

Life Cycle of Red palm weevil, *Rhynchophorus ferrugineus*

Scientific Classification

Kingdom: Animalia

Phylum: Arthropoda

Class: Insecta

Order: Coleoptera

Family: Curculionidae

Genus: *Rhynchophorus*

Species: *Rhynchophorus ferrugineus* Olivier

Geographical distribution

Algeria, Aruba, Bangladesh, Bahrain, Cambodia, China, Cyprus, Egypt, France, Georgia, Greece, India, Indonesia, Iran, Iraq, Israel, Italy, Japan, Jordan, Kuwait, Laos, Malaysia, Malta, Monaco, Morocco, Myanmar, Oman, Pakistan, Papua-New Guinea, Philippines, Portugal, Qatar, Saudi Arabia, Singapore, Slovenia, Solomon Islands, Spain, Sri Lanka, Syria, Taiwan, Thailand, Tunisia, Turkey, United Arab Emirates, Vietnam, and the United States.

Hosts

R. ferrugineus is essentially a pest of palms (Arecaceae), being recorded on *Areca catechu*, *Arenga pinnata*, *Borassus flabellifer*, *Calamus merillii*, *Caryota maxima*, *Caryota cumingii*, *Cocos nucifera*, *Corypha gebanga*, *Corypha elata*, *Elaeis guineensis*, *Livistona decipiens*, *Metroxylon sagu*, *Oreodoxa regia*, *Phoenix canariensis*, *Phoenix dactylifera*, *Phoenix sylvestris*, *Sabal umbraculifera*, *Trachycarpus fortunei*, *Washingtonia* sp., *Agave americana* and sugarcane *Saccharum officinarum*, and **Majesty palm *Ravenea rivularis* (new record in Cyprus).**

Morphology/Biology

All stages (egg, larva, pupa and adult) are spent inside the palm itself and the life cycle cannot be completed elsewhere.

Egg. The females deposit about 300-500 eggs in separate holes they produced while searching for food or injuries on the palm or take advantage of the cracks or wounds in a recently cut palm. At oviposition, females bend upward and the tarsi are anchored to the tissue with the spines of the third pair of legs to push the ovipositor into the tough palm tissue. After laying, the female protects and secures the eggs with a secretion that rapidly hardens around the eggs. On average, females produce 210 eggs per clutch, most of which hatch over a period of 2-5 days. The eggs are white, cylindrical, glossy, oval shaped, and measure 1 to 2.5 mm. The back of these eggs possess special 'gill cover' structures that provide the developing insect with oxygen.

Larva. Up to 35 mm long; brown head, white body composed of 13 segments; mouthparts well developed and strongly chitinised; average length of fully grown larvae 50 mm, and width (in middle) 20 mm. The neonate larvae are yellow-white, segmented, legless, and have a chitinous head capsule (characteristic for curculionids) that is a darker brown than the rest of the body. They have powerful horizontal conical jaws which they use to burrow from the axils of the leaves to the crown, where they feed voraciously. Freshly hatched larvae (grubs) are legless which bore into the interior of the palms, moving by peristaltic muscular contractions of the body and feed on the soft succulent tissues, discarding all fibrous material. Larvae may pass through 3-7 instars. The larval period development varies from 1 to 3 months.

Pupa/cocoon. Pupal case 50-95 x 25-40 mm; pre-pupal stage of 3 days and pupal period of 12-20 days; pupae cream coloured, then brown, with shiny surface, greatly furrowed and reticulated; average size 35 mm x 15 mm.

Upon completion of larval development, the larva will sometimes emerge from the trunk of the palm tree, and build a pupal case of fiber extracted from the galleries inside the palm. The larva will then undergo metamorphosis into an adult. The larva will also weave a pupal case at the base of the palm fronds within the frond itself or at the centre of the base of the plant. The grubs pupate in elongate oval, cylindrical

cocoons made out of fibrous strands. At the end of the pupation period which lasts 14 to 21 days, the adult weevils emerge.

Adult. Reddish brown, about 35 x 10 mm , with long curved rostrum; dark spots on upper side of thorax; head and rostrum comprising about one-third of total length. In male, dorsal apical half of rostrum covered by a patch of short brownish hairs; in female, rostrum bare, more slender, curved and a little longer than in male. Adult is an excellent flier and is able to travel great distances. The adult weevil remains inside the cocoon for 4-17 days (average 8 days). The weevil becomes sexually mature during this period of inactivity. Adults live 2-3 months, irrespective of sex. In captivity, the maximum life span of the adult was 76 days for the female and 113 days for the male. It has been estimated that a single female estimated the RPW potential rate of multiplication to be high and reported that a single female may give rise to more than five million weevils in four generations, within 14 months.

In Egypt, it was reported that the weevil has three generations per year, the shortest generation (first) of 100.5 days and the longest (third) of 127.8 days. Thus, the life cycle is about 4 months.

Photos 1-6. Different life stages of Red Palm Weevil, *Rhynchophorus ferrugineus*.



Photo 1. Eggs of RPW (by P. Kitsis)

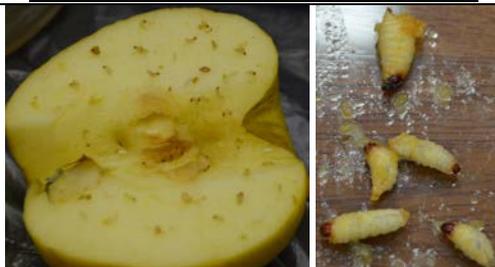


Photo 2. Hatched larvae (by P. Kitsis)



Photo 3. Larva (by V. Vassiliou)



Photo 4. Adult (by V. Vassiliou)



Photo 5. Pupa (by V. Vassiliou)



Photo 6. Cocoons (by V. Vassiliou)

Damage.



Photo 1,2. “Umbrella-like” damage (by V. Vassiliou)



Photo 3. Damaged leaf basis (by V. Vassiliou)



Photo 4. Total damage of palm “heart”

Life Cycle of palm borer, *Paysandisia archon*

Scientific Classification

Kingdom: Animalia

Phylum: Arthropoda

Class: Insecta

Order: Lepidoptera

Family: Castniidae

Genus: *Paysandisia*

Species: *Paysandisia archon* Burmeister, 1880

Geographical distribution

Paysandisia archon is native to South America (Argentina, Brazil, Paraguay and Uruguay), where it inhabits extensive open areas where wild palms grow. It is suspected that *P. archon* was first introduced to Europe between 1985 and 1995 on palm trees imported from Argentina. It has recently spread to Southern Europe where it has become a serious threat to many ornamental palm species. It was first discovered in Spain (Girona) (Montagud Alario and Rodrigo Coll, 2004), and France (near Hyères) in 2001 and has since spread to other regions. It was first recorded from Italy (Colazza *et al.*, 2005; Riolo *et al.*, 2004) in the Campania region in 2002. It is present in Cyprus (Vassiliou *et al.*, 2009), France

(Reynaud *et al.*, 2002), Greece (Vassarmidaki *et al.*, 2006), Slovenia and Switzerland, while isolated findings were reported in the United Kingdom (Reid, 2008).

Hosts

Natural range: *Syagrus yatay*, *Chamaerops*, *Latania*, *Livistona chinensis*, *Phoenix canariensis*, *Syagrus romanzoffiana*, *Trithrinax campestris*.

Introduced range: *Chamaerops*, *Livistona* spp., including: *L. chinensis*, *L. decipiens*, *L. saribus*, *Phoenix* spp., including: *P. canariensis*, *P. dactylifera*, *P. reclinata*, *Sabal*, *Trachycarpus fortunei*, *Trithrinax campestris*, *Washingtonia* spp., including: *W. filifera*

Morphology/Biology

Eggs: They are oblong (5mm long), cream-coloured and with longitudinal ribs. Eggs are deposited on palm fibres close to the crown. A female deposits 140 eggs, more or less.

Larva: Immediately after emergence the larvae start looking for food and shelter, both being obtained by boring into the host plant; unlike other lepidopteran larvae, they do not eat the chorion. The number of instars undergone by larvae of *P. archon* seems to be nine (Victor Sarto i Monteys, 2005). The larvae hatch after 2-3 weeks. On their search for food and shelter, they bore into the trunk. The palm borer overwinters as larva, sometimes twice, and, as result the larval stage can last 11 (one-year cycle) to 19 months (two-year cycle).

Pupa/cocoon. The pre-pupa stage lasts approximately 2.5 weeks. In this stage the cocoon is generated. The pupal stage lasts 1.5 to 2.5 months, depending on the period in which cocoons were formed, respectively half July and half March. Hence, cocoons can be found between mid-March and begin September.

Adult: The moths have “a large wingspan of 9–11 cm. The fore-wings are olive brown-coloured and the hind- wings are brightly coloured with red, black and white. The antennae are clubbed. Females are a little larger and are easily recognizable by their chitinous ovipositor at the end of the abdomen.

The palm borer flies from mid-May to September, with a peak in June and July. Unlike other moths, they are active during the day.

The total life cycle of the palm borer *Paysandisia archon* is more or less 13 months for a one-year cycle and 23 months in case of a two-year cycle.

Photos 1-6. *Paysandisia archon* life stages.



Photo 1. Eggs (by V. Vassiliou)



Photo 2. Eggs and larva hatching (by V. Vassiliou)

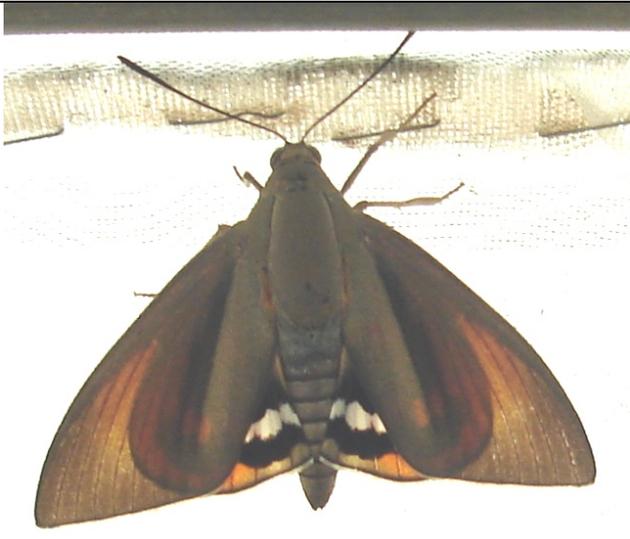


Photo 3. Adult of *P. archon* (by V. Vassiliou)



Photo 4. Cocoon and pupal exuvia (by V. Vassiliou)



Photo 5. Pupa and opened cocoon (by Paola Riolo)



Photo 6. A 9th instar larva (by C. Michael)

Damage. Feeding damage caused by the larvae can easily be recognised. Generally sawdust is found in the palm crown or on the stem. The leaves are chewed and show perforations. Galleries are formed inside the stem. Moreover, an aberrant development of leaf buds can be observed, as well as turned stems. Affected palm trees dry out and soon wilt.

The main symptoms are deformation of leaves, some of which are haggard, yellow in color, and bored. Larvae bore galleries through the stem or young leaves, causing characteristic damage. These palm trees show general decline. Observing these infested palms plugs of debris (like sawdust) is seen on the palm trunk and palm crown. Debris is visible at the outermost extremity of the galleries which the larvae bored inside the trunk or the leaves.

Photos 1-4. Damage symptoms caused by larvae of *P. archon*.



Photo 1. Semi-circular larval perforations on *C. humilis* leaf (by V. Vassiliou)



Photo 2. Damage on *Ph. dactylifera* (by V. Vassiliou)



Photo 3. Gallery on *C. humilis* (by V. Vassiliou)



Photo 4. Central leaves damage on *C. humilis* (by V. Vassiliou)

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