



# Occurrence of the Yellow-Spotted Stink Bug *Erthesina fullo* (Thunberg) (Hemiptera: Pentatomidae) in Brazil, a Polyphagous Species from Asia

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## Abstract

In recent years, the management of invasive stink bugs (Pentatomidae) has been a challenge in many regions of the world, including the Neotropical, where four non-native species were detected in the last two decades. Species with invasive potential include the yellow-spotted stink bug, *Erthesina fullo* (Thunberg). It is polyphagous and is known to cause damages to fruit crops in Southeast Asia. Herein, we report for the first time the occurrence of *E. fullo* in Brazil (Santos, São Paulo). Nymphs and adults have been recorded nearby the Harbor of Santos since November 2020. A fifth instar nymph was collected and reared until adulthood. The insect was found feeding on *Inga* sp. leaves (Fabaceae), a plant restricted to the Neotropical Region. The detection of multiple specimens in Santos, plus their ability to feed on native and or on cultivated plants, may represent a threat to the Brazilian agribusiness and environment.

**Keywords** pest management · invasive species · iNaturalist · citizen science · hitchhiking species

Stink bugs (Pentatomidae) include some species with invasive potential (McPherson 2018). Among the characteristics that allow some species of stink bugs to establish in non-native environments, are their polyphagous habits, and their ability to survive under unfavorable conditions (as overwintering), currently magnified by the climate changes (Panizzi 2015; Esquivel et al. 2018). The more recent case of an invasive pentatomid is the brown marmorated stink bug (BMSB), *Halyomorpha halys* (Stål). It is currently widespread in different regions of the world, causing problems in agriculture, the environment, and people's homes (Leskey et al. 2012; Inkley 2012). In the USA, other important invasive species include *Bagrada hilaris* (Burmeister),

*Murgantia histrionica* (Hahn), and *Piezodorus guildinii* (Westwood) (McPherson 2018).

At least four non-native species of stink bugs have been reported in the Neotropics, which invasive status are still uncertain in some cases: *Agonoscelis puberula* Stål, reported in Mexico, Jamaica, and Dominican Republic (Thomas et al. 2003); *B. hilaris* in Chile (Faúndez et al. 2016); *Chroanta ornata* (Herrich-Schäffer) in the Dominican Republic and Venezuela (Perez-Gelabert and Thomas 2005; Cazorla-Perfetti and Morales-Moreno 2019); and *H. halys* in Puerto Rico and Chile (Segarra-Carmona et al. 2015; Faúndez and Rider 2017). Additionally, the cosmopolitan *Nezara viridula* (L.) is widely distributed in the region, recorded since the end of the eighteenth century (Esquivel et al. 2018). This list also includes other true bugs, such as the black bean bug, *Brachyplatys subaeneus* (Westwood) (Plataspidae) detected in Panamá in 2012 (Aelio et al. 2012), and currently widespread in other countries of the Central, North, and South America (Añino et al. 2020; Eger et al. 2020) and the Kudzu Bug (Plataspidae) *Megacopta cribraria* (F.) which have been recorded in the Southern United States since 2009 (Eger et al. 2018).

Among the stink bug species with the potential to invade new regions, the yellow-spotted stink bug (YSSB), *Erthesina fullo* (Thunberg), has been highlighted in the last few years (Mi et al. 2020). It is native from the Palearctic Region and

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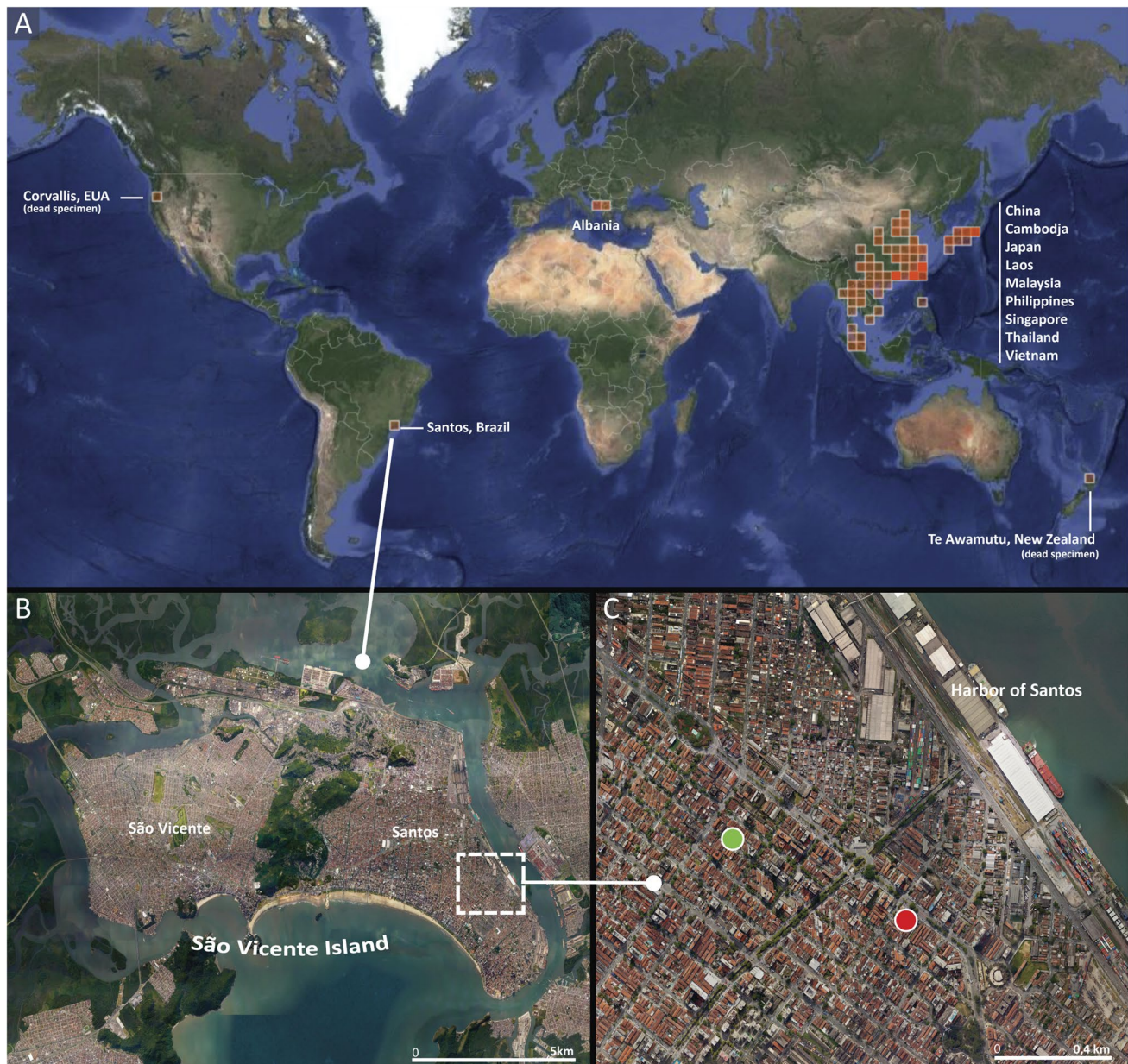
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recorded in Bangladesh, China, India, Indonesia, Japan, Myanmar, Sri Lanka, and Vietnam (Rider 2006, CABI n.d.), including other countries of Southeast Asia (website iNaturalist.org—GBIF 2021) (Fig. 1A). The YSSB is a polyphagous species, feeding on leaves, flowers, shoots, or fruits of at least 57 plants from 29 families (Mi et al. 2020). It is a large species, with males reaching 220–230 mm (Wang 2015). The head is long and acuminate, mostly black with a yellow midline that extends to the pronotum. Adult body

coloration is black, with yellow spots on the dorsal surface, including connexivum, tibia, and tarsus (Fig. 2C–E). The labium always exceeds hind coxae, reaching the third up to the fifth urosternite.

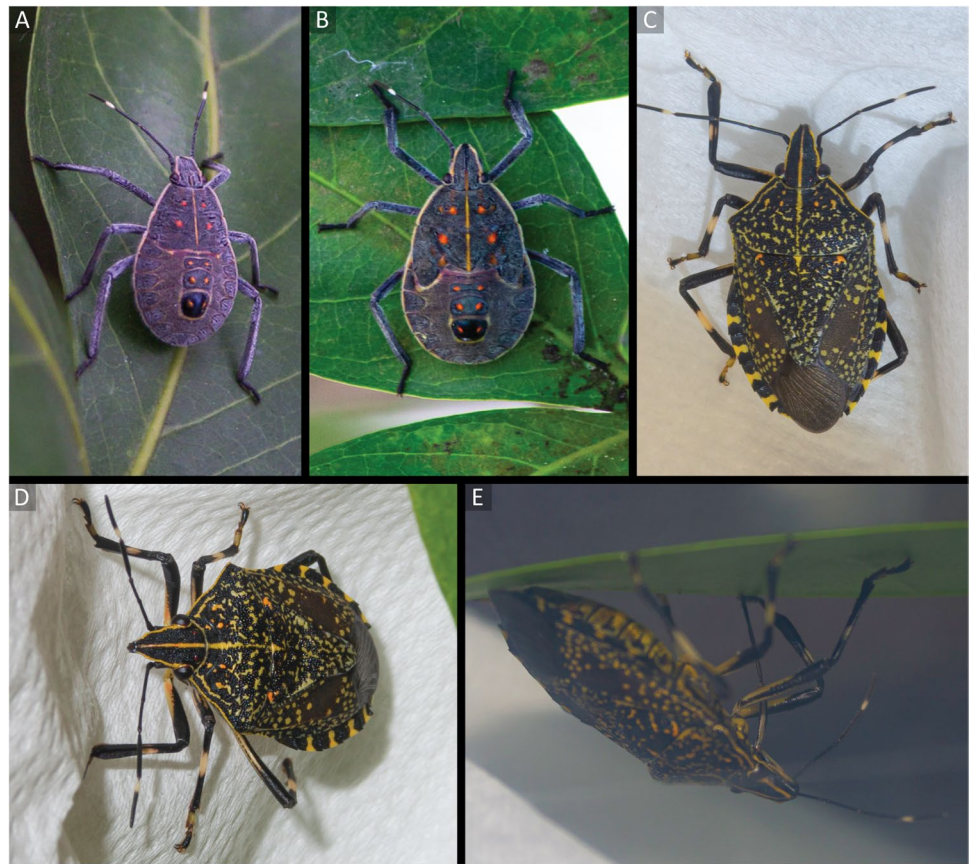
In 2014, a specimen of *E. fullo* was found in Temuka, New Zealand (Mitchell 2014), however, new records were not detected. Since 2017, it has been recorded in Tirana and Durrës, Albania, where it was able to reproduce and survive (Lupoli et al. 2020, 2021). These records call attention to



**Fig. 1** General distribution of *Erthesina fullo* (Thunberg), with new records found in Brazil. **A** World map with the occurrences of *Erthesina fullo* according to 2190 (accessed on May 31, 2021) research-grade observations registered in iNaturalist.org. **B** Map of the São Vicente Island in São Paulo State, southeastern Brazil. **C** Observa-

tions of *Erthesina fullo* near the Harbor of Santos; green spot represent the collected specimen (latitude  $-23.9$  S, longitude  $-46.3$  W); red spot represent the iNaturalist observation by @giuliano1 (<https://www.inaturalist.org/observations/73412688>) on April 9, 2021

**Fig. 2** Collected specimen. **A** Fourth instar nymph. **B** Fifth instar nymph. **C–E** Adult female, deposited in the Hemiptera Collection of Museu de Zoologia of Universidade de São Paulo (MZSP 190221); **C** Dorsal view. **D** Frontal view. **F** Lateral view, feeding of *Inga* sp. leaves



the hitchhike ability of YSSB, by using containers and other types of cargo to reach new regions, as observed in *H. halys* (Aigner and Kuhar 2016).

Here, we report for the first time the presence of *E. fullo* in the Neotropical Region based on four records found in Santos, São Paulo State, Southeastern Brazil. The first record, a fourth instar nymph (Fig. 2A), was observed, photographed, and submitted to the iNaturalist website in November 2020 by Y. Lima. The nymph was found in a tree of *Inga* sp. (Fabaceae) in the urban area, ca. 200 m from the harbor of Santos, one of the major harbors in Brazil (Fig. 1C, red spot). On February 19, 2021, a fifth instar nymph was found on the same tree, which was photographed and collected (Fig. 2B). The nymph was maintained in a plastic pot, fed ad libitum with *Inga* sp. leaves and a piece of moistened paper. The specimen molted to an adult (Fig. 2C–E) on February 22, a female kept in the plastic pot up to February 26. Then, it was cold anesthetized in a freezer and stored in alcohol 99%. The specimen was deposited in the Hemiptera collection of the Museu de Zoologia, Universidade de São Paulo (MZSP 190221).

In a second observation, a photograph of an adult was published on the iNaturalist website ([www.inaturalist.org/observations/73412688](http://www.inaturalist.org/observations/73412688)) on April 9, 2021, located at a place nearby of the previous record (Fig. 1C, green spot).

Two other records were identified in the Facebook group “Insetos do Brasil” dated April 24 and May 11, 2021, without a specific location in the Santos area.

The detection of multiple live specimens, nymphs, and adults of *E. fullo* in Brazil, indicates a possible establishment of the species in the city of Santos. All records were registered near the harbor, suggesting that they reached Brazil on shiploads. Located on the coast of the Atlantic Ocean and with a tropical climate, the annual average temperature up to 20 °C found in Santos, may allow a multi-voltine seasonal phenology to the species, as observed in southern China (Zhou et al. 2000).

In its native range, *E. fullo* is recorded in 57 host plants of 29 families, mostly trees and other perennial hosts (Mi et al. 2020). The YSSB host range includes important crops such as apple, apricot, cherry, grape, kiwifruit, macadamia, peach, pear, plum, pomegranate, and some woody ornamentals. The pest status can vary and depends on the region and the associated crop. Significant damages to kiwifruit (Shaanxi province) and pear (Hebei, Henan, and Shaanxi province) are reported in China (Mi et al. 2020). The species is also pointed to as a potential nuisance pest. On the other hand, there is no record of the YSSB on any important commodity crops, such as corn, cotton, and soybean, which in Brazil include other native

stink bugs as major pests (e.g., Panizzi 2015; Sosa-Gómez et al. 2020).

Nevertheless, considering the polyphagous habits of *E. fullo*, the plant diversity, and the extensive and varied agricultural activity in Brazil, the surveillance of the species is an important step toward its management. The installation of traps in the area and the constant inspection of citizen science initiatives, such as iNaturalist and other online resources, are important tools to contribute to the identification and monitoring of this stink bug, as demonstrated to *B. subaenus* (Eger et al. 2020), *H. halys* (Maistrello et al. 2016), and *E. fullo* (Lupoli et al. 2020).

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**Author contribution** R.B. and C.S.F. planned and designed the study and wrote the manuscript. Y.L. made the observation and the photographs (Fig. 2) and reviewed the manuscript. J.G. designed and reviewed the manuscript. All authors read and approved the manuscript.

## Declarations

**Conflict of interest** The authors declare no competing interests.

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