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FIRST RECORD OF *HALYOMORPHA HALYS* (STÅL, 1855) (*Hemiptera Pentatomidae*) IN SICILY

SUMMARY

The occurrence of the brown marmorated stink bug, *Halyomorpha halys* (Stål, 1855), in Sicily is here recorded for the first time. The species, native of Eastern Asia, was accidentally introduced in North America and Europe, and first found in northern Italy in 2012. In Sicily, the insect was detected in November 2017 in two different areas of Palermo town, the neighbourhood of the maritime port and the Botanical Garden. Detection of *H. halys* in Sicily was expected, due to the high spread rate shown in the different areas in which it was introduced.

RIASSUNTO

Ritrovamento in Sicilia di Halyomorpha halys (Stål, 1855) (*Hemiptera Pentatomidae*). Viene segnalata la presenza in Sicilia di *Halyomorpha halys* (Stål, 1855). La specie, originaria dell'Asia sud orientale, è stata accidentalmente introdotta in America ed Europa, e trovata in Italia per la prima volta nel 2012. In Sicilia è stata rinvenuta in due diverse parti della città di Palermo, nei pressi dei Cantieri Navali e vicino all'Orto Botanico. Il ritrovamento in Sicilia dell'eterottero era prevedibile, alla luce della grande velocità di dispersione manifestata in altre aree di nuova introduzione.

Introduction

The brown marmorated stink bug *Halyomorpha halys* (Stål, 1855) (Heteroptera Pentatomidae), is native to South-Eastern countries of Asia (China, Taiwan, Japan, Korea, Vietnam) (Lee *et al.,* 2013). The highly invasive behavior of *H. halys* caused a rapid expansion throughout the world (Zhu *et al.*, 2016). The insect was accidentally introduced into the United States, where it

was collected in 1998 in Pennsylvania, and then detected in 42 states (LESKEY *et al.*, 2012a, USDA-NIFA SCRI, 2017) and in Canada (FOGAIN & GRAFF, 2011). In Europe it was caught in a light trap in 2004 in Liechtenstein, and reported from Switzerland in 2007 (ARNOLD, 2009; WERMELINGER *et al.,* 2008; EPPO, 2013). In the following years, *H. halys* spread to several other countries: France, Italy, Greece, Hungary, Romania, Austria, Serbia, Spain, Russia, Bulgaria (HECKMANN, 2012; CALLOT & BRUA, 2013; MILONAS & PARTSINEVELOS, 2014; ŠEAT, 2015; MACAVEI *et al.*, 2015; DIOLI *et al.,* 2016; MITYUSHEV, 2016; SIMON, 2016).

In Italy, it was first detected in 2012 in the province of Modena, and then found in many northern and central regions (MAISTRELLO *et al.,* 2013, 2014, 2016; PANSA *et al.,* 2013; BARISELLI *et al.,* 2016) and in Sardinia (DIOLI *et al.*, 2016). For Sicily, occasional detection is reported without information about place and date (COSTI *et al.*, 2017).

The present record is the first for the town of Palermo, Sicily, where two specimens were detected in November 2017 in two different places: in the neighborhood of the maritime port and at the Botanical Garden (Fig. 1). In both cases the proximity of the seaport could explain the introduction; moreover, the Botanical Garden often holds exhibitions of exotic plants involving nursery owners from other Italian regions*.

Fig. 1 — Detection sites of *Halyomorpha halys* (Stål, 1855) in Palermo town, November 2017

* On 1st December, during the proof revision of this paper, a further Sicilian record of *H. halys* from Ispica (Ragusa) was posted on a social network (Rodolfo Occhipinti Sata Srl).

IDENTIFICATION

Halyomorpha halys is a large (12–17 mm) Pentatomidae (Figs 2a, 2b) belonging to the subfam. Pentatominae, tribe Cappaeini; it is dorsally yellowish

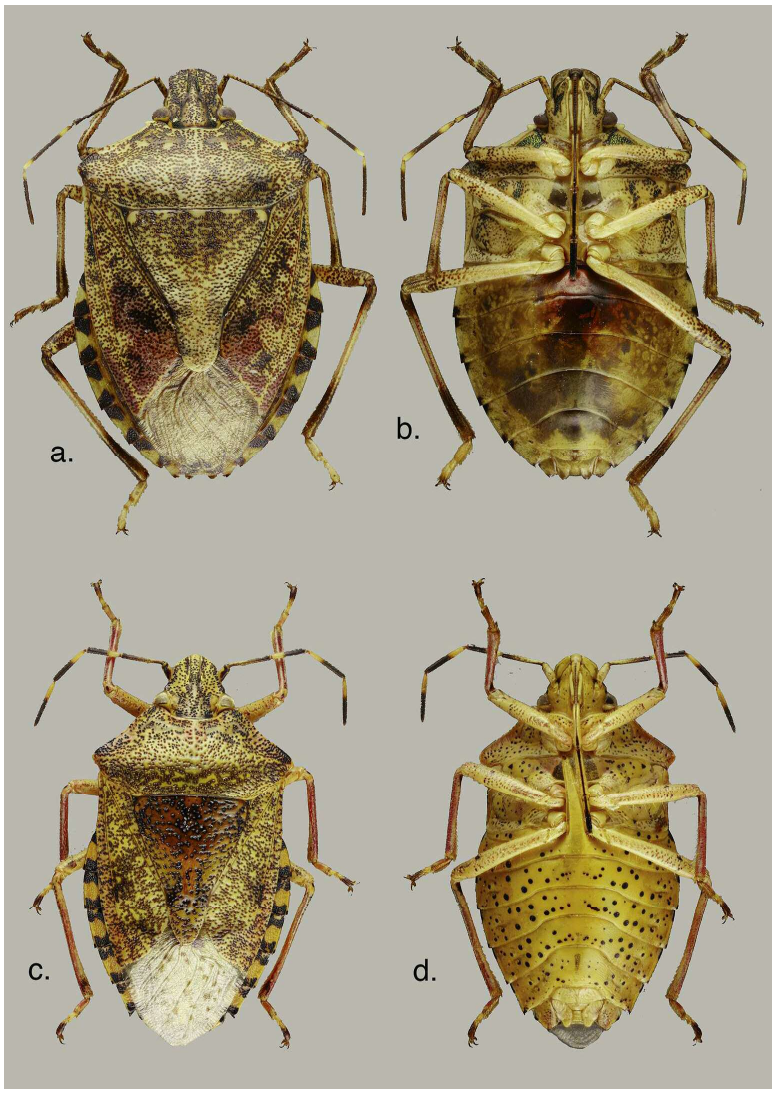

Fig. 2 — a. adult female of *Halyomorpha halys* (Stål, 1855) (Italy, Emilia, Sasso Marconi, 16.VI.2017, L. Colacurcio leg., A. Carapezza coll.); b. same, ventral view; c. adult female of *Rhaphigaster nebulosa* (Poda, 1761) (Italy, Sicily, Godrano, 6.I.2007, M. Arnone leg., A. Carapezza coll.); c. same, ventral view (Photo: A. Carapezza)

to pale brown in colour, mottled in brown, with a reddish tinge in the apical portion of corium, small metallic green spots and an intense black puncturation. Segments of connexivum black or metallic green with a central, trapezoid yellow spot; membrane with longitudinal dark spots on veins. Antennae with the first three segments yellow to brown with more or less intense black dots; third segment black with both base and apex black, fourth segment black with yellow base. Ventral side of body and legs yellowish brown with more or less intense black punctures. Head before eyes generally rectangular in outline with lateral margins distinctly concave, anterior angle of pronotum distinctly thorn-like, scent gland openings not continued outward by a groove.

Larvae of *H. halys* (Fig. 3) are easily distinguished from larvae of other European Pentatomidae by a long spiny process along margin of head anteriad of eye.

Fig. 3 — 5th instar larva of *Halyomorpha halys* (Stål, 1855) (Italy, Lombardia, Milano, X.2013, P. Dioli leg.) (Photo: A. Carapezza)

Among European Pentatomidae *H. halys* is most similar to *Rhaphigaster nebulosa* (Poda, 1761) (Figs 2c, 2d), member of tribe Pentatomini, which can be separated from it by the presence of a robust spine at the base of the abdomen projecting forward, the triangular anterior part of the head, the absence of a pale ring at the apex of the fourth antennal segment, the rectangular central pale spots of segments of connexivum, the rounded dark spots on the membrane and the more convex body.

Biology and economic importance

The pest feeds on a wide range (more than 300 species) of cultivated and wild plant (Leskey *et al.,* 2012a; Lee *et al.,* 2013; Rice *et al.,* 2014; Bakken *et al.,* 2015; Bergmann *et al.,* 2016). Genetic investigations on the potential pathways of origin of *H. halys* populations in Italy allowed to assess that the haplotype present in northern Italy is the same detected in most of the USA and in the Beijing area, while in Switzerland a different haplotype was found (Cesari *et al.,* 2015).

In Europe, the biology of *H. halys* was investigated in northern Switzerland (Haye *et al.,* 2014) and Italy (Costi *et al.,* 2017), showing clear differences in the number of generations/year. In fact, the insect performs only one generation/year in Switzerland and two in Italy (Costi *et al.,* 2017), as found in southern USA and in China (Zhang *et al.*, 1993; Leskey *et al.*, 2012b; Bakken *et al.*, 2015).

In the first 2-3 years after its introduction in Italy, fruit injuries were reported mainly in small untreated orchards, but in 2015 serious economic damage was recorded in commercial pear orchards, in which more than 50% of fruits were infested (Costi *et al.,* 2017; Maistrello *et al.*, 2017).

In order to limit *H. halys* populations and fruit injury, chemical control is widely applied by repeated insecticide treatments, causing disruption of previous integrated pest management programs (Leskey *et al.,* 2012b). The potential of classical biological control is currently investigated (Rice *et al.*, 2014), even if the parasitoid species known to attack *H. halys* eggs in its native range, belonging to the genera *Trissolcus, Telenomus, Ooencyrtus* (Hymenoptera Platygastridae) and *Anastatus* (Hymenoptera Eupelmidae), are usually not specific (Haye *et al.*, 2014, 2015). In order to prevent negative ecological side effects derived from the introduction of not-specific natural enemies, the possibility to use local parasitoids in augmentative biological control programs is being investigated (Haye *et al.*, 2015)

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