



A male cowbird on a metal post. (Paul A. Johnsgard)

'Irresponsible' cowbirds and the decline of songbirds

By SAMUEL TRUAX

JUST like human society, avian society has many individual personalities. There are those raucous types, like crows and jays, loudly quarreling among themselves as they accomplish their duties of survival and procreation. There are those like doves, that quietly go about doing their prescribed duties. With their lovely melodies, various songbirds bring enjoyment to humans as they accomplish their tasks. And then there are those who seem to be completely irresponsible in accomplishing their life duties, without the redeeming qualities of lovely feathers or beautiful songs, like the brown-headed cowbird.

How has the brown-headed cowbird established such a reputation for irresponsibility? The book "Birding" states that "The brown-headed cowbird's most famous, or infamous, attribute is

that it is a brood parasite." That is, "the female lays eggs in the nests of other birds and takes no part in the rearing of her young." And the female cowbird is not even concerned about who raises her offspring. "Brown-headed cowbird eggs have been recorded in the nests of 220 species, ranging from ducks to hummingbirds." Even more extreme, studies find that "they remove the eggs of the host bird on some occasions."

The cowbird developed these seemingly irresponsible habits by evolving a nomadic lifestyle. Cowbirds followed the once massive buffalo herds through their migration cycles, feeding on insects and seeds stirred up by the constant movement of the buffalo herds, and so were never in one place long enough to build and tend to their own nest. In fact their name comes from the buffalo cows they associated with.

From their position in the grasslands, the female cowbird could easily spot nests for her eggs in the shrubbery and undergrowth that occur where the forest edge abuts the grassland. Normally the nests deeper into the forests were not used. The female cowbird would deposit her eggs in the selected nest and then move on with the herd. Though a seemingly irresponsible trait much criticized by humans, this was a behavior well adapted to the conditions of life in which the cowbirds evolved. The species survived, and, though some harm was done to other affected bird species, that harm was typically minimal due to the constant migration of the cowbirds as they followed the bison.

However, the habitat changes that occurred with the arrival of European settlement in America, such as the replacement of migrating buffalo with confined cattle, expanded the conditions suitable for the brown-headed cowbird, at the expense of the birds whose nests they used. The European settlers also cleared trees for crop fields and pastures, creating more and more forest edge suitable for host nest selection by the female cowbird. The cowbird population increased very substantially and, according to some studies, continues to increase, if not in actual numbers, then certainly in range. A study by the Audubon Society concluded that even as the cowbird's range continues to expand, their actual population has declined 1 percent from 1966 to 1996. Regardless of whether the cowbird population is stable or increasing, its expanding range allows parasitism of many more species, some that are poorly adapted to avoid such behavior.

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species of birds, and cowbirds have been fledged by 150 different species, they primarily target the nests of vireos, warblers and some sparrow species. These birds have a tendency to nest in brushy undergrowth typical of the forest edge.

The cowbird eggs have a shorter gestation period than their hosts, so they often hatch before the host species. Cowbird hatchlings are usually larger and more aggressive during feeding by the host parent, and they are often aggressive toward the young of the host species. This can cause the death of the young of the host species, and when combined with occurrences when the female cowbird actually removes the eggs of the host from the nest, the habits of the cowbird are causing a great deal of stress on the populations of some species. Interestingly, some bird species recognize and remove cowbird eggs from their nests. In some cases, engaging in what is called "mafia behavior," the cowbird will return to the nest and destroy all of the host species eggs, sometimes even tearing the nest apart.

The black-capped vireo is on the Endangered Species List. Studies indicate that the primary cause of the endangerment of the species is nest parasitism. The second most important cause of the endangerment, after habitat destruction, of the Kirtland's warbler, is nest parasitism. Recovery plans for the endangered golden-cheeked warbler include a cowbird-trapping program and the control of cowbird populations. Such control methods are controversial.

Studies of Bell's vireo in South Dakota concluded that they "are very common victims of brown-headed cowbird parasitism, and are in decline in many regions." In New Mexico it was found that Bell's vireo "suffers from low productivity due to brood parasitism by brown-headed cowbirds." In some years, nest failures have exceeded 90 percent in the Carlsbad population.

However, the Audubon study does not indicate that these conditions are quite as serious as other scientists believe. The study did find the black-capped vireo experienced a 90 percent nest parasitism in Texas. A study of Bell's vireo and the yellow-breasted chat showed they had 80 percent to 90 percent of their nests parasitized. And the lazuli bunting had 50 percent of their nests parasitized in a Montana

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The cost of being parasitized by swallow bugs. The nestling cliff swallow on the right is from a nest where bugs were removed by fumigating with an insecticide; the nestling on the left is from a nest in the same colony with natural numbers of bugs. Both nestlings were the same age (10 days old). (Mary Bomberger Brown)

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guarding that bad things do happen. Often one bird will steal grass from its neighbor, only to have that neighbor return the favor at a later time; I once watched what looked like the same grass stem change "hands" several times as it was repeatedly stolen from a nest and then stolen back.

Probably the most unique way that cliff swallows exploit others is by foisting some of their eggs off onto their neighbors. Mary and I discovered relatively early in our research that these birds are like other species in that they sometimes lay eggs in the nests of other colony members. Typically, a female finds a neighboring nest unattended, slips in and lays an egg, and the unsuspecting neighbor is none the wiser. This enables the parasitic bird to then lay an additional egg in her own nest, and in that way increase her reproductive output. It also "spreads the risk" by not putting all her eggs in the same nest, should her own nest be depre-

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dated or be washed away by a storm. Up to 20 percent of swallow nests have parasitic eggs laid in them, and the odds of both finding a nest to parasitize and having your own nest victimized increase in larger colonies.

But cliff swallows have evolved an even neater trick to parasitize their neighbors. If you lay a parasitic egg, you have to time the laying to coincide with when your neighbor lays her eggs. Lay too early and the neighbor won't be at the appropriate stage to care for (incubate) the eggs. Lay too late and the neighbor's own eggs will have a head start in development and hatch before yours. This means parasitic laying is only possible during a fairly narrow window of time (three to four days). Yet, if you carry an egg already laid in your own nest into a neighbor's, you have a longer window of time (the entire 16-day incubation period) to find your neighbor's nest left unguarded. Cliff swallows do just that. They physically transfer eggs in their beaks from their own nests into ones nearby. They even seem to be able to predict (how we don't know) which nests in the colony are less likely to have lots of swallow bugs, and eggs are transferred into those nests at a higher frequency than into the more infested nests. In this way, females seem to

insure that at least some of their offspring are reared in nests with fewer bugs and are thus more likely to survive.

Why colonies vary in size

One big reason that the cliff swallows of the Platte Valley have proven to be such marvelous research subjects is that they live in colonies that vary so much in size. A few birds are found each year that live by themselves, and others form colonies containing up to 6,000 nests on a single bridge. Colonies spanning this entire range are found every year, with most birds living in groups of several hundred nests. This variation, which I was unaware of when I selected Keith County as a research site, has allowed us to study not only how the costs and benefits of social life vary with group size but also what ecological conditions might cause colonies to differ in size in the first place. This is a fundamental question about animal behavior but, surprisingly, one that has not been widely addressed.

One factor that determines, in part, the number of cliff swallows at a given colony site (e.g., on a particular bridge) is the nature of the habitat surrounding it. Feeding on small, swarming insects, the swallows prefer areas that support large numbers of swarms. Insect abundance and distribution is influenced by the type of vegetation, land use and amount of water within the birds' foraging range. Sites that have a moderate amount of water (ponds, rivers, canals) relatively close and also have diversity in other kinds of habitat are the ones that support the largest swallow colonies. Sites surrounded by all one kind of habitat (e.g., a cornfield) tend not to regularly attract as many birds, probably because there isn't enough insect food in the vicinity. The overall land use in the Platte Valley, with moderate amounts of standing or flowing water plus a mixture of cropland, prairie, riparian woodland and town-like areas, probably accounts for the high abundance of cliff swallows in this area, simply because conditions are so good for insects.

Perhaps the most surprising single discovery about cliff swallows in the last 28 years is the realization that colony size is, in part, based on genetics. It is well known that some animals produce increased levels of stress hormones in social situations, and some 15 years ago I guessed that cliff swallows might "perform" better (i.e., be more successful in raising young) when in groups of particular sizes. Few colleagues, however, thought that an individual's choice of what size group it would live in could be determined by genes.

To determine if there were innate preferences for groups of particular sizes, we performed an experiment in which some nestlings born in a colony of one size were raised in a colony of a very different size. We had monitored when nestling cliff swallows hatched, and as soon as they were old enough (three to four days), we banded them for permanent identification. We then switched some babies born in large colonies to nests in small colonies to be raised by foster parents; we did the reverse with additional hatchlings.

If the babies' subsequent choice of where to live was based largely on genetic tendencies, the youngsters should later choose colonies that matched in size where they were born (where their parents chose to live), not where they were reared. On the other hand, if early experience as a fledgling in a particular social environment dictated later choices, the exchanged birds should choose colonies that matched the size of the sites where they were reared. The next summer we caught breeding birds, looking to see

where our experimental birds returned and what size colonies they chose as first-time breeders. Yearling cliff swallows chose breeding colonies that matched in size with where they were born and rarely occupied sites similar to where they were reared. Thus, cliff swallows seem genetically programmed to use colonies of a particular size, and this accounts in part for the diversity of colony sizes seen in the population along the Platte River.

Although unappreciated by most people and certainly ignored by the many tourists cruising across Interstate 80 each summer, the cliff swallows of western Nebraska have provided insights that have reshaped the way scientists think about group living in animals. They are a fascinating treasure that everyone who lives in the state should protect and take the opportunity to enjoy.

Charles R. Brown, professor of biological sciences at the University of Tulsa, has studied swallows since age 11. Over the last 28 years in western Nebraska, he and a research team have banded more than 200,000 cliff swallows. Receiving degrees from Austin College (B.A.) and Princeton University (Ph.D.), Brown published his first scientific paper at age 15, and his articles have appeared in *Nature*, *Science*, *Evolution*, *Ecology* and many other publications. His book, "Swallow Summer," was published by the University of Nebraska Press in 1998. In 2009, Brown and collaborator Mary Bomberger Brown of the University of Nebraska-Lincoln received the Elliot Coues Award from the American Ornithologists' Union in recognition of their outstanding research on cliff swallows.

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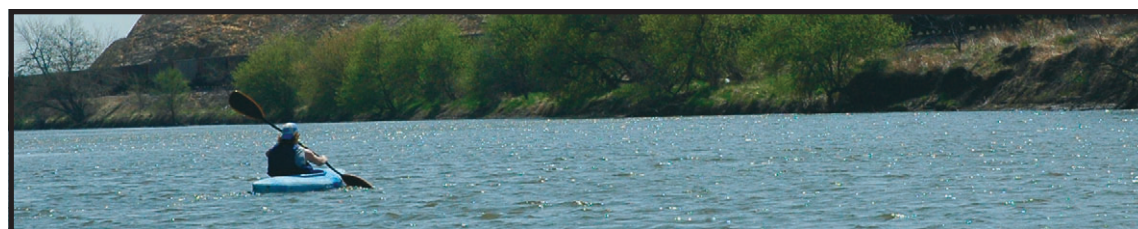
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