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SINGING FOR YOUR SUPPER: ACOUSTICAL LURING OF AVIAN PREY BY NORTHERN SHRIKES[1]

ERIC C. ATKINSON[2]
Raptor Research Center, Boise State University, Boise, ID 83725

Abstract: Northern Shrikes (*Lanius excubitor*) are predatory songbirds in which both sexes sing much of the year. I experimentally tested the hypothesis that winter singing by Northern Shrikes serves the purpose of attracting small passerines to be captured as prey. I broadcast Northern Shrike song for 5 min while recording the number of small passerines that approached the tape player, time taken for approach to occur, nearest approach, and mean number of call notes given by each small passerine observed. A blank tape and the song of American Robin (*Turdus migratorius*) were controls. Treatment effect was significant for number of passerines observed, time taken for approach, and nearest approach, but not for the number of call notes given by each passerine. More small passerines were observed during the Northern Shrike song and these songbirds responded more quickly and approached more closely than during the control and robin treatments. These results support the hypothesis that Northern Shrikes acoustically lure prey.

Key words: Northern Shrike, Lanius excubitor, *foraging, singing, acoustical luring, avian prey.*

The production and function of song in birds has long been a field of great interest. Singing has been shown to serve multiple functions including acquisition and maintenance of mates and territories, maintenance of social structure, and synchronization of breeding activities. Northern Shrikes (*Lanius excubitor*) maintain breeding and nonbreeding territories, and facilitate pair formation through winter singing (Miller 1931, Bent 1950, Atkinson 1991, 1993). Both sexes sing (Miller 1931, Atkinson 1991). The winter song of this species has been described as mimetic and is quite variable. The repertoire consists of warbles, trills, bzeeks, rattles, and whining calls similar to begging and alarm vocalizations (Miller 1931, Bent 1950, Cade 1962, Atkinson 1991). In fact, portions of the winter songs are quite reminiscent of the alarm vocalizations given by chickadees (*Parus* spp.) and nuthatches (*Sitta* spp.) (pers. observ.).

It was suggested more than 500 years ago (*Boke of St. Albans*) and again in the last century that Northern Shrikes may attract small passerines within attack range by imitating their calls and portions of their songs (Witchell 1896, Armstrong 1973). Results of such imitation have not been documented. I tested the premise that the winter song of Northern Shrikes could serve a purpose beyond territory advertizement and mate solicitation; namely, that it may lure potential prey (i.e., small passerines) within close proximity.

METHODS

To test the effect of Northern Shrike song on attraction of potential prey, I applied three treatments: shrike = 5 min of Northern Shrike song; robin = 5 min of American Robin (*Turdus migratorius*) song; and control = 5 min of blank tape to control for mechanical noises involved in playback. Each treatment was followed by a 2.5 min "cleansing" period during which no treatment occurred at the site before the subsequent treatment was applied. I performed field work during the morning hours in March and early April 1994.

I played six unique treatment sequences (control, shrike, robin; control, robin, shrike; shrike, robin, control; shrike, control, robin; robin, shrike, control; and robin, control, shrike) to control for order of presentation (Milliken and Johnson 1992). One sequence was selected randomly with the roll of a die and played at one of 18 individual sites. Each sequence was presented a total of three times. I selected sites in riparian areas near Boise, Idaho, USA that typified areas inhabited by Northern Shrikes during the winter (Atkinson 1993). Selecting sites only within brushy riparian areas served to reduce environmental variation; for example, passerine assemblages and vegetation were similar among sites.

To attempt to control for specific voice characteristics of particular individuals, I used composite tapes of more than one individual (Kroodsma 1990, 1992). Since recordings of Northern Shrike songs are rare, the Northern Shrike tape contained a composite of the songs of two different individuals; one from the local area (15 km southeast of the study area, March 1990) and one from Alaska (Cornell Laboratory of Natural Sounds). The American Robin song contained portions of two songs taped locally. Tapes were played at 80% of maximum volume on a Bell and Howell Model 3179A portable cassette player. This level approximated the normal volume of a singing Northern Shrike as heard from 20-30 meters.

From a hidden position, I recorded the following response variables during the 5 min of playback of

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[2] Present address: Hawk Mountain Sanctuary Association, 1700 Hawk Mountain Rd., Kempton, PA 19529, e-mail: atkinson@hawkmountain.org

each tape: number of small passerines observed within 15 m of the speaker, time (sec) until a small passerine first approached to within 15 m of the speaker, nearest approach (m) to the speaker, and mean number of calls given per small passerine during each treatment. I tallied a "small passerine" when an individual of a potential prey species [birds as small or smaller than a European Starling (*Sturnus vulgaris*) (Atkinson and Cade 1993)] was observed within a 15 m radius of the speaker. After the treatment sequence, I measured nearest approach distances to the nearest 0.5 m with a field tape measure.

STATISTICAL ANALYSES

I square-root transformed all variables to approximate normal distributions. Neither multicollinearity nor singularity between response variables was present. I applied multivariate analysis of variance (MANOVA) to test for effects of order of song presentation and carry-over effects of one sequence to another (PROC GLM, SAS Institute 1989, Milliken and Johnson 1992). When both carry-over and order of presentation effects were nonsignificant, I proceeded with analysis of variance (ANOVA) to assess the significance of treatment effects. I subsequently contrasted Northern Shrike with other treatments (American Robin and control tape) using *a priori* linear contrasts within PROC GLM.

RESULTS

I observed Cedar Waxwings (*Bombycilla cedrorum*), European Starlings, Dark-eyed Juncos (*Junco hyemalis*), Song Sparrows (*Melospiza melodia*), White-crowned Sparrows (*Zonotrichia leucophrys*), American Goldfinches (*Carduelis tristis*), Pine Siskins (*C. pinus*), and House Finches (*Carpodacus mexicanus*) during the experiment. Individuals of these species are eaten by Northern Shrikes (Cade 1967, Atkinson and Cade 1993). During this experiment, small passerines approached as individuals, never arriving in flocks owing to the early spring timing of the field work.

Order of song presentation and carry-over effects were not significant (MANOVA; Wilks' Lambda = 0.42, $F_{20,70.6} = 1.04$, $P = 0.43$, and Wilks' Lambda = 0.20, $F_{40,81.5} = 1.08$, $P = 0.38$, respectively), so each univariate ANOVA could be interpreted directly. Treatment had a significant effect on number of passerines observed ($F_{2,53} = 7.6$, $P < 0.01$), time taken for approach ($F_{2,53} = 4.9$, $P = 0.03$), and nearest approach ($F_{2,53} = 8.1$, $P < 0.01$), but not on the mean number of call notes given by each passerine ($F_{2,53} = 1.2$, $P = 0.34$). I observed more small passerines during the Northern Shrike song ($F_{1,5} = 15.8$, $P < 0.01$), and these songbirds responded more quickly ($F_{1,5} = 6.0$, $P = 0.03$) and approached more closely ($F_{1,5} = 16.3$, $P < 0.01$) than during the control and robin treatments (Fig. 1). Each passerine, however, did not vocalize at a greater rate during the shrike song than during the other treatments ($F_{1,5} = 0.7$, $P = 0.43$). These pairwise comparisons refer only to the *a priori* linear contrasts tested between shrike song treatment and "other" (control and robin) treatment.

DISCUSSION

I demonstrated for the first time that the song of Northern Shrikes lures avian prey, a function beyond serving as mate solicitation and territory advertisement (Cade 1962, 1967, Atkinson 1993). More small passerines approached the source of the shrike song, these songbirds came more quickly, and approached more closely than during American Robin and control treatments. Small passerines can make up a significant portion of the winter diet of Northern Shrikes especially in areas with extended snow cover (Atkinson and Cade 1993, unpubl. data); therefore, luring such birds into proximity may increase opportunities for prey capture (Cade 1962, Denson 1979).

Shrikes are not alone in their capacity for attracting prey species. Higuchi (1986, 1988a, 1988b) and Preston et al. (1986) described bait-fishing by Green-backed Herons (*Ardeola striata*). Through this method, individual herons generally employ the use of manmade articles, twigs, or live insects placed upon the water's surface to attract small fish to within striking distance. Smith (1969) described a technique by which forest falcons (*Micrastur* spp.) attracted avian prey. Like shrikes, these predators perch hidden in vegetation while giving calls that seem to attract passerines searching out the source of the calls. Smith observed three attacks resulting from such behavior. Pollard (1930) noted that Australian Grey Butcherbirds (*Cracticus torquatus*) appeared to mimic vocalizations of prey species, thereby attracting these birds. Finally, Great-horned Owls (*Bubo virginianus*), Gymnogenes (*Polyboroides typus*), and Northern Harriers (*Circus cyaneus*) exploit mobbing as potential hunting techniques (Denson 1979, Thurow and Black 1981, Bildstein 1982). However, because small passerines in my experiment did not emit alarm calls at high rates and approached shrike songs as rapidly as they approached control tapes, it appears that they were more inquisitive regarding the source of the vocalizations, rather than perceiving the shrike song as an indication of danger and as a predator to mob.

Both male and female Northern Shrikes sing in winter from exposed territory-advertisement perches as well as from perches low and hidden in brushy vegetation (Miller 1931, Bent 1950, Olsson 1984, Atkinson 1991, 1993). It is during the latter instances that luring of passerine prey may be most effective. Songbirds tend to flit about in such situations attempting to search out the singing shrike. In four natural instances, I observed shrikes seizing these moments to make attacks, two of which were successful. In each case, I observed a Northern Shrike singing that was then surrounded by small flocks of passerines (Dark-eyed Juncos, American Goldfinches, and Pine Siskins). Some individuals approached to within 1 m of the shrike during each instance. After several moments, each shrike suddenly stopped singing, causing all vocalizing by the small passerines to cease. At this time the shrikes flew swiftly and directly at the prey, capturing an American Goldfinch on one occasion and a Dark-eyed Junco on another. Further study may be able to iden-

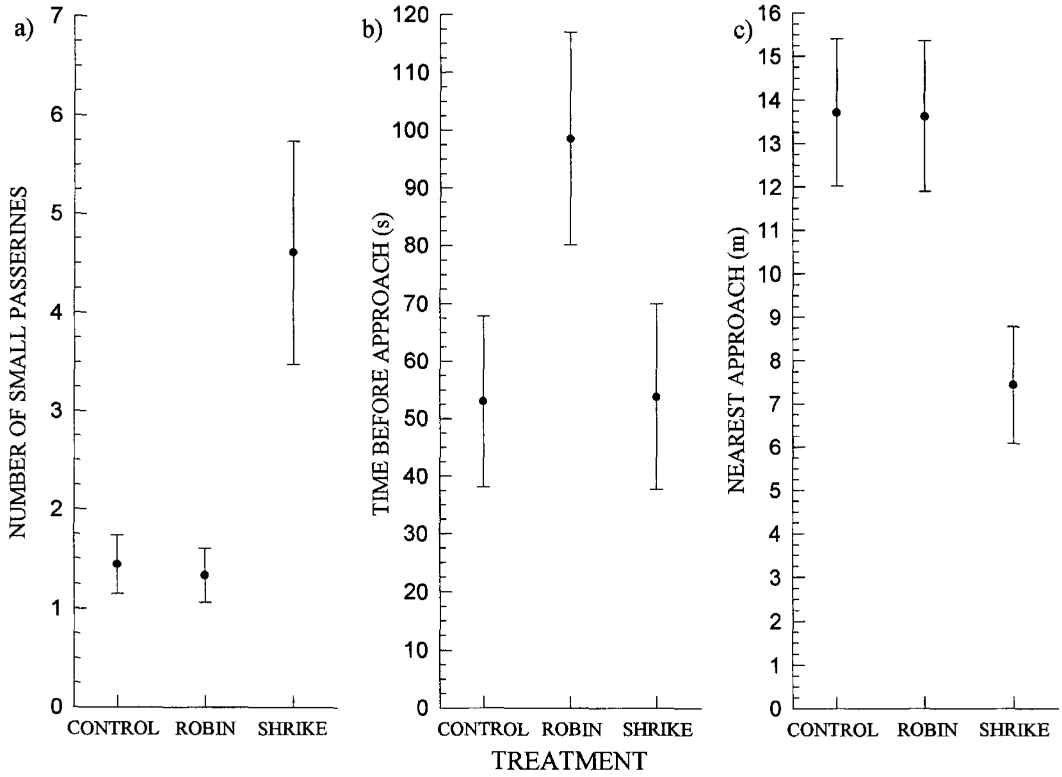

FIGURE 1. (a) Number of small passerines observed during each treatment, (b) time (sec) before initial observation of a small passerine during each treatment, and (c) nearest approach (m) to the tape player made by a small passerine during each treatment. All responses were recorded within a 15 m radius centered on the tape player. Means ± SE.

tify how commonly Northern Shrikes employ this method of hunting in addition to describing which portion of the song elicits these responses and whether specialized vocalizations (i.e., mimicry) are used.

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THE FORAGING BEHAVIOR OF SEMIPALMATED SANDPIPERS IN THE UPPER BAY OF FUNDY: STEREOTYPED OR PREY-SENSITIVE?[1]

W. HERBERT WILSON, JR. AND ERIN R. VOGEL
Department of Biology, Colby College, Waterville, ME 04901,
e-mail: whwilson@colby.edu

Abstract: Videotapes of migrant Semipalmated Sandpipers foraging in the upper Bay of Fundy were analyzed to test for foraging behaviors sensitive to prey density. Over a range of prey densities, both the number of steps $\sec^{-1}$ and probes $\sec^{-1}$ increased with increasing prey density. However, the number of steps between probes was constant over the range of prey densities observed. The average angle of directional change during foraging and the number of turns $\min^{-1}$ were constant despite large differences in prey patchiness.

Key words: Semipalmated Sandpiper, Calidris pusilla, *foraging behavior, stop-over area, migration, Bay of Fundy,* Corophium volutator.

Ornithological studies have contributed much to the development of foraging theory (e.g., Tinbergen, 1967, Davies, 1977, Krebs et al., 1977, Zach and Falls, 1977). However, the foraging behavior of many birds confounds testing many predictions because birds may be difficult to observe continuously for extended periods, may take a diverse array of prey and may thwart efforts to quantify their behaviors because of their rapid movements. In this contribution, we explore the relationship of prey density and prey patchiness (measured by coefficient of variation) on foraging behavior of Semipalmated Sandpipers (*Calidris pusilla*) which essentially prey on a single species in the upper Bay of Fundy. The high visibility and confiding nature of these shorebirds allowed us to videotape foraging behavior at close range, permitting the acquisition of data on foraging behavior that cannot be gathered for many avian species. These data are used to test predictions of the relationship of foraging behaviors to prey density and prey patchiness.

Many scolopacid sandpipers, including Semipalmated Sandpipers, undertake migrations between arctic breeding grounds and subtropical or tropical wintering areas. The distances of these migrations place extraordinary energetic demands on the birds. In addition, shorebirds have higher metabolic rates than expected based on other birds of similar mass (Kersten and Piersma 1987). It is reasonable to expect that there should be strong selective pressure to maximize food intake at stop-over areas during migration.

Semipalmated Sandpipers nest in the low- to mid-arctic (Harrington and Morrison 1979, Gratto-Trevor 1992). After nesting, the majority of central and eastern Canadian breeding birds wend their way to the upper Bay of Fundy. During an average stay of 15 days (Hicklin 1987), the sandpipers feed primarily on the abundant amphipod crustacean, *Corophium volutator* (Hicklin and Smith 1979). These sandpipers

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