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Source: Florida Entomologist, 90(2) : 398-400

Published By: Florida Entomological Society

URL: [https://doi.org/10.1653/0015-4040\(2007\)90\[398:OOASTS\]2.0.CO;2](https://doi.org/10.1653/0015-4040(2007)90[398:OOASTS]2.0.CO;2)

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OBSERVATIONS OF A SUBSOCIAL TREEHOPPER, *STALOTYPA FAIRMIRII* FROM CUBA (HEMIPTERA: MEMBRACIDAE)

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The treehopper *Stalotypa fairmairii* (Guérin-Méneville) is endemic to the Caribbean Island of Cuba and has been placed within the membracine tribe Hoplophorionini (McKamey & Deitz 1996). The hoplophorionine treehoppers are mainly Neotropical, and occur mostly at higher elevations, with greatest species diversity near the equator of South America. Hoplophorionines for which the biology is known have highly developed subsocial behavior of guarding eggs and nymphs (Wood 1984; McKamey & Deitz 1991, 1996; Lin 2003, 2006). Unlike other treehoppers, they do not interact with mutualistic ants or other hymenopterans.

Among the Hoplophorionine, detailed data on natural history is available only for the North American species *Platycotis vittata* (Fabricius) and *Umbonia crassicornis* (Amyot & Serville) (Wood 1974, 1976). Natural histories of the majority of tropical hoplophorionines are less known except for a few species in the Central America (Wood 1984; McKamey & Deitz 1991, 1996). No natural history information for *S. fairmairii* is known but it has been presumed to be subsocial (McKamey & Deitz 1996).

Observations of *S. fairmairii* were made in So-roa, Pinar del Rio Province, Cuba between 19 and 26 of Jun 2001. The observation site was approximately 400 m wide on the edge of the road leading to Manto Bonito from So-roa (mileage marker 11, near Campismo La Caridad) (Fig. 1A). The terrain is agricultural land, open-air dairy farms, fruit trees, and secondary forest remnants. The habitat is on a humid lowland hill with tropical thunderstorms occurring almost every afternoon. Additional treehopper populations were located in similar habitats a few kilometers north of So-roa, near the town of San Diego de Nunez.

Aggregations of adults, nymphs, and females on eggs or with nymphal aggregations were tagged individually with tapes on the branches and observed every 3 h from 8 AM to 5 PM for 8 consecutive days. Plant stems with egg masses guarded by females were collected and dissected. Eggs were counted with the aid of a microscope. Voucher specimens of *S. fairmairii* resulting from this study are deposited in the insect collections of the Department of Life Sciences, Tunghai University, Taichung, Taiwan.

All life stages of *S. fairmairii* were found on cultivated guava, *Psidium guajava* L. (Myrtaceae) (Fig. 1B-H). The plants were blossoming and small fruits were developing during the study period. The only other host-plant record for *S. fairmairii* is an introduced Old World *Eucalyptus*

(Myrtaceae) (Scaramuzza 1951). In that study, only adult treehoppers were observed to be associated with *Eucalyptus*. Moreover, the absence of egg masses, nymphs, or ovipositioning behavior makes this host-plant record dubious.

A single clutch of eggs is deposited on the underside of stems toward the apical portion of the branches (Fig. 1C, D). Females appear to lay eggs on branches that lack ovipositions from other females ($n = 16$). Nevertheless, two egg masses were found on a single stem, one deposited about 3 cm below the other. Egg masses were usually located in the woody stem about 3 ± 1.8 cm ($n = 18$) below the apical green shoot, but 1 mass left in the petiole was below a developing fruit. Eggs were deposited in 4-8 longitudinal slits about 1 cm long and parallel to the bark (Fig. 1C). The average number of eggs per mass is 66 ± 13.9 ($n = 12$), greater than that of *P. vittata* (32 ± 19.93 , Wood 1976), but smaller than that of *U. crassicornis* (97.62 ± 24.34 , Wood & Dowell 1984).

Females cover eggs with watery accessory secretion during oviposition, and this degrades in a few days as eggs swell during development. Egg covering of *S. fairmairii* appears to be similar in color and shape to that of other hoplophorionines (Fig. 1C). Egg-guarding females sitting on top of egg masses oriented themselves toward the apical meristem of the branch ($n = 18$) (Fig. 1C). Brooding females maintain close body contact with egg masses, but when disturbed raise their body above egg masses, perhaps as a defense response.

The average aggregation size of the first instars is 61 ± 13.2 ($n = 3$). Newly hatched nymphs feed in the slits made by females, which are located below the egg masses (Fig. 1D). Unlike spiral-shaped feeding slits in *Umbonia*, *Platycotis* or *Romosella* (Wood 1984; Lin 2003, 2006), these scattered feeding slits of *Stalotypa* appear to be randomly arranged without a regular pattern, similar to those made by *Metcalfiella* (McKamey & Deitz 1991). Females of *S. fairmairii* sit below the offspring aggregation ($n = 10$) (Fig. 1E, F). The size of aggregations of 2-3rd and 4-5th instars is 59 ± 4.7 ($n = 4$) and 23 ± 9.1 ($n = 6$), respectively. The number of 4-5th instars in aggregations without adult females is 9 ± 5.7 ($n = 2$), suggesting a decrease in nymphal survival without maternal care. The average size of teneral adults in aggregations is 28 ± 5.6 ($n = 3$) before dispersal (inferred from the presence of 5th instars and the unsclerotized adult coloration). Unlike other hoplophorionines with female biased sex ratios (*P. vittata*, Wood 1976; *Potnia* sp., McKamey & Deitz 1996; *U. crassicornis* and *U. ataliba*,



Fig. 1. Life stages of *Stalotypa fairmairii*. A, the study site. B, a female (left) and a male (right), with a female guarding her egg masses which are inserted into the bark. C, a female with egg masses and randomly arranged ovipositional slits. D, the position of a guarding female, egg masses and newly hatched nymphs. E, the position and orientation of a female with newly hatched nymphs. F, a female and an aggregation of 4-5th instars. G, the 4-5th nymphs. H, a teneral adult aggregation. This figure can be accessed on line in color at <http://www.fcla.edu/FlaEnt/fe902.htm>.

Wood & Dowell 1984; Master 1989), sex ratio of teneral adults in aggregations of *S. fairmairii* appears to be equal (14 ± 2.7 for males and 14 ± 3.5 for females, $n = 3$).

A mating pair was observed copulating around 11 AM for at least 45 min before separating near the apex of the branch. *Stalotypa* are sexually dimorphic. Males are smaller than females and sexes differ in pronotal shapes with short (male) or long (female) humeral horns. Teneral adults and late instars show presumably aposematic coloration while sclerotized adults are dark brown (Fig. 1B, C, G, F).

As in other hoplophorionines, *S. fairmairii* are not ant-tended, although ants were observed tending scale insects on the same trees. An egg-guarding female was observed to kick an approaching ant with her hind legs. Several egg-guarding females also delivered kicks toward approaching conspecific adults. In addition to kicking, females fanned their wings and made audible buzzes upon disturbance. A female maintained its nymphal aggregation by stopping nymphs from moving down the stem by using movement of her front legs. When disturbed, females walked back and forth along the stem above nymphal aggregations. An unidentified spider was observed to prey on an adult female.

This work was supported in part by an Einaudi Center International Research Award from Cornell University, USA. I thank Alberto Ferrandez who provided assistance in the field and 2 anonymous reviewers who provided helpful comments on this paper.

SUMMARY

Based on observations of treehopper *Stalotypa fairmairii* (Guérin-Méneville) in Soroa, Pinar del

Rio Province of Cuba, this work presents the first documentation of various aspects of its life history and behavior including host plants, ovipositional sites, egg mass characteristics, nymphal and adult aggregations, and maternal care.

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