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THE SOUTH AMERICAN PALM WEEVIL: AN INVASIVE SPECIES FOUND IN SOUTH TEXAS

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ABSTRACT: This study centers in a survey conducted to find *Rhynchophorus palmarum* (L) and *R. ferrugineus* (Olivier) (Coleoptera: Curculionidae), two invasive species of palm trees. The study was performed in the Rio Grande Valley in south Texas, and near the borderline of the state of Tamaulipas in Mexico. A total of 40 traps were inspected biweekly from 26 September 2011 to 20 September 2012. Only, two specimens of *R. palmarum* were found and identified next to a commercial palm plantation on 11 March and 5 May 2012 near the city of Alamo, TX; and none *R. ferrugineus* was found throughout the entire duration of the study. Nematodes of the genus *Rhabditis*, *Poikilolaimus, Pseudodiplogasteroides* (Family Aphelenchidae) were found in the two *R. palmarum* weevil specimens.

Keywords: *B. cocophilus,* invasive pest, South American palm weevil, sugarcane.

Introduction

Invasive palm weevils are a threat to many palm species in subtropical areas and to the ornamental industry of the U.S. In the Rio Grande Valley, the southern-most region of Texas, many species of palm are used as ornamentals in back yards and in landscape design on highways, commercial centers, city parks, and on palm plantations. Two species of weevils have been reported in California: the Red Palm Weevil (Ferry 2010), *Rhynchophorus ferrugineus* (Olivier) (Coleoptera: Curculionidae), and the South American Palm Weevil (USDA-APHIS 2011), *R. palmarum* (L) (Coleoptera: Curculionidae). The introduction of these two exotic invasive species and their associated parasites can be devastating for the palm and landscape industry of many areas of the southern U.S.

Rhynchophorus ferrugineus is native of Southern Asia and Melanesia, whereas *R. palmarum* is native of South America. The former is a devastating pest of palms and over the last few decades it has spread to the Middle East (Faleiro 2006), North Africa (COX 1993), and South Europe (Barranco & Cabello 1996). Recently, *R. ferrugineus* has invaded Japan (Abe 2009), the Mediterranean Sea rim, Egypt, and spread in Spain since 1996; and found in the Caribbean (Roda 2011), and disseminated in Murcia, Balearic Islands, and Canary Islands (CABI/EPPO 2003). Ferry (2010) confirmed that *R. ferrugineus* was found in Laguna Beach, California, USA, infesting *Phoenix canariensis*. The primary hosts of *R. ferrugineus* include 24 species of palms in 14 genera (Faleiro 2006. The main damage of *R. ferrugineus* is by feeding inside the palm crown. The resulting damage is in the form of tunnels on the trunk or base of palm leaf, oozing of viscous fluids from tunnels, distinct fermented odors, and breaking of the trunk

or collapsing of the palm crown. The prolonged damage to the palm tree by *R. ferrugineus* results in the eventual death of the tree.

Rhynchophorus palmarum is a primary pest of palms in Central and South America (Alpizar et al. 2002), and its main host plants are coconut palm (Oehlschlager et al. 1995), oil palm (Oehlschlager 2002), and sugarcane. In 1969, CABI/EPPO reported that *R. palmarum* weevil was found in Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) and the West Indies. In South America, *R. palmarum* was present in Argentina, Bolivia, Brazil, Colombia, Ecuador, French Guyana, Guyana, Paraguay, Peru, Surinam, Uruguay, and Venezuela. Esser & Meredith (1987) indicated that *R. palmarum* was in Barbados, Dominican Republic, Grenada, Saint Lucia, Saint Vincent and Grenadines, and Commonwealth of Dominica (OEPP/EPPO 2005). Recently, *R. palmarum* had established in Cuba, Guadeloupe, Martinique, and Trinidad and Tobago (CABI/EPPO 2006). In North America *R. palmarum* was present only in Mexico (CABI/EPPO 1969). However, the Animal and Plant Health Inspection Service (APHIS) confirmed the first USA detection of *R. palmarum*, in the San Ysidro area of San Diego, California on May 9, 2011, (USDA-APHIS 2011). The National Agricultural Pest Information System informs that *R. palmarum* has not been detected yet in Florida and Hawaii to this date. *R. Palmarum* larvae damage the palm tree while feeding in the apical growth inside the trunk. In addition, *R. palmarum* is a vector of red ring nematode, *Bursaphelenchus cocophilus* (Cobb) Baujard (Nematoda: Tylenchida**).** *Bursaphelenchus cocophilus* causes red ring disease with major economic impact on coconut and commercial oil palms (Griffith 1968). Murphy and Briscoe (1999) established that there are several other nematodes found in *R. palmarum* (Rhabditidae: *Teratorhabditis* sp.; Diplogasteridae; *Diplogasteritus* sp.; *Mononchoides* sp.), including *Hypoaspis* sp., and *Tetrapolypus rhynchophori* Ewing (Pymotidae). This point is very important to keep at the fore front, because *R. palmarum* cause physical damage but the nematode parasites spread a plant disease so the potential for damage is even greater than the weevil itself.

The geographical distribution of the genus *Rynchophorus* increased in recent years due to the active trade between countries which facilitates the movement of invasive species. In this study we described a 1-yr survey to detect two invasive weevil species and their associated parasites on the Lower Rio Grande Valley in Southern Texas, an area bordering the state of Tamaulipas, Mexico.

Materials and Methods

This study was conducted in three counties of the Lower Rio Grande Valley in South Texas (Hidalgo, Cameron and Willacy). *Rhynchophorus palmarum* and *R. ferrugineus* were surveyed near international bridges connecting Mexico and Texas (see Figure 1); highways with great commercial trade between Mexico and the US; areas within cities, and near palm plantations in the Rio Grande Valley. The survey was conducted using bucket traps attached to palm trees located in areas of easy access. Sites were registered with a global positioning system using a GARMIN® GTM35 unit, with World Geodetic System (WGS) 1984 using spheroid and datum standard. On all places we

used one or more of the following conditions to set traps on palms: palm trees needed to be located within 100 ft near palm plantation, sugarcane plantation, international border, interstate, or adjacent to a wildlife area.

Forty traps were usually inspected biweekly throughout the entire year; however, we used forty seven locations that were moved or relocated when traps were inaccessible, palms were removed, location was inundated, or traps were vandalized (Figure 1). The inspection was conducted from 26 September 2011 to 20 September 2012. Eleven traps were placed near international bridges between Texas and Tamaulipas, Mexico (Mission, Hidalgo, Pharr, Donna, Progreso, Los Indios, and Brownsville). Some traps were placed in several points that run three major interstate highways (Hwy 83 running parallel to the border, and highways 77 and 281 that are trade routes that go into San Antonio and Houston, respectively). Sixteen traps were located on palm trees next to sugarcane or palm plantations, and one trap was in the Santa Ana National Wildlife Refuge. The rest of traps were placed across towns in south Texas (Mission, Hidalgo, McAllen, Edinburg, Alamo, Donna, Progreso, Weslaco, Harlingen, Los Fresnos, Olmito, Brownsville, Rangerville, Lyford, Blue Town, Pharr, South Padre Island, and La Feria).

Bucket traps were made of a 25-liter plastic container. Traps were strapped to palm trees (Oehlschlager 2007) with fencing wire. To increase the number of *R. palmarum* on traps we used a solution of 50%sugar with the specific pheromone (2-methylhept-5-en-4-ol), and an aggregation kairomone (ethyl acetate) (Oehlschlager 2007). Complementary, kill solution was 50% ethylene glycol. In the same trap, we used a lure for *R. ferrugineus* (4-methyl-5-nonanol). All the pheromones and kairomone were replaced, every 6 weeks, on 26 September and 22 November, 2011, 3 January, 14 February, 27 March, 22 May, 3 July, and 14 August 2012. An ethylene glycol solution (antifreeze) was refilled as required to maintain at least 2 cm depth level of this solution in the container.

Weevil identification was initially conducted by Drs. Villanueva and Esparza-Díaz and confirmation of weevil specimens were made by USDA scientists. The fungus and nematodes were identified using molecular sequencing at the Nematology Laboratory, USDA ARS.

Results

Two specimens of *R. palmarum* were found in this study; both specimens were confirmed as *R. palmarum* by Kira Metz (USDA APHISPPQ in College Station TX) and Jenz Prena (USDA ARS Systematic Entomology Laboratory in Washington DC). The first weevil was a female found on 11 March 2012, next to a commercial palm plantation in Alamo, TX in trap No. 28; latitude 26.149598°; longitude -98.129027° (Figure 1). The trap was attached to a *Washingtonia robusta* (Mexican Fan Palm or Mexican Washingtonia). In this specimen, nematodes were detected. Identification for an adult nematode (conducted by Carla Lynn USDA specialist in Beltsville, MD, was inconclusive; possible it was a nematode in the Aphelenchidae Family. However, juvenile nematodes of the species of *Poikilolaimus sp.* (Family Rhabditidae) and Genus

Pseudodiplogasteroides were found. Others studies had reported *Teratorhabditis sp.* (Gerber and Giblin-Davis 1990), *Teratorhabditis palmarum* (Magalhães et al. 2007), *Diplogasteritus* sp. (Magalhães et al. 2007), *Mononchoides* sp., and *Bursaphelenchus sp.* (Gerber & Giblin-Davis 1990). Although, the red ring nematode *B. cocophilus* was not found in this specimen; Magalhães et al. (2007) suggested that nematodes associated with *B. cocophilus* could probably be co-participates of the etiology of red ring disease.

The second specimen was from trap 27 (latitude 26.154235°; longitude -98.128855°; Figure 1) found on 5 May 2012 and across a road of the same commercial palm plantation and distant 1 mile from the first finding in Alamo, TX. Its host was *Livistona chinensis* (Chinese Fan Palm). Sequencing analysis of specimen showed that No 28S product or a sequence too messy to decipher, and ITS region gave mostly fungal sequence and a faint band remotely related to *Ditylenchus*. Miguens (2011) reported that *R. palmarum* highly infected by fungus. Nematodes found on our second *R. palmarum* specimen were species of *Rhabditis.*

The plantation where these two specimens were found had several palm species, and it might be possible that *R. palmarum* is established there or these insects were hitchhikers on palm leaves. Weevils might have been introduced on juvenile palm fronds that are traded from Mexico to the USA for floral arrangements. This plantation has been utilizing these fronds for floral arrangements locally or distributing the fronds to the rest of the entire U.S.

Several factors are important with the detection of *R. palmarum.* First, *R. palmarum* can be easily established due to subtropical environmental conditions of the Rio Grande Valley, and the presence of many host plants such as several ornamental palms, coconut and oil palms, and sugarcane; all of them found in the Lower Rio Grande Valley. Second, if *R. palmarum* is successfully established, it can be moved to the rest of the southern U.S., affect the ornamental palm industry, and can infect sugarcane plantations in South Texas, Louisiana, and Florida, having a negative impact in this industry. Finally, this weevil is a vector of red ring nematode (*B. cocophilus*); which causes red ring disease a disease that can kill many palm tree species and it can further increase the negative economic impact on commercial palm plantations, and in urban landscapes.

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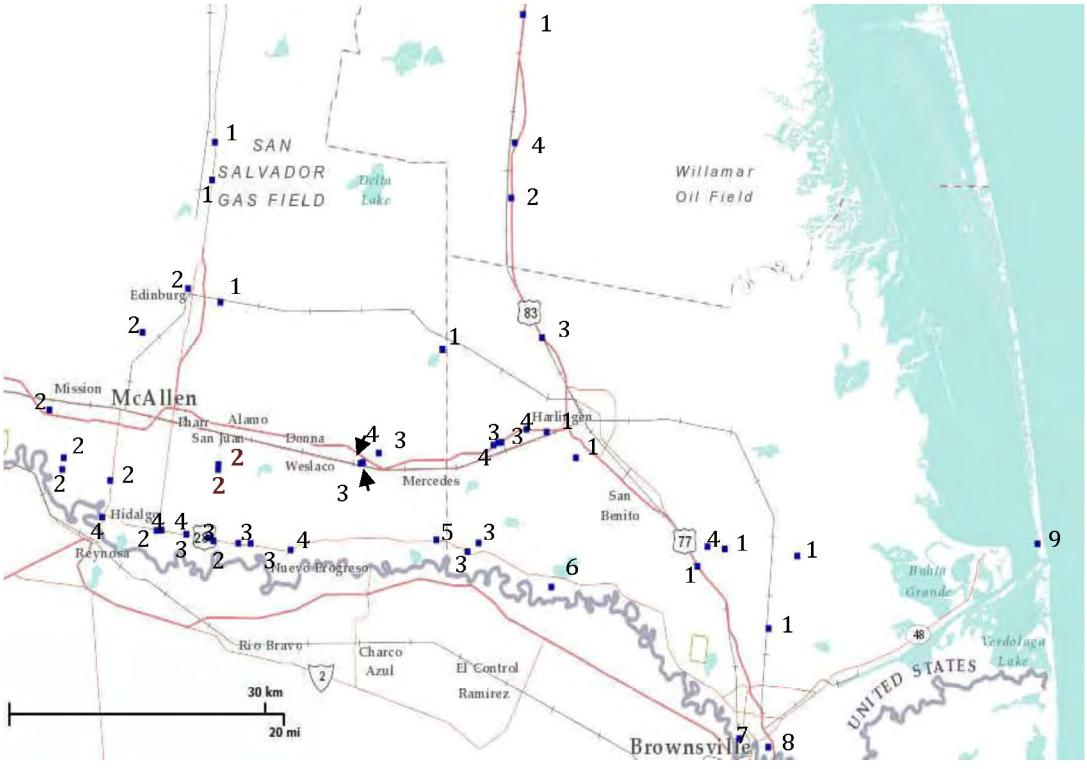

Figure 1. Location points of the 47 traps to survey *R. ferrugineus* and *R. palmarum* in South Texas. One specimen of *R. palmarum* was found on each of the sites No. 27 (Latitude: 26.149598°, Longitude:-98.129027°), and 28 (Latitude 26.154235°, Longitude:-98.128855°)