

FEMALE SONG IN THE YELLOW WARBLER¹

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The occurrence and context of song in female birds have received considerable attention recently (Beletsky 1982, 1983a, 1983b; Richison 1983, 1986; Arcese et al. 1988). Among passerines, singing females are apparently rare (Richison 1983, Arcese et al. 1988). Hypothesized roles of female song consider the maintenance of family groups during fledging (Richison 1983) and aggression, including territorial defense, against female intruders (Beletsky 1983a, 1983b; Arcese et al. 1988). In some species, female song may be due to abnormally high androgen levels in a few individuals (see Nice 1943) and thus serve no ultimate function. Here we describe and examine the context of song in female Yellow Warblers (*Dendroica petechia*), to our knowledge unreported in this or any other species of the Parulinae.

METHODS

Yellow Warblers are sexually dichromatic allowing individuals to be sexed readily. In most cases we also confirmed identification using observations of behaviors such as nest building or incubation, functions performed only by females. Four singing female Yellow Warblers were detected by KAH between 31 May and 30 June 1987, in the forested dune ridge that separates Delta Marsh from Lake Manitoba, Manitoba (MacKenzie 1982). The songs of two of these females were opportunistically recorded on a hand-held cassette tape recorder but recordings were too poor to make sonograms. In 1988, we searched for singing females in a 2-km section of the ridge forest, walking four transects in the morning (08:00–09:00 CDT) and afternoon (13:00–14:00) of 21 and 22 May. Of seven singing females located, four were monitored throughout their breeding attempts during 30-min sessions (07:00–10:00) once a week. Songs were recorded with a UHER Report L tape recorder and a Dan Gibson parabolic microphone. Sonograms of recordings were examined using a Uniscan II real time analyzer equipped with a video copy processor.

RESULTS

FORM OF FEMALE SONG

Female song was first detected on 31 May 1987. A female (FA) sang at intervals of 30 sec to 2 min while changing perches frequently. The song was a series of repetitive high-frequency notes that lasted about 1–2 sec. It was uttered at substantially lower volume than typical male song but could be heard up to about 30 m. In 1988 we recognized this song type during regular transects. The sonograms of four of the females located that year (F1, F2, F3, F4) are shown in Figure 1. Sonograms of two male Yellow Warblers (M1, M2) with similar elements, recorded on our study site in 1984 by S. E. Cosens, are shown in Figure 2.

CONTEXT OF FEMALE SONG

Female song was recorded rarely during our work. Despite over 350 hr of observation by KAH on 192 female Yellow Warblers in 1987 and 1988, song was detected in only four females. Similarly, regular transects through 2 km of our study site, containing approximately 11.4 nests/ha in 1988, revealed only seven singing females. Below we describe the context of female song recorded in 1987 and 1988.

FA, a banded female of unknown age, was observed moving about an area of approximately 225 m² for about 7 min. She was apparently unpaired or away from her territory because no nest was found and she was not seen again.

A banded female (FB), at least 2 years old, sang apparently in response to a model female Yellow Warbler placed 0.5 m from her nest at 10:30 on 31 May 1987. The song was heard approximately 10 times during the 5-min trial. FB did not sing when presented with male Yellow Warbler or female Brown-headed Cowbird (*Molothrus ater*) models during similar trials but instead uttered *chip* and *seet* calls (Hobson and Sealy 1989a) to each of them, respectively. That morning FB's third nest received its second egg. Her first nest was preyed upon and her second abandoned after her mate's territory was lost to a new pair.

On 2 June 1987, at 10:38 an unbanded female (FC) was heard singing within a few meters of a nest containing two eggs. This bird appeared agitated and sang approximately twice per minute. During a 5-min trial with a model female Yellow Warbler the female continued to sing and twice struck the model. She continued to sing and was agitated for several minutes after the model was removed.

FD, a banded female at least 2 years old, was heard singing on 27 and 30 June 1987. On both occasions this bird fed fledged young. Several times during both

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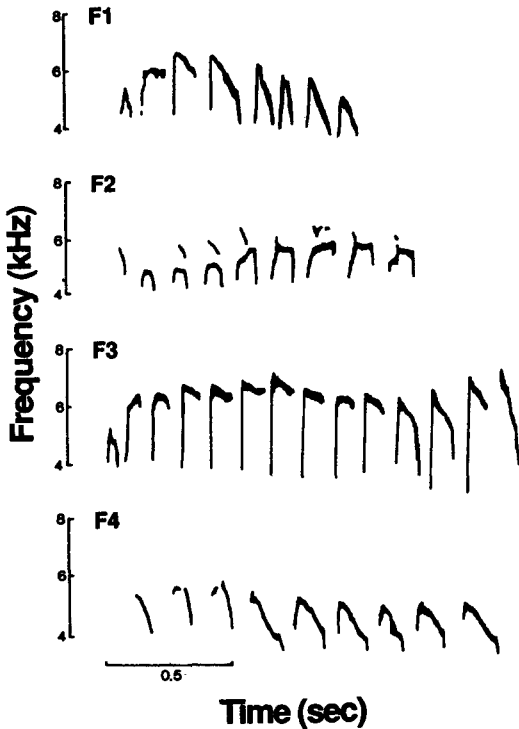


FIGURE 1. Sonograms of female Yellow Warblers, F1, F2, F3, and F4, recorded in the dune-ridge forest, Delta Marsh, Manitoba in 1988.

observations FD approached KAH closely and gave *chip* calls (see Hobson and Sealy 1989a).

In 1988, seven singing females, five already color-banded, were discovered on our study site during regular transects. F4 and F5 were neighbors but all other birds were approximately 50–500 m and usually several territories away from the next nearest singing female. These birds were discovered during settling and early nest building, and sang while they foraged or searched for nest material. Females sang 2.4 ± 1.3 ($\bar{x} \pm SD$; $n = 8$ observation sessions), 0.5 ± 0.8 ($n = 4$), and 0.04 ± 0.09 ($n = 4$) songs/min during nest building, egg laying, and incubation, respectively.

Despite infrequent observations of female aggression in the study population as a whole (Hobson and Sealy 1989b), all females we heard singing in 1988 interacted aggressively with neighbors. F1, F3, and F4 displaced neighbors at territory boundaries (one to three displacements per observation session) only during the nest-building period. Female F2 interacted aggressively six times during nest building and eight times during laying.

DISCUSSION

Female Song Sparrows (*Melospiza melodia*) sang almost exclusively during the period just prior to nest building, suggesting that song plays a role in female intrasexual aggressive contests over resources (Arcese

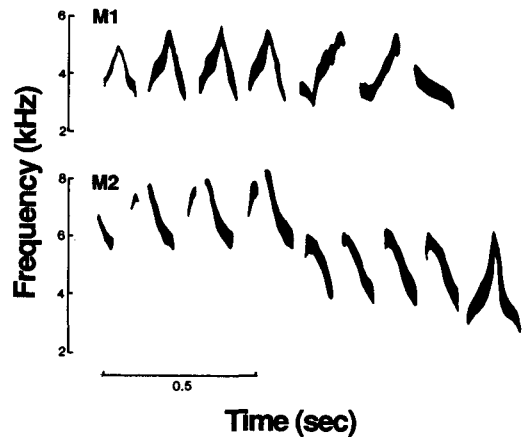


FIGURE 2. Sonograms of male Yellow Warblers, M1 and M2, recorded in the dune-ridge forest, Delta Marsh, Manitoba in 1984.

et al. 1988). Similarly, female Yellow Warblers sang primarily during the early period of settling through egg laying, and singing declined rapidly thereafter. Only FD sang during the fledgling period. Links between female song and intrasexual aggression are also suggested by FB's and FC's responses to a model of a female intruder placed near their nests. They responded to that stimulus by singing and FC attacked the model. However, other females that were not heard singing also responded aggressively to the female model particularly during egg laying (Hobson and Sealy, in press).

Prolonged conflicts between females may result in increased androgen levels that promote female song in some individuals. Arcese et al. (1988) suggested that as population density and variation in reproductive success increase, competition among females for high-quality territories or males becomes more intense thereby increasing the probability that females will sing. Yellow Warblers nest densely on our study site (Goossen and Sealy 1982; Sealy, unpubl. data) and so competition among females for high-quality territories or males occasionally may be intense (Hobson and Sealy 1989b). In this population female-female aggression may also prevent intraspecific brood parasitism (Sealy et al. 1989; Hobson and Sealy, in press) or polygyny (Hobson and Sealy 1989b).

Links between breeding density and female aggression that may promote female song remain poorly understood. Breeding density might influence female-female aggression in passerines especially where females do not usually sing. Thus, female song should be looked for in both dense- and sparse-nesting populations of this and other warblers.

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SAME-NEST POLYGYNY IN THE BARN OWL¹

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Polygyny occurs most frequently among altricial bird species in which females provide most or all of the parental care (Emlen and Oring 1977). Owls are considered to be monogamous and both sexes play vital roles in parental care. Polygyny, though, is known to occur in 10 owl species demonstrating that it may be a more common mating system among owls than once believed (Watson 1957, Scherzinger 1968, Koenig 1973, Schönfeld and Girbig 1975, Korpimäki 1983, Mikkola 1983, Norgall 1985, Sonerud et al. 1987, Marks et al. 1989).

Polygyny, with females nesting in separate sites, has been reported for the Barn Owl (*Tyto alba*) in Europe and North America (Schönfeld and Girbig 1975; Epple

1985; B. A. Colvin and P. T. Hegdal, unpubl. progress reports). I report here the first observations of polygyny in wild Barn Owls where two females used the same nest site concurrently.

METHODS

I collected reproductive data as one part of an ongoing study of Barn Owls in a northern Utah agricultural valley. See Marti et al. (1979), Marti and Wagner (1985), and Marti (1988a) for descriptions of the study area. I visited nesting/roosting sites (mostly nest boxes) monthly to determine occupancy and reproductive status, and to band nestlings and adults. Additional visits were made as needed to monitor egg-laying dates, clutch size, brood size, and fledging success.

RESULTS AND DISCUSSION

In 1987, the 11th year of this study, polygyny was first documented. I found three trios (one male and two females) occupying nest boxes in February of that year and another trio in February 1988. All 12 of these birds were known, either through banding records or from

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