EPPO Datasheet: *Haplaxius crudus*

Last updated: 2022-06-29

IDENTITY

[more photos...]

Preferred name: *Haplaxius crudus*
Authority: (Van Duzee)
Taxonomic position: Animalia: Arthropoda: Hexapoda: Insecta: Hemiptera: Auchenorrhyncha: Cixiidae
Other scientific names: *Myndus cocois* (Fennah), *Myndus crudus* Van Duzee, *Paramyndus cocois* Fennah
Common names: American palm cixiid, pallid cane leafhopper
[view more common names online...]
EU Categorization: A1 Quarantine pest (Annex II A)
EPPO Code: MYNDCR

Notes on taxonomy and nomenclature

Haplaxius crudus was originally described in the genus *Myndus* (Van Duzee, 1907). *Myndus crudus* was maintained until 1946 (Caldwell, 1946) and was then transferred to *Haplaxius* but due to an erroneous synonymy of *Myndus* 1979, was referred to as *Myndus crudus* again (Kramer, 1979). However, in 1989, *Haplaxius* and *Myndus* were split, resulting in the current status of *Haplaxius crudus* (Emeljanov, 1989). *Paramyndus cocois* was described in 1945 (Fennah, 1945) but was transferred to *Haplaxius* in 1946 (Caldwell, 1946) then determined to be a synonym of *Haplaxius crudus* in 1979 (then *Myndus*). Finally, *Haplaxius pallidus* was described in 1946 but was synonymized with *Haplaxius crudus* in 1979 (then *Myndus*).

HOSTS

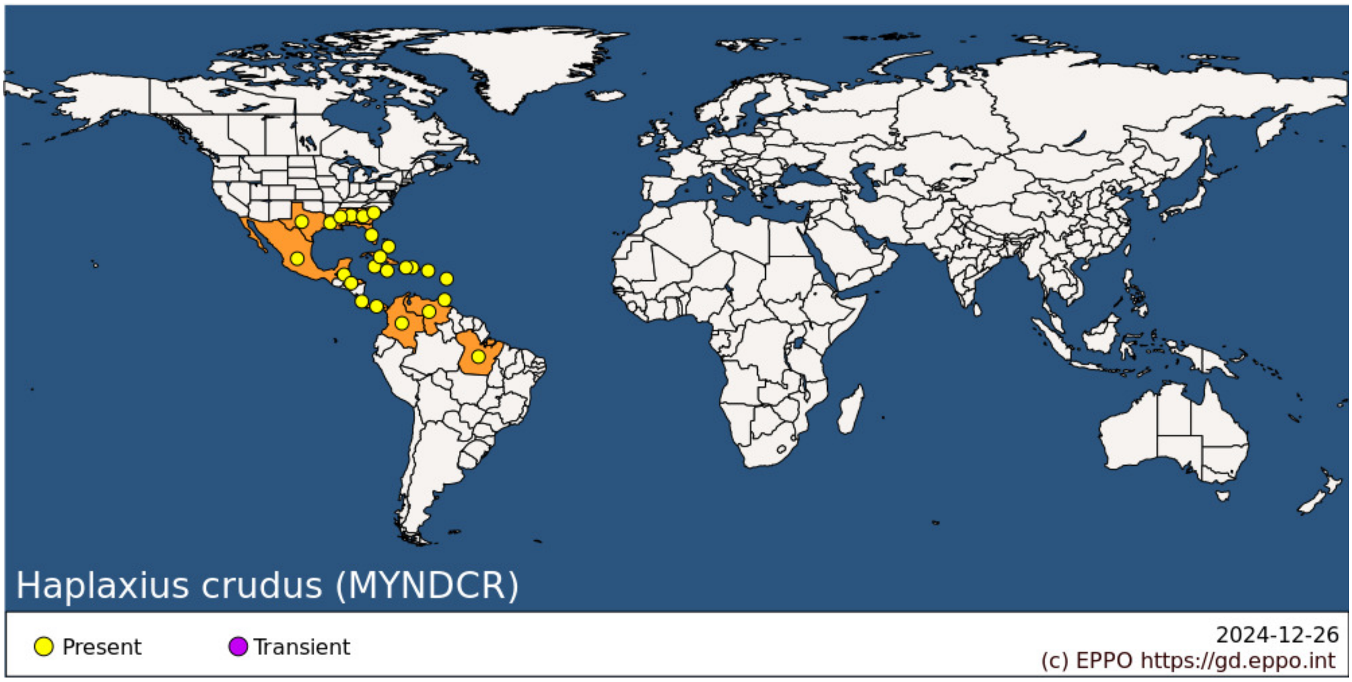
Haplaxius crudus feeds exclusively on monocotyledons, with adults feeding on palm (Arecaceae) foliage and immature stages feeding on grasses (Poaceae) and sedges (Cyperaceae). Adults will feed on immature host plants immediately after emergence, during oviposition or if forced under laboratory conditions. Adults have been documented from approximately 30 species of palm and nymphs have been recorded from just over 40 species of grasses and sedges. Within these families, *Haplaxius crudus* is highly polyphagous.

Host list: *Acoelorraphe wrightii*, *Adonidia merrillii*, *Andropogon bicornis*, *Andropogon virginicus*, *Arenga engleri*, *Axonopus compressus*, *Borassus flabellifer*, *Brachiaria humidicola*, *Caryota mitis*, *Cenchrus ciliaris*, *Cenchrus echinatus*, *Cenchrus purpureus*, *Chloris barbata*, *Chloris gayana*, *Chrysalidocarpus lutescens*, *Coccothrinax miraguama*, *Cocos nucifera*, *Corypha utan*, *Cynodon dactylon*, *Cynodon nlemfuensis*, *Cynodon plectostachyus*, *Cyperus esculentus*, *Cyperus rotundus*, *Dictyosperma album*, *Digitaria abyssinica*, *Digitaria eriantha subsp. pentzii*, *Digitaria eriantha*, *Distichlis spicata*, *Echinochloa colonum*, *Elaeis guineensis*, *Eragrostis curvula*, *Eremochloa ophiuroides*, *Eustachys petraea*, *Fimbristylis cymosa*, *Hemarthria altissima*, *Hyophorbe verschaffeltii*, *Hyparrhenia rufa*, *Leptochloa mucronata*, *Livistona chinensis*, *Megathyrsus maximus*, *Panicum bartowense*, *Panicum laxum*, *Paspalum conjugatum*, *Paspalum notatum*, *Paspalum paniculatum*, *Paspalum virgatum*, *Phoenix canariensis*, *Phoenix dactylifera*, *Phoenix reclinata*, *Phoenix roebelenii*, *Phoenix sylvestris*, *Pritchardia pacifica*, *Pritchardia thurstonii*, *Ptychosperma elegans*, *Roystonea regia*, *Sabal palmetto*, *Saccharum officinarum*, *Satakentia liukiuensis*, *Serenoa repens*, *Setaria parviflora*, *Stenotaphrum secundatum*, *Syagrus romanzoffiana*, *Syagrus schizophylla*, *Trachycarpus fortunei*, *Urochloa brizantha*, *Urochloa eminii*, *Urochloa fusca*, *Urochloa mutica*, *Washingtonia filifera*, *Washingtonia robusta*, *Zea mays*

GEOGRAPHICAL DISTRIBUTION

Haplaxius crudus is a widespread and abundant insect species in the Americas. The northern most record is from

South Carolina, U.S.A. (Humphries *et al.*, 2021) with the southern most record from Para, Brazil (Silva *et al.*, 2019). The western range limit in the U.S.A. is Central Texas (Bartlett *et al.*, 2014). Within this region, *Haplaxius crudus* is present throughout Mesoamerica and the Caribbean (Bourgoin 2020, Caldwell 1951, Hill *et al.* 2018).



North America: Mexico, United States of America (Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, Texas)
Central America and Caribbean: Bahamas, Belize, Cayman Islands, Costa Rica, Cuba, Dominican Republic, Guadeloupe, Haiti, Honduras, Jamaica, Panama, Puerto Rico, Trinidad and Tobago
South America: Brazil (Para), Colombia, Venezuela

BIOLOGY

Haplaxius crudus alternates its life cycle between palm and grass/sedge hosts. The duration from oviposition to eclosion, takes approximately two weeks. There are five nymphal instars and nymphs subsequently feed in the thatch layer of the host grass/sedge. Each instar persists for approximately one to two weeks (depending on ambient temperature). Adults live for approximately one week after emerging from nymphal habitat (Wilson and Tsai, 1982). After adults emerge, they migrate to the canopy of nearby palms to feed. Localization of a mate is probably done using vibrational signals. Copulation occurs in the palm canopy then females migrate back to suitable grass/sedge habitat for egg laying. Adults usually feed on the underside of palm fronds and appear to prefer palm species with deep folds in the leaflets or fronds. Genetically, there are nine distinct haplotypes of *H. crudus* throughout the region thus far. Four are present in Florida, U.S.A. Two distinct haplotypes are present in Costa Rica, one distinct haplotype in Colombia, one distinct population from Texas, U.S.A. and one distinct population from Mississippi, U.S.A. The predominant haplotype in Florida is the same as that in Jamaica (Humphries *et al.*, 2021).

DETECTION AND IDENTIFICATION

Symptoms

There are no visible symptoms associated with *H. crudus*, either feeding damage or sooty mold on adult or immature hosts. However because of the ability of the pest to transmit phytoplasmas responsible for lethal yellowing (LY) and lethal bronzing (LB) (also called Texas Phoenix Palm Decline – TPPD), symptoms of these diseases can loosely be associated with the presence of *H. crudus*.

Morphology

Eggs

White with translucent chorion, approximately 0.54±0.032 mm long and 0.17–0.030 wide with one blunt end (Wilson and Tsai, 1982).

Immatures

Nymphs are white as first instars, becoming more testaceous in second and third instars, then becoming slightly tan as fourth and fifth instars. However, in the field, they all appear white due to being covered in wax secretions. Wax producing pores become evident in the third instar (Wilson and Tsai, 1982).

First instar: approximately 0.64±0.088 mm long, elongate, subcylindrical, slightly flattened dorsoventrally and widest at mesothorax. Vertex, frons, thoracic nota and abdominal tergites with few, shallow, indistinct pits. Vertex broadly rounded anteriorly, widest in anterior half, slightly narrowing posteriorly. Frons subquadrate, lateral margins slightly convex, dorsal margin highly convex, juncture with clypeus obscure. Clypeus narrowing distally. Mouthpart 3-segmented, extending just beyond metacoxae; segment one obscured by clypeus, segments two and three subequal. Eyes reduced, barely visible in ventral view, red. Antennae 3-segmented; scape and pedicel cylindrical and subequal; flagellum bulbous basally, filamentous distally, bulbous portions subequal in size to pedicel. Thoracis nota divided by a longitudinal mid-dorsal line into three pairs of plates. Pronotum longest medially; each plate subrectangular, anterior margin almost straight to ca. level of lateral margin of eye then extending posterolaterally, lateral margin slightly convex, posterior margin slightly sinuate. Mesonotum with median length subequal to that of pronotum; each plate subrectangular, lateral margin convex, posterior margin broadly curved. Metanotum with median length ca. 2/3 that of mesonotum; each plate subrectangular, lateral margin convex. Pro- and mesocoxae posteromedially directed; metacoxae smaller, obscured by trochanters. Tarsi 2-segmented, divisions between segments very obscure; segment one somewhat wedge-shaped; segment two subconical, slightly curved, with a pair of slender apical claws. Abdomen 9-segmented, subcylindrical, widest across segments two and three; segment nine elongate vertically, surrounding anus (Wilson and Tsai, 1982).

Second Instar: approximately 1.01±0.103 mm long, similar to first instar except in following features; antennae with bulbous portion of flagellum ca. 2/3 length of pedicel. Pronotum with each plate bearing 10-15 shallow pits. Each plate of mesonotum bearing ca. seven pits with three pits extending anterolaterally from posteromedial corner and four pits near lateral margin; posterolateral corners of plate slightly lobate. Each plate of mesonotum bearing ca. four pits with two pits near medial border and two pits near lateral margin (Wilson and Tsai, 1982).

Third Instar: approximately 1.29±0.104 mm long, vertex somewhat less rounded anteriorly; pits in two irregular rows, more distinct; posterior and lateral margins distinct, slightly carinate, and sinuate. Frons with two irregular rows of pits bordering lateral margins; lateral margins almost straight, narrowing distally, juncture with clypeus distinct, ventral margin concave; juncture between anterodorsal postclypeus and posteroventral anteclypeus straight and apparent laterally. Antennae with bulbous portion of flagellum ca. ½ length of pedicel. Pronotum with each plate bearing ca. 20 large distinct pits. Each plate of mesonotum bearing 12 to 13 large, distinct pits with one pit in the anteromedial corner, an oblique row of three to four pits (usually four) extending anterolaterally from posteromedial corner, seven to eight pits near lateral margin; posterior margin distinctly lobate in lateral half. Each plate of metanotum bearing seven to eight pits with one to two pits near medial border, two to three pits ca. midway between medial and lateral margins and two to three pits near lateral margin. Abdominal tergites of segments one and two reduced, not extending to lateral margins. The following number of pits on either side of midline of each segment: segment three with two pits on tergite, segments four to five each with five pits on tergite, segment nine with three caudal pits. Tergites six to eight each with a pair of enlarged subtriangular, dorsoposteriorly oriented waxpads in intermembranous area posterior to narrow tergite (waxpads probably present but indistinct in previous instars); each waxpad with a transverse row of three very small obscure pits near anterodorsal margin (Wilson and Tsai, 1982).

Fourth Instar: approximately 2.20±0.162 mm long, more pits present on frons and vertex, antennae with scape reduced, ca. 1/3 length of pedicel, bulbous portion of flagellum ca. 1/3 length of pedicel. Pronotum with each plate bearing 25-30 pits. Each plate of mesonotum bearing 22 to 24 pits with one to two pits in anteromedial corner, an oblique row of five pits extending anterolaterally from near posteromedial corner, and 13 to 15 pits near lateral margin and extending onto wingpad; each wingpad covering ca. 2/3 to ¾ of each metanotal plate laterally. Each plate of metanotum bearing 9 to 13 pits in the following arrangement: three pits near anteromedial border, three to four pits ca. midway between medial and lateral margins and three to six pits near lateral margin. Distal 2/3 of profemora with tooth on median aspect of ventral margin. Metatibiae with setae in longitudinal rows on ventral aspect (present in previous instars but not apparent); distal setae somewhat stout, almost toothlike or spinelike. Metatarsi 3-segmented, segments one and two cylindrical, segment three subconical, slightly curved and bearing a pair of slender apical claws; segment three slightly longer than segment one, segment two ca. 2/3 length of segment one. Abdomen with each segment bearing the following number of pits on either side of midline: segment two with one pit on tergite near midline (obscure), segment three with two pits on tergite near midline and one pit near lateral margin, segments four to five each with a transverse row of seven pits extending from near midline to lateral margin, segments six to eight each with two pits on tergite near lateral margin, segment nine with four caudal pits. Waxpads on segments six to eight with a transverse row of four very small pits near anterodorsal margin (Wilson and Tsai, 1982).

Fifth Instar: approximately 2.68±0.122 mm and head with more numerous pits (vertex and frons). Each pronotal plate bearing 31 to 33 pits. Mesonotal plates bearing 25 to 29 pits with two pits in anteromedial corner, an oblique row of six pits extending anterolaterally from near posteromedial corner, 17 to 21 pits on wingpad and near lateral margin of plate; wingpads extending to or beyond apex of metanotal wingpad. Each metanotal plate bearing eight pits with three pits in anteromedial corner, an oblique row of four pits extending anterolaterally from near posteromedial margin, and one pit near region overlapped by mesonotal wingpad; wingpads extending almost to fourth tergite. Profemora with stouter ventral tooth. Each abdominal segment bearing the following number of pits on either side of midline: segment two with one pit on tergite near midline; segment three with two pits on tergite near midline (lateral pit present in previous instar absent in this instar); segment four with a transverse row of 10 to 11 pits on tergite; segment five with a transverse row of 10 pits on tergite; segment six with four pits on tergite laterally, segments seven to eight each with two pits on tergite laterally, segment nine with four caudal pits. Waxpads on segments six to eight each with a transverse row of five very small pits near anterodorsal margin. Waxy exudate present in this and earlier instars in living specimens(Wilson and Tsai, 1982).

Pupa

N/A (Hemimetabolous)

Adult

Males are approximately 4.2 to 5.1 mm long and females 4.3 to 5.1 mm long (including wings). Females in general are more robust and males have a more tapered end to the abdomen. Males are paler and in the field are a pale yellow with pale green coloration in the abdomen, whereas females are darker and have an olive-brown colour over the body. Wings are hyaline with pale stigma present. Some individuals have white eyes while others have red eyes. Median lobe of pygofer in ventral view is ovally produced with narrow base. Gonostyli rounded at apex, curved dorsad in lateral view, rounded distad in ventral view, more linear mesad. Aedeagus with slightly serrated flagellum and two processes; one arising at apex, relatively short and curved dorsad, second process arising on right lateral side, longer, sinuate angled ventrocephalad.

Detection and inspection methods

To detect populations of *H. crudus*, suitable breeding habitats needs to be surveyed. This generally includes disturbed habitats with palms of moderate height (mature fronds either touching the ground or nearly so) and an abundance of grasses/sedges around the palm(s) that is not regularly mown/maintained. Adults can readily be collected by actively sweeping palm fronds (excessive force yields greater returns). In addition, yellow-sticky traps may be placed within the canopy. Time between checking sticky traps should not exceed one month if only surveying for insects, however, if testing insects for presence of phytoplasmas, traps need to be changed bi-weekly. For nymph sampling, a shovel full of grass and accompanying soil to fill a large ziplock bag can be placed upside down in a Berlese funnelsfor 24 to 48 hours to extract the nymphs. Morphological confirmation is only certain using adult males, however females and nymphs can be identified to species based on descriptive text above but molecular confirmation is recommended in these instances using the primers in Humphries *et al.* (2021).

PATHWAYS FOR MOVEMENT

Adults of *Haplaxius crudus* commonly remain within palm foliage when plants are uprooted and transported to new localities. It is likely that they can also be transported as nymphs in turf. Natural dispersal in the Caribbean by wind dispersal and dislodged vegetation from weather events has been suggested but unconfirmed.

PEST SIGNIFICANCE

Economic impact

Haplaxius crudus has a significant negative economic impact. It is the confirmed vector of lethal yellowing of coconut and lethal bronzing. Both of these are phytoplasma diseases that cause lethal decline in infected palms. Historically, lethal yellowing has killed many coconut palms throughout the Caribbean and lethal bronzing is causing significant losses in *Phoenix* spp. and *Sabal palmetto* in Mexico and the United States. No formal economic impact assessment has been conducted for lethal bronzing, however, current data indicates the impact of the disease in Florida, U.S.A. is at least in tens of millions of dollars, likely upward to hundreds of millions of dollars associated with loss of revenue and cost of palm removal and replacement, testing, and treatment.

Control

Control of *Haplaxius crudus* can be attained by treating habitat infested by nymphs with imidacloprid or aggressive cutting/removal of grasses and sedges. Additionally, imidacloprid is effective as a systemic treatment in palms to reduce adult populations.

Phytosanitary risk

Haplaxius crudus poses a significant phytosanitary risk to countries in the Caribbean basin, the South-Eastern United States and the Neotropics. It is widespread and can easily move throughout the region and if carrying phytoplasma, can cause introductions of either lethal yellowing or lethal bronzing into areas where the phytoplasma is absent. The risk of *Haplaxius crudus* to regions outside the Caribbean/Neotropics is low. Biogeographic barriers (ocean) are too large for *H. crudus* to traverse naturally and movement of plant material that would harbor *H. crudus* populations (living palms) outside of the southeastern United States and Caribbean does not commonly occur. To date, lethal bronzing, lethal yellowing or *H. crudus* have not been documented in other palm growing regions. These regions have their own unique strains of phytoplasma and associated vectors, but strains from the Caribbean and *H. crudus* are confined to the Caribbean basin and southeastern United States.

PHYTOSANITARY MEASURES

Palms and turf/sod should be treated with broad spectrum insecticides in accordance with local laws and regulations. Systemic treatments should be applied at least two weeks prior to movement of plant material (palms and sod).

REFERENCES

Arango M, Beltrán JA, Martínez G & Rairán N (2011) Reconocimiento y manejo de la Marchitez letal (ML) en palma de aceite. *Tecnologías para la agroindustria de la palma de aceite guía de facilitadores, manejo de cultivo.* Guía para facilitadores. Bogotá (Colombia), 86 pp.

Bartlett CR, O'Brien LB & Wilson SW (2014) A Review of the Planthoppers of the United States. Memoirs of the American Entomological Society, 50. American Entomological Society, Philadelphia, PA, U.S.A.

Bourgoin T (2020) FLOW (Fulgoromorpha Lists on The Web): A world knowledge base dedicated to Fulgoromorpha, Version 8. https://www.catalogueoflife.org/data/dataset/1011

Caldwell JS (1951) New Cixiidae from southern North America with notes on others (Homoptera: Fulgoroidea). *Ohio Journal of Science* **51**, 34-36.

Carrillo Ramírez H & Razo JP (1990) Situación actual del amarillamiento letal en el sureste de México. *La problemática del amarillamiento letal del cocotero en México. Centro de Investigación Científica de Yucatán, AC, Mérida, México*, pp 69-93.

Eden?Green SJ (1978) Rearing and transmission techniques for Haplaxius sp. (Horn: Cixiidae), a suspected vector of lethal yellowing disease of coconuts. *Annals of Applied Biology* **89**(2), 173-176.

Emeljanov AF (1989) To the problem of division of the family Cixiidae (Homoptera, Cicadina). *Entomologicheskoe Obozrenie* **68**(1), 93-106.

Fennah RG (1945) The Cixiini of the lesser Antilles (Homoptera: Fulgoroidea). *Proceedings of the Biological Society of Washington*. Washington DC **58**, 133-146.

Hill JG, Hendon A & Bartlett CR (2018) First report of the American palm cixiid (Hemiptera: Cixiidae) from Mississippi, USA. *Transactions of the American Entomological Society* **144**, 593-597.

Howard FW & Mead FW (1980) A survey of Auchenorrhyncha (Insecta: Homoptera) associated with palms in southern Florida. *Tropical Agriculture*, **57**(2), 145-153.

Howard FW (1989) Evaluation of six species of grasses as breeding hosts of *Myndus crudus,* a vector of lethal yellowing of palms. Proceedings of the Caribbean Food Crops Society **25**, 433-438

Howard FW (1990) Evaluation of grasses for cultural control of *Myndus crudus*, a vector of lethal yellowing of palms. *Entomologia Experimentalis et Applicata* **56**(2), 131-137.

Humphries AR, Ascunce MS, Goss EM, Helmick EE, Bartlett CR, Myrie W, Barrantes EA, Zumbado MA, Bustillo AE & Bahder BW (2021) Genetic variability of *Haplaxius crudus*, based on the 5? region of the cytochrome c oxidase subunit I gene, sheds light on epidemiology of palm lethal decline phytoplasmas. *PhytoFrontiers* **1**(3), 127-134.

Kramer JP (1979) Taxonomic study of the planthopper genus *Myndus* in the Americas (Homoptera: Fulgoroidea: Cixiidae). *Transactions of the American Entomological Society*, pp.301-389.

Mena E & Martínez G (1977) Identificación del insecto vector de la marchitez sorpresiva de la palma africana *Elaeis guineensis* Jacq. *Fitopatología Colombiana* **6**(1), 1-14.

Piña Quijano PE (1994) Estudio poblacional de *Myndus crudus* van Duzee (Homoptera: Cixiidae) vector del amarillamiento letal del cocotero en el estado de Yucatán. First Degree Thesis, Universidad Autónoma de Yucatán, México.

Ramos Hernández E, Magaña Alejandro MA, Ortiz García CF, Oropeza Salín C, Lesher Gordillo JM & Sánchez Soto S (2018) The coconut pathosystem: weed hosts of nymphs of the American palm Cixiid *Haplaxius crudus* (Hemiptera: Fulgoroidea). *Journal of Natural History* **52**(5-6), 255-268.

Reinert JA (1980) Phenology and density of *Haplaxius crudus* (Homoptera: Cixiidae) on three southern turfgrasses. *Environmental Entomology* **9**(1), 13-15.

Silva FG, Passos EM, Diniz LEC, Teodoro AV, Talamini V, Fernandes MF & Dollet M (2019) Occurrence in Brazil of *Haplaxius crudus* (Hemiptera: Cixiidae), vector of coconut lethal yellowing. *Neotropical Entomology* **48**, 171-174.

Tsai JH & Kirsch OH (1978) Bionomics of *Haplaxius crudus* (Homoptera: Cixiidae). *Environmental Entomology* **7** (2), 305-308.

Van Duzee E P (1907) Notes on Jamaican Hemiptera: A report on a collection of Hemiptera made on the Island of Jamaica in the spring of 1906. *Bulletin of the Buffalo Society of Natural Sciences. Buffalo, NY* **8**(5), 3-79.

Villanueva-Barradas J & Cano MF (1993) Descripción biológica y métodos de captura de *Myndus crudus* Van

Duzze; Homoptera: Cixiidae. *Amarillamiento Letal del Cocotero, Manuel Fco. Cano A.(Ed). Memoria centro de capacitación Laguna del Pino Barberenea, Santa Rosa, Guatemala. Sp.*

Wilson SW & Tsai JH (1982) Descriptions of the immature stages of *Myndus crudus* (Homoptera: Fulgoroidea: Cixiidae). *Journal of the New York Entomological Society*, 166-175.

Wilson SW & Wheeler AG (2010) Planthopper (Hemiptera: Fulgoroidea) diversity of weeping lovegrass (*Eragrostis curvula*), an introduced host of little-known, rarely collected native species. *Entomologica Americana* **116**(3), 98-106.

Zenner de Polanía I & López Avila A (1977) Apuntes sobre la biología y hábitos del Haplaxius pallidus, transmisor de la marchitez sorpresiva en palma africana. *Revista Colombiana de Entomología (Colombia)* **3**(1-2), 49-62.

ACKNOWLEDGEMENTS

This datasheet was prepared in 2022 by Brian Bahder, University of Florida. His valuable contribution is gratefully acknowledged.

How to cite this datasheet?

EPPO (2024) *Haplaxius crudus*. EPPO datasheets on pests recommended for regulation. Available online. https://gd.eppo.int

Datasheet history

This datasheet was first published online in 2022. It is maintained in an electronic format in the EPPO Global Database. The sections on 'Identity', ‘Hosts’, and 'Geographical distribution' are automatically updated from the database. For other sections, the date of last revision is indicated on the right.

Co-funded by the European Union