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THE SINGING BEHAVIOR OF EASTERN SCREECH-OWLS: SEASONAL TIMING AND RESPONSE TO PLAYBACK OF CONSPECIFIC SONG[1]

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Abstract. Eastern Screech-Owls (*Otus asio*) possess a repertoire of two song types, the bounce and the whinny. We examined (1) seasonal variation in the use of these songs in central Kentucky and (2) the responses of male and female screech-owls to the playback of bounce songs. The spontaneous use of bounce songs increased during February and March, declined in April and May, increased again in June and continued through November. The spontaneous use of whinny songs increased dramatically during August and September and continued through November. Playback experiments revealed that (1) males uttered significantly more bounce songs than did females, and (2) owls responding with bounce songs were located significantly closer to the speaker than were those responding with whinny songs. Our results suggest, therefore, that bounce songs are directed to nearby conspecifics while whinny songs are directed to more distant individuals. Based on patterns of seasonal change in spontaneous use, we tentatively conclude that bounce songs are used in both aggressive and nonaggressive contexts while whinny songs are used in aggressive contexts.

Key words: Eastern Screech-Owl; singing behavior; Otus asio*; song types; playback.*

INTRODUCTION

In most species in the genus *Otus,* songs consist of single short notes repeated at a constant or nearly constant frequency (Weyden 1975). Among the few exceptions is the Eastern Screech-Owl (*Otus asio*). In this species, individuals possess a repertoire of two songs: the bounce song (similar in basic pattern to the songs of other species in the genus) and the whinny (Fig. 1). Little is known about the respective functions of these two songs. Although Marshall (1967) referred to the whinny as the primary or territorial song and the bounce as the secondary or duetting song, few data supporting such descriptive names have been presented. The objective of our study was to gain insight into the function(s) of these songs by (1) gathering information concerning the periods when these songs were uttered and (2) observing the responses of male and female screech-owls to the playback of bounce songs.

METHODS

Data concerning the timing of singing were gathered in conjunction with telemetry studies (Belthoff 1987) undertaken at the Central Kentucky Wildlife Management Area, located 17 km SSE of Richmond, Madison County, Kentucky. These studies were conducted from May 1985 through July 1986. During this period male and female Eastern Screech-Owls (n = 14 adults and 19 juveniles) were radio-tracked on 104 nights for a total of 325 hr. All tracking was conducted between 18:00 and 02:00 EST. During each tracking period both the number of bouts of each song type (whinny or bounce) and the total number of songs per bout were noted. A bout was defined as a series of songs separated in time from each other by intervals significantly longer than the intervals between songs within a bout (Farabaugh 1982).

Playback experiments were conducted from 21 May to 14 July 1984, 23 June to 22 July 1985, and 20 January to 16 April 1987. All experiments were conducted between 19:00 and 02:00. Experiments in 1984 and 1985 (n = 24) were conducted with nine owls (six males and three females) that had been captured previously and fitted with radio-transmitters (Wildlife Mate-

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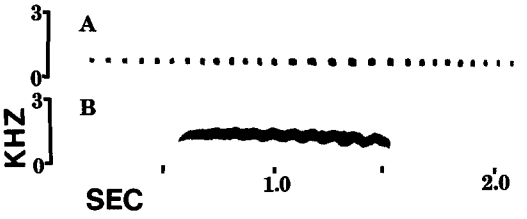

FIGURE 1. The bounce (A) and whinny (B) songs of the Eastern Screech-Owl.

rials, Inc.). Songs were broadcast either within or at the boundary of territories of these radio-tagged owls. Experiments with any one owl were at least 48 hr apart. Because experiments in 1987 ($n = 49$) did not involve radio-tagged owls, songs were broadcast near the edge of woodlots ($n = 7$) in which owls were known to occur. Woodlots were visited approximately every other week. Songs were played with a speaker/amplifier (Perma Power Model S-220) connected to a portable cassette player (General Electric Model 3-5152B). Tapes consisted of bounce songs repeated every 20 sec, an interval characteristic of an undisturbed singing bout (pers. observ.), and were made using (1) recordings of neighboring screech-owls obtained in the study area ($n = 12$; 1984 and 1985) or (2) songs on *A field guide to bird songs of Eastern and Central North America,* 2nd ed., Houghton Mifflin Company, Boston ($n = 61$; 1984, 1985, and 1987). Songs were played for 5 min or until a vocal response was obtained. For all responding owls, focal bird or not, we noted both the type (bounce, whinny, or both) and number of songs uttered. We also noted the distance of the vocalizing bird from the point of playback. Distances were determined by pacing at the conclusion of an experiment or, in the case of more distant individuals, were estimated from aerial photographs of the study area. Experiments were not conducted on nights with precipitation, fog, or winds exceeding 15 km/hr. Analyses were performed using the Statistical Analysis System (SAS Institute 1985).

RESULTS

SEASONAL VARIATION

Bouts of whinny songs were heard from May through November. Although the number of bouts per hour peaked in August (Fig. 2), the total number of songs per hour peaked in September (Fig. 3). Bounce songs were heard in every month except May and December. Two peaks

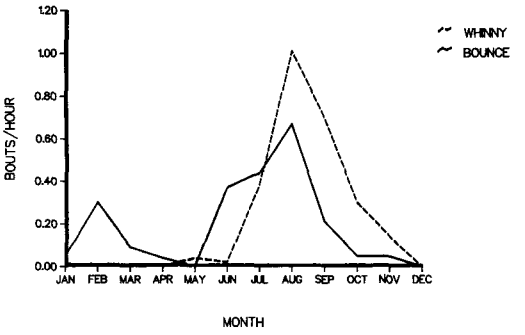

FIGURE 2. The number of bounce and whinny bouts per hour of observation.

were noted for bouts of bounce songs, one in February and another in August (Fig. 2). Peak numbers of bounce songs per hour were observed in March and June (Fig. 3).

PLAYBACK EXPERIMENTS

During the 3 years of the study, 73 playback experiments were conducted (Table 1). During these tests, 78 owls responded vocally, with 57 uttering bounce songs, 17 uttering whinny songs, and four uttering bouts of both song types (Table 1). A significant difference was noted in the mean distance of vocalizing owls from the speaker when the two song types were used (t-test, $P < 0.0001$). Bounce songs were uttered by owls located a mean ($\pm$SD) distance of 27.1 $\pm$ 17.3 m from the speaker while whinnys were uttered at a mean distance of 85.5 $\pm$ 34.9 m from the speaker.

Fourteen playback experiments were conducted with three mated pairs of screech-owls (five, five, and four experiments, respectively) in 1984 and 1985. Males responded with bounce songs in 12 of 14 experiments while females re-

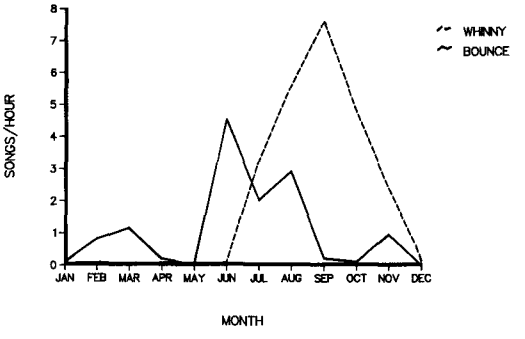

FIGURE 3. The number of bounce and whinny songs per hour of observation.

TABLE 1. Vocal responses of Eastern Screech-Owls to playback of bounce songs.

	Jan	Feb	Mar	Apr	May	Jun	Jul
No. of playback experiments	7	18	14	10	2	12	10
Total no. of owls responding vocally	9	12	9[1]	2	4	20[2]	22[1]
No. of owls uttering bounce songs	7	8	9	2	2	16	17
No. of owls uttering whinny songs	2	4	1	0	2	6	6

[1] One owl responded with bouts of both song types.
[2] Two owls responded with bouts of both song types.

sponded with bounce songs in six. No significant differences were noted among either individual males ($F = 1.09$, $P = 0.3704$) or females ($F = 1.11$, $P = 0.3638$) in mean number of songs uttered per experiment. Overall, males uttered significantly more bounce songs in response to playback than did females (t-test, $P = 0.0011$), with males uttering an average of 19.00 ± 17.15 bounce songs per test and females 1.93 ± 3.27 bounce songs. Only one bird (a male) responded with whinny songs during the playback experiments with mated pairs.

DISCUSSION

Eastern Screech-Owls in the present study exhibited pronounced seasonal variation in the spontaneous use of bounce and whinny songs. The use of bounce songs exhibited a minor peak in February and March, which corresponds to the period when Eastern Screech-Owls appear to form pair bonds (Carpenter 1883, VanCamp and Henny 1975, Belthoff 1987, pers. observ.). Hough (1960) also reported an increase in the use of bounce songs during this period (late January through April) in New York. Such timing suggests that bounce songs may play a role in intersexual communication. Marshall (1967) suggested such a role, referring to the bounce song as the "duetting song." Hough (1960) referred to the bounce song as the "mating call." Gehlbach (1986:58) suggested that male screech-owls used bounce songs "when communicating with their mates. . . ." It is also possible, however, that bounce songs uttered during this period serve an aggressive function. For example, Gehlbach (1986:58) suggested that male screech-owls used bounce songs when "proclaiming ownership of a cavity." In addition, female Eastern Screech-Owls in central Kentucky initiate egg laying in early to mid-March (Belthoff 1987) and during the egg-laying period neighboring males may seek extra-pair copulations, as has been reported in other birds of prey (Birkhead et al. 1987). If so, increased rates of singing by resident males may reduce trespassing by other males and help to insure paternity.

Previous authors have not reported the use of bounce songs by screech-owls during the summer and fall. However, after the decline in use of bounce songs during April and May, we observed a dramatic increase in early June. Belthoff (1987) reported that young screech-owls typically fledge from mid- to late May in central Kentucky. Thus, the need for vocal communication between adults and juveniles may in part account for the increased use of bounce songs in June. Increased territorial aggression may also contribute to the increased use of bounce songs. On five occasions during June (1985) we observed singing duels between radio-tagged adult males. During such duels, males on adjacent territories simultaneously uttered bounce songs near common territory boundaries. The increasing mobility and food demands of recently fledged young may contribute to this increased territorial aggression.

Peak use of both bounce and whinny songs in central Kentucky was observed from July through September, which corresponds to the period when juveniles disperse from natal territories. Belthoff (1987) examined the postfledging behavior of screech-owls in central Kentucky and reported a mean dispersal date of 14 July for nine juveniles. As dispersing juveniles attempt to establish territories, numerous disputes with established adults and other juveniles occur (pers. observ.). The correspondence between the dispersal of juveniles and the increased use of bounce and whinny songs suggests that both types of song serve an aggressive or territorial function. The possible aggressive function of whinny songs has been noted previously (Marshall 1967, Gehlbach 1986). The increased use of aggressive or territorial vocalizations in late summer or fall has also been reported in other species of owls. Lundberg (1980) reported territorial hooting exchanges among Ural Owls (*Strix uralensis*) dur-

ing the fall months in central Sweden. Higuchi and Momose (1980) observed increased calling from September through December in the Collared Scops Owl (*Otus bakkamoena*) in Japan. Lundberg (1980) suggested that resident owls, unlike migrant species, need to advertise and defend territories only during the period when the young disperse.

Although both male and female Eastern Screech-Owls sing, our playback data indicate that males sing more than females (at least during the period from May through July). Gehlbach (1986) also reported that male Eastern Screech-Owls sang more frequently (bounce songs) than did females. Similar differences in the vocal behavior of males and females have been reported in Flammulated Owls (*Otus flammeolus*; Marshall 1939), Great Horned Owls (*Bubo virginianus*; Springer 1978), and Ural Owls (Lundberg 1980).

Both bounce and whinny songs appear to be used in aggressive contexts. Our playback data suggest that the type of song used depends on the distance between interacting owls, with owls responding to nearby conspecifics with bounce songs and to more distant individuals with whinny songs. Similar correlations between certain songs or calls and distance have been reported in other species. For example, Cosens and Falls (1984) suggested that the "buzzing songs" of Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus*) are used primarily for short-range interactions whereas "accenting songs" are used primarily for long-range advertising.

Both frequency and loudness are signal features that can influence propagation distance (Morton 1975, Marten and Marler 1977). In forest habitats, such as those typically occupied by Eastern Screech-Owls, low frequencies are optimal for sound propagation (Wiley and Richards 1982). Although both the bounce and whinny are low frequency (below 1.5 kHz) songs (Cavanagh and Ritchison 1987), whinny songs appear to be better suited for transmission over long distances for at least two reasons. First, whinny songs are often uttered with greater volume than bounce songs (Cavanagh 1986, Gehlbach 1986, pers. observ.). Second, bounce songs consist of a rapid series of notes repeated at a constant or nearly constant frequency (Cavanagh and Ritchison 1987). Wiley and Richards (1982) observed that sounds consisting of a rapid repetition of one frequency degrade rapidly in forest habitats as a result of reverberation. Whinny songs consist of one continuous sound and generally cover a wider range of frequencies than do bounce songs (Cavanagh and Ritchison 1987). Such sounds would appear to be better suited for long-distance propagation through forest habitat.

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