A New Invasive Pest in the Western Hemisphere: Amrasca biguttula (Hemiptera: Cicadellidae)

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A new invasive pest in the Western Hemisphere: *Amrasca biguttula* (Hemiptera: Cicadellidae)

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We report the first New World records of the Indian cotton leafhopper, *Amrasca biguttula* (Ishida) (Hemiptera: Cicadellidae) in Puerto Rico. Species of the genus *Amrasca* have never before been officially recorded from the Western Hemisphere. A population of this pest was first observed at a private winter nursery in the town of Juana Díaz, Rio Cañas Abajo, Puerto Rico (18.0144444 °N, 66.4480556 °W) on 26 Apr 2023 on different lines of cotton (*Gossypium* spp. [Malvaceae]). Severe damage to foliage was observed. The infested leaves showed chlorosis, discoloration, red spots, burned areas and defoliation (Fig. 1 A, B, and C). Females, males, and nymphs were observed on both sides of the leaves, but a larger number of the population was observed feeding on the undersurface of the leaves (Fig. 2 F and G). *Amrasca biguttula* also was observed affecting the foliage in eggplant (*Solanum melongena* L. [Solanaceae]), and wild cotton (*Gossypium* spp.) in the town of Santa Isabel, Boca Velázquez, Puerto Rico (18.0019444 °N, 66.4122222 °W) on 18 May 2023. The only other New World record of *A. biguttula* known to us is represented by a single male specimen discovered by JN Zahniser that is preserved in the U.S. National Museum of Natural History collection, Washington, D.C. (U.S.A), labeled "CUBA, Motembo [Villa Clara Province], IX-1956, on rice, F.V. Barry". This specimen was associated in a unit tray with *A. biguttula* specimens from India identified by DA Young. The entire male specimen from Cuba is cleared and stored in a genitalia vial. Young's identification is confirmed here based on male genitalia. This record was apparently never reported or published and may represent a short-lived introduction, given that there are no previous or subsequent published records of this species from Cuba or elsewhere in the Caribbean.

To confirm the identification of specimens from Puerto Rico, male abdomens were cleared in 10% potassium hydroxide (KOH) solution, rinsed with water and immersed in glycerine. Although characters of the male abdomen and genitalia may be necessary for unequivocal species identification (see Xu et al. 2017), the external color pattern of *Amrasca biguttula* allows it to be distinguished from most native Typhlocybinae. *Amrasca biguttula* resembles many native New World species of Empoascini in its pale green (in life) external coloration with symmetrical white markings on the head, pronotum, and mesonotum (Fig. 2 G). However, *A. biguttula* may be distinguished from most native Empoascini by the pair of small black spots preapically on the crown of the head, and the larger round black spot near the apex of the brachial cell of each forewing (Fig. 2 A, B, and G). The black spots of *A. biguttula* may be variably developed in different individuals, with some lacking the spots on the head and having the wing spots reduced in size. Nymphs are uniformly pale green in life except in the later instars, with a lateral pair of small black spots on the pro-, meso-, and meta-notum (Fig. 2 F).

Most other Neotropical Empoascini, including species native to Puerto Rico, are either pale green with symmetrical white markings on dorsal parts of the head and thorax or have additional markings consisting of numerous spots, lines or larger areas of contrasting color. The endemic Mexican genus *Tripunctiasca* also has a pair of dark spots on the head but has a median anterior head spot and lacks the dark preapical spot on the forewing (Xu et al. 2021). The only other genus of Empoascini distributed in the New World that is pale green with similar black spots on the forewing is the Holarctic genus *Kyboasca*, species of which feed on various trees and occur in the temperate zone of the U.S.A. and Canada (Dmitriev et al. 2022). Species of *Kyboasca* lack paired black spots on the head. *Amrasca biguttula* also could possibly be confused with species of the New World dikraneurine genus *Alconeura*, which also have a black spot near the apex of the forewing, but the spot in this genus is located in the second apical cell rather than the brachial cell, and the color pattern usually includes additional red or orange spots.

Xu et al. (2017) clarified the correct scientific name of the Indian cotton leafhopper as *Amrasca* (*Sundapteryx*) *biguttula* (Ishida) and designated a neotype, but in the economic entomology literature this species is still often referred to incorrectly as "*Amrasca devastans*" or "*Amrasca biguttula biguttula*".

Photos of whole mounted specimens were taken using a Canon SLR camera mounted on a motorized lift and photos of the cleared male abdomen were taken using a Jenoptik Arktur camera mounted on an Olympus compound microscope. Voucher specimens Acc. Nos. 855351–855352 are deposited in the Illinois Natural History Survey and at the Museum of Entomology and Tropical Biodiversity of the University of Puerto Rico with PR Acc. No. MEBT-I0044918.

Amrasca biguttula, is a polyphagous pest causing hopperburn that attacks cotton and other crops including okra (*Abelmoschus esculentus*

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Fig. 1. Damage of *Amrasca biguttula* in cotton leaf: A) chlorosis and discoloration, B) reddening point, and C) burn areas.

L. [Malvaceae]), eggplant (*Solanum melongena* L. [Solanaceae]), cowpea (*Vigna unguiculata* L. [Fabaceae]), pigeon pea (*Cajanus cajan* Millsp. [Fabaceae]), potatoes (*Solanum tuberosum* L. [Solanaceae]), millet (*Sorghum* sp. [Poaceae]), maize (*Zea mays* L. [Poaceae]), and sunflower (*Helianthus annus* L. [Asteraceae] and is reported to have many additional ornamental hosts in its native range in Asia such as china rose (*Hibiscus rosa-sinensis* L. [Malvaceae]) and Bermuda grass (*Cynodon dactylon* L. [Poaceae]) (Kamble & Sathed 2015; Saeed et al. 2015). The genus *Gossypium*, from which cultivated cotton was domesticated, is native to both the Eastern and Western Hemispheres; however, the genus *Amrasca* is endemic to the Indomalayan region (Dmitriev et al. 2022). Due to the widespread cultivation of cotton, this non-native species (*A. biguttala*), when introduced to a new site, may have the potential to reproduce and disperse without control, potentially causing significant economic impact. Perhaps the observed increase of this pest in the reported crops is because it does not have local natural enemies, as predicted by the enemy release hypothesis (Middleton 2008). There is the potential for this to occur in Puerto Rico, with additional challenges unique to island ecosystems.

The economic impacts of this species in cotton in its native range, which extends from Iran in western Asia to Japan and Micronesia, have not been estimated precisely, but yield losses resulting from feeding damage by *A. biguttula* may sometimes exceed 60% (Ahmed 1982; Ahmad et al. 1985). In okra, 50% yield reduction has been reported (Devi et al. 2018), and in eggplant the yield losses may reach 37% or more as the population of the leafhopper increases (Ahmed 1982).

If *A. biguttula* has become established in Puerto Rico, it could have major potential consequences for agriculture in the Western Hemisphere, particularly in the southern U.S.A. and on other Caribbean islands including Hispaniola, Cuba, and Jamaica where cotton is produced. Although, this species has not yet been reported elsewhere in the Caribbean or in the mainland U.S.A., its occurrence in Puerto Rico presumably increases the risk of introduction to nearby countries due to inadvertent anthropogenic transport or via natural dispersal. It will be important to know how natural enemies of this pest that can be brought to the island would behave, as some of the local predators such as: *Chrysopodes collaris* Schneider (Neuroptera: Chrysopidae), *Orius insidiosus* Say (Hemiptera: Anthocoridae), *Zelus longipes* (L.) (Hemiptera: Reduviidae), *Chrysotus* spp. (Diptera: Dolichopodidae), *Taeniaptera* spp. (Diptera: Micropezidae), *Chilocorus cacti* L. (Coleoptera: Coccinellidae), *Cycloneda sanguinea* L. (Coleoptera: Coccinellidae), *Hippodamia convergens* (Guérin-Méneville) (Coleoptera: Coccinel-

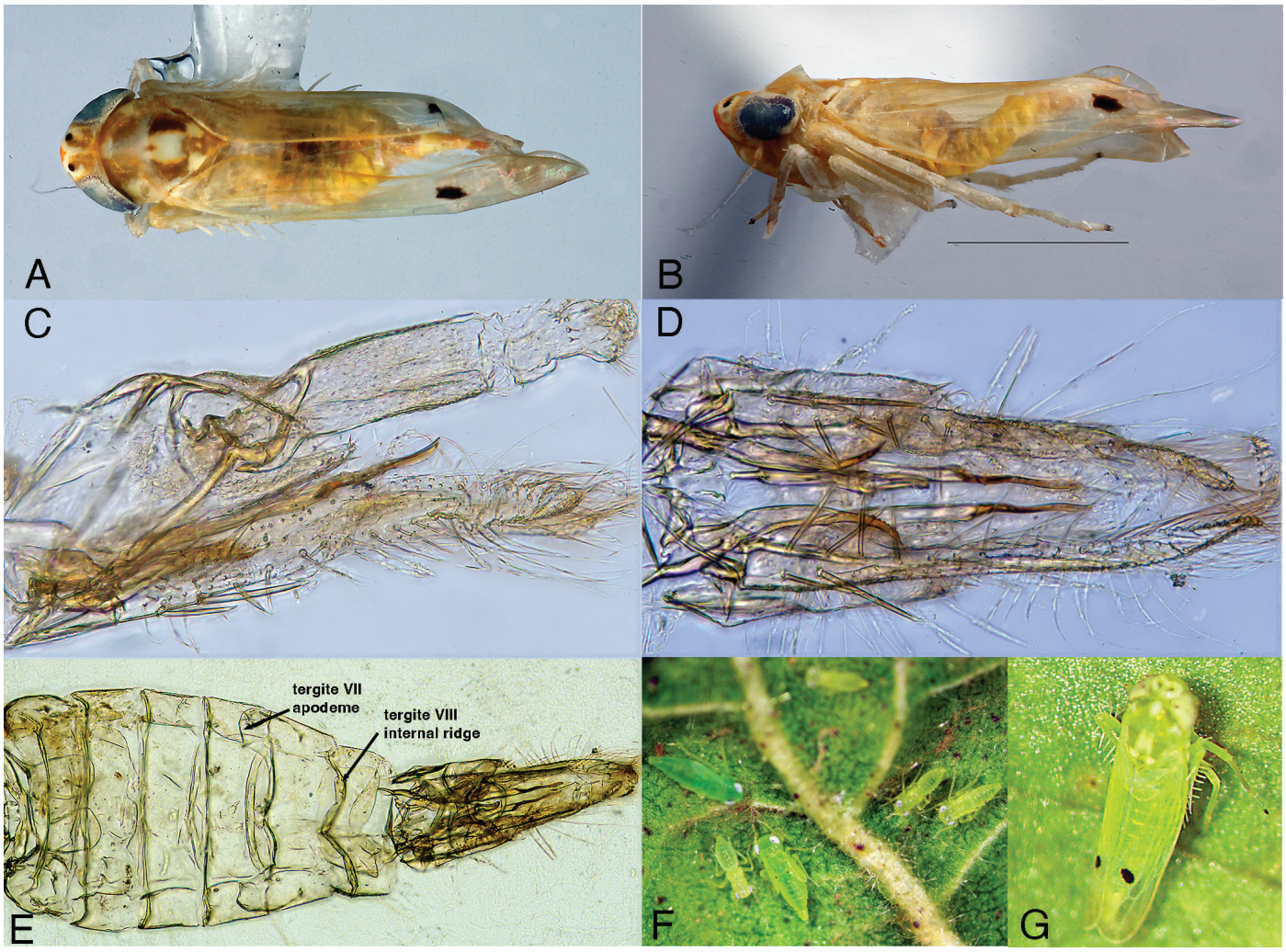

Fig. 2. *Amrasca biguttula* specimens from Puerto Rico. A) Adult male dorsal view, B) adult male lateral view (scale bar = 1 mm), C) male genital capsule lateral view, D) male genital capsule ventral view, E) cleared male abdomen dorsal view, F) nymphs feeding on cotton, and G) adult on cotton.

lidae), *Solenopsis geminata* (Fabricius) (Hymenoptera: Formicidae), *Polistes crinitus* Felton (Hymenoptera: Vespidae), *Enallagma civile* (Hagen) (Odonata: Coenagrionidae), and miscellaneous spiders reported in another genus of Empoascini are not reported to prey on *A. biguttula* (Cotte & Cruz 1989*)*. It is necessary to evaluate the current distribution of this pest in Puerto Rico to better understand the potential impacts and management needs on the island in the future.

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Summary

A new invasive pest, *Amrasca biguttula* (Ishida) (Hemiptera: Cicadellidae), has recently been detected in southern Puerto Rico. This is the first time that this species has been officially reported in the Western Hemisphere. The species was observed affecting cotton, both cultivated and wild, and eggplant. More research is needed to understand the potential impacts of this species on the island.

Key Words: Indian cotton leafhopper; Empoascini; New World; economic impact; *Gossypium*; crop host

Sumario

Recientemente se ha encontrado una nueva plaga invasiva en el sur de Puerto Rico. Este es el primer registro de la especie en el hemisferio occidental. Se observó el mismo afectando líneas de algodón, berenjenas y algodón silvestre. Se necesita más investigación para comprender los impactos potenciales de *A. bigutulla* en la isla.

Palabras Clave: saltahoja indio del algodón; Empoascini; Nuevo Mundo; impacto económico; *Gossypium*; cultivos hospederos

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