

Palmageddon:

The Invasion of California by the South American Palm Weevil is Underway



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In December 2010, the South American palm weevil (SAPW), *Rhynchophorus palmarum* (Coleoptera: Curculionidae) (Fig. 1), was found in association with dying Canary Islands date palms in Tijuana Mexico. Adult weevils are large, about 1.25 inches in length, and SAPW is now the largest weevil found in California. Weevil larvae (Fig. 2) feed in the crown of palms killing the apical growing region. This feeding causes fronds to fall from palms, and eventually the crown will drop leaving a halo of dying mature fronds encircling the top of the palm trunk (Fig. 3). Larvae form fibrous cocoons within which they pupate. Often these cocoons are tightly wedged within tunnels excavated by pre-pupal larvae at the base of the frond (Fig. 4). When infestations are particularly heavy, cocoons may litter the ground beneath affected palms (Fig. 5). Opened cocoons may reveal larvae getting ready to pupate (Fig. 6), pupae, or unemerged adult weevils.



Economic Impact

The potential economic damage in California from SAPW is significant. For example, it is estimated that California's ornamental palm industry is worth ~\$70 million each year. Some estimates suggest that each 12-inch length of trunk of a Canary Islands date palm transplant is worth \$500. The installation of a mature date palm in the

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urban landscape may cost as much as \$5,000 per palm. In addition to ornamental palms, the California date industry, with an estimated value of \$68 million per year, is also vulnerable to SAPW. And what is the value of iconic native California fan palms, *Washingtonia filifera*, inhabiting desert oases? These desert-dwelling palms may also be attacked by SAPW.

The impact of SAPW on palms in California may eventually be amplified by a palm-killing nematode, the red ring nematode, *Bursaphelenchus cocophilus*, which causes red ring disease, a lethal malady of palms. SAPW vectors this nematode, but it has not yet been recorded in California.

Over the next few years, we expect SAPW will continue to spread in California, and we are anticipating significant levels of palm mortality, especially to Canary Island date palms growing in urban residential areas, public and private recreational zones where palms are common landscaping features, and in wilderness areas where palms have naturalized (e.g., river washes in San Diego County). Removal of palms killed by SAPW is an expensive and technically difficult procedure (Figs. 7-8).

The Response to SAPW Detections

In response to the discovery of this notorious palm pest in Tijuana in December 2010, the California Department of Food and Agriculture (CDFA) initiated a monitoring program in southern California in 2011 to delineate the newly infested area. Palm weevil monitoring is straight-forward and utilizes a bucket trap baited with fermenting fruit (e.g., pineapple chunks or dates in water mixed with baker’s yeast) which is held in a separate container with a perforated lid that is placed inside the bucket trap, commercially-available SAPW aggregation pheromone, and a synergist, ethyl-acetate, both of which are suspended from the bucket lid (Fig. 9). The combination of volatile odors from fermenting fruit, pheromone, and ethyl acetate is highly attractive to SAPW adults. Typically the bucket trap is wrapped with burlap to help adult weevils attracted to the trap to crawl up the sides of the trap and through windows cut in the bucket from which they drop into a preservative (e.g., propylene glycol) (Fig. 10). Traps are suspended above the ground to minimize animal interference (Fig. 11).

The CDFA trapping program detected SAPW in San Ysidro in San Diego County in May 2011. Captured weevils had likely originated in Tijuana and flown the ~3 miles



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fig. 8

Fig. 3-6 photos by Mark Hoddle, Dept. of Entomology, UC Riverside

Fig. 7-8 photos by Mike Lewis, Center for Invasive Species Research, UC Riverside



Fig. 9

to the traps. This is probably an easy distance for SAPW to fly. CDH has accumulated flight distance data using computerized flight mills in the laboratory that indicates SAPW is capable of flying tens of miles in a 24 hour period should it elect to do so. The take home message from these lab studies is that SAPW is a very strong flyer and capable of dispersing long distances without human assistance (e.g., accidental movement into new areas inside infested palms).

During the two year life span of the trapping program, CDFA caught 111 SAPW until the program ceased operating in 2013 because of a lack of funding. Trapping programs in Texas and Arizona caught SAPW in 2012 and 2015, respectively. It is unknown if SAPW has established in these two states.

Beginning in May 2016, concern over SAPW activity grew because of reports of increasing numbers of dead palms in Tijuana that had died because of SAPW attack. A casual 8 hour driving survey around Tijuana in May 2016 resulted in the recording of about 140 dead Canary Islands date palms (Fig. 12). Dead desiccated palms are a significant fire risk in Tijuana as several home owners described incidences of dead palms combusting as a result of sparks that originated from overhanging powerlines. Heavy weevil attack to fronds of some palms was also evident in Tijuana (Fig. 13). Around this time, reports of dead Canary Islands date palms were made from San Ysidro in San Diego County and cause of mortality was subsequently assigned to SAPW.

Beginning in June 2016, surveys around southern San Diego County were undertaken by MSH and CDH in an attempt to determine how widespread SAPW was in southern California. Weekend driving trips through areas with high invasion potential and the running down of leads emailed or called in from concerned citizens quickly led to the conclusion that SAPW had established in San Diego County from San Ysidro north to Chula Vista. At this time it is unknown how far west, east, and north of Chula Vista populations of SAPW may be. The reason for this uncertainty is due largely to a lack of financial support to develop a monitoring and management program for this pest. Also, because of the widespread distribution of SAPW in San Diego County, and the probable existence of high density populations in infested areas, it is unlikely that this pest can be eradicated from California as was achieved recently with another invasive palm weevil, *Rhynchophorus vulneratus*, in Laguna Beach (Hoddle et al. 2017). Containment and control programs, should they be initiated in San Diego County, may have their efficacy reduced if simultaneous programs targeting SAPW populations in Tijuana are not undertaken.

Control Options

There are currently no recommended control programs for managing SAPW infestations in California palms. However, experience with the management of other closely related palm



Fig. 10



Fig. 11



Fig. 12



Fig. 13

Fig. 9 photo by Christina Hoddle, Dept. of Entomology, UC Riverside

Fig. 10-13 photos by Mark Hoddle, Dept. of Entomology, UC Riverside

weevils, like the extremely invasive and destructive red palm weevil (RPW), *R. ferrugineus*, indicate that a combination of management practices are needed. These programs are insecticide intensive and usually incorporate a contact pesticide applied to palm foliage, especially the central crown region that target adult weevils and simultaneous application of systemic insecticides that are translocated within the palm to kill larvae. Some arborists cut “windows” into the palm crown and the removal of these fronds permits visual inspection of this highly sensitive area for weevil activity. In addition to pesticides, bucket traps loaded with bait and pheromone and the removal and destruction of infested palms have resulted in programs that have significantly suppressed RPW in date plantations in the Middle East (Hoddle et al. 2013). In Spain and other Mediterranean countries with active RPW infestations, numerous iconic Canary island date palms that have significant “heritage” value are outfitted with a permanently affixed shower head positioned over the palm crown. Pipe is attached to the palm trunk through which pesticide is pumped and it exits the shower head “showering” the palm crown with insecticide.

Biological control options for SAPW may exist, and one potential natural enemy of interest is a parasitic fly, *Billaea rhynchophorae* (Diptera: Tachinidae), from South America that is reported to attack SAPW larvae and pupae. Little is known about the biology and ecology of this fly or the population-level impacts it may have on SAPW (Löhr 2013). A major concern over running a classical biological control program targeting SAPW in California is safety, in particular, the host specificity of potential weevil parasitoids. The risk of attacks to non-target weevil species, especially native California weevils (and potentially other species of native US weevils), by a SAPW natural enemy from South America may be unacceptable. Another anticipated difficulty would be the mass rearing of SAPW and non-target weevil species for host specificity and host range studies in quarantine; establishing and maintaining colonies of target and non-target weevil species will likely be challenging and very expensive.

The Way Forward

In response to the obvious threat posed by SAPW to California’s palms, UC Riverside, UC Cooperative Extension, CDFA, the San Diego County Agricultural Commissioner’s Office, and San Diego Parks and Recreation with financial support from the Western Regional IPM Center, held a one day meeting in October 2016 to inform concerned parties about the extent of the SAPW invasion in southern California. From this meeting, a list of management, research, and extension needs were developed largely with input from meeting attendees. These identified priorities are being used to develop grants to solicit funding to commence work on SAPW. The need to respond to the SAPW invasion is obvious, the expertise to develop strategies to manage SAPW in California is available,

and with the procurement of financial support, program development can commence. Obtaining funding in 2017 is a major goal for the incipient SAPW program – so please stay tuned, we anticipate having more to report on this highly destructive palm pest in the near future.

Background Reading

Hoddle, M.S. 2011. Palmageddon: Are California’s palms about to face the perfect storm? <http://cizr.ucr.edu/blog/invasive-species/palmageddon-are-california%e2%80%99s-palms-about-to-face-the-perfect-storm/>

Hoddle, M.S., Al-Abbad, A.H., El-Shafie, H.A., Faleiro, J.R., Sallam, A.A., Hoddle, C.D. 2013. Assessing the impact of area-wide pheromone trapping, pesticide applications and eradication of infested date palms for *Rhynchophorus ferrugineus* (Coleoptera: Curculionidae) management in Al Ghowaybah, Saudi Arabia. *Crop Protection* 53: 152-160.

Hoddle, M.S. 2016. Has the South American palm weevil, *Rhynchophorus palmarum*, established in southern California? <http://cizr.ucr.edu/palmarum.html>

Hoddle, M.S., C.D. Hoddle, M. Alzubaidy, J. Kabashima, J.N. Nisson, J. Millar, and M. Dimson. 2017. *Rhynchophorus vulneratus* palm weevil is eradicated from Laguna Beach. *California Agriculture*. <http://dx.doi.org/10.3733/ca.2016a0012>

Hodel, D.R., M.A. Marika, and L.M. Ohara. 2016. The South American palm weevil: a new threat to palms in California and the Southwest. *Palm Arbor* 3: 1-27 (PDF is accessible here: http://cizr.ucr.edu/pdf/south_american_palm_weevil_hodel.pdf)

Löhr, B. 2013. Biological control of palm weevils: rediscovering forgotten opportunities. *Biocontrol News and Information* 34 (3): 20N-23N.

Additional Resources

The “Exotic Palm Weevil Symposia” is an online resource that provides access to digital recordings of the talks made at the SAPW meeting that was held at the Sweetwater Summit House in Bonita, San Diego County, on 26 October 2016.

https://cizr.ucr.edu/palm_weevil_symposia.html

This web page has been developed to report palms that may be infested by SAPW. If you suspect you’ve found a palm killed or infested with SAPW please take a photo, upload it, and report it here:

https://cizr.ucr.edu/palmarum_survey.html 🐞