BioOne COMPLETE

Report of Astaena pygidialis Kirsch (Coleoptera: Scarabaeidae), the Main Chafer Beetle Causing Damage to Avocado Fruit and Young Leaves in Antioquia Department, Colombia

Authors: Holguin, Claudia M., and Mira, Rosa H.

Source: Florida Entomologist, 104(1) : 36-41

Published By: Florida Entomological Society

URL: https://doi.org/10.1653/024.104.0106

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

Report of *Astaena pygidialis* Kirsch (Coleoptera: Scarabaeidae), the main chafer beetle causing damage to avocado fruit and young leaves in Antioquia Department, Colombia

Claudia M. Holguin[1,], and Rosa H. Mira[1]*

Abstract

Scarab beetles (Coleoptera: Scarabaeidae) are one of the most limiting pests of avocado in Antioquia Department, Colombia. The establishment of management strategies to control these beetles has been difficult because the species causing damage to avocado fruit and young leaves have not been identified. Selected commercial avocado fields were surveyed at different times of d for scarab beetle adults affecting small fruit and young leaves, as well as other plant structures such as flowers, tender buds, stems, and mature leaves. Additionally, ultraviolet light traps were placed at each field to quantify the species captured. After direct scouting of avocado trees, the only scarab beetle species detected causing damage to fruit and young leaves at all sampling sites was *Astaena pygidialis* Kirsch (Coleoptera: Melolonthinae). Adults were observed chewing the green skin of small fruit causing striations on the fruit and skeletonization of young leaves by chewing the leaf tissue between veins on the upper surface. Other species observed include *Anomala cincta* Say (Coleoptera: Rutelinae), *Charioderma xylina* Blanchard, and *Strigoderma* sp. (all Coleoptera: Rutelinae) associated with flowers, *Isonychus* sp. (Coleoptera: Melolonthinae) with flower buds, *Cyclocephala fulgurata* Burmeister (Coleoptera: Dynastinae) with tender buds, stems and flowers, and *Astaena valida* Burmeister and *Plectris pavida* (Burmeister) (both Coleoptera: Melolonthinae) with mature leaves. The species detected through scouting also were captured with light traps. The dominant species captured with light traps was *Phyllophaga obsoleta* (Blanchard) (Coleoptera: Melolonthinae), which was not observed causing damage to avocado fruit or young leaves. Correct identification of the species is the key to establish adequate sampling and management strategies for these scarab beetles in avocado crops.

Key Words: damage; direct scouting; light traps; avocado plant structures

Resumo

Los escarabajos (Coleoptera: Scarabaeidae) son una de las plagas más limitantes del cultivo de aguacate en el departamento de Antioquia, Colombia. El establecimiento de estrategias de manejo para controlar estos escarabajos ha sido difícil porque no se han identificado las especies que causan daño a los frutos de aguacate y las hojas jóvenes. Se seleccionaron predios de aguacate comerciales y se monitorearon en diferentes momentos del día para determinar la presencia de los escarabajos adultos que afectan los frutos pequeños y hojas jóvenes, así como a otras estructuras de plantas como flores, brotes tiernos, tallos y hojas maduras. Además, se ubicaron trampas de luz ultravioleta en cada campo para cuantificar las especies capturadas. Después del monitoreo directo de los árboles de aguacate, la única especie de escarabajo detectada causando daño en frutos y hojas jóvenes en todos los sitios de muestreo fue *Astaena pygidialis* Kirsch (Coleoptera: Melolonthinae). Se observó a los adultos alimentándose de la epidermis de la fruta pequeña, causando estrías en la fruta y esqueletización de las hojas jóvenes al masticar el tejido foliar entre las venas de la superficie superior. Otras especies observadas son *Anomala cincta* Say (Coleoptera: Rutelinae), *Charioderma xylina* Blanchard, y *Strigoderma* sp. (todos Coleoptera: Rutelinae) asociados con flores, *Isonychus* sp. (Coleoptera: Melolonthinae) con botones florales, *Cyclocephala fulgurata* Burmeister (Coleoptera: Dynastinae) con botones tiernos, tallos y flores, y *Astaena valida* Burmeister y *Plectris pavida* (Burmeister) (ambos Coleoptera: Melolonthinae) con hojas maduras. Las especies detectadas mediante monitoreos directos también fueron capturadas con trampas de luz. Sin embargo, la especie dominante capturada con este método fue *Phyllophaga obsoleta* (Blanchard) (Coleoptera: Melolonthinae), la cual no se observó causando daños a los frutos de aguacate o las hojas jóvenes. La identificación correcta de la especies es la clave para establecer estrategias adecuadas de muestreo y manejo de estos escarabajos en cultivos de aguacate.

Palabras Claves: daño; monitoreo directo; trampas de luz; estructuras planta de aguacate

Avocado, *Persea americana* Mill. (Lauraceae) is an important commercial fruit produced in tropical and subtropical countries throughout the world (Altendorf 2017). Mexico, Dominican Republic, and Peru are the top 3 avocado producing countries (FAOSTAT 2018). Colombia occupies the fourth position in terms of production, and it ranks third in terms of harvested area with 35,114 ha (6.2% of the global production) (FAOSTAT 2018). Although domestic consumers prefer wild avocados (criollo varieties) and local cultivars such as Lorena and Choquette, areas cultivated with Hass avocado in Colombia have increased rapidly in the past yr due to the high demand for this cultivar worldwide (Al-

[1]Corporación Colombiana de Investigación Agropecuaria (Agrosavia), C.I. La Selva, Rionegro, Antioquia Department, Colombia; E-mails: cholguin@agrosavia.co (C. M. H.); rmira@agrosavia.co (R. H. M.)
*Corresponding author; E-mail: cholguin@agrosavia.co

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

tendorf 2017). Antioquia is one of the leading departments of avocado production in Colombia. Hass cultivated areas have increased in this region from 1,829 ha in 2007 to around 8,900 ha in 2018 (AGRONET 2019).

However, avocado production may be affected by phytosanitary problems that reduce fruit production and quality. The most commonly reported insect pests causing damage to fruit are beetles, especially weevils (Coleoptera: Curculionidae). The small avocado seed weevil, *Conotrachelus perseae* Barber, and the stem weevil, *Conotrachelus aguacatae* Barber (both Coleoptera: Curculionidae), are pests in Mexico that cause damage to avocado fruit (Vázquez et al. 2015). The big avocado seed weevil, *Heilipus lauri* Boheman (Coleoptera: Curculionidae), also is a pest in Mexico and Colombia that causes significant damage to fruit (Castañeda-Vildozola et al. 2013; ICA 2016). In Antioquia, another group of beetles, the chafers (Coleoptera: Scarabaeidae: Melolonthinae), have been reported causing damage to avocado fruit and leaves. These beetles, commonly are known in the region as "marceños" (March beetles) because adults usually start to emerge during the rainy season in early Mar (Londoño et al. 2014), and are one of the most limiting insect pests of avocado production and fruit commercialization in Antioquia. Adult beetles feed on small avocado fruit causing feeding damage on the skin by scraping the fruit skin with their mouthparts, resulting in significant scarring on the fruit surface (Londoño et al. 2014). Damage caused by these beetles is of the cosmetic type and does not affect the pulp, but affects commercialization by reducing fruit quality (Londoño et al. 2014).These beetles cause skeletonization of young leaves, and severe attacks may affect the apical meristems of young plants (Londoño et al. 2014). Despite the injury caused by these scarab beetles to avocado plantations in Antioquia, the species causing damage had remained unknown until now.

The monitoring of adult scarab beetles in different crops in Antioquia is done commonly with the use of light traps (Acevedo 2005; Bran 2005). This method has been used for many yr by avocado farmers to monitor beetles associated with the crop. However, large numbers of scarab beetle genera and species are captured in these traps, and it is not clear whether the species caught are responsible for causing damage to avocados in Antioquia. Londoño et al. (2014) listed *Anomala undulata* Melsheimer (Coleoptera: Rutelidae), *Anomala cincta* Say (Coleoptera: Rutelidae), *Astaena* aff. *pygidialis* Moser (Coleoptera: Melolonthidae), *Phyllophaga obsoleta* (Blanchard) (Coleoptera: Melolonthidae), and *Phyllophaga menetriesi* (Blanchard) (Coleoptera: Melolonthidae) as species associated with avocados in Colombia. In the department of Antioquia, Palacio (2010) suggested *Astaena* sp. as 1 of the species causing damage to avocado crops in the municipalities of El Retiro and Rionegro. A recent study did not list any species in particular, and referred to the scarab beetle species causing damage to avocado fruit and young leaves in Antioquia as "the Melolonthidae (Coleoptera: Scarabaeoidea) Complex" (Valencia Arias et al. 2019). Based on the above reasons, in order to develop adequate management strategies for these scarab beetles in Antioquia, it is necessary to confirm the identity of the adult species causing damage to avocado.

The primary purposes of this study were to (1) identify the scarab beetle species causing damage to fruit and young leaves, and (2) identify the scarab beetles species that are associated with different avocado plant structures such as flowers, tender buds, stems, and mature leaves, in avocado groves in Antioquia, Colombia.

Materials and Methods

A field survey was conducted from 2016 to 2017 in 5 avocado (cultivar 'Hass') commercial fields with high levels of scarab beetle damage in the main avocado growing regions of Antioquia, Colombia (Table 1). Two sites were sampled in 2016: San Pedro de los Milagros (site-EB; 6.494861°N, 75.528333°W), and El Peñol (site-LA; 6.342500°N, 75.393888°W), and 3 sites in 2017: in La Ceja (site-VH; 6.033611°N, 75.382222°W), La Ceja (site-BV; 6.051388°N, 75.376666°W), and in Rionegro (site-LS; 6.130277°N, 75.415555°W).

Sampling was carried out once or twice per wk during the emergence period for scarab beetle adults from Mar to May. In each field, direct inspection was done through observation of sampled trees for 5 to 10 min. Approximately 10% the avocado trees at each study site were randomly chosen for inspection. The observations were done at different times of the d: 5:30 to 7:00 AM, 9:00 to 11 AM, and 3:00 to 4:30 PM, and at night from 6:30 to 8:30 PM. When scarab beetle adults were detected on trees, the individuals were collected alive along with the associated structure (young shoots, leaves, flower buds, or fruit), placed in plastic cups (Darnel®; Ajover, Bogota, Cundinamarca, Colombia) and transported to the laboratory at the Corporación Colombiana de Investigación Agropecuaria, La Selva Research Center in Rionegro, Antioquia, Colombia (6.129444°N, 75.414444°W). In the laboratory, to confirm the association of the species collected with the avocado plant structures, adult insects were transferred to 200 mL plastic containers (Darnel S. A., Madrid, Cundicanamarca, Colombia), which contained the different fresh structures (e.g., flowers, leaves, etc.) removed from avocado trees. The plant structures were replaced every 2 d until the observations were completed.

One light trap was placed at the edge of each sampling site, except for the field located in San Pedro de los Milagros. Fluorescent ultraviolet light traps were powered by a solar panel, and insects attracted to the light were retained by an inverted cone that had a collecting container at the base. Every 2 wk from Mar to Jun in both sampling yr (2016, 2017), scarab beetle adults were collected from traps and transferred to the laboratory in plastic bags (Ziploc, Dow, Indianapolis, Indiana, USA) labeled with the collection data. Scarab beetle adults collected using both sampling methods (direct inspections of avocado trees and light traps) were identified to species based on male genitalia using the taxonomic keys from Saylor (1942, 1945) and Evans and Smith (2007), and by comparison with specimens from the entomology collections of the laboratory of Universidad de Caldas and the Alexander von Humboldt Institute. Species identifications were made by John César Neita and by Luis Carlos Pardo, curators of Alexander von Humboldt Institute and Colección Familia Pardo-Locarno (CFPL-COL)

Table 1. Avocado orchards monitored for scarab beetles in Antioquia, Colombia, 2016 and 2017.

Field code	Municipality	Orchard area (m^2)	Coordinates
BV	La Ceja	2,700	6.051388°N, 75.376666°W
LA	El Peñol	2,200	6.342500°N, 75.393888°W
LS	Rionegro	2,500	6.130277°N, 75.415555°W
VH	La Ceja	2,100	6.033611°N, 75.382222°W
EB	San Pedro de los Milagros	3,000	6.494861°N, 75.528333°W

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

collections, respectively. All specimens were deposited in the Agrosavia National Insect Collection "Luis María Murillo" at Corporación Colombiana de Investigación Agropecuaria, Tibaitatá Research Center, in Mosquera, Colombia. For the specimens collected in light traps, following species identification, the relative abundance of each species per sampling site was calculated.

Results

ADULT BEETLES CAPTURED BY DIRECT INSPECTION OF AVOCADO PLANTS

Scarab beetle adults collected by direct inspection of avocado trees during the 2 sampling periods revealed 9 species and 8 genera: *Anomala cincta* Say (Coleoptera: Rutelinae), *Astaena valida* Burmeister (Coleoptera: Melolonthinae), *Astaena pygidialis* Kirsch (Coleoptera: Melolonthinae), *Charioderma xylina* Blanchard (Coleoptera: Melolonthinae), *Cyclocephala fulgurata* Burmeister (Coleoptera: Rutelinae), *Gymnetis pantherina* Blanchard (Coleoptera: Cetoniinae), *Isonychus* sp., *Plectris pavida* (Burmeister) (Coleoptera: Melolonthinae), and *Strigorderma* sp. Of these species, 4 were observed mainly during diurnal surveys: *C. xylina*, *G. pantherina*, *A. cincta*, and *Strigoderma* sp.; the other species except for *Isonychus* sp. were exclusively detected during nocturnal inspections: *A. valida*, *A. pygidialis*, *C. fulgurata*, and *P. pavida*.

SPECIES ASSOCIATED WITH AVOCADO FLOWERS

Charioderma xylina, *A. cincta*, and *Strigoderma* sp. were associated with avocado flowers at different sampling sites (Table 2; Fig. 1). Of the 3 species, *C. xylina* was the most abundant; it was observed at the San Pedro de los Milagros (EB) location feeding on the base of the floral bud, and sometimes feeding on the ovary and the perianth of the flower. However, at the other sampling sites, as well as under laboratory conditions, this species was observed only in association with avocado flowers. On the other hand, *A. cincta* and *Strigoderma* sp. were observed feeding on pollen and nectar during the d, and occasionally a few individuals were seen at night. In the laboratory, adults of these species visited flowers but did not feed on this structure.

Isonychus sp. was another species found associated with avocado flowers at 2 sampling sites (Table 2; Fig. 2). In contrast to the other species found associated with flowers, *Isonychus* sp. mainly was nocturnal with a few individuals detected during the d. In the field, mating individuals of *Isonychus* sp. were observed on young and mature leaves, and also causing damage to the floral bud. Observed injury caused by *Isonychus* sp. started with adult feeding at the base of the floral bud and the feeding resulted in a hole and consumption of all structures inside the flower (Fig. 2). This pattern of feeding damage by *Isonychus* sp. was confirmed in the laboratory.

SPECIES ASSOCIATED WITH TENDER BUDS AND STEMS

Cyclocephala fulgurata was observed associated with tender buds, stems and flowers, at 2 sampling sites (Table 2; Fig. 2). This species, when present, was 1 of the most abundant observed during nocturnal inspections. Usually, several couples were detected mating, mostly on floral shoots, and a few mating couples were found on vegetative shoots. However, in the field or under laboratory conditions, this species was not observed feeding on any avocado plant structures.

SPECIES ASSOCIATED WITH MATURE LEAVES

Astaena valida and *P. pavida* were found associated with mature avocado leaves at different sampling sites (Table 2; Fig. 2). Several mating couples of *P. pavida* were observed on mature leaves at the La Ceja (VH) location, while at the other sampling sites, both species were detected causing damage to mature avocado leaves by feeding on the edge of the leaves; in some cases the entire leaves were consumed by these 2 species (Fig. 2). However, in the laboratory, this feeding activity was confirmed only for *A. valida*.

Gymnetis pantherina was another species observed on mature leaves on 1 occasion during the d and only at 1 sampling site (Fig. 1). Its presence on avocados was sporadic and no feeding was observed by this species either in the field or in the laboratory.

SPECIES ASSOCIATED WITH YOUNG LEAVES AND FRUIT

Astaena pygidialis was the only species found at all sampling sites associated with fruit, tender shoots, and young leaves, and only during nocturnal inspections (Table 2; Fig. 3). Adults were observed mating on young leaves and small fruit (1 to 3 cm diam). While mating, females fed on the upper surface of young leaves, chewing leaf tissue between veins resulting in the skeletonization of leaves (Fig. 3). Individual adults also were observed causing similar damage, and occasionally this feeding activity was observed on older leaves. Adults were observed chewing the green skin of small fruit (up to 3 cm diam) causing striations which turned into brownish, broad, oval, or irregular shaped scars when fruit increased in size (Fig. 3). Feeding on the fruit and leaves by *A. pygidialis* was confirmed in the laboratory.

ADULT BEETLES CAPTURED AT LIGHT TRAPS

In total, we recorded 1,235 scarab adult beetles belonging to 8 genera during both sampling periods at the 5 sampling sites (Fig. 4). The

Table 2. Scarabaeidae species collected as adults via direct visual scouting of avocado trees in Antioquia, Colombia, in 2016 and 2017.

Species	Location code	Sampling yr	Collection time	Plant structure
Strigorderma sp.	BV*	2016–2017	Daylight	Flowers
Anomala cincta Say, 1835	LS	2016–2017	Daylight	Flowers
Charioderma xylina Blanchard, 1850	EB, VH	2016–2017	Daylight	Floral buds, flowers
Cyclocephala fulgurata Burmeister, 1847	LS, VH	2016–2017	Night	Tender buds, stems, flowers
Plectris pavida (Burmeister, 1845)	LA, VH	2016–2017	Night	Leaves
Gymnetis pantherina Blanchard, 1842	LS	2017	Daylight	Leaves
Isonychus sp.	BV, VH	2017	Night	Floral buds
Astaena pygidialis Kirsch 1885	EB, LA, LS, VH, BV	2016–2017	Night	Fruit and leaves
Astaena valida Burmeister, 1845	BV	2017	Night	Leaves

*BV = Site-BV La Ceja; LS = Site-LS Rionegro; VH = Site-VH La Ceja; EB = Site-EB San Pedro de los Milagros; LA = Site-LA El Peñol.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

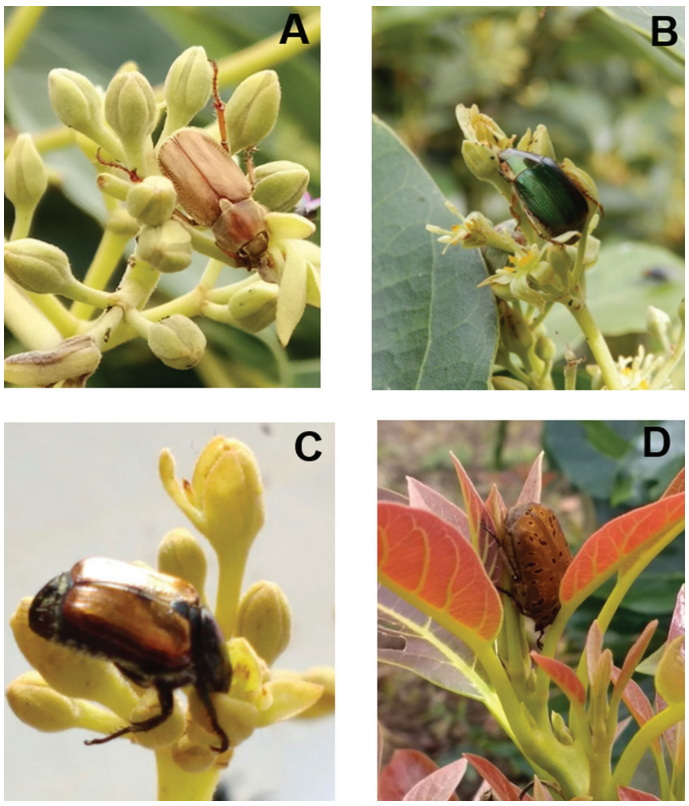


Fig. 1. Diurnal species captured during direct visual observations of avocado trees: (A) *Charioderma xylina*, (B) *Anomala* sp., (C) *Strigoderma* sp., (D) *Gymnetis pantherina.*

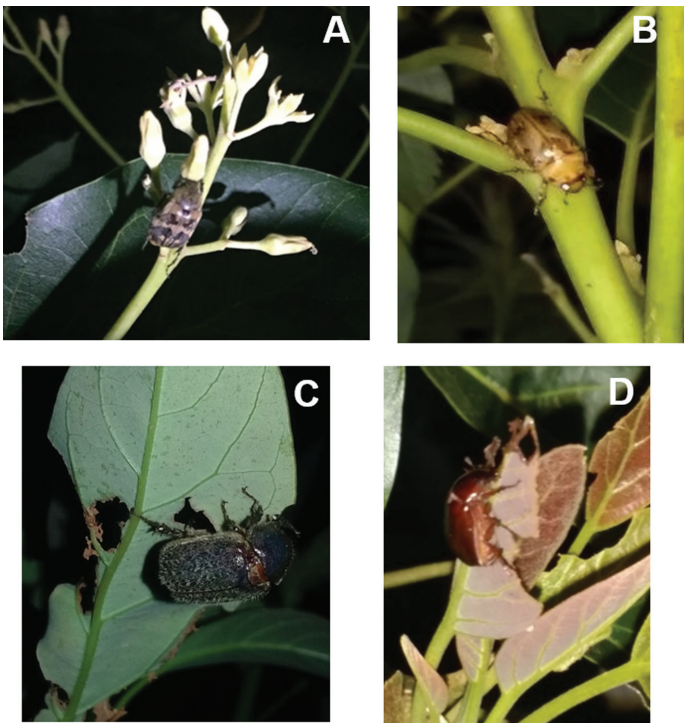


Fig. 2. Nocturnal species captured in direct scouting of avocado trees: (A) *Isonychus* sp., (B) *Cyclocephala fulgurata*, (C) *Plectris pavida*, (D) *Astaena valida.*

dominant species was *P. obsoleta* (*n* = 479), followed by *C. fulgurata* (*n* = 212), *A. pygidialis* (*n* = 192), *C. sexpunctata* (*n* = 77), and *C. xylina* (*n* = 65). An exception was the La Ceja (VH) location where the dominant species was *A. pygidialis.*

Discussion

The only scarab beetle species detected causing damage to fruit and young leaves was *A. pygidialis*. During nocturnal inspections at all sampling sites, *A. pygidialis* was found feeding on small fruit, young shoots and leaves; and feeding injury caused by this species was confirmed in the laboratory. Londoño et al. (2014) reported a species of *Astaena* (as *Astaena* aff. *pygidialis* Moser) along with *P. obsoleta*, *P. menetriesi*, *A. undulata*, and *A. cincta*, as the scarab beetles (Melolonthinae) causing damage to avocado fruit and leaves. In this study, with the exception of *A. pygidialis*, the other species reported by Londoño et al. (2014) were not observed causing damage to avocado fruit and leaves in the sampled orchards. Nevertheless, sampling was focused on adults, and it is possible that immature stages of the other scarab beetles reported by Londoño et al. (2014) also may cause damage to avocados in Antioquia, and possibly in other regions of Colombia where similar types of damage have been recorded.

According to Evans and Smith (2007), the distribution of *A. pygidialis* is restricted to Colombia. Adults are nocturnal, phototactic, and beetles are active during rainy periods (Pardo-Locarno et al. 2007). Species of *Astaena* are recognized as pests of citrus, coffee, potatoes, and tomatoes (Pardo-Locarno 1994). In Antioquia, species of *Astaena* are captured commonly by using light traps in different municipalities such as El Carmen de Viboral, El Retiro, Entrerríos, Rionegro, San Vicente, and Santa Rosa de Osos (Bran 2005; Yepes et al. 2000; Acevedo 2005), and are associated with crops such as beans, beets, cabbage, carrots, and potatoes (Acevedo 2005; Bran 2005). Palacio (2010) recognized *Astaena* species in 2 Colombian highland departments, Antioquia and Nariño, and reported *Astaena* aff. *pygidialis* as the species present in Antioquia. In the same study, Palacio (2010) also reported *Astaena* sp. causing damage to avocado fruit and immature foliage in avocado orchards in Rionegro, La Ceja, and El Retiro (municipalities of Antioquia Department). However, the author did not identify the chafer to species level. In the present study, we confirm that adult *A. pygidialis* is the chafer beetle causing damage to avocado fruit in orchards located in the main growing regions of Antioquia.

Other scarab beetle species also were found causing damage to different avocado plant structures: *P. pavida* and *A. valida* on mature leaves, and *Isonychus* sp. and *C. xylina* on floral buds and flowers, respectively. Adults of the genus *Plectris* generally are recognized as phytophagous and their larvae as rhizophagous (Stechauner-Rohringer & Pardo-Locarno 2010), but there is little information about *P. pavida*. In Colombia, adults of *Plectris* aff. *pavida* have been captured using light traps in coffee agroecosystems (Pardo-Locarno 2013), but in general, feeding habits of adults of this species are unknown (Pardo-Locarno et al. 2005, 2013). On the other hand, in Colombia, *A. valida* has been found associated with cassava, coffee, grasses, *Inga* sp. (Fabaceae), *Mangifera indica* L. (Anacardiaceae), and *Musa* spp. (Musaceae), in the departments of Cauca and Valle del Cauca, but damage mainly is associated with larval feeding (Pardo-Locarno 2013). To our knowledge, this is the first report of these 2 species feeding on mature avocado leaves.

Different species in the genus *Isonychus* have been captured in studies conducted in Colombia (Villegas et al. 2008; López-García et al. 2015). However, reports of the adult stage feeding on avocados are unknown. In this study, the injury caused by *Isonychus* sp. on interior structures of floral buds was significant, and further studies should investigate the economic impact of the injury caused by this species to avocado plants. Another species found causing significant damage to

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

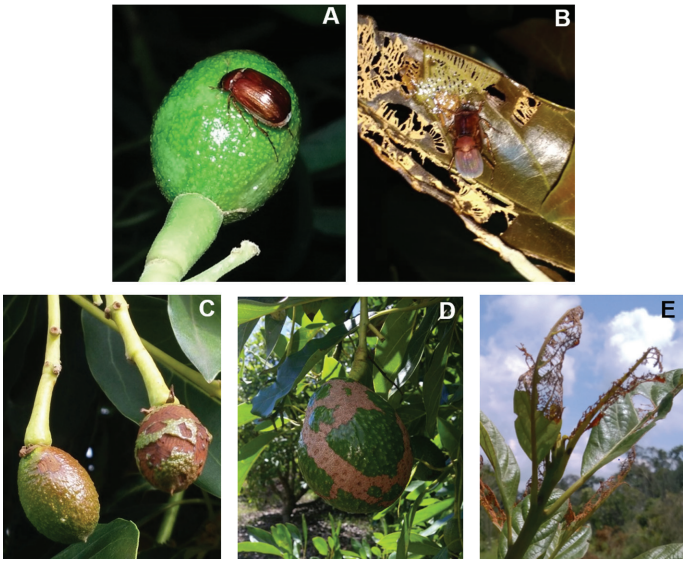


Fig. 3. *Astaena pygidialis* Kirsch, the species found causing the damage to Hass avocado fruit and leaves at all sampling sites: (A) adult feeding on an immature Hass avocado fruit, (B) adults copulating and feeding on immature avocado Hass leaves, (C) old feeding damage on small fruit, (D) feeding scars that elongated as fruit matured, (E) skeletonized young leaves.

avocado flowers, although just at 1 sampling site, was *C. xylina*; in the other locations, this species was observed feeding on pollen and nectar during the d or just visiting flowers. In a study of pollinators associated with avocado orchards in Colombia, Carabali et al. (2016) found *C. xylina* as an occasional flower visitor. The significance of the damage caused by *C. xylina* should be confirmed in future studies.

Other species found in this study, such as *A. cincta* and *Strigoderma* sp., also were found associated with flowers, and *C. fulgurata* and *G. pantherina* were observed occasionally in the sampled avocado orchards. Although there are reports of adult species of *Anomala* associated with flowers in other crops (Morón 1996; Hinson 2014), species

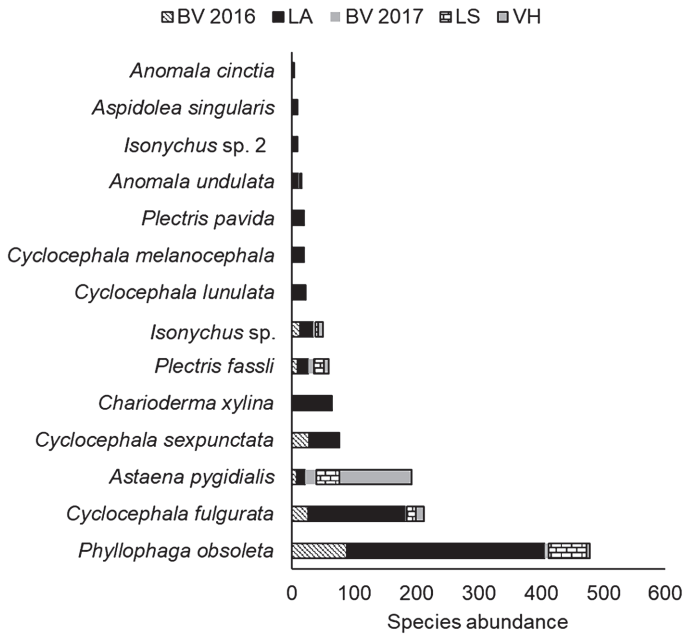


Fig. 4. Species collected using light traps placed in avocado orchards in Antioquia, Colombia, in 2016 and 2017: BV = Site-BV La Ceja; LS = Site-LS Rionegro; VH = Site-VH La Ceja; LA = Site-LA El Peñol.

of this genus are considered as serious pests only in the larval stages (Ramírez & Castro 2000; Deloya et al. 2005). There are several reports of adults of *Cyclocephala* sp. feeding on nectar, flower structures, pollen, and exudates of different plant species (Gibernau et al. 1999; Aragón et al. 2001; Voeks 2002; Cavalcante et al. 2009; Souza et al. 2015). *Cyclocephala fulgurata* was observed during nocturnal inspections in both sampling yr associated with tender shoots, stems, and flowers. Adults often were found in clusters, but we were unable to determine if they were feeding on any structure of the avocado plant in the field or the laboratory. *Gymnetis pantherina* and *Strigoderma* sp. were found occasionally over the course of the study. *Gymnetis pantherina* has been reported in association with fruit, flowers, branch, and trunk exudates (Pardo-Locarno 2013), but there is no information on the feeding habits of *Strigoderma* sp.

The predominant species captured in light traps was *P. obsoleta* at most of the sampling sites. *Phyllophaga obsoleta* is reported commonly in studies using light traps in different crops in Antioquia (Vallejo et al. 2007; Vallejo & Wolf 2013). This species may be strongly attracted to ultraviolet light but was not observed in any of the avocado orchards sampled during the d or night. These results suggest that the light traps currently used in avocado groves have little specificity to the chafer species associated with avocado trees in Antioquia. Therefore, more specific monitoring methods (e.g., semiochemicals, pheromones) should be evaluated in order to develop a sampling strategy that is more specific for the species reported in the current study, especially *A. pygidialis*.

Correct species identification is essential to establish adequate management strategies for pests of avocado in Colombia. Our findings contrast with other studies that report a Scarabaeidae complex causing damage to avocado fruit and young leaves in orchards located in Antioquia (Valencia Arias et al. 2019). Our results indicate that a single species, *A. pygidialis*, is causing fruit scraping and skeletonization of young leaves across sampled sites. These results confirm observations made by Palacio (2010) in other avocado orchards in Antioquia. Other scarab beetle species were found associated with different avocado plant structures such as flowers, tender buds, stems, and mature leaves. The information obtained in this study provides base-line information for the development of sampling and management strategies specific for the chafer species found associated with avocado production in Antioquia and possibly other regions of Colombia.

Acknowledgments

The authors thank the Sistema Nacional de Regalias, Antioquia Department, Colombia [Project 4600001078 “Desarrollo tecnológico, productivo y comercial del aguacate en el departamento de Antioquia,” 2012, adhesion contract number [1], for funding this project, as well as the supporting research professionals of Corporación Colombiana de Investigación Agropecuaria, La Selva Research Station, especially Ovidio Montoya for sampling collection and field work. We also thank Takumasa Kondo for his reviews and suggestions that helped improve the manuscript.

References Cited

Altendorf S. 2017. Perspectivas mundiales de las principales frutas tropicales. Perspectivas, retos y oportunidades a corto plazo en un mercado global pujante. Boletín FAO. http://www.fao.org/fileadmin/templates/est/COMM_MARKETS_MONITORING/Tropical_Fruits/Documents/Tropical_Fruits_Spanish2017.pdf (last accessed 8 Sep 2020).

Acevedo DP. 2005. Identificación de adultos fototácticos de la familia Melolonthidae (Scarabaeidae: Pleurosticti) en siete localidades del departamento de Antioquia. MS Thesis, Universidad Nacional de Colombia, Medellín, Colombia.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use

AGRONET – Red de información y comunicación del sector Agropecuario Colombiano. 2019. http://www.agronet.gov.co/estadistica/Paginas/default.aspx (last accessed 25 Jul 2020).

Aragón AM, Morón A, Tapia-Rojas AM, Rojas-García R. 2001. Fauna de Coleóptera Melolonthidae en el Rancho "La Joya," Atlixco, Puebla, México. Acta Zoológica Mexicana 83: 143–164.

Bran AM. 2005. Aspectos básicos de los estados inmaduros del complejo chisa (Coleoptera: Melolonthidae) asociados a cultivos de papa en tres municipios de Antioquia, Colombia. Undergraduate thesis, Universidad de Antioquia, Medellín, Colombia.

Castañeda-Vildozola A, Franco-Mora O, Pérez-Lopez DDJ, Nava-Díaz C, Valdes Carraxco J, Vargas-Rojas L. 2013. Association of *Heilipus lauri* Boheman and *Conotrachelus perseae* Barber (Coleoptera: Curculionidae) on avocado in Mexico. The Coleopterists Bulletin 67: 116–118.

Carabalí-Muñoz A, Pinchao Tenganan SY, Lamprea Rodriguez IM, Peña Mojica JF, Carabalí Manguero DJ. 2016. Insectos Polinizadores del Aguacate (*Persea americana* Mill.) cv. Hass en Colombia. Corporación Colombiana de Investigación Agropecuaria. Mosquera, Colombia.

Cavalcante TRM, Naves RV, Franceschinelli EV, Pereira da Silva R. 2009. Polinização e formação de frutos em araticum. Bragantia 68: 13–21.

Deloya C, Morón M, Lobo J. 2005. Coleoptera Lamellicornia (MacLeay, 1819) del sur del estado de Morelos, México. Acta Zoológica Mexicana 65: 1–42.

Evans VA, Smith ABT. 2007. An electronic checklist of the new world chafers (Coleoptera: Scarabaeidae: Melolonthinae), Version 2. Updated Mar 2007. Tribe SERICINI Kirby, 1837.

FAOSTAT – Food and Agriculture Organization of the United Nations. 2019. http://www.fao.org/faostat/en/#home (last accessed 25 Jul 2020).

Gibernau M, Barabé D, Cerdan P, Dejean A. 1999. Beetle pollination of *Philodendron solimoesense* (Araceae) in French Guiana. International Journal of Plant Science 160: 1135–1143.

Hinson KR. 2014. The oriental beetle *Anomala orientalis* Waterhouse (Coleoptera: Scarabaeidae: Rutelinae) from Charleston, South Carolina, and its status in the southeastern United States. Entomological News 124: 64–66.

ICA – Instituto Colombiano Agropecuario. 2016. Resolución No. 00001507 22/02/2016. ICA, Bogotá, Colombia.

Londoño M, Kondo T, Carabalí A, Varón EH, Caicedo AM. 2014. Insectos y ácaros, pp. 228–284 *In* Actualización Tecnológica y Buenas Prácticas Agrícolas (BPA) del Cultivo del Aguacate. Corporación Colombiana de Investigación Agropecuaria, Corpoica, Medellín, Colombia.

López-García MM, García-Atencia S, Amat-García G. 2015. Escarabajos fitófagos (Coleoptera: Scarabaeidae "Pleurosticti") de los Andes Orientales de Colombia (Departamentos de Santander, Boyacá y Cundinamarca). Boletín Científico Centro de Museos Museo de Historia Natural 19: 322–358.

Morón MA. 1996. Coleoptera Melolonthidae asociados con las flores de *Hibiscus rosa-sinensis* L. (Malvaceae) en la región de Xalapa, Veracruz, México. Giornale Italiano di Entomología 8: 111–123.

Palacio MM. 2010. Determinación de las especies de *Astaena* (Coleoptera: Melolonthidae) asociadas a cultivos en dos altiplanos Colombianos. MS Thesis, Universidad Nacional de Colombia, Medellín, Colombia.

Pardo-Locarno LC. 1994. Escarabajos (Coleóptera: Melolonthidae) de importancia agrícola en Colombia. Proceedings of the XXI Congress of Colombian Society of Entomology 1: 159–176.

Pardo-Locarno LC. 2002. Aspectos sistemáticos y bioecológicos del complejo chisa (Col, Melolonthidae) de Caldono, Norte del Cauca. MS Thesis, Universidad del Valle, Valle del Cauca, Colombia.

Pardo-Locarno LC. 2013. Escarabajos (Coleoptera: Melolonthidae) del plan aluvial del Río Cauca, Colombia I. Ensamblaje, fichas bioecológicas, extinciones locales y clave para adultos. Dugesiana 20: 1–15.

Pardo-Locarno LC, Moron MA, Montoya LJ. 2007. Descripción de los estados inmaduros de *Astaena valida* (Coleoptera: Melolonthidae: Melolonthinae: Sericini). Acta Zoológica Mexicana 23: 129–141.

Pardo-Locarno LC, Montoya-Lerma J, Schoonhoven A, Belloti A. 2005. Structure and composition of the white grub complex (Coleoptera: Melolonthidae) in agroecological systems of Northern Cauca, Colombia. Florida Entomologist 88: 355–363.

Ramírez S, Castro A. 2000. El complejo "*Gallina ciega*" (Coleoptera: Melolonthidae) en el cultivo de Maíz, en el Madronal, municipio de Amatemango del Valle, Chiapas, México. Acta Zoológica Mexicana 79: 17–41.

Saylor LW. 1942. Ten new *Phyllophaga* beetles from Panama and South America. Revista de Entomología 13: 154–166.

Saylor LW. 1945. Studies in the Melolonthinae Scarab beetle genera of the American continents. No. III. A new Colombian genus and species. The Washmann Collector 6: 79–81.

Souza TB, Maia AC, Albuquerque CMR, Iannuzzi L. 2015. Biology and management of the masked chafer *Cyclocephala distincta* Burmeister (Melolonthidae, Dynastinae, Cyclocephalini). Revista Brasileira de Entomologia 59: 37–42.

Stechauner-Rohringer R, Pardo-Locarno LC. 2010. Redescripcón de inmaduros, ciclo de Vida, distribución e importancia agrícola de *Cyclocephala lunulata* Burmeister (Coleóptera: Melolonthidae: Dynastinae) en Colombia. Boletín Científico Centro de Museos Museo de Historia Natural 14: 203–220.

Valencia Arias C, Martínez A, Morales-Osorio JG, Ramírez-Gil JG. 2019. Spatial analysis of presence, injury, and economic impact of the Melolonthidae (Coleoptera: Scarabaeoidea) complex in avocado crops. Neotropical Entomology 48: 583–593.

Vallejo LF, Wolff M. 2013. The genus *Phyllophaga* Harris (Coleoptera: Scarabaeidae: Melolonthinae) in the Colombian Andean Mountains. Zootaxa 3722: 101–142.

Vallejo LF, Morón MA, Orduz S. 2007. Biología de *Phyllophaga obsoleta* Blanchard (Coleoptera: Melolonthidae), especie rizófaga del complejo "chisa" de Colombia. Boletín Científico Centro de Museos Museo de Historia Natural 11: 188–204.

Vázquez MA, Cruz-López L, Chamé-Vázquez ER. 2015. First record of *Conotrachelus perseae* (Coleoptera: Curculionidae) in Comitán, Chiapas, Mexico. Florida Entomologist 9: 1252–1253.

Villegas NP, Gaigl A, Vallejo LF. 2008. El complejo chisa (Coleoptera: Melolonthidae) asociado a cebolla y pasto en Risaralda, Colombia. Revista Colombiana de Entomología 34: 83–89.

Voeks RA. 2002. Reproductive ecology of the piassava palm (*Attalea funifera*) of Bahia, Brazil. Journal of Tropical Ecology 18: 121–136.

Yepes FL, Pardo LC, Pérez C, Quiroz J. 2000. Contribución al reconocimiento de especies de escarabajos (Coleoptera: Scarabaeoidea) en el departamento de Antioquia, pp. 351–376 *In* Proceedings, Congreso de la Sociedad Colombiana de Entomología. Medellín, Antioquia.

Downloaded From: https://bioone.org/journals/Florida-Entomologist on 29 Mar 2024
Terms of Use: https://bioone.org/terms-of-use