INTRASPECIFIC DUELING IN PALM APHIDS, *CERATAPHIS BRASILIENSIS* (HOMOPTERA: HORMAPHIDIDAE)

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Two subfamilies of aphids (Aphididae), Pemphiginae and Hormaphidinae, exhibit intra- and interspecific aggression. For example, *Pemphigus betae* Doane (Pemphigidae) fights duels for feeding sites on *Populus angustifolia* James, in which two aphids may kick and shove each other for up to two days (Whitham 1979). Foster (1996) recently described duels for feeding sites among colony mates of *Astegopteryx minuta* van der Goot (Hormaphidinae). Interspecific aggression in these subfamilies is displayed in the soldier caste of some species (Aoki 1977; Foster 1990).

In its native range in Southeast Asia, the palm aphid, *Cerataphis brasiliensis* (Hempel) (Hormaphidinae), alternates between a dicotyledonous tree, *Styrax benzoin* Dryand, where colonies form galls, and palms where they live externally on green tissue. The gall-inhabiting colony has a soldier caste that attempts to protect the colony from predators (Stern et al. 1995).

Cerataphis spp. have been introduced into many tropical areas and survive exclusively on palms where *Styrax* or other suitable alternate hosts are not present. They are pests of palms in some countries (Enobakhare 1994; Reinert and Woodiel 1974). Flat, circular and aleyrodid-like (Fig. 1), all stages bear a pair of minute spikes, or 'horns', on the front of the head. Some species additionally have several pairs of minute dagger-like setae on the ventral side of the head. The function of these structures has been presumed to be of an offensive or defensive nature but this presumption has not been confirmed until now.

Palm aphids are common on coconut palm, *Cocos nucifera* L., and several other palm species in southern Florida. They usually occur on the unopened frond and the youngest two or three fronds and sometimes on young fruits. They normally remain motionless, apparently feeding for long periods. They are associated with ants, and show the typical mutualistic ant-aphid relationship involving protection by the ants in exchange for honeydew.

One of our students, Claudia Vanderbilt, called our attention for the first time to two palm aphids involved in an altercation. Since then, we have observed dueling palm aphids about 15 times, have videotaped three dueling pairs (running time approximately 60 minutes), and report the behavior in this note.

The altercations that we observed were on excised palm frond tissue under the microscope in a laboratory at about 23°C. When manipulated slightly with a probe made of a human hair, the aphids sometimes secrete a small drop of honeydew, as aphids in general do when ants manipulate them. With insistent probing, they retract their stylets from the palm tissue and begin to crawl.

Disturbed aphids wander slowly and randomly. Occasionally one aphid encounters another aphid that is motionless and apparently feeding. The moving aphid sometimes explores the feeding aphid with its antennae and then moves on; at other times the moving aphid butts the outer margins of the feeding aphid with its horns. After several butts, the feeding aphid typically rotates a few degrees and appears to withdraw from feeding. Moving slowly, the aphid that was feeding turns to face the in-

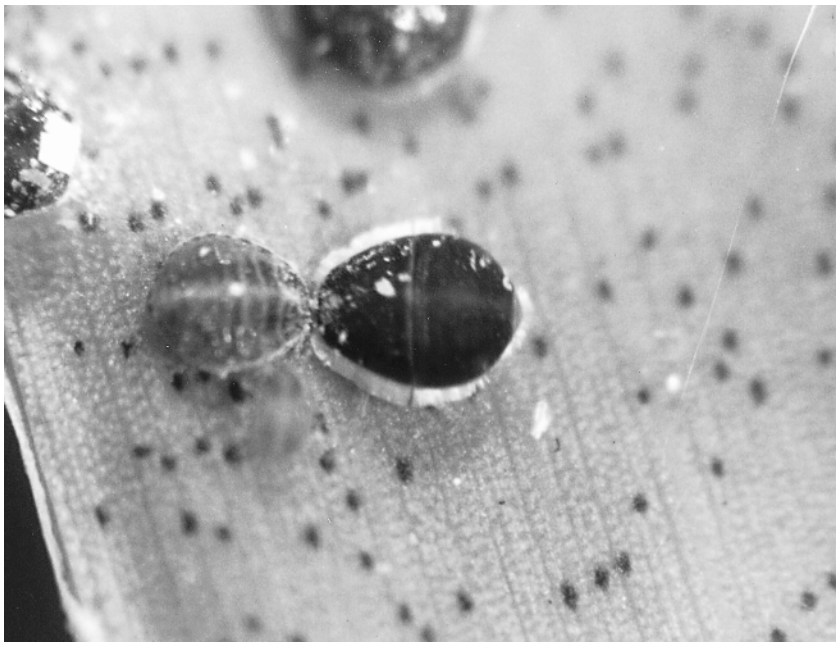

Fig. 1. Dueling palm aphids.

truder. Shortly, the aphids engage in a butting duel. To butt another aphid, an aphid lowers its head, places its horns beneath the head of the other aphid, then snaps its head upward while simultaneously thrusting forward with the legs. The motion often lifts the other aphid at its margin. Each of the dueling pair responds to being butted within a few seconds by butting its opponent. The altercation may last up to 19 minutes, the aphids often exchanging blows about 40 times per minute and alternately resting for intervals of several minutes. We were unable to observe any role of the minute dagger-like setae mentioned above.

The dueling aphids usually seemed well matched, even when younger nymphs challenge larger adults. Neither one seemed to be injured by the other, and one gained ground over the other only after prolonged butting. It was not clear to us what factors brought about the end of these duels. Often, in what would appear to be the middle of a well matched duel, the opponents appeared to pause slightly, after which one of them would climb upon the other, rotate clockwise, remain for a few minutes, then climb down and walk off; some aphids would then encounter another aphid and begin a new duel. Some altercations between three aphids simultaneously were observed, in which case one aphid would be butted from both sides or from front and back. Only one aphid that displaced a feeding aphid appeared to occupy the loser's feeding site, as observed by Foster (1996) for *A. minuta*.

The aphids readily engaged each other upon contact, but ignored other small arthropods placed with them, including nymphs and adults of brown citrus aphids (*Toxoptera citricida* Kirkaldy) and nymphs of psyllids *(Ceropsylla sideroxyli* Riley), the latter which were of similar size and shape as the palm aphids. The palm aphids did

not attempt to defend themselves against a small larva of a coccinellid beetle that attacked and consumed several of them.

Dueling among palm aphids may usually be for feeding sites, since this is known in their close relatives (Foster 1996; Whitham 1979). Aphids generally have highly specific requirements not only in their host plants, but in the sites on the plant in which they feed (Dixon 1985). Also, palm tissue is notoriously tough and fibrous. Perhaps an aphid expends less energy in displacing a feeding aphid than in finding a suitable new site and penetrating it.

However, the objective of the dueling was not apparent in our observations. More extensive investigation of the palm-inhabiting phase of palm aphids in nature may further elucidate this behavior.

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Summary

Duels between palm aphids, *Cerataphis brasiliensis,* infesting palm tissue were observed and videotaped in the laboratory. The objective of this aggression was not clear. In nature they presumably duel for feeding sites, as do related species. This is the first report of intraspecific aggression in the palm-infesting phase of palm aphids.

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