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NOCTURNAL SINGING BY MARSH WRENS

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ABSTRACT.—We quantified nocturnal singing by Marsh Wrens (*Cistothorus palustris*) at Delta Marsh, Manitoba, and determined nightly and seasonal patterns of this behavior in order to assess its costs and potential functions. Male Marsh Wrens sang intensively between 01:00 and 03:00 throughout the breeding season at rates approaching their daytime singing rates. Environmental conditions and moon phase did not appear to influence nocturnal singing activity and there was considerable individual variation. Pairing and reproductive success of male Marsh Wrens were not correlated with their nocturnal singing activity. The behavior could serve to attract nocturnally migrating females, stimulate reproductive behavior of females, facilitate male-male interactions in the face of acoustic interference and aggression from other species during the day, or affect the songs learned by offspring. Since males of this species sing at night throughout the breeding season, however, no one function is likely responsible for this behavior.

The dawn chorus is a well-known phenomenon for many bird species (e.g., Kalcelnik and Krebs 1983) and may be at least partially due to the fact that environmental conditions for long-range sound propagation are ideal at dawn (e.g., Henwood and Fabrick 1979, Wiley and Richards 1982). A few diurnal species sing at night, although most references to this behavior are anecdotal or refer to sporadic or isolated events (e.g., Harvey 1980, Elliot 1983). Some birds (e.g., Nightingales, *Luscinia megarhynchos*; Hultsch and Todt 1982) sing regularly at night, but few studies have investigated such behavior in detail.

Here, we report on the nocturnal singing behavior of Marsh Wrens (*Cistothorus palustris*). Although nocturnal singing by this species is well known (e.g., Bent 1948, Kale 1965, Low and Mansell 1983), reports of it are anecdotal. The purpose of our study was to determine what benefits might accrue to nocturnally singing Marsh Wrens in the face of energetic and, possibly, predation costs. To accomplish this, we examined nightly, seasonal, and individual variations in nocturnal singing, as related to the stage of the breeding season and mating and reproductive success of individual males.

METHODS

Our study was conducted at the University of Manitoba Field Station, Delta Marsh, Manitoba (50°11′N, 89°19′W) from May through August, 1983. The study site was an extensive stand of cattails (*Typha* spp.), phragmites (*Phragmites australis*), and bulrush (*Scirpus* spp.) surrounding several small open bodies of water. This site was inhabited by large breeding populations of Marsh Wrens and Yellow-headed Blackbirds (*Xanthocephalus xanthocephalus*) and a smaller number of Red-winged Blackbirds (*Agelaius phoeniceus*).

We marked the study site with 2-m stakes 20 m apart in a grid 180 × 280 m. Male wrens were captured at this site using nest traps (Picman 1980) and were individually marked with color bands. Each bird was observed for 1 h at least once a week to determine territory boundaries. Nests in each male's territory were checked twice a week (by Leonard), and the number of eggs and nestlings were recorded.

Twelve marked Marsh Wrens were monitored once a week throughout the summer (by Friesen and Barclay). The nocturnal song rate of each individual was recorded during four observation periods. The first period, which ended 15 min after sunset, included the end of the diurnal singing period, and was used to locate and identify each bird. The second observation period began 30 min after sunset, the fourth ended 30 min before sunrise, and the third period was midway between the latter two. We determined song rates for each bird over two 5-min periods in each time slot except the first, in which two 3-min counts were made.

Ambient temperature, precipitation, and wind speed and direction were noted at the beginning and end of each observation period, using Environment Canada meteorological instruments at the Field Station.

During one 24-h period (19–20 June), the song rates of five of the study wrens were determined for 5 min every half-hour.

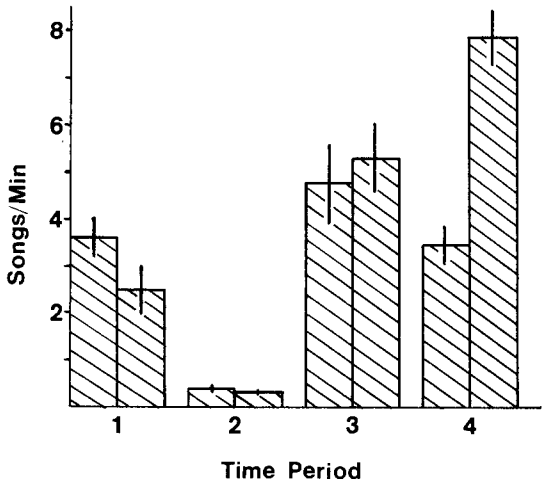

FIGURE 1. Mean (±SE) nocturnal song rate over the summer for all study wrens (n = 11 nights). Song rates were counted twice per bird during four time periods (see text). Sunset occurred near the end of period one and sunrise occurred after period four.

RESULTS

Individual Marsh Wrens sang regularly during the night, although much variation occurred (Figs. 1 and 2). Wrens stopped singing shortly after sunset and were silent during the second observation period. During the third period (ca. 01:00 to 03:00), some individuals sang at rates of up to 13 songs/min, a level approaching those noted during the day (Leonard, pers. observ.). On any given night, an average of 95% of the Marsh Wrens that we were monitoring were heard during the third observation period (n = 9–12 wrens, 11 nights). Singing activity declined briefly just before the dawn chorus, which began 1–1.5 h before sunrise (Figs. 1 and 2).

The 24-h observation period indicated that, on average, the nocturnal singing activity of Marsh Wrens constituted their second highest peak in singing (Fig. 2). Average song rates were lower than those recorded during the dawn chorus for all five birds, but were higher than the singing activity noted during the rest of the day for four of the five birds. We do not know if this pattern occurs throughout the breeding season.

Marsh Wrens sang at night from the time the first males arrived on the study site (mid-May) until they left in late July and early August (Fig. 3). Seasonal fluctuations in nocturnal singing did not appear to be correlated with various environmental conditions. Singing was noted in temperatures between 0 and 23°C, on nights with winds up to 40 km/h and in moderate rain. Moon phase also did not account

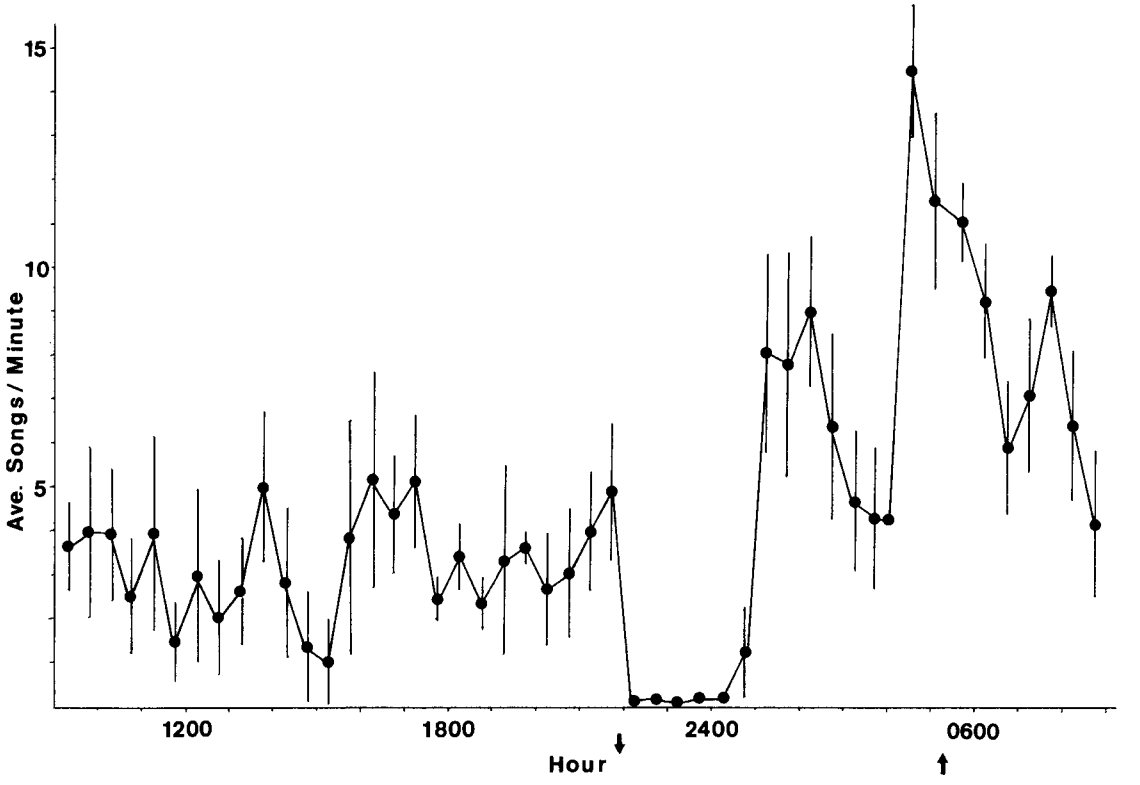

FIGURE 2. Mean (±SE) song rate of five Marsh Wrens over a 24-h period (19–20 June). Arrows indicate sunset and sunrise.

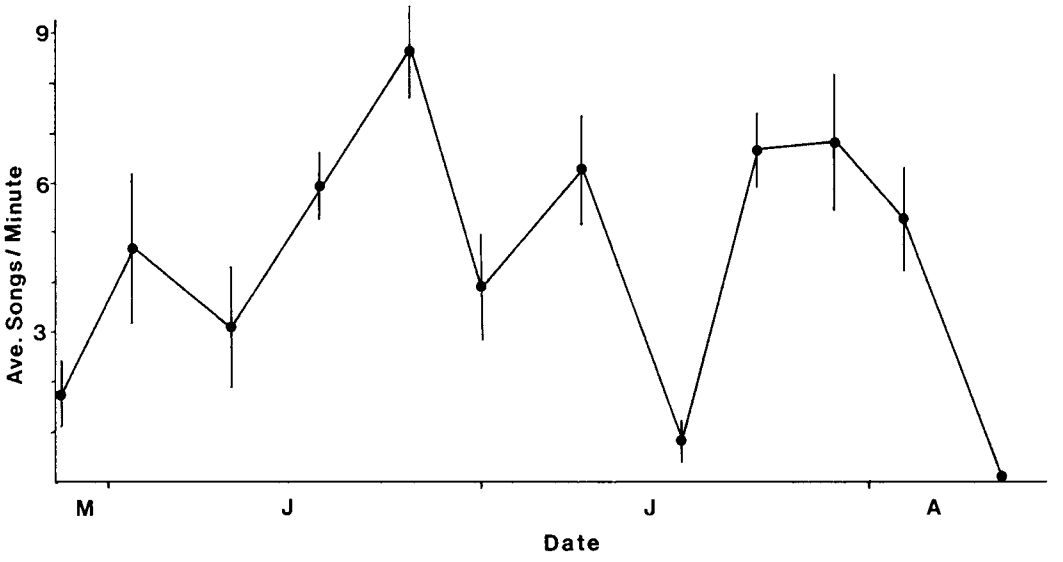

FIGURE 3. Seasonal pattern of nocturnal song rate for twelve Marsh Wrens, measured as the mean (±SE) number of songs per minute during the third observation period (01:00–03:00).

for the seasonal fluctuations. Singing rates tended to be higher on nights near the full moon, but the correlation was not significant (Spearman rank $r = 0.52$, $n = 10$, $P > 0.05$).

Because nocturnal singing was greatest during the third observation period, we used song rates from that period as a measure of an individual's nocturnal singing activity. Most clutches (18/21) were initiated before 18 June and the rest were initiated between 29 June and 21 July. We thus calculated the average nocturnal song rate for nine of the study males for the periods (1) 24 May–17 June; (2) 24 June–15 July; and (3) for the entire summer. Pairing (there were two monogamous, six bigamous, and one trigamous male) and reproductive success of the males varied considerably, but we found no correlation between nocturnal song rate and (i) male pairing success ($r1 = -0.404$, $r2 = 0.527$, $r3 = 0.218$, $n = 9$, $P > 0.05$), (ii) total number of eggs/male ($r1 = 0.515$, $r2 = 0.576$, $r3 = 0.059$, $n = 9$, $P > 0.05$), (iii) total number of fledglings/male ($r1 = -0.331$, $r2 = 0.284$, $r3 = -0.277$, $n = 8$, $P > 0.05$), and (iv) territory size ($r1 = 0.650$, $r2 = 0.194$, $r3 = 0.475$, $n = 6$, $P > 0.05$) during each of the three periods.

We also found no apparent association between nocturnal song rates and nesting stage (Fig. 4). The highest average song rates were recorded after the majority of clutches had been initiated (18 June) and males continued to sing at night after the last clutch of the summer had been completed (25 July; Fig. 4).

DISCUSSION

Nocturnal singing by Marsh Wrens has been attributed to bright moonlight (Kale 1965) or disturbance (Low and Mansell 1983). Marsh Wrens in our study area, however, sang at night throughout the breeding season, during all phases of the moon and regardless of other environmental factors such as temperature and wind.

Diurnal singing by birds is important for attracting mates and defending territories (e.g., Catchpole 1982), and both functions may be served by nocturnal singing. What is not clear is why these otherwise diurnal birds sing at night as well as during the day. We offer several hypotheses.

Attraction of nocturnally migrating females.—Nightingales may sing at night to attract migrating females (Hultsch and Todt 1982). Marsh Wrens migrate at night, at least during the fall (Taylor et al. 1983), and males may attract mates by singing as females move into the breeding area. This hypothesis predicts high rates of nocturnal singing early in the season when females are moving into an area. This did not occur in our study.

Stimulation of females.—Male song has been shown to stimulate the nest-building behavior and egg-laying of females in several bird species (Brockway 1965, Kroodsma 1976). Male Marsh Wrens could potentially stimulate females by singing at night, although this would not explain why nocturnal singing continued after all clutches had been completed.

Male-male vocal interactions.—Male Nightingales interact vocally at night, potentially to avoid background noises present during the day (Hultsch and Todt 1982). Male Marsh Wrens have complex song repertoires (Verner 1976, Kroodsma and Verner 1978), and engage in ritualized counter-singing bouts with

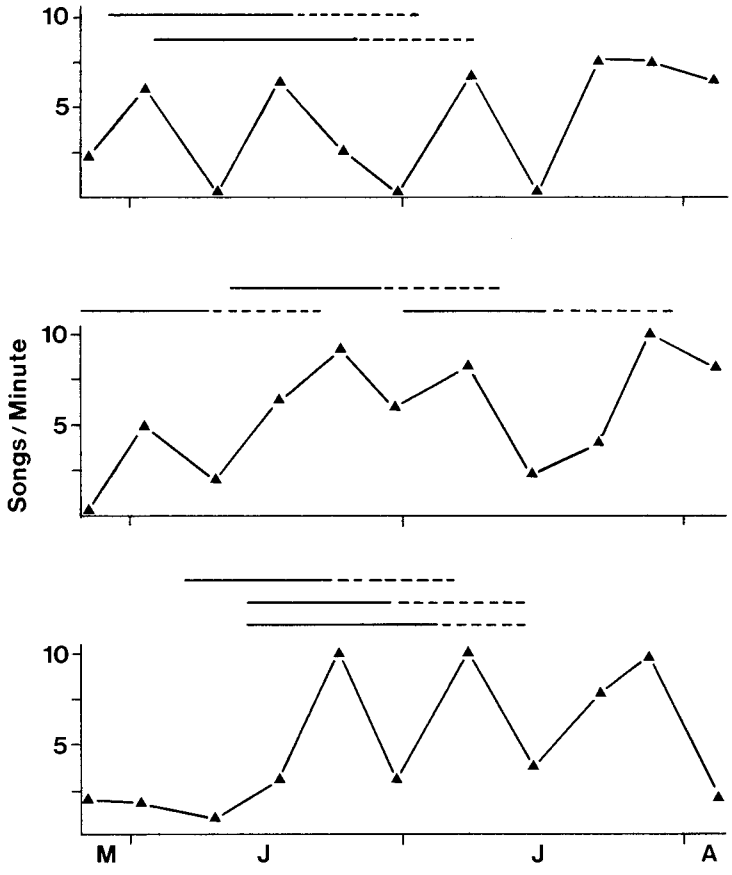

FIGURE 4. Seasonal changes in the singing activity of three randomly chosen Marsh Wrens during the third observation period (01:00–03:00) as related to nesting stage. Solid and dashed lines above each graph indicate the presence of eggs and nestlings, respectively, in each nest in a male's territory.

neighbors (Verner 1976, Kroodsma 1979). Such interactions may be facilitated at night in the absence of acoustic interference created by other species. In our study area, both Yellow-headed and Red-winged blackbirds nest in close association with wrens and have loud dawn choruses. This may make vocal interactions difficult and, given the widespread sympatry of these species, could have selected for a temporal shift in these interactions.

Aggression by blackbirds.—Nocturnal singing may have been selected for by intense diurnal aggression from Yellow-headed and Red-winged blackbirds. Both species are aggressive toward Marsh Wrens (Orians and Willson 1964, Verner 1975), possibly as a defense against the egg- and nestling-destroying behavior of wrens (Picman 1977). Blackbirds approach or chase male wrens, causing them to drop low in the vegetation, thus reducing the broadcast efficiency of wren song. The fact that Marsh Wrens continued to sing at night after the blackbirds in our study area abandoned their territories suggests, however, that blackbird aggression may not be the only selective force for nocturnal singing.

Song learning by offspring.—Song learning by young Marsh Wrens is affected by the amount of adult song to which they are exposed (Kroodsma and Pickert 1980). Nocturnal singing late in the season may thus enhance song learning in offspring and indirectly benefit a male.

Presumably, some benefit should accrue to nocturnally singing males to compensate for the energetic costs and the potential risks of exposure to nocturnal predators, such as weasels (*Mustela* spp.), which could cue in on the wren songs. Our data provide no evidence for a benefit in terms of greater pairing or reproductive success. Our sample size is small, however, and the reproductive success of male wrens is undoubtedly influenced by several factors. Given the fact that male wrens sing at night during all stages of the breeding season, it seems likely that the behavior may have more than one function.

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RECENT PUBLICATIONS

The dictionary of American bird names, revised edition.—Ernest A. Choate, revised by Raymond A. Paynter, Jr. 1985. Harvard Common Press, Harvard and Boston, Massachusetts. 226 p. $17.95 hard cover, $9.95 paper cover. Bird names, like other words, commonly attract no notice except when one wants to be sure that they are correct and unmistakable as to their subject. They embody, however, a rich history of popular and scientific observations, beliefs, and associations, couched in many languages. This book draws together linguistics and ornithology in exploring the origins and meanings in the past of the names of North American birds. Owing to the large number of names, especially those in local vernacular use, the list is selective. Common names and scientific names are treated in separate chapters. The entries delve into languages, history, mythology, superstition, and nonsense, as well as the appearance and habits of birds. In revising the work (from the 1973 edition), Paynter has brought it into conformity with the sixth edition of the AOU *Check-list* and corrected errors in the derivations and origins of names that had come to light. An appendix gives thumbnail biographical sketches of 100 people who are commemorated in bird names. Bibliography and list of scientific name equivalents for common names. If you are intrigued by names such as *Oceanites* and "Big Cranky," here is the reference for deciphering them.