

# The Hibiscus Bud Weevil (*Anthonomus testaceosquamosus* Linell, Coleoptera: Curculionidae)<sup>1</sup>

Alexandra M Revynthi, Yisell Velazquez Hernandez, Juleysy Rodriguez, Paul E Kendra, Daniel Carrillo, Catharine M Mannion<sup>2</sup>

*A profile of the hibiscus bud weevil intended for the use of interested laypersons with some knowledge of biology as well as academic audiences. The hibiscus bud weevil, a pest of China rose hibiscus, originates from northeastern Mexico and southern Texas and can cause large economic losses to hibiscus growers. This fact sheet provides nursery owners, homeowners, and other interested people with information on this serious pest.*

## Introduction

The hibiscus bud weevil (*Anthonomus testaceosquamosus* Linell, Coleoptera: Curculionidae) is a pest of China rose hibiscus (*Hibiscus rosa-sinensis* L., Malvales: Malvaceae). This weevil originates from northeastern Mexico and southern Texas and was first found in Florida in May 2017 (Skelley and Osborne 2018). Increased weevil population densities in 2019 and 2020 negatively impacted the hibiscus industry in south Florida during the spring shipping period, resulting in large economic losses. Florida leads hibiscus production nationally, and the majority of nursery production occurs in south Florida. Approximately 20 to 25% of plants sold from Miami-Dade County are hibiscus, where the market value of ornamental plants was 697 million (farmgate price) in 2017 (United States Department of Agriculture 2017). The hibiscus bud weevil is a regulated pest by the Florida Department of Agriculture and Consumer Services, Division of Plant Industry (FDACS-DPI).

Because of this designation, any nursery found with this weevil has to sign and follow a compliance agreement with FDACS-DPI to reduce the chance of spreading the weevil. The purpose of this article is to provide nursery owners, homeowners, and other interested people with information on this serious pest.

## Identification

The hibiscus bud weevil is a beetle (Order Coleoptera) in the weevil family (Curculionidae). It belongs to the *Anthonomus squamosus* species-group of the Anthonomini tribe. This species-group is characterized by weevils predominantly covered with scales (Clark et al. 2019) (Figure 1). The adult body length is 2.5 - 2.7 mm and the snout or beak is approximately 1 mm long.

Females can be distinguished from males using two characters, one in the protibia (the fourth segment of the first pair of legs) and one in the abdomen. In the protibia, females have an apical uncus and subapical, inner-marginal prominence (mucron) (spur-like structure on the inner side of the tibia) (Figure 2a), which is absent in males (Figure 2b). Additionally, the posterior part of the fifth ventrite (margin of the fifth abdominal segment) in females is straight (Figure 3a right) and in males curved (Figure 3b right). Moreover, females (Figure 3a left) have a small pygidium (the last body part, exposed when the elytra is at rest) in comparison to males (Figure 3b left). The validity

1. This document is ENY-2069 one of a series of the Entomology and Nematology Department, UF/IFAS Extension. Original publication date August 2021. Visit the EDIS website at <https://edis.ifas.ufl.edu> for the currently supported version of this publication.
2. Alexandra M Revynthi, Entomology and Nematology Department, UF/IFAS Tropical Research and Education Center (TREC); Yisell Velazquez Hernandez, Entomology and Nematology Department, TREC; Juleysy Rodriguez, Entomology and Nematology Department, TREC; Paul E Kendra, USDA ARS, Subtropical Horticulture Research Station; Daniel Carrillo, Entomology and Nematology Department, TREC; and Catharine M Mannion Entomology and Nematology Department, TREC; UF/IFAS Extension, Gainesville, FL 32611.

of these characters was confirmed by dissecting weevil genitalia (Figure 4).

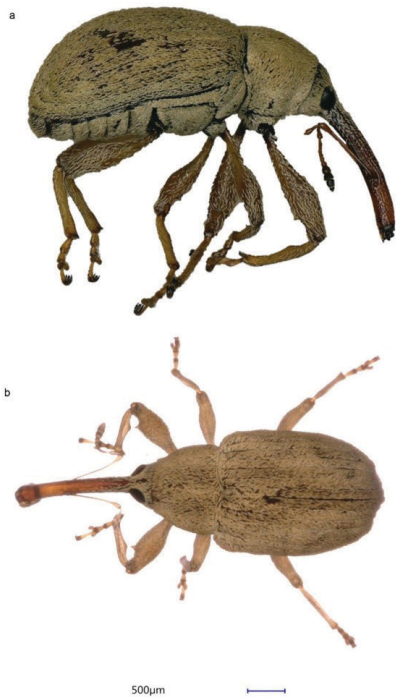


Figure 1. Adult *Anthonomus testaceosquamosus*, a) lateral and b) dorsal habitus.

Credits: Daniel Carrillo, UF/IFAS TREC

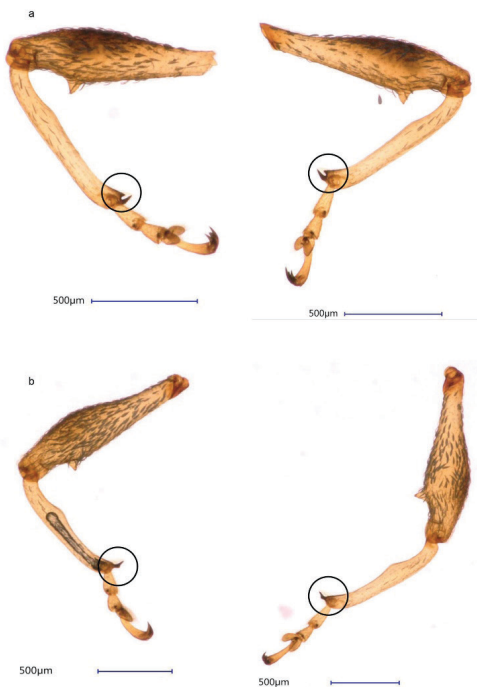


Figure 2. Female and b) male protibias of *Anthonomus testaceosquamosus*. Subapical inner-marginal prominence (circled) (mucron) is present in females while absent in males.

Credits: Daniel Carrillo, UF/IFAS TREC

Eggs (Figure 5) are white when newly deposited and turn yellow as they mature. The larvae of hibiscus bud weevil are transparent to yellow in color, have a well developed head

capsule and lack thoracic legs (Figure 6). Larval size varies with the size of the flower bud they are within. In general, larger flower buds have larger larvae.

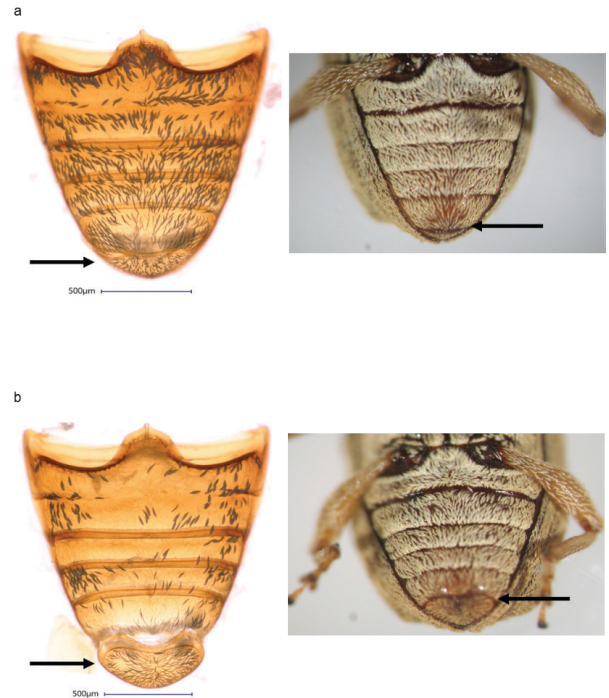


Figure 3. Female and b) male abdomens of *Anthonomus testaceosquamosus*. The posterior end of the fifth ventrite in females is straight (a, right arrow) and in males curved (b, right arrow). Females (a, left arrow) have a small pygidium (the last body part that is exposed when the elytra is at rest) in comparison to males (b, left arrow).

Credits: Daniel Carrillo, UF/IFAS TREC

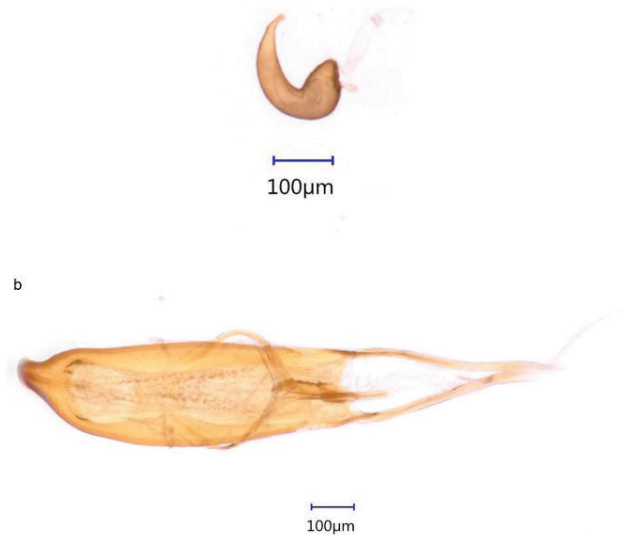


Figure 4. Female and b) male genitalia of *Anthonomus testaceosquamosus*.

Credits: Daniel Carrillo, UF/IFAS TREC



Figure 5. Multiple eggs are oviposited by females of *Anthonomus testaceosquamosus* on hibiscus anthers within the flower bud.  
Credits: Juleysy Rodriguez and Yisell Velazquez Hernandes, UF/IFAS TREC

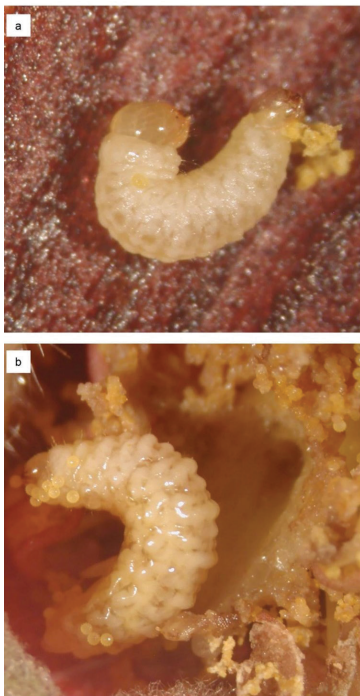


Figure 6. Early and b) late instar larvae of *Anthonomus testaceosquamosus* feeding on pollen.  
Credits: Juleysy Rodriguez and Yisell Velazquez Hernandes, UF/IFAS TREC

## Host Range and Damage

Weevils belonging to the *Anthonomus squamosus* species-group are associated with plant species in the families, Asteraceae or Malvaceae. The hibiscus bud weevil, *A.*

*testaceosquamosus* has been associated with multiple plant species, all from the family Malvaceae (Table 1).

Adult weevils feed primarily on buds, stems, and to a lesser extent on leaves of hibiscus. The females oviposit in flower buds and larvae develop inside the bud, causing bud drop prior to flowering. Symptoms include holes in stems and unopened buds (Figure 7) and severe bud drop in high pest densities. Feeding damage on the leaves is not apparent. In south Florida nurseries, pink and yellow hibiscus varieties appear to be more susceptible to hibiscus bud weevil than red and other varieties (Table 2). The pink variety ‘Painted Lady’ and the yellow variety ‘Sunny Yellow’ are reported to be the most susceptible varieties. The red variety ‘President Red’ is reported to be the most resistant.

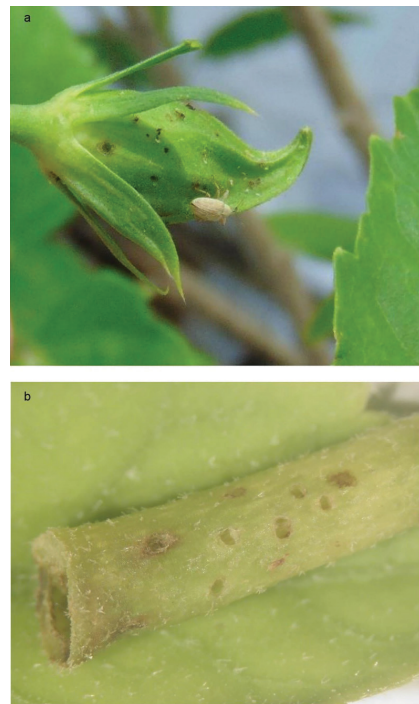
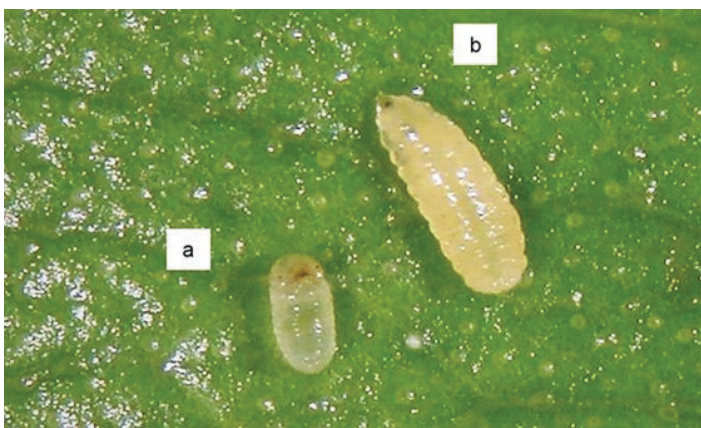


Figure 7. Feeding damage caused by *Anthonomus testaceosquamosus* on Hibiscus a) bud with adult weevil and b) petiole.  
Credits: Juleysy Rodriguez and Yisell Velazquez Hernandes, UF/IFAS TREC

In Florida, another species from the *Anthonomus squamosus* species-group, *Anthonomus rubricosus*, has been reported infesting cotton and hibiscus plants (Clark et al. 2019; Loiácono et al. 2003). However, there are no reports showing its establishment in Florida. This weevil is similar in size with the hibiscus bud weevil, but it is brown color. The *Anthonomus* genus includes several pest species of great agricultural importance, such as the cotton boll weevil *Anthonomus grandis*. The most economically important *Anthonomus* pests reported in Florida are the pepper weevil *Anthonomus eugenii* and the acerola weevil *Anthonomus macromalus*. The pepper weevil attacks plants of the family

Solanaceae, particularly peppers (*Capsicum* spp.) (Capinera 2002), while the acerola weevil attacks Barbados cherry (*Malpighia glabra*, Family: Malpighiaceae) (Hunsberger and Pena 1998).

Bud drop can also be caused by infestation with the hibiscus bud midge (*Contarinia maculipennis*, Diptera: Cecidomyiidae), which can be mistaken for hibiscus bud weevil damage (Mannion et al. 2006). Both pests can infest the same hibiscus plant; however, they will rarely infest the same flower bud. Buds infested with the hibiscus bud midge will have multiple white to yellow maggots (larvae) inside them that jump when disturbed. Midge maggots lack a head and legs and need to exit the bud to pupate in the soil while the weevil larvae have true heads and pupate within the buds (Figure 8; Figure 9).



testaceosquamosus) and b) hibiscus bud midge (*Contarinia maculipennis*).

Credits: Juleysy Rodriguez and Yisell Velazquez Hernandez, UF/IFAS TREC



Figure 9. A hibiscus bud midge (*Contarinia maculipennis*) larva exits the flower bud. Picture shows the damage caused on the flower bud by the feeding maggots.

Credits: Juleysy Rodriguez and Yisell Velazquez Hernandez, UF/IFAS TREC

## Biology

Adult female weevils oviposit 3-5 eggs in a single hibiscus flower bud close to the anthers (Figure 4). Emerged larvae feed on pollen and remain in the flower bud until reaching adulthood. Due to the high incidence of larval cannibalism, not all eggs will develop into an adult weevil; however, multiple weevils might exit one flower bud. At 26.7°C (80°F), eggs hatch within 2-3 days. The larval stage has three instars and can last, on average, 10 days. The pupal stage (Figure 10) lasts 2.9-4.2 days. Development from egg to adult can range from 12.8-16.3 days and survival has been observed up to 90%. Adult longevity ranges from 13-169 days, with the males living longer than the females. When fed solely on pollen, adults can survive up to 52 days. Adult weevils can survive on average for 28 days without food when they have access to water, and 16 days without water. The sex ratio is 1:1 females to males.



Figure 10. Pupa of *Anthonomus testaceosquamosus*.

Credits: Juleysy Rodriguez and Yisell Velazquez Hernandez, UF/IFAS TREC

Very low or high temperatures appear to be detrimental to the development of this weevil. In laboratory experiments at the University of Florida, at 10°C (50°F) no eggs hatched, while at 15°C (59°F) eggs hatched 12 days after oviposition, but the larvae did not feed and eventually died. Similarly, at 38.8°C (93 °F), eggs hatched within 5.6 days, but none of the larvae managed to pupate. In south Florida, the peak activity of this weevil has been observed from March through June with lower populations from September until February.

## Development of Pest Management and Monitoring Techniques

Integrated pest management programs targeting the hibiscus bud weevil will involve a combination of cultural practices, sanitation, chemical, and biological control. Crop rotation with non-host species has been recommended for breaking population cycles (Bográn et al. 2003). Sanitation includes systematic collection and destruction of all dropped buds from the ground. Although sanitation is labor-intensive, it has been proposed as the most efficient management practice against this weevil since dropped buds contain weevils that will continue to infest new plants (Bográn et al. 2003). Currently there are no insecticides specifically registered for the hibiscus bud weevil in Florida, but growers can legally use insecticides that are registered for use in nurseries. FDACS-DPI has attached a list to the compliance agreement with recommended insecticides that can be used against the hibiscus bud weevil. Efficacy trials of several insecticides registered for weevils/beetles and other specific species on ornamental plants are presently underway. No natural enemies of *A. testaceosquamosus* have been reported; however, entomopathogenic fungi and nematodes are being explored as potential biological control agents.

Several species within the *Anthonomus* genus are attracted to a group of commercial lures that consist of male aggregation pheromones and host plant volatiles (Tumlinson et al. 1969; Eller et al. 1994; Innocenzi et al. 2001). There are four components of the synthetic male aggregation pheromone, also known as Grandlures (I-IV). Pheromone traps broadly used for other *Anthonomus* species are also being explored as a pest monitoring tool. In Texas, pheromone traps developed for the cotton boll weevil (*A. grandis*) were evaluated for the detection of the hibiscus bud weevil adults, but without success (Bográn et al. 2003). The authors, however, argue that this might be due to the early deployment of the traps in the season. Yellow sticky traps are the most attractive traps for several *Anthonomus* species (Cross et al. 2006; Szendrei et al. 2011; Silva et al. 2018). Field trials are currently being conducted to test for attraction to the boll (*A. grandis*) and pepper weevil (*A. eugenii*) lures and to identify the best trap to catch adult hibiscus bud weevils. An IPM program implementing all the above strategies is needed to manage *A. testaceosquamosus* populations in Florida and decrease the economic damage caused by this species.

## References

- Bográn CE, Helnz KM, Ludwlg S (2003) The bud weevil *Anthonomus testaceosquamosus*, a pest of tropical hibiscus. In: SNA Research Conference Entomology. pp 147–149
- Capinera JL (2002) Pepper weevil *Anthonomus eugenii* Cano (Insecta: Coleoptera: Curculionidae). Featured Creatures, University of Florida EENY-278
- Clark WE, Burke HR, Jones RW, Anderson RS (2019) The North American Species of the *Anthonomus squamosus* Species-Group (Coleoptera: Curculionidae: Curculioninae: Anthonomini). *Coleopt Bull* 73:773. <https://doi.org/10.1649/0010-065X-73.4.773>
- Cross JV, Hesketh H, Jay CN, et al (2006) Exploiting the aggregation pheromone of strawberry blossom weevil *Anthonomus rubi* Herbst (Coleoptera: Curculionidae): Part 1. Development of lure and trap. *Crop Prot* 25:144–154. <https://doi.org/10.1016/j.cropro.2005.04.002>
- Eller FJ, Bartelt RJ, Shasha BS, et al (1994) Aggregation pheromone for the pepper weevil, *Anthonomus eugenii* cano (Coleoptera: Curculionidae): Identification and field activity. *J Chem Ecol* 20:1537–1555. <https://doi.org/10.1007/BF02059879>
- Hunsberger A, Pena JE (1998) Biodynamics of *Anthonomus macromalus* (Coleoptera : Curculionidae ), a weevil pest of Barbados Cherry in Florida. *Florida Entomol* 334–338
- Innocenzi PJ, Hall DR, Cross JV. (2001) Components of male aggregation pheromone of strawberry blossom weevil, *Anthonomus rubi* Herbst. (Coleoptera: Curculionidae). *J Chem Ecol* 27:1203–1218. <https://doi.org/10.1023/A:1010320130073>
- Loiácono MS, Marvaldi AE, Lanteri AA (2003) Description of larva and new host plants for *Anthonomus rubricosus* Boheman (Coleoptera: Curculionidae) in Argentina. *Entomol News* 114:69–74
- Mannion C, Hunsberger A, Gabel K, et al (2006) Hibiscus bud midge (*Contarinia maculipennis*)
- Silva D, Salamanca J, Kyryczenko-Roth V, et al (2018) Comparison of trap types, placement, and colors for monitoring *Anthonomus musculus* (Coleoptera: Curculionidae) adults in highbush blueberries. *J Insect Sci* 18:. <https://doi.org/10.1093/jisesa/iey005>

Skelley PE, Osborne LS (2018) Pest Alert *Anthonomus testaceosquamosus* Linell, the hibiscus bud weevil, new in Florida. Gainesville

Szendrei Z, Averill A, Alborn H, Rodriguez-Saona C (2011) Identification and field evaluation of attractants for the cranberry weevil, *Anthonomus musculus* Say. *J Chem Ecol* 37:387–397. <https://doi.org/10.1007/s10886-011-9938-z>

Tumlinson JH, Hardee DD, Gueldner RC, et al (1969) Sex pheromones produced by male boll weevil: Isolation, identification, and synthesis. *Science* 166:1010–1012. <https://doi.org/10.1126/science.166.3908.1010>

United States Department of Agriculture U (2017) Market Value of Agricultural Products Sold Including Food Marketing Practices and Value-Added Products : 2017 and 2012 Census of Agriculture 2017. 275–302

Table 1. Plant species on which the hibiscus bud weevil *Anthonomus testaceosquamosus* Linell has been found (Clark et al. 2019).

Plant species scientific name	Plant common name
<i>Abutilon abutiloides</i>	Shrubby Indian Mallow
<i>Hibiscus martianus</i>	Tulipan Del Monte
<i>Malvastrum americanum</i>	Indian valley false mallow
<i>Malvastrum corchorifolium</i>	False mallow
<i>Malvastrum spicatum</i>	False mallow
<i>Pseudabutilon lozanii</i>	Lozano's false Indian mallow
<i>Wissadula holosericea</i>	Chisos Mountain false Indian mallow
<i>Sida sp</i>	Fanpetals
<i>Hibiscus rosa-sinensis</i>	China rose hibiscus
<i>Malvaviscus drummondii</i>	Turk's Cap Mallow
<i>Pseudabutilon hypoleucum</i>	White-leaf Indian mallow
<i>Hibiscus acicularis</i>	Rose mallow
<i>Hibiscus cardiophyllus</i>	Heartleaf Hibiscus
<i>Tillandsia ionantha</i>	Blushing Bride
<i>Abutilon simulans</i>	Corona de reina

Table 2. Hibiscus varieties cultivated in Florida that have been found infested with the hibiscus bud weevil (*Anthonomus testaceosquamosus*).

Hibiscus variety	Flower color
Double Peach	Orange
Double Orange	
Orange Sunset	
Painted Lady	Pink
Seminole Pink	
Pink	
Passion Wind	
Salmon	
President Red	Red
Fiesta	
Double red	
Starry Wind	
Hot Shot	
Sunny Yellow	Yellow
Fort Mayer's Yellow	
Tequila	
Yellow	
Chatty	