



## Update on Management Methods for Cycad Aulacaspis Scale<sup>1</sup>

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### Introduction

More than 20 species of scale insects occur on cycads in Florida, the most damaging of which is the cycad aulacaspis scale (*Aulacaspis yasumatsui* Takagi) (Figure 1). Cycad aulacaspis scale is native to Thailand and currently found in China, Singapore, Hong Kong, Cayman Islands, Puerto Rico and Vieques Islands, U.S. Virgin Islands, Hawaiian Islands (Hawaii and Oahu) and Florida (Ben-Dov 2003). In addition to the known distribution, cycad aulacaspis scale has been intercepted in Europe (but not established), having been reported in France in 2001 (Germain 2002). This species was first found in Florida in 1996. Since this initial discovery in the Miami area, it has become widely distributed in Florida (Figure 2) (Hamon 2000). Homeowners and nurserymen alike have been struggling with control of this pest. Populations readily reach high densities (Figure 3) on their hosts, causing necrosis of fronds and eventually plant death.



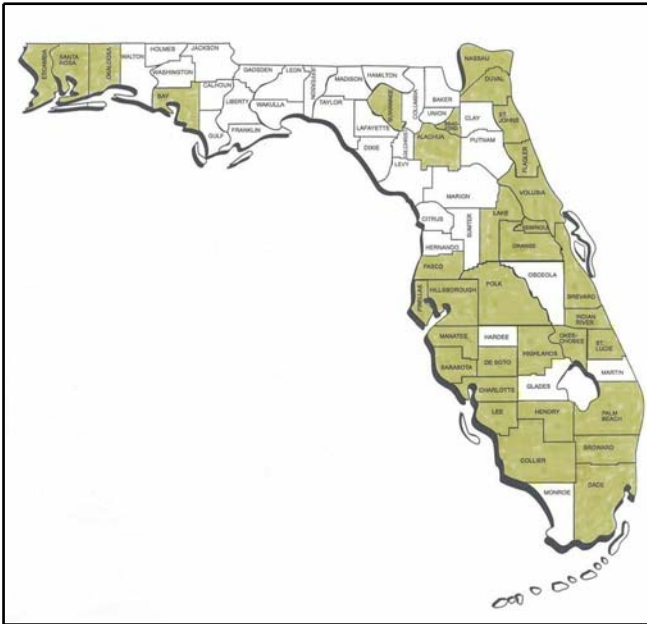
**Figure 1.** Adult female *Aulacaspis yasumatsui*. Credits: Division of Plant Industry

The magnolia white scale (*Pseudaulacaspis cockerelli* (Comstock)), which may be confused with the cycad aulacaspis scale in the field, occurs on cycads and many other hosts, but is not as difficult to control. It superficially resembles the cycad aulacaspis scale with the adult females having a

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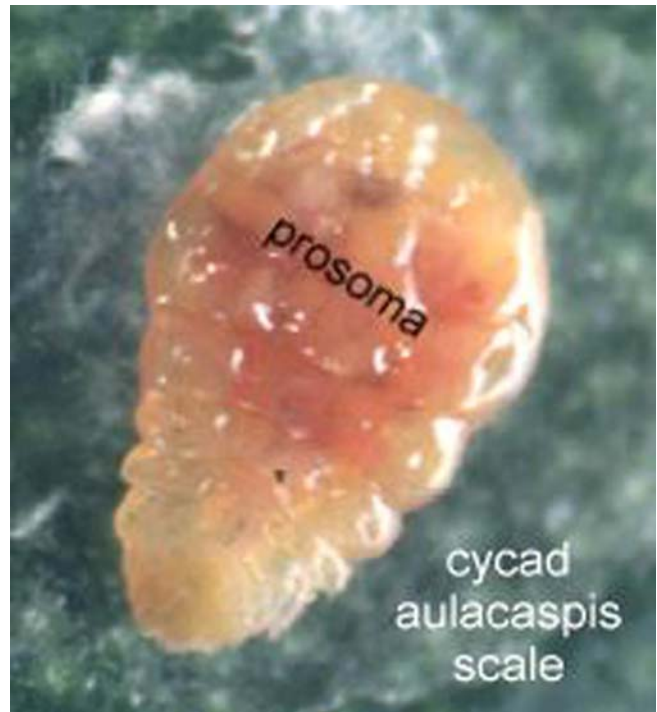
**Figure 2.** Counties with reports of cycad scale (shaded). Credits: Division of Plant Industry



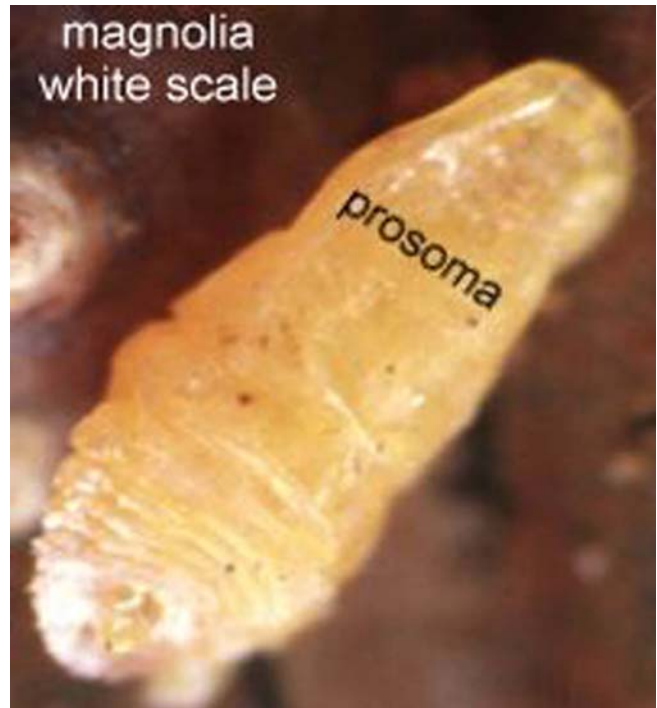
**Figure 3.** Infested cycad. Note white undersides of leaves. Credits: Division of Plant Industry

silvery teardrop-shaped cover and the males with elongate-fluted tubes for covers. Key differences exist and are observable in the field. Once the scale cover is flipped over, the cycad aulacaspis scale female (Figure 4) is generally orange in color, and has a swollen prosoma, and overall looks very compact. The magnolia white scale (under the scale cover) (Figure 5) is yellow in color and very elongate with a narrow prosoma. A 10<sub>x</sub> hand lens may be helpful for seeing these features.

Due to the overall impact of the cycad aulacaspis scale, several researchers are studying the life history and control of this pest.



**Figure 4.** Cycad aulacaspis scale adult female. Credits: Division of Plant Industry



**Figure 5.** Magnolia white scale adult female. Credits: Division of Plant Industry

### Chemical Control on Foliage and Other Above-Ground Parts

In various tests and observations researchers have found that oils (either paraffin-based ultra-fine

horticultural oils, or Organocide (which is 95% fish oil) applied to foliage and trunks of infested cycads greatly reduce the scale insect populations. Results can be variable, due partly to the plant architecture (for example, the margins of the pinnae (leaflets) of *Cycas revoluta* curl down and inwards, forming a trough which the insecticides/oils may not always penetrate) and perhaps also due to varying thickness of the oil coating.

Cycad aulacaspis scale management using foliar oil treatments are effective, but good control may require several applications. Periodical use of oils or using oils “as needed” may be required to prevent subsequent re-infestations. However, frequent oil treatments can result in an unsightly build up of oil and dead scales. The appearance of the plant can be improved by occasionally hosing off old oil and scales.

Greater scale mortality can be achieved by mixing oils with a contact insecticide, such as malathion or Sevin, than with oil alone. Some synthetic organic contact insecticides have been very effective even when applied without the oils. However, use of contact insecticides can negatively impact the biological control agents that have been released.

### **Use of Systemics for Control of Cycad Aulacaspis Scale**

Foliar applications of methidathion and Cygon can result in a high rate of kill on containerized cycads. However, use of these insecticides on field-grown cycads have yielded mixed results. In some instances good control was attained, in other cases very little control was seen.

Soil drenches of Merit at recommended rates have not been effective in tests on either containerized or field-grown cycads.

### **Biological Control**

Two natural enemies of cycad aulacaspis scale were released by Dr. Richard Baranowski of the Tropical Research and Education Center (TREC) in 1998. These are a predaceous beetle, *Cybocephalus binotatus* Grouvelle, and a parasitic wasp, *Coccobius fulvus* (Compere and Annecke). Approximately

15,000 *Coccobius fulvus* were released by DPI from February-April 2002 in Brevard, Broward, Dade, Hillsborough, Indian River, Lake, Manatee, Martin, Orange, Palm Beach, Pinellas, Sarasota, and St. Lucie Counties. These natural enemies seem to control cycad aulacaspis scale very effectively during certain periods, but the scale insect undergoes outbreaks that are more severe at some sites than at others.

Use of oils (either Organocide or paraffin-based horticultural oil) is more compatible with biological control than foliar applications of synthetic organic insecticides.

### **Controlling Infestations on the Roots**

In recent experiments, nearly 100% kill of mature females on the roots of cycads was observed following dipping treatments of 2% horticultural oil. A root drench with this material on field-grown cycads could be expected to be effective if the material penetrates the root zone sufficiently. This would depend on the amount used and the kind of soil.

### **Cultural Practices**

Understanding the biology of any scale insect can lead to cultural practices that may prevent their spread and keep populations at low levels. For example, growers and homeowners should practice plant sanitation in pruning infested plants. In many cases, the crawler stage (dispersal life stage) can be spread from plant to plant by pruning equipment or by infested clippings that are not discarded properly. A good practice is to clean pruning equipment before moving to new plants and to destroy infested clippings.

Growers can also isolate infested plants or blocks of plants away from non-infested plant material. Crawlers are readily dispersed by wind currents and can be blown for great distances to new host plants. The direction of the wind should be considered when isolation is needed. Placement of infested plant material up-wind of non-infested plant material can result in infestation of the previously non-infested plants.

One grower reported good control by pruning all infested fronds. However, the next flush of fronds may become infested from the stem or roots, and successive pruning to control the scale may severely stress the plant.

### Impediments to Management

Unfortunately, the cycad aulacaspis scale insect is an unusually hard pest to control. The effects of chemical (including oil) treatments are often variable. Treatments with highly toxic products such as methidathion may be highly effective, but would be disruptive to biocontrol. The scale covers remain on the plant long after the insect itself dies and previous scale sites may still look chlorotic, so when control is achieved it may not be obvious to the observer. This scale quickly re-infests plants. This may be at least partly due to its presence on the roots, where it is even harder to control.

### Long Term Outlook for Cycad Aulacaspis Scale

A factor in this problem is that the two most popular species of arborescent cycads in Florida, *Cycas rumphii* and *C. revoluta*, have for many years been grown as "low maintenance plants." They are quite drought resistant, have low fertilizer requirements, and had relatively few significant pest problems prior to the invasion of cycad aulacaspis scale. Homeowners who prize their cycads and managers of valuable cycad collections in botanical gardens are willing to invest considerable effort in managing this scale, while others question whether such effort is justified for what they conceive as a "low maintenance plant."

A long-term strategy may involve the use of cycads that are resistant or not preferred by the cycad aulacaspis scale. For example, *Dioon spinulosum* (Figure 6), gives an effect in the landscape that is similar to that of *Cycas revoluta*, *C. rumphii*, or *C. taitungensis*. This species is almost never attacked by cycad aulacaspis scale.



**Figure 6.** *Dioon spinulosum*. Credits: F. W. Howard, University of Florida

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