

THE LARVAL HABITAT OF *CEDUSA INFLATA*
(HEMIPTERA: AUCHENORRHYNCHA: DERBIDAE) AND ITS RELATIONSHIP
WITH ADULT DISTRIBUTION ON PALMS

F. W. HOWARD¹, T. J. WEISSLING² AND LOIS B. O'BRIEN³

¹University of Florida, Fort Lauderdale Research & Education Center
3205 College Avenue, Fort Lauderdale, FL 33314

²Present address: Subtropical Horticulture Research Station, United States Department of Agriculture
Agricultural Research Service, 13601 Old Cutler Road, Miami, FL 33158

³Entomology-Biocontrol, Florida A & M University, Tallahassee, FL 32307

ABSTRACT

Adults of Derbidae (Hemiptera: Auchenorrhyncha) are common on foliage of Palmae in many tropical localities; their larvae are believed to develop in decaying debris. The larval stage of *Cedusa inflata* (Ball), a derbid common on palms in Florida and the Caribbean Region, was observed and is figured for the first time, and its habitat, decaying organic debris, was documented. In plantings of coconut palm, a mean of 56.1 larvae of *C. inflata* solitary or in aggregations of up to 13 individuals were found in each of 10 piles of organic debris from the palms. The larvae were in moist places in the interior of debris piles usually near fungal mycelia, their presumed food resource. Sparse numbers ($x = 6.06$) of *C. inflata* adults were observed on foliage of each of 10 palms adjacent to piles of organic debris, but were virtually absent from 10 palms >15 m from debris piles. These observations have implications for decaying debris as the assumed larval habitat of derbid species found as adults on palms in many tropical countries.

Key Words: Homoptera, fungivorous insects, *Cocos nucifera*, planthopper, organic debris, tropical plantation crops

RESUMEN

Adultos de Derbidae (Hemiptera: Auchenorrhyncha) son comunes sobre el follaje de Palmae en muchas localidades tropicales; se suponen que sus larvas se desarrollan sobre detrito orgánico podrido. La larva de *Cedusa inflata* (Ball), un dérbido común sobre las palmeras en Florida y la Región Caribeña, fue observada e ilustrada por primera vez, y su hábitat, detrito orgánico podrido, fue documentado. En plantíos de palma de coco un promedio de 56.1 larvas de *C. inflata*, o solitario o en agregaciones de hasta 13 individuos, fueron encontrados en cada uno de 10 montones de detrito orgánico de las palmas. Las larvas estaban en lugares húmedos en el interior de los montones y usualmente estaban cerca de micelios de hongos, su recurso alimenticioso presumido. Números esparcidos ($x = 6.06$) de los adultos de *C. inflata* fueron observados sobre follaje de cada una de 10 palmeras adyacentes a montones de detrito orgánico, pero fueron virtualmente ausentes de 10 palmeras >15 m de distancia de montones de detritos. Estas observaciones tienen implicaciones para el detrito podrido como el hábitat presumido de las larvas de especies de dérbidos que se encuentran sobre las palmeras en muchos países tropicales.

The adults of Derbidae are found on diverse host plants but are exceptionally well represented on palms (Lepesme 1947; Wilson 1987). Little is known of their bionomics. One species, *Cedusa inflata* (Ball), was described from Hispaniola, and is reported from Puerto Rico, Cuba and Florida (Flynn & Kramer 1983). In a survey of auchenorrhynchous insects on palms grown as ornamental plants in mostly urban areas of southern Florida, *C. inflata* was found on 21 species of palms, second in number of "apparent palm hosts" only to *Myndus crudus* Van Duzee (Cixiidae) which was found on 26 species of palms (Howard

& Mead 1980). However, while in this survey *M. crudus* was found on palms at many sites, *C. inflata* was found at only at 6 of the 112 sites where auchenorrhynchous insects were sampled (F. W. H., unpublished). The presence of this insect on diverse palm species reflected the diversity of the palms themselves at the sites where it was collected, which included a large collection of living palms at Fairchild Tropical Garden in Miami, and two additional sites with unusually large palm collections. A notable feature of the palm collections was that they were under particularly conscientious horticultural maintenance,

which included periodic watering and the use of wood chips and other organic debris as a mulch around the base of each palm.

Both *C. inflata* and *M. crudus* occur as adults on palm foliage but do not complete their life cycle on it. *Myndus crudus* larvae develop in the root zone of grasses (Howard & Villanueva-Barradas 1994). The larvae of species of *Cedusa* were unknown but were assumed to occupy cryptic habitats such as rotting organic debris (Flynn & Kramer 1983). Larvae of the derbid *Omolicna cubana* Myers, the adults of which feed on palms in the Caribbean Region, were reared on an *in vitro* culture of the fungus *Rhizoctonia solani* Kuhn (Eden-Green 1973). Derbidae in general are thought to feed on fungi in such habitats (Carver et al. 1991; Wilson et al. 1994).

In June 1996 we noticed that adults of *C. inflata* were consistently present on a small coconut palm (*Cocos nucifera* L.) adjacent to a pile of decaying wood, but absent from palms elsewhere in the vicinity. After a 1½-hour search in the pile, an auchenorrhynchos larva was found. This was reared to adult and identified as *C. inflata*. This is a report of a study to determine whether organic debris consistently served as a larval habitat for *C. inflata*, and whether adults of this species were more abundant on palms near this type of habitat.

MATERIALS AND METHODS

The study was conducted on the Fort Lauderdale Research and Education Center, Florida, in 5 plantings, each of which consisted of about 100-380 coconut palms (total = ca. 1000). In each planting, 2 "treatment" palms (total = 10) were selected at random, young coconut palms 4-5 m tall to the tip of the tallest leaf being preferred so that they could be easily examined from the ground or a ladder. Beginning in June 1996, debris that fell from coconut palms (fronds, inflorescences, etc.) was periodically gathered and piled so that large quantities were consolidated immediately adjacent to the 10 treatment palms. For each treatment palm a similar palm in the same planting and about 15-50 m from the nearest debris pile was selected as a control.

Treatment and control palms were examined about a year later during the period July 29-August 11, 1997. On each of 10 days the numbers of adult *C. inflata* on the foliage were counted. On the first day, observations were made from about 0730 hrs-0830 hrs and from 1300-1400 hrs. Since there was a negligible difference between the numbers of *C. inflata* in the early morning compared to midday, observations were made in the early morning on all other days.

During the period August 11-August 26, 1997, the debris piles were searched for insects. Counts were made of *C. inflata* adults and larvae. Specimens collected as adults and 20 adults reared

from larvae captured in the debris were identified. Differences in mean numbers of adults on foliage of treatment and control palms were tested by Student's t-test (SAS 1985).

RESULTS

There was a mean of 6.1 (SD = 4.43) *C. inflata* adults on the foliage per treatment palm compared to a mean of 0.02 (SD = 0.03) per control palm. This difference was statistically significant (df = 109, prob > F = 0.0000). This indicated that sparse numbers of these insects were on foliage of palms adjacent to piles of debris, and were virtually absent from palms greater than 15 m from debris piles.

A mean of 56.1 larvae (SD = 41.0, range 22-151) of *C. inflata* (Fig. 1) were found in the 10 debris piles. Callow adults were found in this same habitat. Specimens collected as adults or reared from larvae were positively identified as *C. inflata*.

The larvae of *C. inflata* are reddish purple in the early instars. Later instars are a dark, dull purple and about 1.8-2.0 mm. long. No *C. inflata* larvae

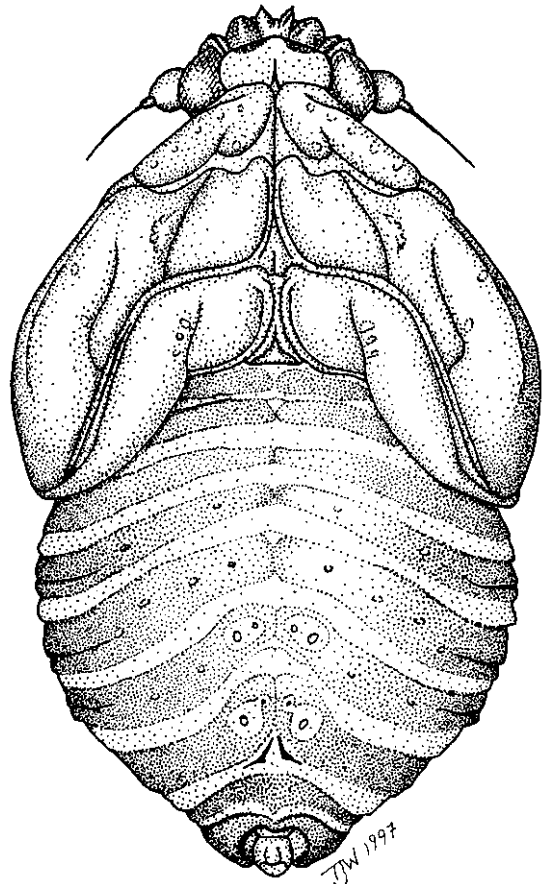


Fig. 1. *Cedusa inflata*, late instar larva.

were observed in the dry outer layers of debris piles. Larvae were solitary or in aggregations of up to 13 individuals on moist debris from about 10 cm below the pile surface to the ground surface. They, along with occasional adults, were most often found near rich growth of fungal mycelia (Fig. 2). We did not attempt to culture and identify the fungi.

Like other Auchenorrhyncha on palms, the adults of *C. inflata* tend to remain motionless on the foliage for long periods. When disturbed, they jump and escape from the foliage more quickly than other Auchenorrhyncha that we have observed in this habitat. However, their presence on palms near debris piles, but virtual absence from palms more than 15 m away from piles, suggests that they do not readily disperse from the vicinity of their larval habitat. Like the adults, the larvae of *C. inflata* become extremely active when their habitat is disturbed, running rapidly and frequently jumping.

DISCUSSION

These results are consistent with our hypothesis that the presence of adults of *C. inflata* on palms at certain sites in Florida (Howard & Mead 1980) was related to the presence of organic debris.

Populations of *C. inflata* are typically sparse and patchy both in Florida and in the Caribbean

(Howard et al. 1981; Howard & Mead 1980; F. W. H., unpublished observations). In this study, abundant larval habitats were created by consolidating debris near palms. Even so, only a mean of 6.1 adults of the species were seen on adjacent palms. The numbers of larvae relative to the size of the debris piles indicate that the species tends to occur in low populations even when conditions would appear to be optimal. In contrast, in coconut plantations in Mexico, Central America and the Caribbean, *Omolicna* spp. (Derbidae), which are rare on palms in Florida (Howard & Mead 1980) are among the most consistently found auchenorrhynchous insects on fronds. In Jamaica, debris in petiole axils was searched exhaustively without finding derbid larvae (Wilson 1997). Fungi, ferns and seed plants commonly grow in debris in petiole axils, implying that moisture levels are fairly stable there. However, abundant debris on the ground may be the principal habitat of larvae of *Omolicna* spp. and other derbids in palm plantations in various tropical countries.

ACKNOWLEDGMENTS

We thank J. V. DeFilippis and Jorge Vargas for field assistance and Simon Eden-Green, Michael Wilson, and Dave Moore for reviewing the manuscript. This work



Fig. 2. Habitat of larva of *Cedusa inflata*: decaying palm tissue with fungal mycelia. Arrow indicates larva.

was partially funded by a University of Florida Program Enhancement Award to F. W. H. This is Florida Agricultural Experiment Station Journal Series No. R-06039.

REFERENCES

- CARVER, M., G. F. GROSS, T. E. WOODWARD, G. CASSIS, J. W. EVANS, M. J. FLETCHER, L. HILL, I. LANSBURY, M. B. MALIPATIL, G. B. MONTEITH, M. S. MOULDS, J. T. POLHEMUS, J. A. SLATER, P. STYS, K. L. TAYLOR, T. A. WEIR, AND D. J. WILLIAMS. 1991. Chapter 30, Hemiptera. pp. 429-509. *In* I. D. Naumann et al. (eds.). The Insects of Australia. Cornell University Press, Ithaca, NY.
- EDEN-GREEN, S. J. 1973. Some attempts to rear potential leafhopper vectors of lethal yellowing (Abstract). *Principes* 17: 156.
- FLYNN, J. E., AND J. P. KRAMER. 1983. Taxonomic study of the planthopper genus *Cedusa* in the Americas (Homoptera: Fulgoroidea: Derbidae). *Entomography* 2: 121-260.
- HOWARD, F. W., J. P. KRAMER, AND M. FÉLIZ PERALTA. 1981. Homópteros auchenorrhyncha asociados á palmeras en un área de la República Dominicana afectada por el amarillamiento letal del cocotero. *Folia Entomológica Mexicana* 47: 37-50.
- HOWARD, F. W., AND F. W. MEAD. 1980. A survey of Auchenorrhyncha (Insecta: Homoptera) associated with palms in southern Florida. *Tropical Agriculture (Trinidad)* 57: 145-153.
- HOWARD, F. W., AND J. VILLANUEVA-BARRADAS. 1994. The abundance of the American palm cixiid in relation to grass height and location of nymphs in relation to soil surface. *Zeitschrift für angewandte Entomologie* 118: 239-244.
- LEPESME, P. 1947. Les insectes des palmiers. Paul Lechavalier, Paris.
- SAS, I. 1985. SAS user's guide: statistics. SAS Institute, Cary, NC.
- WILSON, M. R. 1987. African Derbidae (Homoptera: Fulgoroidea). Taxonomic notes with descriptions of new species collected mainly from coconut. *Journal of Natural History* 21: 567-595.
- WILSON, M. R. 1997. Leafhoppers and planthopper faunas (Homoptera: Auchenorrhyncha) of coconut palms in lethal yellowing areas. pp. 261-267. *In* S. J. Eden-Green and E. Ofori (eds.), Proceedings of an International Workshop on Lethal Yellowing-like Diseases of Coconut, Elmina, Ghana, November 1995. National Resources Institute, Chatham, UK.
- WILSON, S. W., C. MITTER, R. F. DENNO, AND M. R. WILSON. 1994. Evolutionary patterns of host plant use by delphacid planthoppers and their relatives. *In* R. F. Denno and T. J. Perfect (eds.). Planthoppers: their ecology and management. Chapman & Hall, New York, London.