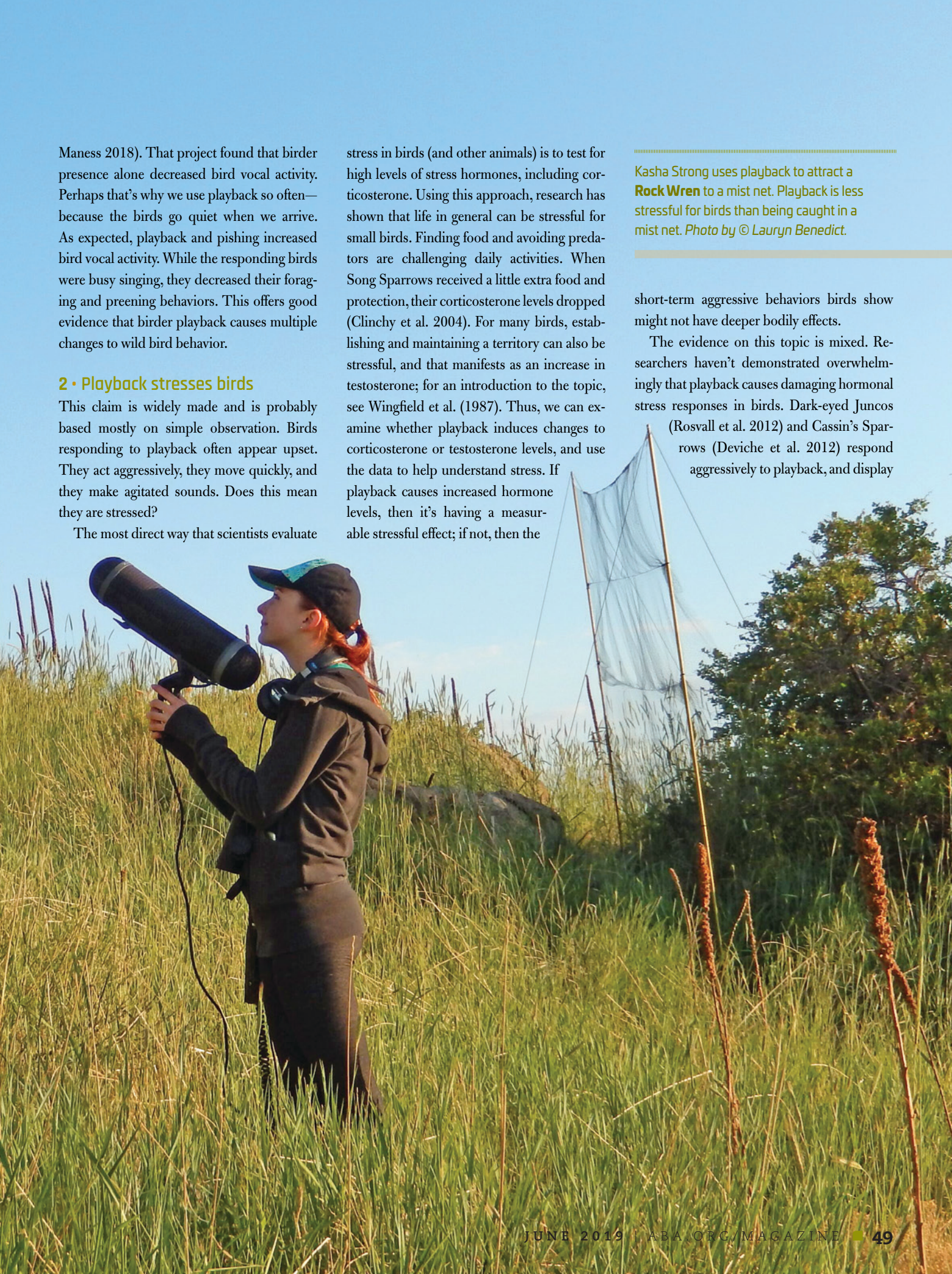
Maness 2018). That project found that birder presence alone decreased bird vocal activity. Perhaps that's why we use playback so often—because the birds go quiet when we arrive. As expected, playback and pishing increased bird vocal activity. While the responding birds were busy singing, they decreased their foraging and preening behaviors. This offers good evidence that birder playback causes multiple changes to wild bird behavior.

2 • Playback stresses birds

This claim is widely made and is probably based mostly on simple observation. Birds responding to playback often appear upset. They act aggressively, they move quickly, and they make agitated sounds. Does this mean they are stressed?

The most direct way that scientists evaluate stress in birds (and other animals) is to test for high levels of stress hormones, including corticosterone. Using this approach, research has shown that life in general can be stressful for small birds. Finding food and avoiding predators are challenging daily activities. When Song Sparrows received a little extra food and protection, their corticosterone levels dropped (Clinchy et al. 2004). For many birds, establishing and maintaining a territory can also be stressful, and that manifests as an increase in testosterone; for an introduction to the topic, see Wingfield et al. (1987). Thus, we can examine whether playback induces changes to corticosterone or testosterone levels, and use the data to help understand stress. If playback causes increased hormone levels, then it's having a measurable stressful effect; if not, then the short-term aggressive behaviors birds show might not have deeper bodily effects.

The evidence on this topic is mixed. Researchers haven't demonstrated overwhelmingly that playback causes damaging hormonal stress responses in birds. Dark-eyed Juncos (Rosvall et al. 2012) and Cassin's Sparrows (Deviche et al. 2012) respond aggressively to playback, and display



Kasha Strong uses playback to attract a **Rock Wren** to a mist net. Playback is less stressful for birds than being caught in a mist net. *Photo by © Lauryn Benedict.*

the typically agitated behaviors that appear to represent stress, but their hormone profiles don't change with their behavior.

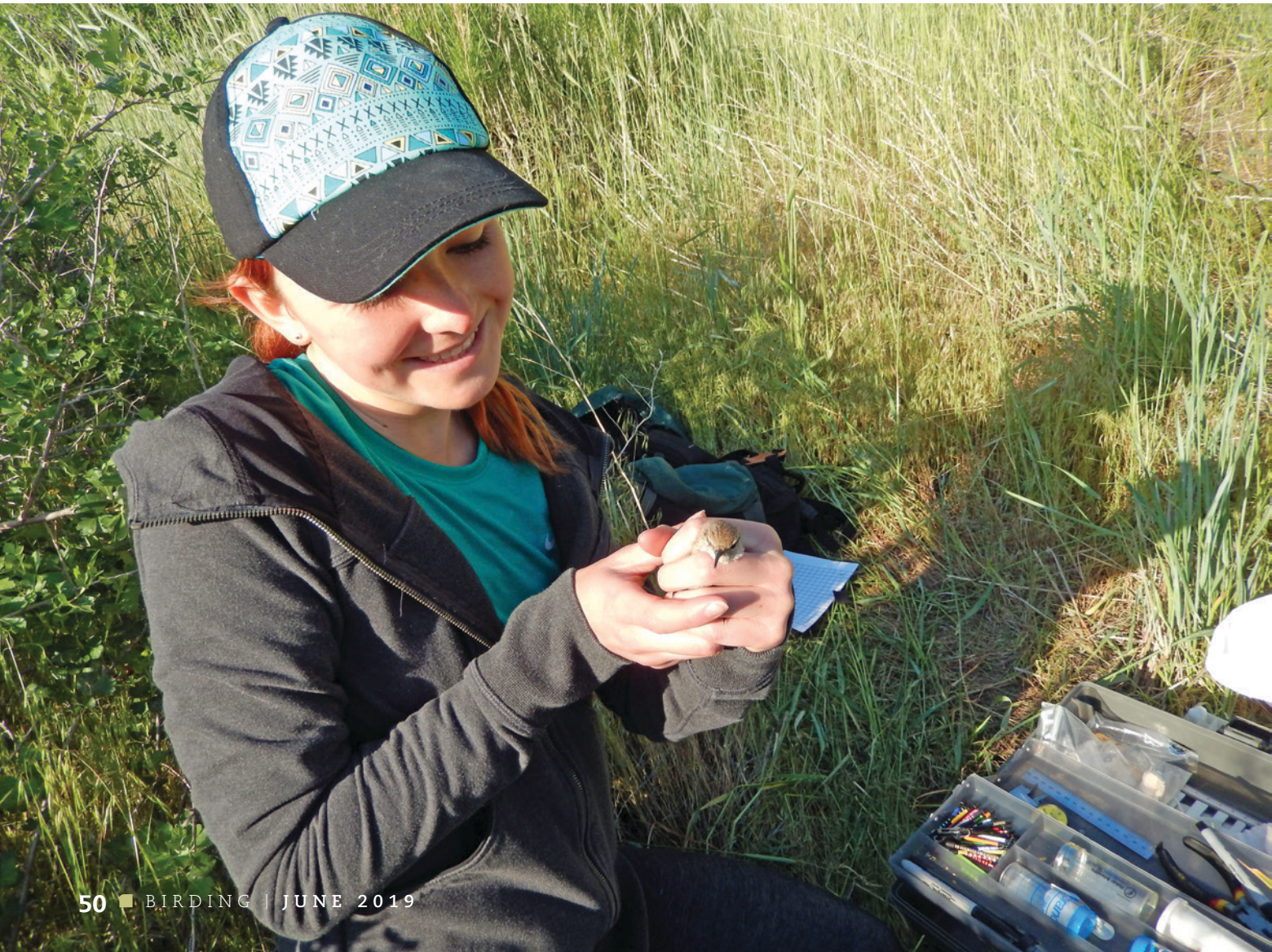
In European Nuthatches (Landys et al. 2010) and Rufous-winged Sparrows (Deviche et al. 2014), playback doesn't affect testosterone in birds that are behaviorally responding, but it does elevate corticosterone levels. Among the sparrows, corticosterone levels rise less after playback than in presence of a rival or when the bird is captured. These results bring up some important points. First, stress responses might vary among species. Second, playback from humans might be somewhat stressful, but apparently less so than territorial challenges from other birds—which birds face frequently in nature. Third, censusing birds with playback should be less stressful for them than capture-and-release surveys with mist nets.

A number of playback studies have varied the sounds played in an attempt to identify which sound features might be stressful. One experiment found that the identity of the singer had an effect; Song Sparrows which heard playback of neighbors had elevated levels of testosterone compared with Song Sparrows which heard strangers (Moser-Purdy et al. 2017). Another study tested whether the duration of playback affected corticosterone and testosterone levels in Curve-billed Thrashers and Abert's Towhees (Fokidis et al. 2011). Short answer: It didn't. Playback lasted anywhere from 13 seconds to 34 minutes before the experimenters measured hormone levels, and even that range of variation in time had no effect. I don't recommend using playback for 34 minutes straight, but it's nice to know that, at least in some species, longer playback is not more stressful than shorter playback.

3 • Playback impacts a bird's survival or nesting success

This idea follows closely on the previous two. If birds hearing playback alter their behavior to spend less time foraging or feeding chicks, and if they are overly stressed as a result, then they might be more susceptible to predators and their nests might be more likely to fail. This concern about predators might come from research showing that birds of multiple species

Paradigm-shifting research on the evolution of birdsong requires experiments on wild birds like this **Rock Wren.** *Photo by © Lauryn Benedict.*



Ornithological technician Abby Hayes sets up an experiment involving playback. Both birding and field research alter bird behavior but have larger goals of helping to conserve and appreciate the natural world. *Photo by © Braelei Hardt.*

are slower to respond to a predator when they are engaged in fights (Jakobsson et al. 1995, Dunn et al. 2003). These experiments are compelling, but they are typically done with a physical intruder and don't rely exclusively on playback. When a bird is physically fighting with another bird, it is directing its attention to that rival. When a bird is responding to playback, in contrast, it is searching for the rival. This searching behavior will tend to make a bird more alert as it scans the area for an intruder. A focused search could cause it to ignore a predator, but a broad search could protect it from predators.

Few experiments have exactly simulated this situation, but at least one offers some insight. A study by Çağlar Akçay and collaborators (2016) showed that Song Sparrows responding to playback of another Song Sparrow pause their aggressive behavior when the sound of a predator is heard. The sparrows are not so wrapped up in attacking the playback speaker that they sacrifice their safety.

Playback might also affect the behavior of non-target species. As already noted, playback of hawk sounds makes Great Tits more cautious. Playback of non-predatory species can put the whole neighborhood on alert. For example, Common Mynas react more quickly to an approaching predator after they have heard the alarm calls of a Red-vented Bulbul (Hubbard et al. 2015). These behaviors have the potential to protect birds from predators, but might take time away from foraging and nesting.

What do we know about the impacts of playback on nesting? One experiment found that female Superb Fairywrens who sang more in response to playback had more chicks than those who sang less (Cain et al. 2015). In this species, some extra singing and aggression doesn't seem to have a negative impact on nesting. On the other hand, playback can disrupt nesting if it tires out parents or interferes with social interactions. Male Black-capped Chickadees faced with playback can lose status in the eyes of their mates, leading the females to seek other partners (Mennill et al. 2003). That's a clear negative consequence for the male's breeding success, but we don't know how widely this result applies to other species.

Overall, it is unclear whether playback makes birds more susceptible to predation and nest failure. Some studies found negative effects of playback and others found positive effects. The impacts of playback depend on the species and the circumstances. In the field, you can watch birds as they respond to playback and make informed judgments about local dangers. Changes in behavior and alertness that you may observe aren't necessarily harmful. If you see behaviors that put a bird or its nest at risk, then it isn't the right time or place for playback.

4 • Playback is the easy way out

In a somewhat different vein, there are arguments against playback based on ethical or aesthetic concerns. Playback is sometimes considered "cheating." It's a simple way to make the birds come to you, relieving you of the real work of birding. Is this a problem? That is not for science to say. It's a purely personal choice.

My Takeaways

Over 700 scientific articles about playback research have been published since 2010. This may seem like a lot, but it is only a drop in the playback bucket. Recreational birders are bound to use playback much more than scientists do, and the former far outnumber the latter. As with researchers, playback practices vary widely among birders, but the decisions they make can have broad consequences. The sheer number of birders puts pressure on everyone to make sure we employ playback responsibly. Doing so can have important conservation, social and economic benefits around the world (Watson et al. 2018). There are situations in which we might use playback and others in which we might not, and either decision can be justified by the science described here.

In my scientific role, I favor the use of playback. We have learned much about the personal communications of birds by using

this technique. As a birder, though, I prefer not to use playback. For me, it isn't a moral issue. I recognize that birders can use playback ethically and I support anyone's choice to do so. Instead, it's because when I go birding I just want to see what happens in the natural state of the world. My field experiments are always tightly controlled with a clear process to follow and specific observations to collect. On birding excursions, I want the opposite of that. I want to imagine I'm not a player in the avian dramas that unfold in front of me. I want to spend whatever time it takes to observe whatever I can. Often, I see the most exciting and intimate details by making myself inconspicuous. And then I ponder those observations, I go read the literature, and I develop my next, better playback experiment. But maybe not in Arizona.

Literature Cited

Abbey-Lee, R. N., A. Kaiser, A. Mouchet, and N. J. Dingemanse. 2015. Immediate and carry-over effects of perceived predation risk on communication behavior in wild birds. *Behavioral Ecology* 27: 708–716.

Akçay, Ç., A. Clay, S. E. Campbell, and M. D. Beecher. 2015. The sparrow and the hawk: Aggressive signaling under risk of predation. *Behavioral Ecology* 27: 601–607.

Benedict, L., A. Rose, and N. Warning. 2012. Canyon Wrens alter their songs in response to territorial challenges. *Animal Behaviour* 84: 1463–1467.

Borges, S. H., L. M. Henriques, L. M., and A. Carvalhaes. 2004. Density and habitat use by owls in two Amazonian forest types. *Journal of Field Ornithology* 75: 176–183.

Cain, K. E., A. Cockburn, and N. E. Langmore. 2015. Female song rates in response to simulated intruder are positively related to reproductive success. *Frontiers in Ecology and Evolution* 3: 119.

Clinchy, M., L. Zanette, R. Boonstra, J. C. Wingfield, and J. N. Smith. 2004. Balancing food and predator pressure induces chronic stress in songbirds. *Proceedings of the Royal Society of London, Series B–Biological Sciences* 271: 2473–2479.

Deviche, P., B. Beouche-Helias, S. Davies, S. Gao, S. Lane, and S. Valle. 2014. Regulation of plasma testosterone, corticosterone, and metabolites in response to stress, reproductive stage, and social challenges in a desert male songbird. *General and Comparative Endocrinology* 203: 120–131.

Deviche, P., P. J. Sharp, A. Dawson, J. Sabo, B. Fokidis, S. Davies, and L. Hurley. 2012. Up to the challenge? Hormonal and behavioral responses of free-ranging male Cassin's Sparrows, *Peucaea cassinii*, to conspecific song playback. *Hormones and Behavior* 61: 741–749.

Dunn, M., M. Copelston, and L. Workman. 2004. Trade–offs and seasonal variation in territorial defence and predator evasion in the European Robin, *Erithacus rubecula*. *Ibis* 146: 77–84.

Fokidis, H. B., M. Orchinik, and P. Deviche. 2011. Context-specific territorial behavior in urban birds: No evidence for involvement of testosterone or corticosterone. *Hormones and Behavior* 59: 133–143.

Geberzahn, N., W. Goymann, C. Muck, and C. Ten Cate. 2009. Females alter their song when challenged in a sex-role reversed bird species. *Behavioral Ecology and Sociobiology* 64: 193–204.

Griesser, M. 2008. Referential calls signal predator behavior in a group-living bird species. *Current Biology* 18: 69–73.

Harris, J. B. C., and D. G. Haskell. 2013. Simulated birdwatchers' playback affects the behavior of two tropical birds. *PLoS One* 8: e77902.

Hathcock, T.J., and L. Benedict. 2018. Conspecific challenges provoke female Canyon Wrens to sing but not to duet. *Behavioral Ecology and Sociobiology* 72: 196.

Hubbard, L., W. King, A. Vu, and D. T. Blumstein. 2015. Heterospecific nonalarm vocalizations enhance risk assessment in Common Mynas. *Behavioral Ecology* 26: 632–638.

Jakobsson, S., O. Brick, and C. Kullberg. 1995. Escalated fighting behavior incurs increased predation risk. *Animal Behaviour* 49: 235–239.

Johnson, J. M., and T. J. Maness. 2018 Response of wintering birds to simulated birder playback and pishing. *Journal of the Southeastern Association of Fish and Wildlife Agencies* 5: 136–143.

Landys, M. M., W. Goymann, I. Schwabl, M. Trapschuh, and T. Slagsvold. 2010. Impact of season and social challenge on testosterone and corticosterone levels in a year-round territorial bird. *Hormones and Behavior* 58: 317–325.

Leisler, B., and C. K. Catchpole. 1996. Female Aquatic Warblers (*Acrocephalus paludicola*) are attracted by playback of longer and more complicated songs. *Behaviour* 133: 1153–1164.

Mennill, D. J., P. T. Boag, and L. M. Ratcliffe. 2003. The reproductive choices of eavesdropping female Black-capped Chickadees, *Poecile atricapillus*. *Naturwissenschaften* 90: 577–582.

Moser-Purdy, C., S. A. MacDougall-Shackleton, F. Bonier, B. A. Graham, A. C. Boyer, and D. J. Mennill. 2017. Male Song Sparrows have elevated testosterone in response to neighbors versus strangers. *Hormones and Behavior* 93: 47–52.

Nolan, P. M., and G. E. Hill. 2004. Female choice for song characteristics in the House Finch. *Animal Behaviour* 67: 403–410.

Richmond, O. R., J. Tecklin, and S. R. Beissinger. 2008. Distribution of California Black Rails in the Sierra Nevada foothills. *Journal of Field Ornithology* 79: 381–390.

Rosvall, K. A., D. G. Reichard, S. M. Ferguson, D. J. Whittaker, and E. D. Ketterson. 2012. Robust behavioral effects of song playback in the absence of testosterone or corticosterone release. *Hormones and Behavior* 62: 418–425.

Searcy, W. A. 1984. Song repertoire size and female preferences in Song Sparrows. *Behavioral Ecology and Sociobiology* 14: 281–286.

Searcy, W. A. 1992. Song repertoire and mate choice in birds. *American Zoologist* 32: 71–80.

Watson, D. M., E. Znidersic, and M. D. Craig. 2019. Ethical birding call playback and conservation. *Conservation Biology* 33: 469–471.

Wingfield, J. C., G. F. Ball, A. M. Dufty, R. E. Hegner, and M. Ramenofsky. 1987. Testosterone and aggression in birds. *American Scientist* 75: 602–608.