FNGLA Endowed Research Funded Project 2005-2006

Biology and management of West Indies mahogany scale, *Conchaspis cordiae* (Insecta: Hemiptera: Conchaspididae).

Final Report – September 1, 2006
Submitted to the Florida Nursery, Growers, and Landscape Association

By F. W. Howard
Associate Professor of Entomology
University of Florida
Fort Lauderdale Research & Education Center

Abstract. Work was initiated to learn the biology of West Indies mahogany scale, *Conchaspis cordiae* Mamet, evaluate its distribution and importance as a pest, learn its basic biology, and develop pest management methods for it. It is a scale insect of Caribbean origin that was accidentally introduced into Florida and found here in 2003. In this project it was determined that this scale attacks primarily West Indies mahogany, *Swietenia mahagoni* Jacquin, which is an important shade tree in southern Florida, as well as an important native tree in natural areas. It occurs in minor infestations on some related species of Meliaceae. A survey was conducted that determined this scale to be present on West Indies mahogany trees over at least 70 km of the southeast Florida coastal region. The scale is found only on main stems and branches, not on leaves. Many of the trees were heavily infested and on some trees the scale infestation caused a branch die-back. The scale insects are attacked by a hymenopterous parasitoid, *Marietta* sp.(Hymenoptera: Aphelinidae), that was possibly introduced from the Caribbean with the scale insect itself. Based on counts of exit holes

in the scales, about 5-8% of the scales were parasitized. Chemical control experiments were planned but could not be completed this year due to damage in the experimental area by Hurricane Wilma in October 2005.

Introduction. This project was initiated with the objective of obtaining knowledge of the biology of the West Indies mahogany scale, *Conchaspis cordiae* Mamet, to support the ultimate objective of developing pest management for this insect. This accidentally introduced insect was found in Florida in 2003. It is native to several islands of the West Indies where it is not considered a pest, and in fact is apparently a rare insect there. By spring of 2005 the populations in Florida of this scale insect had exploded on West Indies mahoganies, *Swietenia mahagoni* Jacquin, thus the insect was recognized as a pest of this tree. The West Indies mahogany is one of the most important shade trees in southern Florida, and also a threatened species in its native habitats in Florida and the Caribbean.

Objectives. This project was initiated to determine the parts of the tree attacked by this scale insect, the extent of its spread in southeastern Florida, its host range and host preferences, life cycle, damage, and to ultimately develop pest management methods for it.

Methods.

a. Within plant distribution. We conducted observations on West Indies mahogany scale infesting trees in the Mahogany Research Grove at the FLREC to determine which plant parts were most often infested with West Indies mahogany scale.

b. Distribution in Florida. The West Indies mahogany scale was detected in Florida in West Hialeah in 2003, and we found it at the Fort Lauderdale Research & Education Center and vicinity in spring of 2005. To determine whether it had become widespread in southeastern Florida, we conducted a survey in which we examined West Indies mahoganies from Boca Raton on the north to southern Miami, i.e., over a over a distance of 70 km on the southeast coast area.

c. Host range and apparent preferences. To obtain evidence of the host preferences of this scale, we examined mature trees of several species in the family Meliaceae in the Mahogany Research Grove at the FLREC. This is a planting of mature trees of mahoganies and closely related species of Meliaceae and includes 196 West Indies mahoganies, 14 Honduras mahoganies (*S. macrophylla* King), 29 mahogany hybrids (*S. macrophylla* X *S. mahagoni*), 4 African mahoganies (*Khaya nyasica* [Stapf} ex Baker f.), 2 tropical-cedars (*Cedrela odorata* L.), and 2 neem trees (*Azadirachta indica* A. Jussieu).

d. Damage evaluation. To make a judgment on the severity of damage by West Indies mahogany scale, infested mahogany trees in the region were examined, with detailed examinations made at the 16 sites mentioned and in the FLREC Mahogany Research Grove.

e. Life History. Studies of the biology of the West Indies mahogany scale were initiated. Work was conducted to devise a technique of establishing colonies of the scale on containerized mahogany seedlings so that they could be studied in detail. To attempt to learn several aspects of the biology of the mature female scales, an experiment was conducted to determine if they survive and thus can be observed after the scale is removed. As a

species of the family Conchaspidae, the mature females of West Indies mahogany scale differs from armored scale insects (family Diaspididae) in possessing functional legs. Since they are thus capable of locomotion in this stage observations were also conducted to determine if the scale covering were removed from a female, it would move to another site and settle and construct a new scale covering. To gain preliminary data on the development period of this scale we transferred crawlers to seedling mahoganies and monitored them in a chamber at 27^{o} C.

f. Management. When an exotic scale insect is accidentally introduced into a new region, classical biological control may be considered as the best option for managing the pest. This approach involves importing natural enemies from the insect's native home. However, there is a chance that some of the scale insects of the exotic species may have become parasitized before their transfer to the new area, in which case they would bring natural enemies along with them. Also, parasitoids already present in the new region may be pre-adapted to attack the exotic pest when it is introduced. To investigate the possible presence of parasitoids of West Indies mahogany scale in Florida, hundreds of scales on samples of branches from three sites in Broward County were examined in the laboratory under a microscope and the numbers of parasitoid exit holes determined. These branch samples were then kept in Ziploc bags and observed for several weeks for adult hymenopterous wasps that may have emerged from the scales.

Chemical control experiments were planned and field sites on the FLREC selected for these experiments. Topical treatments for controlling the scale in containerized mahogany trees and root drenches and

trunk injection treatments were planned for testing on larger trees.

Results.

a. Within-plant distribution. West Indies mahogany scales tend to attack twigs and smaller branches. They were observed on stems and not on other plant parts such as leaves or fruit capsules. Infestations were concentrated on twigs and branches of up to about 6 cm in diameter. Only occasional scale insects were observed on larger branches and main trunks, where they occurred in bark fissures.

b. Distribution in Florida.
The West Indies mahogany scale was found on West Indies mahoganies on 63% of 16 sites that we examined. These sites were distributed from 25^{o} 45’N (southern Miami) to 26^{o} 22’ N (Boca Raton), i.e., over a over a distance of 70 km on the southeast coast area.

c. Host range and apparent preferences
Based on observations in the FLREC mahogany research grove, West Indies mahoganies and the *S. macrophylla X mahagoni* hybrid are preferred hosts of the West Indies mahogany scale. Infestations were found on 40.8% of the West Indies mahoganies, and 41.3% of the *S. macrophylla X mahagoni* hybrids, compared to 14.2% of the Honduras mahoganies. Large patches of dense populations of up to 30 mature female scales per cm^{2} along with numerous first and second instars were visible on branches of most of the infested West Indies mahoganies and the *macrophylla* X *mahagoni* hybrids. In contrast, infestations on Honduras mahoganies were sparse and consisted of relatively few individuals per tree. One of the African mahoganies was lightly infested.

No scale insects were found on Spanish-cedar or neem tree.

d. Damage evaluation. Previously, scale insects were rarely found on West Indies mahogany in Florida. Thus, the West Indies mahogany scale could be said to fill an “open niche”. Heavy infestations of mature trees appeared to have resulted in death of branches in only a few cases. Possibly long term infestations could result in serious damage or curtailment of growth. We observed heavy infestations on young West Indies mahogany seedlings, indicating that this scale insect is potentially a nursery pest.

e. Life History of the Scale Insect. A technique of transferring crawlers of the scale to West Indies mahogany seedlings was developed. At a constant temperature of 27^{o} C., the insects developed from crawler to mature stage in about 60 days. Mature females with the scale cover removed survived and laid eggs for about a week, but did not survive after that. Although they have functional legs, mature females with scale covers removed did not move from the original feeding site. Observations are being continued to complete our knowledge of the life cycle of this insect species.

f. Management.
Parasitoid exit holes were observed in about 5-8% of the scale coverings of mature female West Indies mahogany scale in samples from three sites in Broward County. Minute wasps reared from West Indies mahogany scales were identified as *Marietta* sp. (Hymenoptera: Aphelinidae) by Michael Gates, a taxonomic specialist with the USDA-ARS Systematic Entomology Laboratory, Beltsville, MD. This species is likely to be native to the Caribbean, and may have been introduced along with the scale insect.

The planned experiments in chemical control of West Indies mahogany scale were postponed because the mahogany trees in field sites that had been selected were severely damaged, and the field site made impassable by Hurricane Wilma on October 24. The field site was restored within several weeks, but the distribution of the scale insects in the grove was highly uneven due to the effects of the storm. The chemical control experiments were delayed but will be completed in the near future.

Conclusions and Recommendations.

West Indies mahogany scale was found for the first time in southeastern Florida three years ago, and is now spread throughout the southeast costal region. It infests primarily West Indies mahogany, one of the most frequent shade trees in the region. Although the scale insect often builds up heavy infestations, it has not thus far caused extensive damage in the landscape. Its propensity to infest small containerized trees is of concern. Over time greater damage may occur. The scale is attacked by a parasitoid, which thus far exerts little control over the pest. Chemical control experiments have not yet been completed. It is recommended that research on this scale insect be continued in order to understand its biology and complete the work of devising control methods.