SCIENTIFIC NOTES

NOTES ON THE MATING BEHAVIOR OF *ACHURUM CARINATUM BREVIPENNE* (ORTHOPTERA: ACRIDIDAE)

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In the Orthoptera, acoustic, visual and occasionally vibratory cues may be used by females during pair formation to locate or choose singing males (Boake 1983). Most female ensiferans do not stridulate and a female usually mounts a male. In the Acrididae, silent males and stridulating males of some species must search for females (Otte 1970, Steinberg & Willey 1983). Various acoustic and/or silent visual signals, and perhaps olfactory cues (Steinberg & Willey, 1983) occur between a stalking acridid male and the target female before he attempts to mount the female. Male acridids produce a relatively small spermatophore (as compared to tettigoniids) and sexual selection theory predicts that this small investment should result in males searching and competing for females and females discriminating among males (Gwynne 1983, Thornhill & Gwynne 1986). However, under laboratory conditons I occasionally observed female *Achurum carinatum brevipenne* (Thomas), a silent, brachypterous, gomphocerine grasshopper of southern Florida, stalk and mount males. This note describes the usual and reversed role behavior.

Adults and nymphs were collected at Archbold Biological Station (Highlands County) in south-central Florida between 18 February and 13 March 1986. Terraria (21 x 41 x 26 cm high) were arranged with sand and grass to resemble the habitat, and an overhead incandescent bulb provided a temperature ranging from 26 to 29°C. The photophase ranged from 13 to 16 h. Individuals were fed fresh natalgrass (*Rhynchelytrum repens* (Willd.) C. E. Hubbard). Each terrarium held 10 males and 10 females. A Bolex super-8 movie camera was used to film femoral movement and other behavior.

Males approached and attempted to mount females on 31 of 39 occasions during 40h of observation over a 2-week period. The cues used by males to recognize females were not evident other than perhaps her larger size (body length: ♂, x̄ = 33 mm ±0.5 S.D.; ♀, x̄ = 43 mm ± 0.9 S.D.). No courtship behavior was observed and the male simply moved slowly toward the female, usually approaching from a posterolateral angle. When the male was within 5 to 10 mm his head and antennae pointed slightly downward and the antennae were spread at about a 45° angle. The antennae were then brought together as he suddenly leaped on the motionless female, and alternately moved his antennae up and down on each side of her head and thorax. The female spread her hind femora slightly if receptive. Nine percent of the time the male approached and mounted from an anterolateral angle and attempted to turn around; this repositioning usually caused the female to kick with her hind femora and reject the male.

Sex-role reversal occurred on 8 occasions. Females directly approached and attempted to mount 5 males and 3 late-instar females. Post-mounting courtship and copulation were never observed in these few observations of aggressive females because of the resistance of males. Late instar females were similar in length to males, which may explain why these females were also mounted. The following describes the most elaborate incident: a female climbing down the side of a terrarium slowly but undeviatingly approached a male resting on the sand 21 cm away. It took about 1 minute to reach the

sand and face him at a right angle at a distance of 2.5 cm. Her antennae were spread about 45° and pointed slightly above the male's head, and his antennae were pointed upward but spread about 30-40°. After about 55 seconds the male's hind femora moved up and down 5 times in 1 sec in a large arc which Otte (1970) has referred to as a femur-tipping movement, but different here in that it was repetitive rather than a single event. The male then further spread his antennae and lowered them to the sand while simultaneously lowering and spreading his hind femora very slightly, and the female quickly moved to straddle the male. The male's antennal and femoral positioning may have been weak defensive signals that failed to stop the female, because he resisted the female with general body and hind femora shaking and kicking and after about 7 sec she climbed off from him to face away at a distance of about 3 cm. Both remained motionless until 9 minutes had passed whereupon the female turned her head and thorax and then her whole body to face the male. Her antennae were spread apart again and angled upward. After 1 minute she moved forward quickly and again tried to mount the male but did not align her body with his. The male weakly shook his hind femora and after 5 sec she moved off and slowly walked away. The male moved away after 1 minute.

Female aggressiveness was not a result of competition for food nor was it in response to obvious signaling activity from males. Thornhill & Gwynne (1986) review examples of role reversal where (1) the male provides parental care and his dorsum is a limiting resource as an oviposition site, (2) the male gives protection to the female and (3) he aggressively secures a site for oviposition. None of the situations was relevant to *Achurum*. However, the relatively high grasshopper population density in the terraria along with the low grass density provide more visual contact than would occur under field conditions. This environment may have altered typical role behavior. For example, high but not low population densities of Morman crickets resulted in courtship role reversal (Gwynne 1984). The influence of the surrounding environment was also shown with a katydid from Australia. When males and females were moved from a site where no role reversal occurred to one where it was evident, they assumed a role reversal and the males' song structure also changed (Gwynne 1985). Even if the sex-role reversal of *A. c. brevipenne* was induced by captivity, it is another example where sexual behavior of insects is not always stereotyped nor sex-linked.

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WITHIN-VINE DISTRIBUTION AND DAMAGE OF SWEETPOTATO WEEVIL, *CYLAS FORMICARIUS ELEGANTULUS* (COLEOPTERA: CURCULIONIDAE), ON FOUR CULTIVARS OF SWEET POTATO IN SOUTHERN FLORIDA

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The sweetpotato weevil (SPW), *Cylas formicarius elegantulus* (Summers) is the most economically important insect pest of sweet potato, *Ipomoea batatas* (L.) Lam., worldwide. Low level infestations reduce quality and marketable yield (Proshold 1983). Terpenoids that are produced by sweet potato in response to SPW feeding may make even slightly damaged roots unfit for human consumption (Uritani et al. 1975, Akazawa et al. 1960). Yield losses of up to 60-80% have been attributed to SPW (Hua 1970, Subramaniam et al. 1977, Mullen 1984).

Economically effective control measures for SPW in regions with large resident populations are lacking. There are no insecticides that will adequately control weevils in an infested field (Stall et al. 1984) because SPW immature stages are spent within vines and/or roots. For this reason, other SPW management approaches, such as host plant resistance, have been explored (Waddill & Conover 1978, Mullen et al. 1980a,b, 1981, 1982, 1985). With one exception (Waddill & Conover 1978), "resistant" cultivars have not been field tested in regions with high SPW population pressure. The present study was conducted to evaluate SPW resistance in four sweet potato cultivars in southern Florida, a region with a dense SPW population. Also, we determined the impact of a mechanical barrier (polyethylene mulch) on field plant protection from SPW. Lastly, we compiled preliminary data on the within-vine distribution of SPW in sweet potato.

The experiment was conducted in 1986 at the Tropical Research and Education Center in Homestead, Florida. Four sweet potato cultivars, *I. batatas* cv. Resisto, Regal, Sumor, and NC1135, were planted in a split-plot design with three replications. Plastic polyethylene mulch (white/black, 38 microns thick covering a 0.9-m bed width) was the whole-plot factor and cultivar was the split-plot factor. Cultivars were hand-planted on 22 April in raised beds with 1.8 m centers. Slips (0.3-m long) of each cultivar were planted 0.3 m apart in one row per bed. Replicate plots consisted of 40 slips