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Behavior of a polygynous yearling Yellow Warbler.—Mating system theory predicts that a female should choose to mate with an already mated male over an available unmated male when the genetic or territorial benefits exceed the cost of decreased male parental care (Searcy 1982). Recently, much attention has been directed at determining what male and territory qualities influence a female bird's decision to mate polygynously (Searcy 1982). Here we report a bigamous mating involving a yearling male Yellow Warbler (*Dendroica petechia*), a primarily monogamous, facultatively polygynous species (Ford 1983). We compared the breeding behavior of this bigamous male with other monogamous males in the population. We examined four measures that have been suggested as potentially important in female choice of a mate: song repertoire size (Krebs 1977), song rate (Greig-Smith 1982), nest defense, and feeding of nestlings.

Observations were made in 1983 on the forested dune ridge near Delta Marsh, Manitoba, in a dense nesting population of Yellow Warblers (Goossen and Sealy 1982). All individuals in the polygynous association were banded: the male (M1) was color banded as a free-flying fledgling the previous year, Female 1 (F1) was color banded as an adult in 1982 (thus was at least 2 years old), and Female 2 (F2) was also banded as an adult in 1982 or earlier. The territory of M1 was situated on the south side of the ridge, which is typically settled first by the earlier-arriving older males (unpubl. data).

F1 was seen regularly (beginning 29 May) in the area of M1's territory several days before M1 occupied the territory. At that time, the area was defended by another yearling male. M1 established himself on the territory on 1 June, apparently in the short interval when the previous owner was removed for individual marking. F1 subsequently remained in the area. A female banded on the left leg with an aluminum band (probably F2, as most females were color marked or not banded at all) was gathering nesting material in M1's territory on 9 June.

The nests of the two females were about 20 m apart. Both contained an egg on 14 June and both had completed clutches of five eggs. On 17 June, M1 moved frequently between the two nests and appeared to courtship feed both females consecutively. F2's nest was destroyed on 23 June on about the sixth day of incubation; F2 was not seen thereafter. F1 successfully hatched all five eggs beginning 27 June, but the nest was empty by 3 July, presumably the result of predation.

Singing behavior.—We compared the size of M1's repertoire with those of 10 other individually marked males whose ages were known. Recordings were made between 05:30 and 10:00 from 12 to 20 June using a Dan Gibson parabolic microphone and a Uher 4000 Report-L tape recorder. The average number of songs recorded for each of 11 males was 68 ± 31 [SD]. Song types were analyzed using a Kay Electronics Digital Sonograph 7800 with a medium band setting. A repertoire was considered complete when 20 songs sung produced only two new song types (a very distinct plateau in song types).

M1's repertoire of six song types was the smallest of the repertoires observed ($\bar{x} = 8.1 \pm 2.0$), a trait shared by two other males. Age did not appear to influence repertoire size: the five 2-year-old males sampled had repertoires ranging from the smallest (6 song types) to the largest (12 song types) repertoires recorded.

Song-rate data were collected for M1 and 11 other individually marked males on 3, 6, 7, and 9 June. This was a critical period for mate attraction (first clutch initiation in the population was on 9 June). Song rates were the number of spontaneous songs sung by a male per 5-min sample. We recorded an average of 6 samples (range = 3–7) per bird per day. Song-rate data were collected between 06:00 and 11:00. We collected samples each

hour for each bird. Time of day did not consistently affect song rate due to greater differences in song rates between birds than between hours. On each of the four days sampled, M1 had one of the lowest song rates observed.

Nest defense.—We quantified nest defense behavior of M1 and other male Yellow Warblers by examining their response to a human intruder at the nest for a 2-min period. We noted whether the male responded (was seen near the nest), and, if so, his estimated nearest approach. Nest visits occurred usually every second day.

Two visits were made to F2's nest before it was destroyed. On the day before the first egg was laid, M1 responded by coming to within about 5 m of the nest and chipping, but six days later he did not respond. Eight visits were made to F1's nest from Day 3 until Day 18 of the nesting cycle, and M1 responded on Days 8, 10, 14, 16, and 18 with vigorous chipping. His mean nearest approach on these days was 4.8 m. M1's frequency of response and nearest approach were similar to those of other males in the population tested during the same part of the nesting cycle (other males: \bar{x} frequency of response = $57 \pm 34.5\%$, $N = 30$; nearest approach: $\bar{x} = 6.6 \pm 2.4$ m, $N = 29$).

Feeding nestlings.—We watched F1's nest for a half hour on 1 July and for 1 h on 2 July. A blind was set up 10 m from the nest at least 1.5 h before the nest watches. Observations did not begin until at least 18 min after the observer was settled in the blind. M1 hesitated near the nest, and frequently chipped, despite the precautions we took to minimize disturbances during watches. M1 fed his nestlings only once while F1 made 7, 4 and 1 feeding visits, respectively, during the two nest watches. M1's feeding rate was much lower than the average male feeding rate (3.1 and 4.2 trips/half hour for 2- and 8-day-old nestlings, respectively [Biermann and Sealy 1982]).

Discussion.—Although M1 did not fledge offspring in 1983, he did establish pairbonds with more females than did most males in the population. M1 was an unlikely candidate for polygyny, based on several criteria of male quality. First, he was a yearling, and polygyny is usually observed in older males (Weatherhead 1984). Even monogamous older males often have better reproductive success than yearlings (Harvey et al. 1979, Ross 1980). In the case of M1, it is unclear what characters he possessed to merit this success. His advertising behavior and feeding of nestlings were less than those of the average male in the population.

M1's females, however, may have chosen his territory rather than his qualities. This idea is supported by the observation that F1 was seen regularly in the area several days before M1 took ownership of the territory. M1's territory was located on the south side of the ridge, which is settled first by older males (unpubl. data). Females choosing such an area may expect a good territory and a high-quality (older) male. Yet in the following year, M1 returned to this same territory, but attracted only a yearling female. This female fledged two young from a nest in the same tree crotch as F1's nest. Alternatively, F1 may have chosen the previous owner of M1's territory, and then was constrained from sampling other males again when M1 took ownership. Finally, the two females may simply have exhibited sub-optimal mate choice.

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- MARY L. REID AND SPENCER G. SEALY, *Dept. Zoology, Univ. Manitoba, Winnipeg, Manitoba R3T 2N2, Canada.* (Present address of MLR: *Dept. Biology, Carleton Univ., Ottawa, Ontario K1S 5B6, Canada.*)

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Range extension of Cayenne Terns on the Puerto Rico Bank.—The range of the Cayenne Tern (*Sterna sandvicensis eurygnatha*) is described as Aruba, Netherlands Antilles, to Trinidad in the southeastern Caribbean and the Atlantic coast of South America to Argentina (French 1976, Voous 1983). Buckley and Buckley (1984) and Halewyn (1985) have recently discussed the taxonomic problems of its association with Sandwich Terns (*S. s. acuflavida*) in the Caribbean region and elsewhere.

Kepler and Kepler (1978) surveyed Culebra and its adjacent islands, 37 km east of Puerto Rico, for nesting sea birds in 1971. Having discovered colonies, they closely observed > 100 of the 735 pairs of Sandwich Terns at cayos Lobito and Matojo for morphological features that would indicate introgression of the Cayenne Tern. They saw no birds having any amount of mottled black and yellow or all yellow bills typical of *eurygnatha*. Norton (1984) reported nesting groups of *S. s. acuflavida* in the northern Virgin Islands, 40 km east of Culebra, with the first mixed pairs of *acuflavida*, the northern form, and *eurygnatha*, the southern form, in the West Indies in 1982. Schaffner and Taylor have conducted seabird studies at Culebra since 1983 and have found no evidence of Cayenne Terns.

On 12 June 1984, Schaffner and Taylor visited Cayo Matojo and counted at least 123 active nests of Sandwich Terns, 103 nests of Royal Terns (*S. maxima*), and 88 nest scrapes perhaps half of which were also *sandvicensis*. Schaffner observed several *sandvicensis* at this colony that exhibited varying amounts of yellow on their otherwise black bills. He also