



Using Conspecific Attraction to Conserve Endangered Birds

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Abstract

Conspecific attraction, the tendency for individuals of a species to settle near one another, may provide managers and conservationists with a new tool for the recovery of many bird species. Conspecific attraction has been used in the recovery of colonial birds for over 20 years, and recent research suggests that conspecific attraction may occur in a number of territorial birds. Cues suggesting the presence of conspecifics can potentially be used to attract individuals to previously unoccupied sites that are managed for the species' benefit. In this article, we discuss the ecological issues surrounding the use of conspecific attraction for managing birds, including which cues should be used to attract birds, when these cues should be used, which species are likely to exhibit conspecific attraction, and other factors that should be considered before attempting to attract individuals to a site.

Resumen

La atracción de coespecies, o tendencia de individuos de una especie para establecerse cerca de otros, puede facilitar un método nuevo para la recuperación de diferentes especies de pájaros. El método ha sido usado en la recuperación de pájaros coloniales por los últimos 20 años, y estudios recientes sugieren que la atracción de coespecies puede ocurrir en algunos cuantos pájaros territoriales. Posiblemente, las señales que sugieren la presencia de coespecies pueden ser usadas para atraer individuos a sitios previamente desocupados y manejados para el beneficio de la especie. En este artículo, discutimos las cuestiones ecológicas sobre el uso de la atracción de coespecies por el manejo de pájaros, incluyendo cuales señales deben ser usados para atraer pájaros, y otros factores que se deben considerar antes de intentar atraer individuos a un sitio.

Introduction

Conspecific attraction is the tendency for animals to settle near other members of their species. This behavior is most conspicuous in colonial species that settle in close proximity to one another and eschew living alone (Burger 1988). Colonial species presumably benefit from the presence of conspecifics through improved ability to locate food or ward off predators. Territorial animals, on the other hand, actively defend space against conspecifics. Furthermore, as the density of territorial animals increases, reproductive success often decreases due to density-dependent effects (Sinclair 1989; Newton 1998). As a result, until recently, few ecologists considered the possibility that conspecific attraction may also occur in territorial animals, including the vast majority of birds (Lack 1968). In contrast to predictions based on theory, a series of studies by Stamps showed that lizards actually prefer to settle near conspecifics, even when unoccupied habitat is available nearby (Stamps 1987; 1988; 1991). She termed this behavior conspecific attraction and suggested that animals show it because the presence of conspecifics in an area is a reliable cue of habitat quality. Now, many of the best examples of conspecific attraction in territorial animals come from birds (Graber 1961; Sherry & Holmes 1985; Herremans 1993; Muller et al. 1997; Poysa et al. 1998).

If this behavior is widespread in territorial birds, it may have important implications for how birds use space and, therefore, for their conservation and restoration (Smith & Peacock 1990). Animals that prefer to settle near conspecifics may be unlikely to settle in empty or newly created habitat patches. Con-

servationists could potentially use this preference for previously settled sites to “fool” animals into settling at unoccupied sites by artificially introducing the cues naturally produced by conspecifics (Reed & Dobson 1993). To test whether or not territorial birds are attracted to conspecifics when settling, we conducted an experiment on the federally endangered black-capped vireo (*Vireo atricapilla*) (Ward & Schlossberg 2004). During spring 2000 and 2001, we played vireo vocalizations at sites in Central Texas with appropriate habitat where either one or no pairs of vireos had been present during the previous year. At each site where we played vireo songs, the population of vireos increased during the first year of playbacks. In a few cases, results were striking, with up to 30 vireos settling at previously unoccupied sites. Birds attracted to these playback sites paired, bred, and in most cases had high reproductive success. These results provide experimental confirmation that conspecific attraction occurs in at least one territorial songbird. Furthermore, the results suggest that conspecific attraction can provide a powerful tool for managing and conserving birds. The purpose of this article is to discuss some of the ecological factors that need to be considered when using conspecific attraction as a management tool for birds.

Cues to Attract Birds

Two types of cues could potentially be used to attract birds to a site: vocalizations and models. Birds produce a variety of vocalizations that could be used for playbacks. Avian vocalizations include songs (complex, learned vocalizations produced only by passerines)

and calls (relatively simple, unlearned vocalizations produced by all types of birds). For songbirds, we suggest primarily broadcasting songs for two reasons. First, songs are the most conspicuous vocalizations given by most birds, and second, they indicate the presence of an occupied territory, which could make an area attractive for birds. Other vocalizations such as chip notes, flight calls, and alarm calls can be included as well to increase the variety of vocalizations and reduce habituation by birds. In our research with black-capped vireos, we used CDs with approximately 50 min of vireo songs and 5 min of other vireo calls. For non-passerines, we suggest primarily using territorial advertisement calls, as these are the calls most frequently given by these birds.

While models may be important cues for attracting colonial birds to new breeding sites (Podolsky & Kress 1992; Kress 1997), models may not always be important for territorial species. This should be especially true for small, cryptic birds or for those that inhabit dense vegetation because these species would be unlikely to rely on visual cues to determine the presence of conspecifics. In contrast, conspicuous birds that use open habitats may be more likely to use visual cues and would be better candidates for the use of models. We tested whether models and playbacks were necessary to attract the shy black-capped vireo as well as the large, conspicuous yellow-headed blackbird (*Xanthocephalus xanthocephalus*) to new sites. Not surprisingly, vireos did not respond to conspecific models at all (Ward & Schlossberg 2004). In contrast, yellow-headed blackbirds were attracted to sites where models and

vocalizations were used but failed to occupy sites that had either models alone or vocalizations alone (Ward unpubl. data).

Timing of Playbacks

Although most songbirds are diurnal, they primarily migrate at night (Kerlinger & Moore 1989). This raises the important question of what time of day to broadcast vocalizations. Playing songs continuously may be unwise or impractical because continuous play could stress settlers and create greater energy demands than the power source for the playback system can provide. Early morning may be the key time to play vocalizations to attract new settlers as recent research suggests that settling males assess sites at dawn, during the dawn chorus (Amrhein et al. 2004). Since songbirds migrate at night and settle at or before dawn, we suggest playing vocalizations from late night through early morning. For instance, in our study of black-capped vireos, we played songs from roughly two hours before dawn until four hours after and for one to two hours each afternoon because occasional playbacks during the day may reinforce the perception that a site is occupied. To attract nocturnal species, we suggest playing their vocalizations throughout the night because, like diurnal birds, nocturnal species migrate at night.

In addition to the time of the day, the seasonal timing of playbacks may also be important. To maximize the number of potential settlers exposed to playbacks, we suggest beginning playbacks a few days before the typical first arrival date for the target species at a study location. Continuing playbacks through the breeding season is rec-

ommended because many individuals disperse or prospect within the breeding season. In our research with black-capped vireos, the number of vireos on each site increased gradually through the first 2 months of each breeding season (Ward and Schlossberg unpubl. data). Furthermore, many species prospect for potential breeding sites at the end of the breeding season (Reed et al. 1999), so playbacks near the end of one breeding season may help to attract birds the following year.

Species that May Exhibit Conspecific Attraction

Given the small number of species studied to date, little is known about which species exhibit conspecific attraction. Since we completed our original study on black-capped vireos, subsequent research has found that several species did not settle in response to playbacks at unoccupied sites (Schlossberg and Ward unpubl. data). These species include yellow-headed blackbird, prairie warblers (*Dendroica discolor*), and wood thrush (*Hylocichla mustelina*). In contrast, Henslow's sparrow (*Ammodramus henslowi*), grasshopper sparrow (*Ammodramus savannarum*), and cerulean warbler (*Dendroica caerulea*) did not settle in response to playbacks at unoccupied sites. We suggest that candidate species likely to respond to playbacks can be identified based on their behavior and ecology. Characteristics of species likely to respond to conspecific attraction include being migratory, singing nocturnally, and having a clumped distribution.

Migratory vs. nonmigratory species. Migratory species are likely to be better candidates for conspecific

attraction than nonmigratory species. Because migratory species move en masse each spring, a large number of birds is likely to move through any given area over a relatively short period of time. Playbacks, therefore, can be targeted to a time when many birds may potentially hear the playbacks. Furthermore, because migratory birds exhibit low natal philopatry (Weatherhead & Forbes 1994) many migrating birds will be yearlings searching for breeding sites for the first time. These younger birds may be especially susceptible to artificial cues (Ward & Schlossberg 2004), which makes them a good target for using our methods of attraction. In contrast, dispersal in nonmigratory species often involves only a small percentage of the total population and can take place over an extended time period (Greenwood & Harvey 1982). This could make playbacks for nonmigratory species relatively inefficient.

Nocturnal singing. Several diurnally active bird species call or sing at night. Examples from North America include marsh wren (*Cistothorus palustris*), sedge wren (*Cistothorus platensis*), northern mockingbird (*Mimus polyglottos*), yellow-breasted chat (*Icterina virens*), and cuckoos (*Coccyzus* spp.) (Barclay et al. 1985; Merritt 1985; Walk et al. 2000). The function of nocturnal singing in these species has not been determined, but one possibility is that males sing to attract night-migrating females (Merritt 1985). Bird species in which males sing nocturnally may be predisposed to settle at sites where they hear vocalizations during nighttime hours.

Clumped distributions. Many territorial birds show clumped distributions in otherwise homoge-

neous habitats (reviewed in Stamps 1988). Bird species known to cluster their territories include loggerhead shrike (*Lanius ludovicianus*), house wren (*Troglodytes aedon*), acorn woodpecker (*Melanerpes formicivorus*), and least flycatcher (*Empidonax minimus*) (Burgess et al. 1982; Muller et al. 1997; Eттerson 2003; Perry & Andersen 2003). Obviously, clumped distributions could be caused by underlying variation in resource abundance or quality but in a few cases, authors have been unable to find such variation when they specifically looked for it (Eттerson 2003; Perry & Andersen 2003). Clumped populations in homogeneous environments suggest that the birds simply prefer to establish territories near conspecifics.

Choosing Suitable Habitat

Selecting appropriate species and playback methods are only the first steps in establishing a new population with conspecific attraction. Perhaps the most important consideration for this technique is that sites must be managed to ensure that newly attracted birds can survive and reproduce well enough to be a source population. Simply attracting birds to a new site has little conservation value in itself; only if the population is productive will this technique be a benefit to the species. This was well demonstrated in our own research on black-capped vireos. The main threat to the vireo is the brood-parasitic brown-headed cowbird (*Molothrus ater*), which lays its eggs in vireo nests, reducing their productivity (U.S. Fish and Wildlife Service 1991). Most of our research sites were on government-owned land at Fort Hood, Texas, where cowbirds were controlled by shoot-

ing and trapping (Eckrich et al. 1999). As a result, birds that were attracted to playback sites in this area had low brood parasitism rates and high nesting success (Ward & Schlossberg 2004). In contrast, at an experimental site on private property where no cowbird control was undertaken, birds had high brood parasitism rates and produced no vireo young. This illustrates the importance of active management when using conspecific attraction.

Determining playback locations can be difficult, and many ecological factors may affect the suitability of a habitat. One factor that should be considered when using conspecific attraction is the potential for interactions between the target species and other bird species in the area. Many birds are interspecifically territorial, showing aggression towards another species (Sherry & Holmes 1988; Robinson & Terborgh 1995). In such cases, the presence of the competing species at playback sites could reduce the effectiveness of playbacks. For instance, in our research we found that black-capped vireos were displaced from some territories by the larger, more aggressive Bell's vireo (*Vireo bellii*).

Some knowledge of the target species' ecology can help to determine which factors are likely to limit its survival and reproduction at the playback site. Thus, we strongly suggest that managers be aware of the relevant literature describing how avian demography varies with local and landscape-level habitat factors in their region. Census data can be used to select sites that lack the potential competitors. To a great extent, managers may be able to control limiting factors by selecting appropriate sites.

Factors that can be controlled directly include predators, brood parasites, diseases, and disturbances (e.g. road or foot traffic). For instance, for forest-dwelling species, choosing large patches of habitat or extensively forested landscapes should lead to reduced levels of nest predation and brood parasitism for songbirds (Wilcove 1985; Robinson et al. 1995).

Establishing a Population

If playbacks attract birds to a site, and they successfully reproduce, managers must decide whether to use conspecific attraction in subsequent years. Assuming one's goal is to establish a population that will persist over the long term, there are two possible courses of action. One could forgo playbacks and allow the birds attracted in the first year to return, since most birds show site fidelity after reproducing successfully (Greenwood & Harvey 1982). On the other hand, if the target species does not have high site fidelity or has low reproductive success, few individuals may return. This could create the need to use playbacks in subsequent years. For black-capped vireos, we found that birds initially attracted to playback sites had relatively high site fidelity (approximately 50%). In the second year of our experiment, not knowing if the vireos would return, we used playbacks on some of our occupied sites but not on others. On all of the sites, there was little change in population sizes between the first and second years, suggesting that playbacks may be unnecessary to maintain established populations (Ward and Schlossberg 2004).

Conclusion

If endangered birds use the

presence of conspecifics when determining where to settle, then the protection or restoration of suitable habitats may not be sufficient for the site to be colonized. Birds may avoid unoccupied habitat, hindering recovery efforts (Scott et al. 2001). In such cases, conspecific attraction could be a significant tool, aiding in the recovery of bird populations at suitable but unoccupied sites. Several federally endangered or candidate species (e.g. willow flycatcher [*Empidonax traillii*], yellow-billed cuckoo [*Coccyzus americanus*], and golden-cheeked warbler [*Dendroica chrysoparia*]) exhibit behaviors that suggest conspecific attraction could be used in their conservation.

Although conspecific attraction has the potential to be an important tool for conservation, little data exists on its prevalence in territorial birds. For conspecific attraction to be of value in the recovery of endangered species, it is important that managers have as much information on this behavior as possible. If, therefore, managers do attempt to use conspecific attraction as a tool in conservation, it is imperative that both positive and negative results be published.

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