

SCIENTIFIC NOTES

SINISTRALITY IN THE SOUTHERN AND TAWNY MOLE
CRICKETS (GRYLLOTALPIDAE: *SCAPTERISCUS*)

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Wing folding in the Insecta evolved early in the history of the group and often the wings are folded one on top of the other over the abdomen. Whether or not the right wing is folded over the left or vice versa is of little importance except when the two wings have evolved different tasks. Such is the case in a number of families of Orthoptera: Gryllidae, Gryllotalpidae, Haglidae, and Tettigoniidae. In these families the forewings of the males are specialized for sound production. The plectrum, or scraper, of one wing is drawn across the pars stridens, or file, on the underside of the other wing. This action causes certain membranes of the wing to vibrate and produce sound. Usually the right wing rests over the left in crickets and the left rests over the right in katydids. Interestingly, the females, whose wings are not usually adapted to produce sound, follow the same rules (Masaki et al. 1987). In many species, because of the specialization of the two wings, they differ considerably with respect to pigmentation, reduction in the number of teeth on the file, and in retrogression of the file (Masaki et al. 1987). In the haglids the males may sing using the left over the right or the right over the left (Morris & Gwynne 1978) and apparently can switch while singing (Spooner 1973). I have examined the wingedness of both sexes in two species of mole cricket, *Scapteriscus acletus* and *S. vicinus*, to determine how they relate to the other three groups.

Individuals were collected as part of another study (Forrest 1986) from the routine sound-trapping station on the Agronomy Farm of the University of Florida (Walker et al. 1983). Quarter-monthly samples of up to 50 individuals were collected during the crickets' spring and fall flights of 1981 and 1982. A total of 1431 *S. acletus* females, 1222 *S. acletus* males, 714 *S. vicinus* females, and 284 *S. vicinus* males were captured and classified as to wing overlap. These are the largest samples of singing Orthoptera where the wingedness of individuals has been studied.

In neither sex of either species did right- and left-wingedness differ from 50:50. Female *acletus* were 51% right-winged (734:697), males were 49% right-winged (602:620). For *vicinus*, females were 51% right-winged (367:347) and males were 48% right-winged (135:149). I also examined 19 (2 males and 17 females) *Neocurtilla hexadactyla*, the northern mole cricket, from the Florida State Collection of Arthropods. Both males had right wings over left but only 5 of the 17 females were this way. Checking two other species of mole cricket, *Scapteriscus abbreviatus* [$n=13$; males (4:4), females (1:4)] and *Gryllotalpa africana* ($n=4$), revealed at least some specimens with each configuration.

Masaki et al. (1987) found equal numbers of left-winged and right-winged males of a scaly cricket, *Ornebius kanetataki*. I examined 30 male *Cycloptilum antillarum*, another mogoplistine, from the collection and found 16 (53%) with their right wing over their left.

It is interesting that the mole crickets and scaly crickets would differ so greatly from the other gryllids and tettigoniids with respect to the constancy of wing overlap. One possible reason for the differences might be because of the ancestry of the group. Evidence from the fossil record leaves "no doubt that mole crickets developed from

Gryllidae" (Sharov 1971), and the Gryllidae are believed to have evolved from a haglid ancestor. Present-day haglids have mixed wing overlap and it is likely the early gryllids were also switch-winged. Sharov (1971) shows the Gryllotalpidae branching early from the Gryllidae, and this may account for the mole crickets being haglid-like with 50:50 wing overlap. The mogoplistines may also be an ancient group of gryllids, since they also show mixed wingedness. If so, then once these two branches split the rest of the gryllids developed the right wing over left trait.

Are male mole crickets switch-wing singers? I have observed males of *S. acletus* and *S. vicinus* singing with the right wing above the left and other males singing with the opposite configuration, however whether or not an individual can use either wing is unknown. I kept 6 male mole crickets (1 *acletus*, 5 *vicinus*) in 15-dram vials containing moist soil. I checked which wing overlapped the other each day for 5 days. The males did not sing, however during the 5 days of observation all males switched overlap at least once, and switching occurred on 10 of the 30 checks. Gryllid males, on the otherhand, rarely switch wing overlap and when switched they will restore them to their normal right over left overlap (Elliott & Koch 1983). The mole cricket, *Gryllotalpa vulgaris*, apparently is a switch-wing singer (Elliott and Koch 1983) and since *acletus* and *vicinus* often switch wing overlap it seems likely that mole crickets are switch-winged singers. If males can switch wings then another possible explanation for the differences between the mole crickets, mogoplistines and other gryllids could be due to ecological pressures.

The forewings of male mole crickets may be particularly susceptible to wear since while calling the wings are held against the roof of the burrow. The wings are moved back and forth as much as 130 times per second and this could cause excessive wear to the forewings. In a manner similar to the mole crickets, mogoplistine males call with forewings pressed against the underside of a pronotal shield, and both systems apparently serve as baffles that increase efficiency (Forrest 1982). Wings rubbing against these shields may cause wear.

If wing wear was a factor causing differences between these two groups and other crickets, one would predict that Decticine katydids, which also have the pronotal shield, would have both right- and left-winged individuals. However, examination of over 25 male *Atlanticus gibbosus* revealed that all had the normal katydid convention, left over right. Casual glances at other Decticines suggested that this is the rule, although 2 of the 4 specimens of *Aglaothorax* spp. were right over left.

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REARING IMMATURE *MESOVELIA MULSANTI*
(HEMIPTERA: MESOVELIIDAE)
ON A SUBSTRATUM OF DUCKWEED

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The surface-dwelling, aquatic insect *Mesovelia mulsanti* White suffers high mortality in laboratory cultures. Only 10% of the first instars reared by Hungerford (1917) reached the adult stage; only 68% of the second instars reared by Hoffmann (1932) survived to adulthood, and he also noted a high (but unstated) mortality of first instars. More recently, Galbreath (1975) found that survival from egg to fourth instar was 9% and 15% in separate experiments. (Other species of the genus *Mesovelia* are also difficult to rear (Hoffmann 1932, Zimmerman 1984).)

Since the substratum in these previous rearing attempts (open water, open water with bits of card or sedge stem, or moistened paper towels) differs significantly from that used by the insects in nature (surface vegetation), a possible cause of the poor survival of *M. mulsanti* in the laboratory is the surface upon which the insects are reared. Individuals of *M. mulsanti* are often observed in the field resting on and running over duckweed, which provides a dry surface in the humid air present just over the water. This observation and the ease of maintaining various species of duckweed in the laboratory suggest a rearing technique using duckweed as a substratum.

Twelve wingless, gravid *M. mulsanti* were collected from Lake Alice, Gainesville, Florida on 21 August 1986 and were isolated in plastic vials (3 cm in diameter and 7 cm in height) containing one-half to three-fourths of their volume in water. The water surface was completely covered with plants of 2 species of duckweed, *Lemna minor* L. and *Spirodela polyrhiza* (L.). A circular hole cut in each vial cap was covered with fine nylon screening. Three frozen adult *Drosophila melanogaster* Meigen were provided for food each day. The vials were held in uncovered plastic boxes and placed in a constant-temperature chamber set at 28°C and with a 12 h light-dark cycle. Eggs were oviposited primarily in the larger, thicker *S. polyrhiza* leaves and were noted in some vials within 24 h of set-up. Nymphs began appearing 8 days after the first eggs were laid.

The first 27 nymphs that emerged (from eggs of 8 different females) were isolated and held in vials as described for adult females, except that instars 1 through 3 were given 1 *D. melanogaster* and instars 4 and 5 were given 2 *D. melanogaster* per day.