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OBSERVATIONS ON THE MATING BEHAVIOUR OF *GRYLLODES SIGILLATUS* (WALKER) (INSECTA : ORTHOPTERA : GRYLLIDAE)

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INTRODUCTION

A review of the literature reveals that description of the mating behaviour of *Gryllodes sigillatus* (Walker) is fragmentary. Alexander and Otte (1967) are of the opinion that mating in this species differs from that of the species of the genera *Gryllus* Linnaeus and *Acheta* Fabricius in only a couple of features. The present study includes descriptions of courtship, copulation and post-copulatory behaviour of *Gryllodes sigillatus* (Walker) based on observations made in the laboratory.

MATERIAL AND METHOD

Two sets of observations were made : the first on 2 females and 3 males collected from the kitchen of a house in Pune, Maharashtra, a male and female collected from under stones on the banks of the reservoir at Mulshi, about 40 Km from Pune, and a male and female collected from a crevice in rocks on the road to Sinhagad, about 26 Km from Pune, and the second on several males and females, some collected from a house in Madras, and others bred in the laboratory at Madras. All observations were made either in 1 litre glass jars, or in a glass cage measuring 60 cm × 30 cm. Pellets of wheat flour were supplied as food. A tube of water was also provided. In all, 31 copulations were observed with different combinations of males and females.

Figs.1—5. Photographs of courtship and copulation in *Gryllodes sigillatus* (Walker)

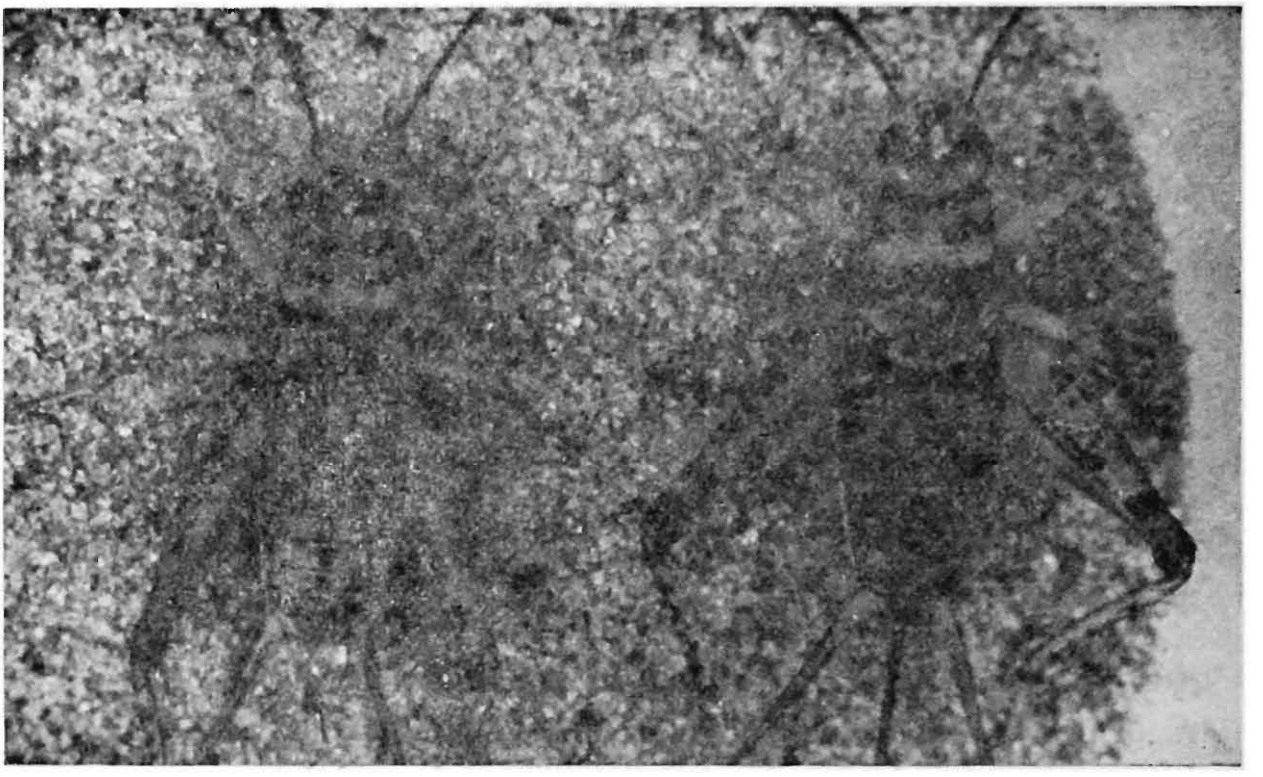

Fig. 1. Courting pair (male on left)

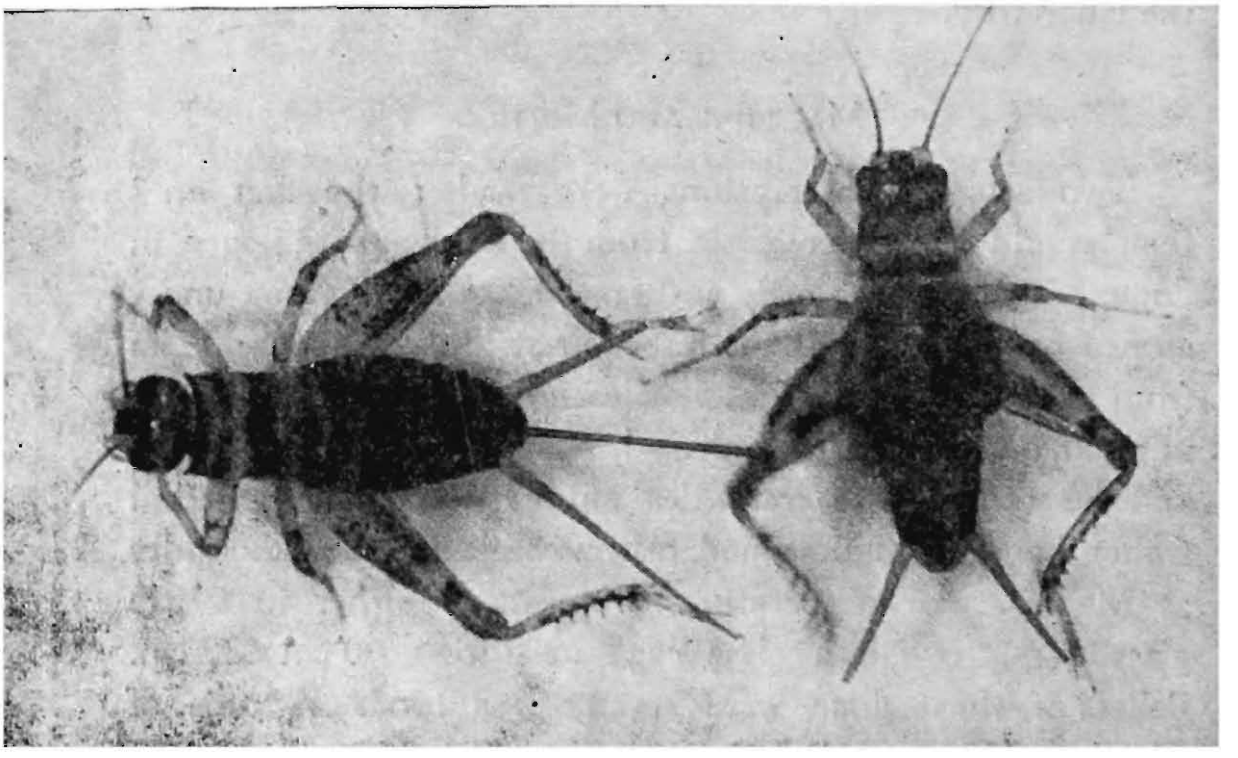

Fig. 2. Courtship, male (right) producing courtship sound

OBSERVATIONS

The basic features of pre-copulatory (courtship), copulatory and post-copulatory behaviour in *G. sigillatus* are as follows : The initial cantact between the two sexes is by the antennae ; in almost every instance observed, the male makes the first contact. He sweeps his antennae over the body of the female, generally from front to back, touching her head and antennae, pronotum, abdomen, posterior legs, cerci and ovipositor. This usually induces the female to turn her

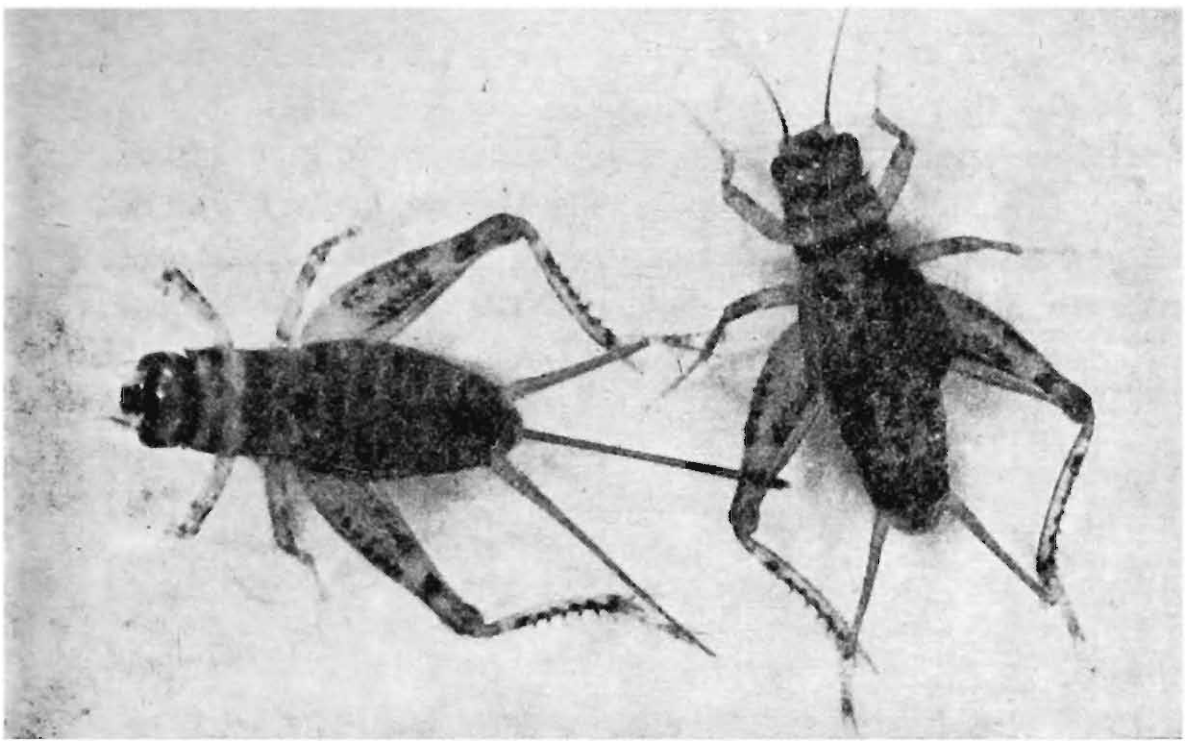

Fig. 3. Courtship, male (right) producing courtship sound

posterior end to the male, raise it and reach out with her posterior leg/legs and place it/them on him. But, sometimes, she moves away evincing no concern, in which case the male pursues her. When he nears her from behind, he antennates her ovipositor, cerci and posterior extremity. Soon, he moves over to her lateral side and starts producing a courtship song, which consists of a series of muffled pulses in very quick succession, interspersed with a frequent, irregular, loud 'tick'. During this song, the tegmina are held tilted roof-like above the abdomen, their bases overlapping

only a little. The song seems to be produced by only the internal portion of the stridulatory file. During the 'tick' the tegmina move a greater distance over each other. The commencement of the song is accompanied by the turning of the male so that his posterior end is usually directed toward the lateral aspect of the female. He begins backing

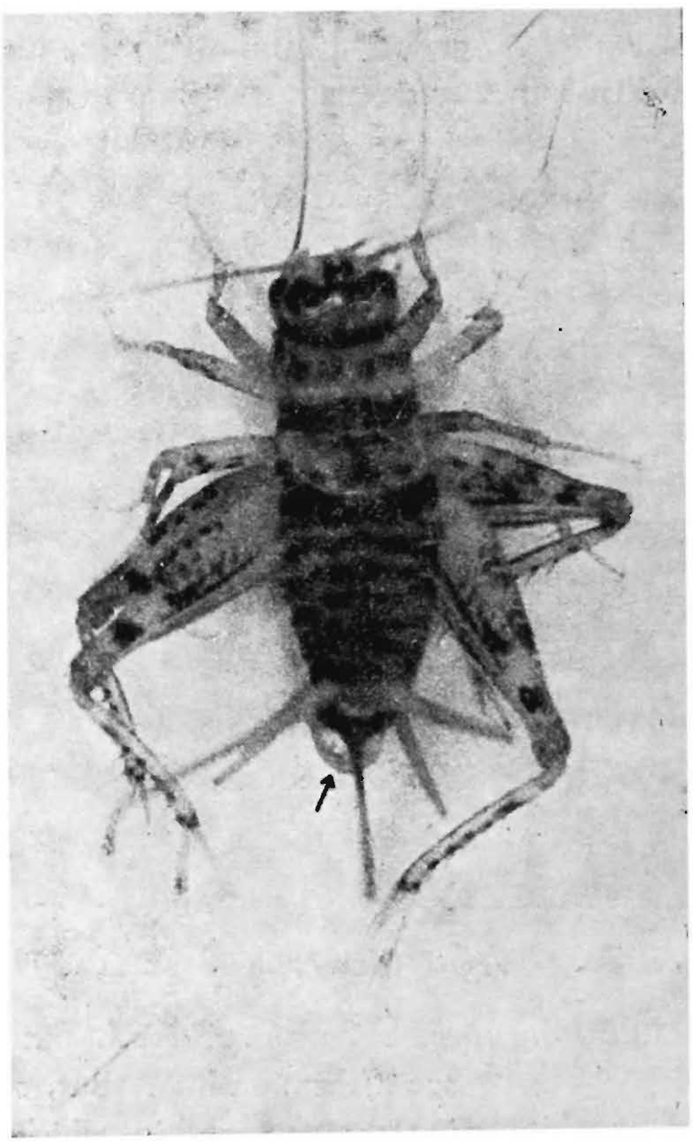

Fig. 4. Copulation (dorsal view)
Arrow indicates spermatophore

toward the female, simultaneously shaking his body up and down and laterally. The male usually backs towards the lateral or antero-lateral aspect of the female, although backing directly from the front of the female has also been noticed in a few cases. By this time, the female, who is usually

aroused, mounts the male. The song ends at once, and a spermatophore appears at the posterior extremity of the male. The spermatophore may be seen slightly protruding from the posterior extremity of the male even during courtship (Fig. 3). The male adjusts himself for a few seconds, probably to bring the posterior end of the female in line with his. The pair, then, becomes motionless. The copulating partners may or may not be parallel to each other. In every case, during copulation, the ovipositor of the female is held just a little over 90° in relation to her body. Once the spermatophore is transferred, the male moves away from beneath the female. The latter immediately bends and plucks off the spermatophylax—"a large fibrous mass attached to the ampulla" (Alexander and Otte, 1967) of the spermatophore-with her mandibles and proceeds to eat it, during which process her maxillary palpi can be seen to be in constant motion. Immediately after removing the spermatophylax, the female rubs the posterior extremity of her abdomen, more or less alternately, with her left and right posterior legs. During this action the legs touch the sperma-

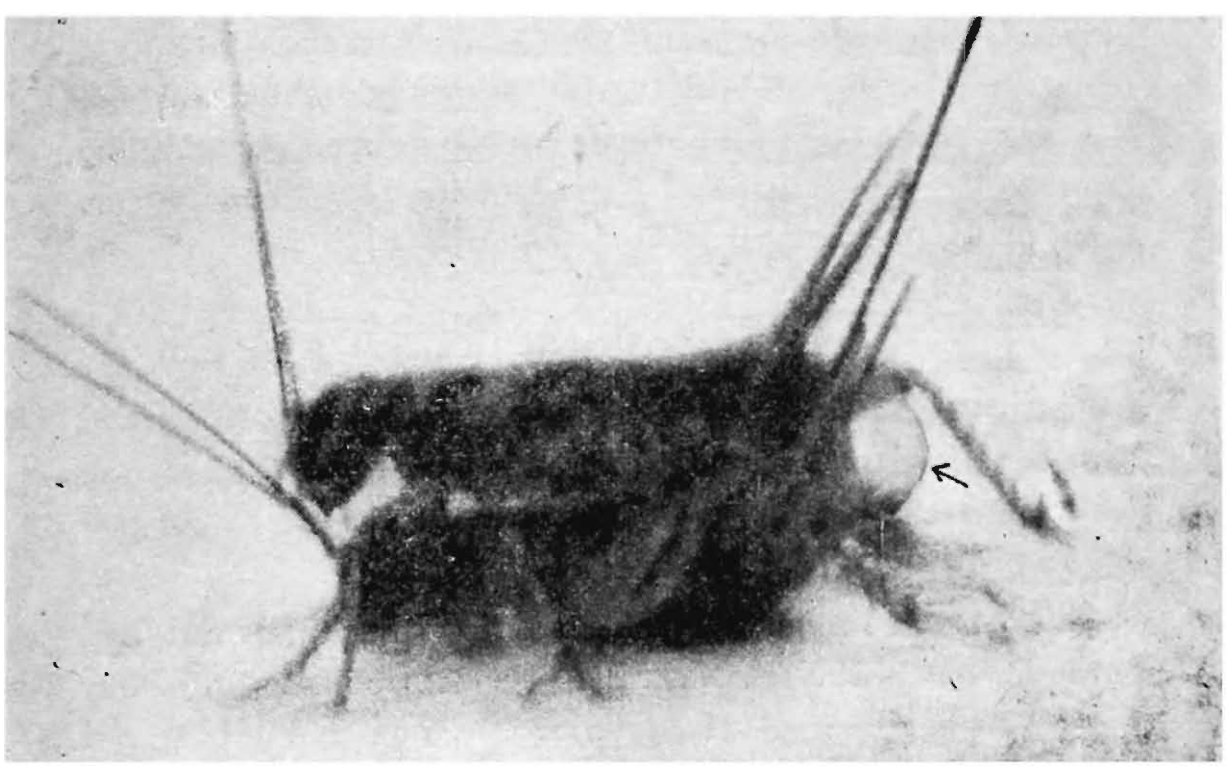

Fig. 5. Copulation (lateral view). Arrow indicates spermatophore.

tophore, which remains attached by its tube to the end of the female abdomen. Upon moving away from beneath the female, the males turns around and antennates the body of the female, and generally reaches out to her with his posterior legs. If the female moves away, he pursues her. If he loses contact with the female, he searches for her frantically.

The duration of mating recorded in the present study, *i.e.* from mounting to the time the male moves away from beneath the female, varies from 21 seconds to 2 minutes, 55 seconds. The female takes from 45 minutes to 1 hour, 20 minutes to consume the entire spermatophylax.

On the whole, courtship was found to be less intense when only a single male and female were kept together. The presence of another male introduced the element of aggression into the picture. When the two males contacted each other, one male usually assumed a proprietary attitude towards the female, chasing away the other male whenever he approached her. Display of aggression was observed to be by three basic means—1. charging headlong at the other male, 2. short bursts of song consisting of only a few quick, loud pulses, sung with the head facing away from the contending male, and 3. 'kicking' by the posterior legs. After a while, the less aggressive (subordinate) male stopped pursuing the female, and the 'victor' began courting her. The female, then, usually copulated.

Discussion

Although the salient features of courtship, copulation and post-copulatory behaviour in *Gryllodes sigillatus* (Walker) are as described above, some other interesting features were also found in the present study :—

1. All mountings of the male by the female did not result in the transfer of the spermatophore. In 10 out of 31 matings (approximately one-third) observed during this study, males were unable to transfer the spermatophore. In one instance, a male was mounted

by a female thrice in succession, each mount lasting shorter than the preceding one (66 seconds and 21 seconds respectively), but ultimately the male was unable to transfer the spermatophore to his partner. Throughout each of these attempted copulations, the male appeared to be continually adjusting his position, movements which were observed in almost all cases of unsuccessful matings. Finally, the spermatophore was transferred when the female mounted the male for the fourth time.

2. Young virgin (unmated) females copulated more readily than older, mated females. Similarly, females confined solitarily or with other females only for several days, mated more readily when presented with a male than females which had been deprived of contacts with males for shorter periods.
3. When a female was presented with more than one male, the choice of the mating partner rested with her; she was even seen to reject the vigorous male.

According to Alexander (1961), in low-density populations of field crickets, the majority of the male-female contacts are brought about by the movement of the sexually responsive female towards the immobile, stridulating male, in response to his calling song, which is different from the courtship song, and is prodnced by the male for extended periods when out of contact with other members of its species. It functions in sexual pair formation. In the present study, most of the contacts between the members of the opposite sexes were initiated by the males, without the production of the calling song. This might have been due to the restricted observation area. Only in one instance was a female observed to be attracted to a male by his calling song.

SUMMARY

A study of the pre-copulatory, copulatory and post-copulatory behaviour of *Gryllodes sigillatus* (Walker) (Orthoptera : Gryllidae) is presented.

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