

DUETS AND DRAWLS.(bird calls)

by Jordan Price and R. Haven Wiley

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When two scientists lent an ear to tropical stripe-backed wrens, they heard more than songs and calls; they heard family histories. Here they describe the unique vocalizing of a very social bird.

On a July morning in the llanos, or savannas, of Venezuela, the air is muggy and thick with mosquitoes. Most of Hato Masaguaral, the cattle ranch and wildlife refuge where we work, is covered with water and mud a foot deep. On the few patches of dry ground, tropical rattlesnakes lie low, and in shallow pools, spectacled caiman doze just beneath the surface. Occasionally we disturb the sleeping reptiles as we wade across the llanos, probably because our minds are less on the perils beneath our feet than on the staggering abundance of birds above our heads.

More than 300 species of birds--from waterfowl and parrots to hawks and flycatchers--can be seen on this ranch alone. For birds that breed in the llanos, July (the peak of the wet season, which extends from May to October) is a time of plenty, when food for hatchlings is abundant. The air is filled with the sounds of birds busy raising their families. High in a grove of trees, a dozen or so small, gray-and-white streaked songbirds chase each other through the dense foliage. These are stripe-backed wrens, a species common throughout the llanos of Colombia and Venezuela. Two neighboring groups are fighting over the common boundary of their territories. Choosing our steps carefully, we move in for a closer look.

The owner of Hato Masaguaral, Tomas Blohm, has preserved much of the ranch's natural habitat and has allowed birders, naturalists, and scientists from around the world to use it as a tropical research station. Biologists from the University of North Carolina at Chapel Hill and from Purdue University have intensively studied the ranch's stripe-backed wrens since the 1970s. Each bird wears a unique combination of colored plastic bands for easy identification; most have been banded in their natal territories during their first year. By using these genealogies and DNA fingerprinting techniques, Kerry Rabenold and his team from Purdue have worked out the family histories of nearly every bird in the population. But our research has focused mainly on the wrens' vocalizations. Without even looking at their leg bands, we can tell which birds belong to which family, simply by listening to their sounds. Our most recent work with stripe-backed wrens has revealed a complex system of vocal communication that includes two sets of learned

vocalizations. One of these has a pattern of cultural transmission unlike that of any other songbird. Passed from fathers to sons and from mothers to daughters, these vocalizations are as reliable as any high-tech method for determining family ties.

The development of vocal traditions in this species probably derives in part from its social organization. Stripe-backed wrens never live alone. Year-round residents of the llanos, they are cooperative breeders that live in groups and work together to defend permanent territories of about an acre. Each group is an extended family consisting of a breeding male and female and up to twelve of their offspring from previous years. Both male and female offspring help the breeders maintain the communal nest, feed the young, and, as we are seeing in the feuding families above us, defend the home turf from intruding neighbors.

In each of the families we are watching, the breeding male belongs to the patriline, or male lineage, that has occupied the territory for generations. The breeding female has immigrated into the group from a nearby territory. Males usually remain in the territory of their birth and wait to inherit the breeding position when it becomes available, while females disperse after a few years of serving as helpers and compete for vacant breeding positions in other groups. Male helpers form a kind of queue based on age: the oldest bird is first in line to become the next breeder. Like the scions of some old European royal families, a few unfortunate males spend their entire lives waiting to succeed their fathers. An adventurous few roam far afield and attempt to found their own dynasties, but most of these birds are unsuccessful.

The wren families squabbling above us produce a variety of sounds as they dart from branch to branch. Particularly prominent are their duets. Sung by a male and female, these consist of loud staccato notes. (The sound is the source of the species' onomatopoeic Spanish name, *chocorocoy*.) Although the complex syncopated rhythms of duets can sound to the untrained ear as if they are coming from one bird, they are the efforts of two wrens perched side by side and interposing their notes with precise timing.

The stripe-backed wren's duets, like those of such other tropical duetters as the Central American bay wren, seem to be the equivalent of the territorial songs issued by individual males of many temperate-zone songbird species. They advertise a group's occupation of a territory and are usually performed by the breeding pair. The strident take-home message of a duet is basically, "This

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territory will be defended against intruders, and no, there are no available breeding positions here."

But we can also detect subtler utterances that act as a kind of counterpart to the duets. Individual wrens emit nasal calls, some of which sound like a human voice drawling, "Where are you?" For this reason, despite our best efforts to avoid anthropomorphism, we have come to call these querulous-sounding phrases WAY calls. The modulated nasal sounds and interspersed raspy clicks of WAY calls are some of the strangest vocalizations produced by songbirds.

WAY calls are not nearly as loud as duets and can be heard at only about one-quarter the distance. Often they are not audible much beyond a group's home ground. The back-and-forth WAY-calling of family members can, in fact, with a little imagination, sound almost like a human conversation. We believe that WAY calls are used for close-range communication rather than for conveying information between neighboring groups at a distance.

Like other songbirds, young stripe-backed wrens have to learn the complex sounds that characterize their species. Songbirds are one of the few groups of animals in which vocalizations are learned rather than genetically inherited (others include parrots, hummingbirds, whales, and, of course, humans). Like all learning, song transmission in birds can involve occasional errors; if passed on to other individuals, these become variations that are in turn perpetuated. Biologists who study birdsong can compare the acoustic details of different birds' sounds to determine who their teachers were. In northern temperate zones, songbirds usually copy songs not from their parents but from unrelated members of the same species, usually neighbors. Much less is known, however, about vocal learning in tropical birds with more complicated social relationships, such as stripe-backed wrens. In this species, vocal complexity appears to mirror social complexity.

Rather than learning from unrelated neighbors, male stripe-backed wrens pick up WAY calls from their fathers and older brothers, and young females learn from their mothers and older sisters. Many of the birds involved in the skirmish above us are males, and they call more frequently than the females do as they chase each other from branch to branch. All the male wrens in a family have identical repertoires of about twelve distinct WAY calls, while unrelated males rarely share any call patterns at all. During territorial disputes, group-specific calls--like the colors of sports-team jerseys--signal to each contestant who is and who is not on its team. WAY calls seem not to be given to proclaim the whereabouts of a good food source or to alert the group to the presence of danger (the wrens have a distinct call to unmask predators).

Female wrens' WAY calls consist of sounds that resemble those of males. We cannot tell, just by hearing a WAY call, whether it is produced by a male or a female. However, females have smaller repertoires, usually of about four different calls. Male and female family members never share the same call patterns, nor do female WAY calls match those of males in nearby groups or those of any unrelated females. Instead, the calls are passed from mother to daughter in a separate, matrilineal tradition.

Females often issue WAY calls when they search out and compete for breeding vacancies in other territories. Female relatives (usually sisters) often travel together and compete as teams, so their WAY calls, like those of males, might be used to verify who's on which team. Contests for breeding opportunities sometimes involve females from a number of families and are characterized by much WAY-calling by female competitors and resident males. This is one of the few situations in which females WAY-call intensively.

Because we can trace genealogies in this population back several generations, we have shown that WAY calls are passed from older to younger wrens with remarkable fidelity. This is illustrated by our finding that while the males of each group normally have a unique set of WAY calls, there are exceptions--cases of two widely separated groups in which males have a nearly identical repertoire of calls. In each of these cases, however, the family trees (compiled by Rabenold and others) reveal that the males in these groups shared a paternal ancestor that left one group generations earlier to join the other one and apparently carried his WAY-call repertoire with him. In two of these instances, the shared patriarch was a great-grandfather that had died as much as two decades earlier. Few other birds are known to have such lasting cultural traditions.

Amid the seeming cacophony of calls to which young birds are exposed during development, wren offspring somehow manage to learn only the WAY calls produced by the parent of the same sex. Even under close inspection, male and female stripe-backed wrens look alike (presumably to one another, as well), so sex-specific calls could serve to distinguish the sexes in this highly social species. Also, because WAY calls reflect genealogy, they may permit individuals to identify unknown relatives by comparing other birds' calls to their own or to the calls of known relatives and thus may allow them to direct cooperative behavior preferentially toward close kin. On the other hand, if a female looking for a breeding vacancy finds that a widowed male of another group has WAY calls very like those of her father, she might withdraw to avoid close inbreeding. Although we don't know for certain whether the birds do use the calls in this manner, we have shown, by

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playing tape-recorded WAY calls to males, that individuals react differently to the calls of relatives and outsiders.

To a lesser extent, sex-specific learning is also necessary for singing duets. Since duets cannot be performed by members of the same sex, when two males or two females attempt to initiate a duet, their efforts will degenerate into a series of sputtering notes. A proper duet has a male part and a female part, learned from older birds of the same sex. But unlike the same-sex teachers of WAY calls, duet vocal coaches need not be relatives. Some duet patterns of neighboring families can be nearly identical, although playback experiments have shown that the wrens can identify neighbors solely by hearing their duets.

The gregarious stripe-backed wrens of Hato Masaguaral continue to spur scientific inquiry. Their vocal communication alone has proved to be rich and layered, with two sets of learned vocalizations: duets and WAY calls. The dual, his-her routes of WAY-call transmission are unlike any previously described. Yet we suspect they might not remain unique for long. Many tropical birds have complex social organizations, and many await the attention of rubber-booted, caiman-hopping researchers eager to learn more about them. Once we do, we are likely to discover patterns of avian communication of equal or maybe even greater complexity.

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