

The use of playbacks can influence encounters with birds: an experiment

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RESUMO: O uso de *Playbacks* pode influenciar encontros com aves: um experimento. A reprodução do repertório sonoro “*playback*” costuma ser utilizada para atrair aves tanto para visualizá-las como para capturá-las. O uso combinado de *playback* e captura pode afetar o comportamento das aves de modo que a continuidade do uso pode não gerar os resultados desejados na coleta de dados. Neste trabalho estudamos efeitos do uso desta técnica na detectabilidade das aves subsequente ao uso de *playback*. Aves expostas a *playbacks* tendem a se aproximar menos do observador nas amostragens subsequentes. Estas aves ainda respondem de modo mais breve aos *playbacks* em relação a indivíduos que nunca tiveram contato prévio com esta técnica. É possível que a captura em si tenha menor ou pouca importância nos comportamentos posteriores das aves. Considerando o amplo uso de *playbacks*, recomendamos atenção para as análises em estudos populacionais que utilizam este método.

PALAVRAS-CHAVE: *playback*, viés amostral, *Conopophaga melanops*, *Drymophila squamata*, *Myrmeciza squamosa*, experimento

ABSTRACT: Playback of recorded bird songs is often used to attract birds for sighting as well for captures. The combined use of playbacks and captures may in fact change the behavior of birds such that the response to playbacks does not reflect responses to natural songs. Here we studied whether the use of playbacks changes detectability of the birds. Birds previously exposed to playbacks (experienced birds) did not approach the sound source as closely as did naive birds in playback trials. The response time of experienced birds is also shorter than that of naive birds. Limited data suggest that the biased response to playbacks is unrelated to whether the bird was captured. Considering the common use of playback, we recommend caution in the analysis in population studies in which playbacks are used.

KEY-WORDS: playback, bias, Black-cheeked Gnatcatcher, Scaled Antbird, Squamate Antbird, experiment.

The use of playbacks may be a useful tool for a variety of studies of bird behavior, ecology, and population dynamics. Studies of vocalization and behavior in birds often use playbacks of recorded bird songs to gather data of the role of those songs (Ficken and Ficken 1970, Verner and Milligan 1971, Simpson 1984, Rigelski and Moldenhauer 1996, Kroodsma 2005). Other studies, especially those of survival, reproductive success and population dynamics, often require that birds be captured and uniquely color-banded (Kearns *et al.* 1998, Bayne and Hobson 2002, Hansen and Slagsvold 2003, Roper 2005). In these studies, recorded songs may be used to attract birds to nets to improve capture probabilities. Later, marked birds must then be found again to gather the relevant data, where re-sighting marked birds is equivalent to recapture. If birds are difficult to find or bands difficult to read, researchers may again use playbacks to attract the birds for sighting or recapture.

If birds that were previously exposed to playbacks behave differently than unexperienced birds (denominated here as naive birds), then this bias must be taken into consideration when analyzing data. If this bias exists, then birds exposed to playbacks are likely to respond to playbacks differently than they would to songs of neighboring birds. Also, if sighting of birds is required and birds that were previously captured by the use of playbacks behave differently than naive birds, then using playbacks will result in a biased sampling. Here we tested whether birds that had been exposed to playbacks and capture responded differently to playbacks than did naive birds.

METHODS

This study took place in the Salto Morato Nature Reserve (25°10'S, 48°18'W) in southern Brazil. The reserve comprises coastal tropical Atlantic Forest, relatively

close to the city of Guaraqueçaba, in the state of Paraná. Experimental use of playbacks included three species of insectivorous, permanently territorial, understory forest birds: the Black-cheeked Gnatcatcher (*Conopophaga melanops*, Conopophagidae), the Scaled Antbird (*Drymophila squamata*) and the Squamate Antbird (*Myrmeciza squamosa*, both Thamnophilidae).

Birds were captured beginning in July 2006. By September 2006, males of *C. melanops* (n = 10), *D. squamata* (n = 6) and *M. squamosa* (n = 3) and three females of *C. melanops* were captured and uniquely color-banded, all prior to the beginning of the experiment proposed in the current study. Captures were carried out by using playbacks to attract birds to the mist-nets. All of these were randomly exposed at least two times to playbacks of three different recorded songs. Songs destined to be used as playbacks were recorded nearby, but not in the study area, prior to the beginning of the experiment. Three distinctive recorded territorial songs per species were used for all tests.

Since these three species are territorial and pairs travel together, playbacks exposed both members of each pair to the playback. Thus, we consider each pair as naive or unexperienced (if there was no attempt at capture with the use of playback) or experienced (at least one member of the pair captured after the use of playback), according to the area where the playbacks were conducted. Also, since members of a pair travel together, exposing one to playbacks also exposes the other. Thus, when only one member of a pair was color-banded, we assumed the other was the mate who was also exposed. Observations indicate that this assumption is valid since pairs remain together while on an established territory within one breeding season (Lima and Roper in review).

Experiment

Two areas (each ~20 ha, separated by > 300 m) were used in the experiment, one with experienced birds (previously exposed to playbacks) and the other with naive birds (never exposed to playback). Playbacks of each of the three species were used to attract birds during a nine day interval in late October 2006, in the breeding season of these species. In the experienced area, playbacks were used in 12 locations, and in the naive area playbacks were used in 22 locations. Playback locations were used only once each in the naive area. All playback locations were a minimum of 100 m from each other. Each day of the experiment the location of the playback was selected randomly, with the constraint that adjacent territories were never used on the same or the following day. Each day 20 locations were used.

The experiment was carried out throughout the day at all 20 daily playback points and began with two repetitions of the recorded song. Playbacks lasted for 6 min after the initial response (defined as singing nearby or

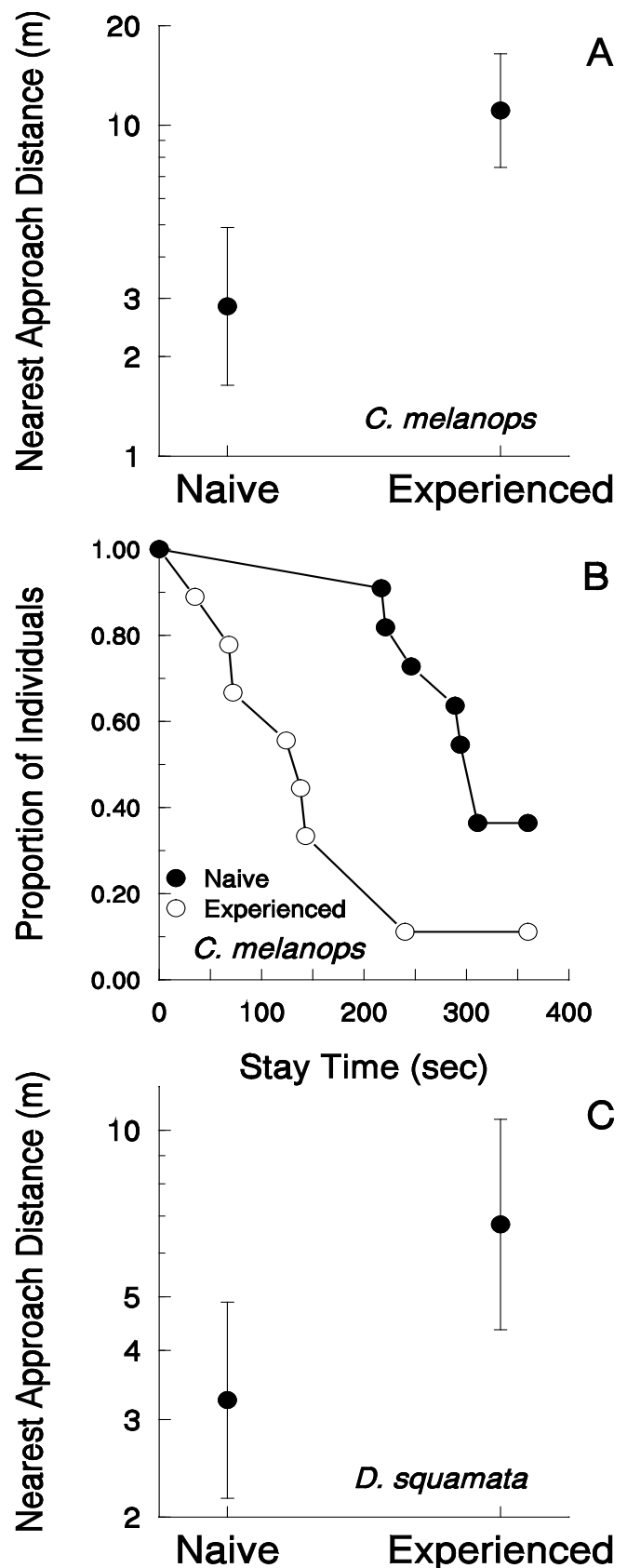


FIGURE 1: A comparison between Naive and Experienced birds of the Nearest Approach Distance (A) and Stay Time (B) for *Conopophaga melanops* and *Drymophila squamata* (only Distance, C), showing that experienced birds tend to remain farther from the sound source (A, C), and they leave the area sooner (B), than do naive birds. Averages and 95% confidence intervals are shown (A and C, all $P < 0.05$). In the distance comparison, values were log transformed prior to testing to normalize the residuals, and therefore the Y-axis is logarithmic.

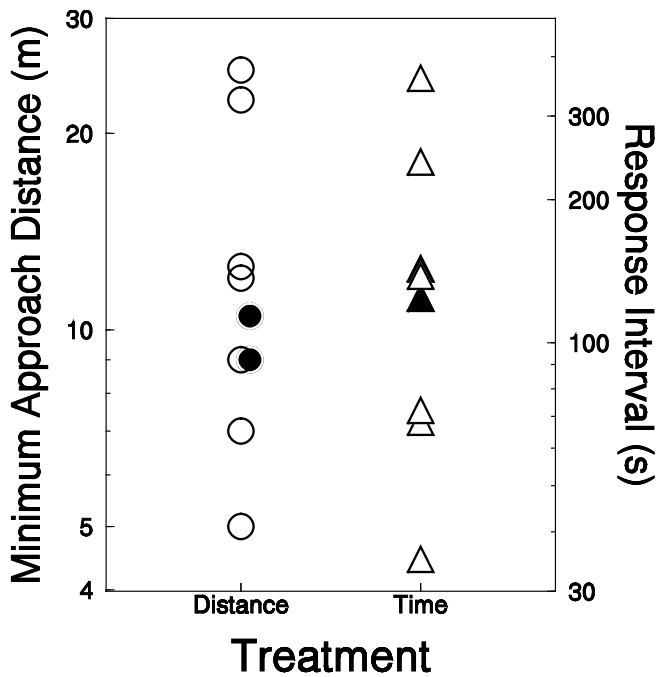


FIGURE 2: Approach distance (left axis, circles) and Stay Time (right axis, triangles) for *C. melanops* compared between captured-and-banded birds (white) and attempt-to-capture birds (black), both exposed to playbacks, showing that despite the small sample size, both treatments fall within the same range, suggesting that the effect shown in Figure 1 is due to playback and not capture *per se*.

approaching the loudspeaker < 30 m). During the 6 min, the closest distance that the bird approached the loudspeaker was measured (Minimum Approach Distance). Duration of the response (Stay Time) was timed, beginning with the first sign of response (song or approach) and lasted until the bird lost interest and flew away (> 30 m), or 6 min, whichever came first. Immediately after 6 min the experiment was moved to the next location and repeated. If there was no response by the target species to the playback within 5 min, the experiment was moved to the next location.

The unit of analysis was each individual response. If both birds of the pair responded, only that of the first individual seen was used for the main analysis. In the test of the dependency of the capture and playback exposure, we included responses of unmarked males mated to the three marked females of *C. melanops*. Minimum Approach Distance (meters) was compared between naive and experienced birds with *t*-tests. Since Stay Time was censored (that is, not continuous because it has a maximum cut-off at 360 seconds) we used Proportional Hazards Survival Analysis to compare the two treatments. All tests used a decision rule of $\alpha = 0.05$.

RESULTS

Distance was log-normally distributed and so analyses were based on log_e-transformed data; in the description

the values were back transformed. Naive *C. melanops* approached more closely (2.8 m *versus* 11.1 m for experienced birds, $t_{18} = 4.34$, $P < 0.05$, Figure 1A) and stayed longer (302.6 s *versus* 157.8 s, log-likelihood ratio $\chi^2 = 6.18$, d.f. = 1, $P < 0.05$, Figure 1B) than experienced birds. naive *D. squamata* also approached more closely (3.3 m *versus* 6.8 m, $t_{14} = 2.89$, $P < 0.05$, Figure 1C). Stay Time for *D. squamata* was similar for naive and experienced birds and most birds stayed the entire 6 min (2 experienced birds had shorter stay times). Sample size for *M. squamosa* did not allow statistical comparison, yet the one naive individual approached more closely than did the three experienced individuals (3.0 m *versus* 5.5-8.0 m respectively).

While the sample size was small to test for the effects of actual capture, with *C. melanops* a simple comparison was possible for Minimum Approach Distance and Stay Time. Uncaptured but experienced individuals ($n = 2$) were within the ranges of values of the captured individuals (Figure 2).

DISCUSSION

The use of playbacks may result in changes in the responses of the birds being studied. These responses may influence the probabilities of resighting and recapture, when playbacks are used. These changes have implications for studies of avian behavior and ecology when playbacks are used. In studies that specifically examine bird song (Ficken and Ficken 1970, Martin 1980, Richards 1981, Rigelski and Moldenhauer 1996, Kroodsma 2005), the repeated use of playbacks may have caused biased responses by the birds which would lead to subsequent biased analyses. We suggest that the response to the first exposure to a playback might be the only unbiased response by territorial forest birds. The use of different recorded songs for each trial may resolve this issue and only further testing will confirm this possibility (*e.g.*, Dabelsteen and McGregor 1996). In nature, singing interlopers are usually visible to and interactive with the territory occupant. Once the bird arrives at the location of the sound-source, the playback may no longer elicit correct or typical responses of the territory owner, since there is no subsequent behavioral interaction.

Behavioral studies that use playbacks to elicit responses must also take into consideration that the biased "experiment effect" may be important. For example, if censuses include seasonal (*e.g.*, Yahner and Ross 1995) or annual (Boscolo *et al.* 2006) estimates of bird abundance, then a bias may be expected that decreases with time since the last capture or playback trial. Due to the short time interval of this study, it is unclear whether this bias decreases with time, or whether birds become more accustomed to playbacks and change their response even

further. Many ornithologists recognize that birds may learn to ignore playbacks. Indeed, there are anecdotal reports of popular birding locations where birds no longer respond to playbacks because of their intense and continued use (personal communications with several ornithologists and online discussion groups, Neorn-l archives, www.museum.lsu.edu/~Rensen/NEOORNIntro).

For mark-and-recapture studies, this bias has several implications. First capture probabilities will depend on whether the birds are naive or experienced with respect to playbacks (Amstrup *et al.* 2005). Also, if playbacks are involved, recapture probabilities should be assumed to be different from initial capture probabilities. If birds may be captured or found both with and without using playbacks, then the use of playbacks must be considered in the model. In other words, if other birds show the same patterns as these, then capture and recapture probabilities both depend whether playbacks were used, and the appropriate adjustments must be made in the models (Amstrup *et al.* 2005). On the other hand, if playbacks are only used to find individuals and not estimate population parameters (*e.g.*, Roper 2003, 2005) then the associated bias will be unimportant.

Similarly, distance methods for estimating population size should not include the use of playbacks due to the assumptions of the methods (Buckland *et al.* 2004). Biases would come from two sources that both violate the assumptions: experienced birds will remain farther from the observer, and naive birds will stay longer in the area, increasing the probability of encounter.

Additionally, playbacks, perhaps surprisingly, may have a greater influence on behavior than does bird capture (Figure 2), suggesting that these effect are due to the playback itself and not due to the capture of the birds. Perhaps, from the bird perspective, to be held is less memorable than an apparent and strange interloper in the territory. Further study with larger sample sizes will be needed to adequately test this.

In summary, the use of playbacks for some aspects of study must be avoided, such as estimating population size. For understanding behavior associated with songs, the use of playbacks is more complicated, since response may only occur after the use of playbacks. Nevertheless, the use of playbacks and the interpretation of the results require well-designed experiments that control for the introduced bias (examples in Kroodsma 2005).

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