



Food and Agriculture
Organization of the
United Nations



International
Plant Protection
Convention



Survey Guidance for
Rhynchophorus ferrugineus



Survey Guidance for *Rhynchophorus ferrugineus*

Scientific Name

Rhynchophorus ferrugineus (Olivier)

Common Name

Red palm weevil, Asiatic palm weevil, coconut weevil, red stripe weevil

Type of Pest

Weevil

Taxonomic Position

Class: Insecta, **Order:** Coleoptera,

Family: Curculionidae (often listed as Dryophthoridae)



Figure 1. *R. ferrugineus* adult

(Image courtesy of Amy Roda, USDA-APHIS)

Notes on taxonomy and nomenclature: Color variation of adult *Rhynchophorus ferrugineus* caused multiple taxonomic changes in the past. Recent molecular research suggests that *R. ferrugineus* may be a species complex composed of two or more cryptic species.



Figure 2. *R. ferrugineus* adult color variation

(Image courtesy of Center for Invasive Species Research)

Known Hosts

Preferred hosts

Many species of palm can be infested. These are the preferred hosts and should be the focus of survey efforts if there is a wide range of palms in the country: *Cocos nucifera* (coconut palm), *Phoenix canariensis* (Canary Island date palm), and *Phoenix dactylifera* (date palm).

Other palm hosts

Areca catechu (betel nut palm), *Arenga pinnata* (sugar palm), *A. pinnata* (syn: *A. saccharifera*) (sugar palm), *Borassus flabellifer* (plamyru/toddy palm), *Brahea armata* (Mexican blue palm), *Calamus merrillii* (palasan), *Caryota cumingii* (Philippine fishtail palm), *C. maxima* (pugahan), *Chamaerops humilis* (dwarf fan palm), *Corypha utan* (syn. *C. elata*, *C. gepanga*) (gebang palm), *C. umbraculifera* (talipot palm), *Elaeis guineensis* (oil palm), *Livistona australis* (Australian fan palm), *L. chinensis* (Chinese fan palm), *L. decisions* (ribbon fan palm), *L. rotundifolia* (fountain palm), *L. saribus* (taraw palm),

Metroxylon sagu (sago palm), *Oncosperma horridum* (thorny palm), *O. tigillarum* (nibung palm), *Phoenix sylvestris* (date palm), *P. theophrasti* (Cretan date palm), *Roystonea regia* (royal palm), *Sabal palmetto* (syn. *S. blackburniana*) (cabbage palm), *Trachycarpus fortunei* (windmill palm), *Washingtonia robusta* (Mexican fan palm), *Washingtonia* sp.

Survey Protocol

Target Life Stage:

Trapping will target adults; however, visual surveys to detect larvae and pupae may be used to detect populations before adults emerge.

Time of year to survey:

Year Round – Trapping and visual surveys can be conducted year-round.

Adult flight activity is lower during hot summer and cold winter conditions in the Middle East and during monsoon season in tropical areas. In Mediterranean climates, flight activity likely begins in the spring, with most flight activity taking place during the summer, extending into winter in locations like Israel.

Visual Survey

- Target palms with highly suspect damage or clear signs of infestation.
- For mature palms, inspect the crown and the base of fronds.
- For young palms, inspect the crown, fronds, and trunk.
- **Note:** Accessing the crown/canopy of large palms may be difficult or dangerous.

To inspect the crown or trunk:

- Search for holes caused by weevils (Fig. 6, 7), which may be accompanied by oozing brown liquid, chewed up fibers, or a foul fermented odor.
- For highly suspect or heavily damaged trees, cut a “window” in the crown of the tree.
 - Remove all fronds from one side of the crown.
 - Inspect the denuded crown for tunnels or other damage.
 - **Caution:** This method will negatively affect the appearance of the palm.

To inspect fronds:

- Pull fronds to the ground by hand or cut them at the base with a machete or pole cutter.
- Search for frass and cocoons at the base of damaged fronds after they are removed from the tree (Fig. 8, 9, 10).

Signs and Symptoms:

Early detection of weevil infested palms is challenging because larvae are concealed within the plant. Larval feeding destroys meristematic tissue which may not show up from the exterior. Damage caused by larval feeding can also resemble symptoms caused by other palm pests, namely *Fusarium* fungi (e.g., wilting, drooping fronds) or

rodents (e.g., holes at the base of fronds). It can be difficult to definitively diagnose the damage until *R. ferrugineus* specimens are found inside the palm.

Visible symptoms include:

- Distorted or deformed growing point at the top of the palm; often with an umbrella-like appearance (Fig. 3).
- Distorted or “clipped” fronds (Fig. 4, 5).
- Holes caused by weevils (Fig. 6, 7).

Evidence of *R. ferrugineus* infestations is shown below in **Figures 3-10**:



Figure 3. Umbrella-like Canopy
Deformed, offset growth of the upper canopy creating an umbrella-like appearance due to drooping of damaged leaf petioles



Figure 4. Clipped Fronds
Extreme *R. ferrugineus* adult damage to palm fronds



Figure 5. Distorted Fronds
R. ferrugineus larval damage to palm fronds



Figure 6. Larval Feeding Holes
R. ferrugineus larval feeding holes at base of frond (see arrows)



Figure 7. Adult Emergence Holes
Adult *R. ferrugineus* emergence holes (see arrows)



Figure 8. Tunnels and Cocoons
R. ferrugineus larval tunnels in frond and fibrous pupal cocoons are visible



Figure 9. Pupal Cocoons
Frond with fibrous pupal cocoons (see arrow)



Figure 10. Unemerged Adults and Pupae
Palm frond with unemerged adult weevils inside partially opened pupal cocoons

(Figures 3-10: Images courtesy of Amy Roda, USDA-APHIS)

Trapping

Survey Site Selection

Surveys should target date farms or palm production areas like nurseries, natural environments where native palms occur, and urban environments where palms have been planted as ornamental trees. Locations that receive international shipments of host material from countries with known populations of *R. ferrugineus* should be considered high risk for introduction.

Recommended Traps

- Palm weevil cone traps (Picusan traps)
- Palm weevil bucket traps
- Homemade bucket traps (4 to 20 liters)



Figure 11. Palm Weevil Bucket Trap
Suspended above the ground
(Image courtesy of USDA-APHIS-IPHIS)



Figure 12. Palm Weevil Cone Trap (Picusan Trap)
Placed on the ground (Image courtesy of SOSPALM.com)

Bucket traps are suspended above the ground while palm weevil cone traps are placed on the ground. Both types of traps use the same propylene glycol-water solution, lures, and food baits. For home-made traps, the bucket may range in size from 4 to 20 liters.

Recommended Lures

- *Rhynchophorus ferrugineus* aggregation lure (ferrugineol)
- Synergist (ethyl acetate)
- Food bait (fermenting sugar cane, cut apples, palm pieces, pineapple chunks, dates mixed with water and baker's yeast, or 10% molasses containing 5 ml of baker's yeast). Addition of baker's yeast to the bait greatly increases attractiveness to palm weevils.

Simultaneous use of all three attractants (commercially available aggregation pheromone, synergist, and food bait) in traps is highly recommended to detect *R. ferrugineus*.

The length of effectiveness of a polysleeve palm weevil lure dispenser (*Rhynchophorus ferrugineus* aggregation lure) is 42 days. However, other types of lure dispensers may need to be replaced more or less often; follow the manufacturer's recommended replacement interval for the type of lure being used.

The release rates and longevity of the lures are based on temperature (i.e., the pheromone evaporates faster at higher temperatures). Lures may need to be changed more frequently in hot, dry regions. Placing traps in the shade may help with the longevity of the lure.

Food baits should be placed in the bottom of the bucket or cone trap and covered with liquid. Water is necessary for the bait to ferment. Food baits can be placed in separate aerated containers that are placed inside traps. These containers allow fermentation to occur by protecting bait, water, and yeast from the propylene glycol that is often added to traps to drown and preserve weevils.

Trap Placement and Spacing

Bucket traps should be suspended from **non-host** trees or poles. Traps should be hung approximately 2 m above the ground to reduce the possibility of disturbance by people, pets, and wild animals. Hang the traps at least 30 m from host palms that may be attractive to *R. ferrugineus*.

Palm weevil cone traps are placed on the ground and use the same liquid and baits as the bucket trap. These traps should also be placed at least 30 m from host trees.

Note: It is important to place all traps at least 30 m from any palms. If traps are near host trees, weevils not captured by the trap may attack the palm instead.

Trap Servicing

Collect insect specimens from the trap and replace food baits every seven to nine days. Replace pheromone and ethyl acetate lures every six weeks (42 days). Lures may need to be changed more frequently in hot, dry regions. To ensure fermentation of baits, it is of crucial importance to keep food bait covered with water.

Sample Collection

Weevils captured by hand from infested trees or found in traps should be placed in *labeled* vials of ethanol or isopropyl alcohol (minimum 70%) and submitted for confirmatory identification. Vials should be labeled with the following information: trap number (if from trap), location, host plant species, date collected, and surveyor's initials.

Pest Identification and Diagnostics

Pest Description

Rhynchophorus ferrugineus are large weevils that attack palms. Adults can be seen crawling or flying near palms or captured in traps. Adults primarily fly during the day but will also fly at night. The larval stage feed on meristematic tissue and, in some cases, can kill host plants.

Adult males and females are similar in appearance, varying in size from 15 to 40 mm in length and 7 to 15 mm in width. Male weevils have hair on the dorsal side of the snout. The body is elongate (oval in shape) and can be variable in color,

but often is a dull orange with dark spots. The antennae arise from the base of the snout. The elytra (wing covers) can be dark red to black, shiny or dull, and slightly pubescent (hairy). The black spots on the pronotum are extremely variable in appearance (see the dorsal region behind the head of the adult weevils in Fig. 1, 2, 13).



Figure 13. *R. ferrugineus* larva, pupa, and adult
(Image courtesy of Center for Invasive Species Research)

Adults and larvae can infest palms year-round with multiple generations (see Fig. 14). Different life stages can be found residing in the same palm plants simultaneously.

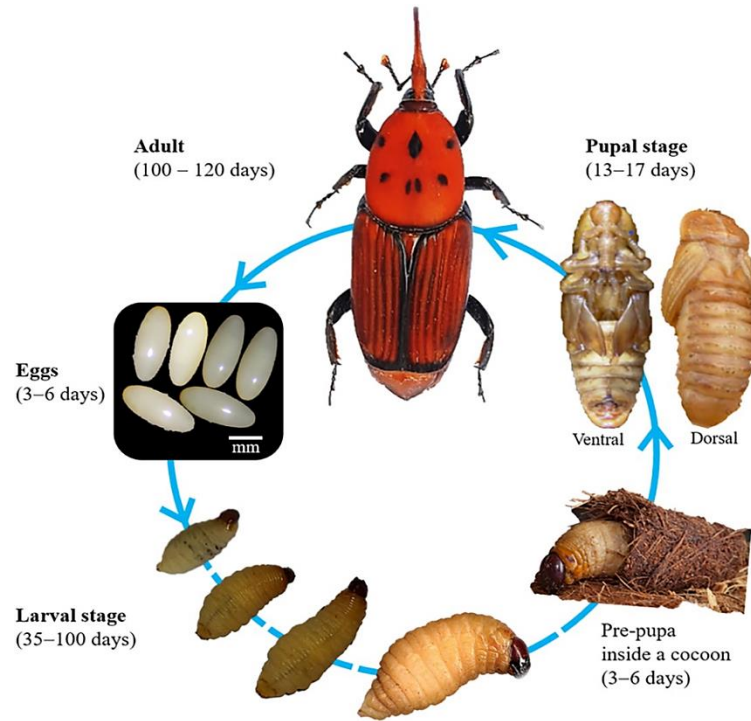


Figure 14. *R. ferrugineus* life cycle
(Image courtesy of CABI)

Sorting and Screening

Rhynchophorus pheromone traps should be sorted initially for the presence of weevils of the appropriate size, color, and shape. Traps that contain weevils meeting all of the following requirements should be screened.

- 1) Weevils are longer than 25 mm (Fig. 15).
- 2) Weevils have an overall shape that is like the outline depicted in Fig. 15.
- 3) Weevils have an elongated rostrum (Fig. 16).
- 4) Weevils are dark red to black with variable red coloration (Figs. 17-19).

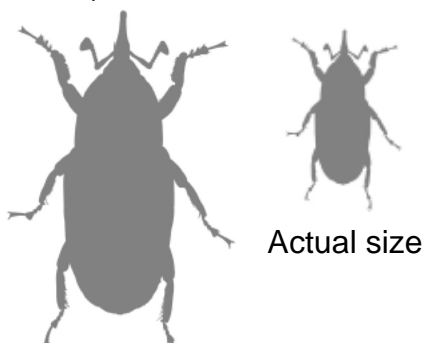


Figure 15. Outline of an adult *Rhynchophorus ferrugineus*



Figure 16. Elongated rostrum. Males of *Rhynchophorus palmarum* have stout setae on the rostrum (Photo by Hanna Royals)



Figure 17. Variable red and black coloration of *Rhynchophorus ferrugineus* (female)
(Photo by Hanna Royals)



Figure 18. Variable red and black coloration of *Rhynchophorus ferrugineus* (male)
(Photo by Hanna Royals)



Figure 19. Black coloration of *Rhynchophorus palmarum*
(Photo by Hanna Royals)

Family-level Screening

Separation to family can be accomplished based on tarsal and antennal characteristics.

Tarsus: Dryophthoridae have flaps between tarsal claws (Fig. 20a) and Curculionidae do not (Fig. 20b).

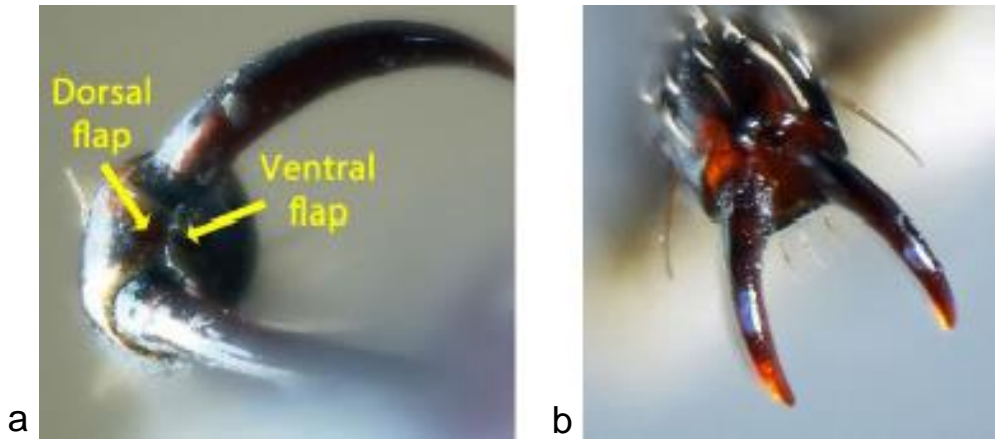


Figure 20. Tarsal Claw Characteristics. Flaps between tarsal claws are present in the Dryophthoridae (a) and absent in Curculionidae (b)

Antenna: Dryophthoridae have a glabrous (lacking setae) first antennal club segment (Fig. 21a) and a scape that surpasses the posterior margin of the eye (Fig. 21b). Curculionidae have a first antennal club segment that is not glabrous (Fig. 21c) and a scape that does not surpass the posterior margin of the eye (Fig. 21d):

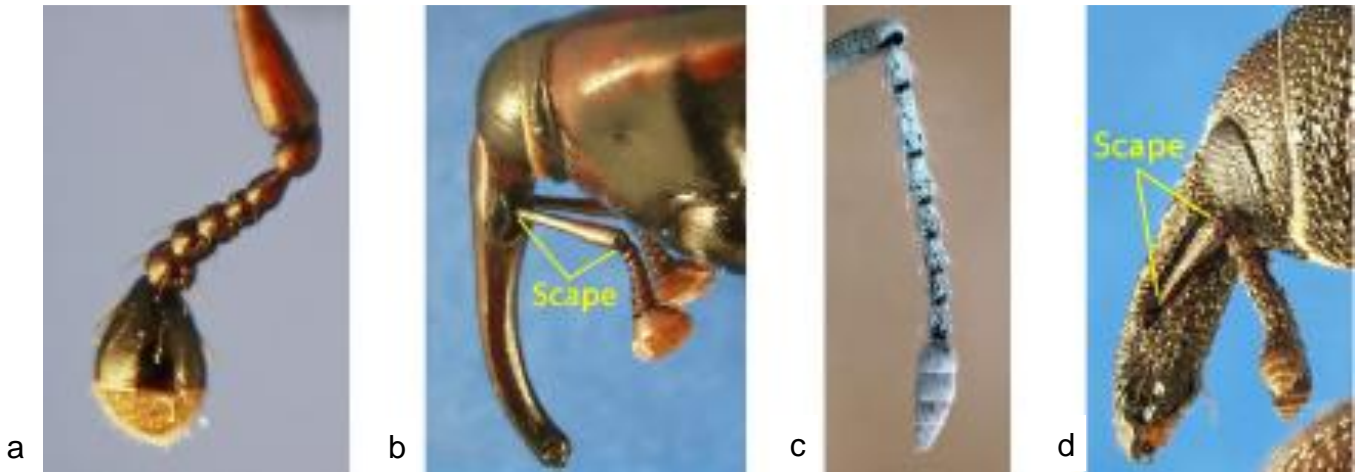


Figure 21. Antennae Characteristics. Dryophthoridae antennae have a glabrous first antennal club (a) and a scape that surpasses the posterior margin of the eye (b). Curculionidae have a first antennal club that is not glabrous (c) and a scape that does not surpass the posterior margin of the eye (d)

(Photos by Charles Brodel USDA-APHIS-PPQ)

Genus-level Screening

There are many genera in the Rhynchophorini subfamily that might be similar in appearance to the *Rhynchophorus* palm weevils, though none are comparable in terms of size. In addition to their large size, *Rhynchophorus* can be differentiated by their relatively broad metepisternum (Fig. 22) and distinct antennae with a transverse sub-triangular club that is wider than it is long (Fig. 23).

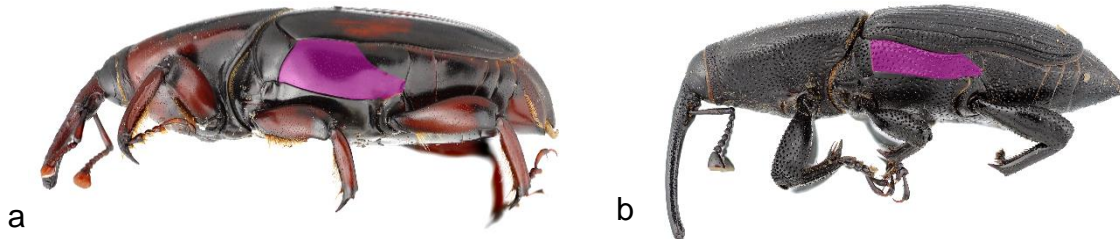


Figure 22. Metepisternum Shape. (Highlighted in Magenta) *Rhynchophorus* species have a broad metepisternum (a) and *Scyphophorus* species have an elongate metepisternum (b)

(Photos by Hanna Royals)

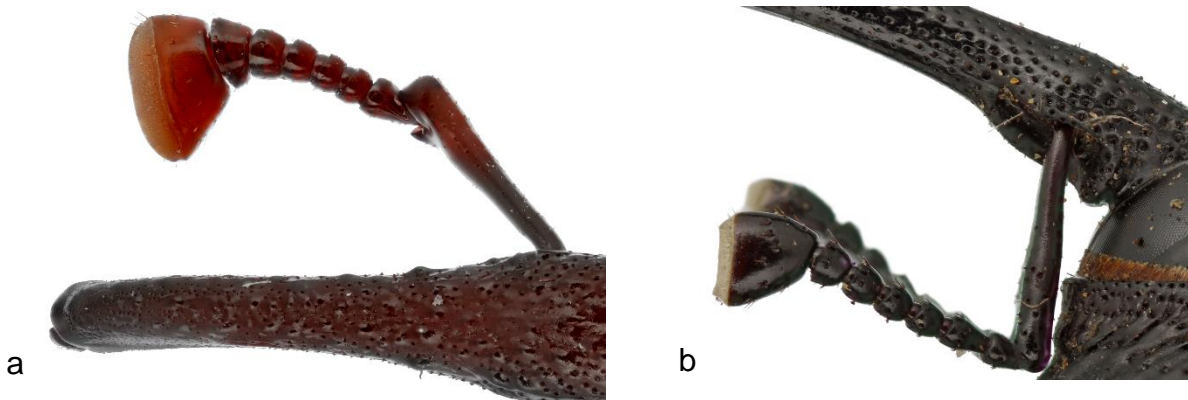


Figure 23. Antennae Shape. *Rhynchophorus* antennae have a wide antennal club (a), and *Scyphophorus* have a longer antennal club (b)

(Photos by Hanna Royals)

Key to Genus-level Screening of *Rhynchophorus* spp. Suspects

1. Metepisternum broad, length more or less 2 times width (Fig. 22); antenna with club transverse, wider than long, shape sub-triangular (Fig. 23); total body length greater than 25 mm..... *Rhynchophorus* suspect
2. Metepisternum narrow, length 3 or more times width; antenna with club elongate, longer than wide, shape sub-quadrate or sub-oval; total body length less than 25 mm....Not *Rhynchophorus*

Species-level Identification Resources

Rhynchophorus are difficult to identify to species without expert knowledge. Therefore, all specimens passing Family and Genus-level Screening should be submitted for identification by a specialist.

Diagnostic Resources

EPPO Diagnostic: *Rhynchophorus ferrugineus* and *Rhynchophorus palmarum*:

[Link to Diagnostic Publication with a Key to Species](https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2338.2007.01165.x)

(<https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2338.2007.01165.x>)

Easily Mistaken Species

There are multiple large palm weevils that can be mistaken for *R. ferrugineus*, including *R. bilineatus*, *R. phoenicis* and *R. quadrangulus*.

The United States Department of Agriculture developed this datasheet in support of the Africa Phytosanitary Program (2023).

International Plant Production Convention Secretariat
ippc@fao.org | www.ippc.int

Food and Agriculture Organization of the United Nations
Rome, Italy