1980 (Weissman et al. 1980). Smith and Cade (1987) showed that *G. integer* from California (its type locality) would not produce offspring in laboratory crosses with "integer" from Austin, TX, or with *G. rubens* from McAlester, OK. Walker (1998) confirmed the distinctness of *G. rubens* and *G.* "integer" where they overlap, and Cade and Otte (2000) described "integer" as *G. texensis.*

Materials and Methods

Specimens. Robert L. Crocker collected fall generation *G. texensis* by broadcasting synthetic *G. texensis* calling song at Dallas, TX, 10 October 1996. On 20 May 1997, he collected spring generation *G. texensis* at Dallas, and at a nearby site in Ft. Worth, by broadcasting synthetic calling song and by inspection. At Gainesville, FL, I collected *G. rubens* using broadcasts of synthetic *G. rubens* song (Walker 1996). Fall generation females were collected 21 and 24 September 1996 and spring generation females were collected 17 May 1997. Males were collected in 11 of the 14 mo between September 1996 and October 1997.

Rearing. Crickets were reared as described by Wineriter and Walker (1988). The 3.8-liter rearing jars were serviced weekly. Six to eight field-collected females representing each generation and species were placed individually in jars with damp sand for oviposition and held in a rearing room at 25 ± 1°C and a long-day photoperiod of 16:8 (L:D) h. Females were removed no later than the week after first hatch. No later than 4 wk after first hatch, most sibships that had >120 juveniles were divided evenly among three fresh jars. For each of these sibships, one jar was left in the rearing room under 25°C and long days (16:8 [L:D] h); another was placed in a Florida Reach-In environmental chamber (Walker et al. 1993) that maintained a short day (11:13 [L:D] h) and 25.0 ± 0.2°C; and a third was placed in a similar chamber at 32.0 ± 0.2°C and a photophase of either 16 or 11 h. For spring- and fall-collected female *G. rubens* and for spring-collected *G. texensis,* three sibships each were divided as described above. For fall-collected *G. texensis,* no female produced >35 progeny; therefore, 5 wk after initial hatch, the 65 progeny in a jar that had held three field-collected females were divided into three cohorts and put in fresh jars as described above. Members of this trio of cohorts were potentially from three mothers and, therefore, unlikely to be as closely related as the members of other trios, which had a single mother. To simplify references to the four rearing conditions, I used three-character abbreviations that denote their temperature (25 or 32°C) and daylength (long or short)—namely, 25L, 25S, 32L, 32S.

Hybrid Study. The four possible crosses were made between Gainesville *G. rubens* and Dallas *G. texensis. G. texensis* were from the F_2 generation of a colony established with fall generation parents and reared under 25L conditions. Female *G. rubens* were from the F_1 generation of a colony established with spring generation parents and reared under 32S conditions. Male *G. rubens* were collected at broadcast song, 3 May to 3 June 1997. Females to be used in the crosses were isolated from males as nymphs to ensure virginity. For each cross, five pairs of crickets were established in individual wide-mouth, 1-liter jars one-fourth filled with damp sand. Parents were removed when dead or when their progeny began to hatch. Hatchlings were transferred to 3.8-liter rearing jars corresponding to their cross and replicate. When numerous F_2 hatchlings were noted in the rearing jar of a TxR sibship, they were reared and the songs of males recorded. All crosses were made and reared in a room held at 25 ± 1°C and a photoperiod of 16:8 (L:D) h.

Tape Recording. As sons of field-collected females or laboratory-crossed pairs matured, they were transferred to individual 120-ml glass or plastic containers with screen lids, assigned an identification number, and placed in an array on a table in a windowed room kept at 25 ± 2°C. They were fed oat cereal and small pieces of apple, which also provided moisture. I initially monitored the array >4 h a day and recorded songs whenever I could. When I found that most calling occurred at dawn or when lights were turned on before or during dawn, I made that a regular time for recording. Recordings were made with a reel-to-reel tape recorder (Nagra IV, Kudelski, New York, NY) and a dynamic microphone (D33, American, New York, NY) affixed to one end of a 0.4-m shaft. In each taping session, I tried to make a 20-s recording of each calling male that had not been recorded within 24 h. Temperature was measured after each recording with an electric thermometer (BAT-12, PhysiTemp, Clifton, NJ) from a copper-constantan thermocouple at a container near the center of the array. A cylinder made from a 13 by 18-cm card surrounded each container to keep callers from seeing the approach of the microphone. Twice-recorded crickets were usually killed, pinned, labeled, and placed in the Florida State Collection of Arthropods. To determine whether pulse rate changes with adult age, eight males, from fall-collected *G. rubens* females, were taped again 25 or more days after their second taping.

Analysis of Taped Songs. The calls of trilling field crickets often have frequent, brief, irregularly occurring delays in what would otherwise be a uniform series of pulses. These delays interfere with measuring the fundamental pulse rate in taped songs of *G. rubens* and *G. texensis.* I overcame this difficulty by using a custom program that produces a histogram of all pulse periods (pulse plus pulse interval) in a 16.4-s digitized sample of song. The modal pulse period is noted from the histogram, and its reciprocal, the modal pulse rate, estimates the fundamental pulse rate (Walker 1998).

Pulse rate varies predictably with the temperature of the singer's immediate surroundings. I adjusted pulse rates to the standard temperature of 25°C with this formula, where R_x is the pulse rate (sec^{-1}) at temperature x, and R_{25} is the expected rate at 25°C:

$$R_{25} = 20R_x/(x - 5).$$

The formula assumes that pulse rate is a linear function of temperature that extrapolates to 0 at 5°C (Walker 1975). The same formula was used for both