ENTOMOLOGY

First record from Calabria (southern Italy) of the "bronze bug" *Thaumastocoris peregrinus* Carpintero & Dellapé, 2006, alien *Eucalyptus* pest native to Australia (Hemiptera: Heteroptera: Thaumastocoridae)

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Abstract

The occurrence in Calabria (southern Italy) of *Thaumastocoris peregrinus* Carpintero & Dellapé, 2006, alien pest on various species of *Eucalyptus*, native to Australia, is reported for the first time. The first specimens were collected in September 2019; later the authors found feeding damage on the leaves, eggs batches and the various stages of the insect in various localities in Reggio Calabria (Italy). Notes on its distribution and biology are reported.

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Key words: Heteroptera, *Thaumastocoris peregrinus*, Italy, Calabria, first record.

Acknowledgments: the authors would like to thank the colleague hemipterologist Francesco Poggi (Missaglia, Italy) for the critical revision of the text and for the bibliographic support.

Conflict of interests: the authors declare no potential conflict of interests.

Funding: none.

Received for publication: 5 February 2020.
Revision received: 6 March 2020.
Accepted for publication: 15 March 2020.

Journal of Entomological and Acarological Research 2020; 52:8879
doi:10.4081/jear.2020.8879

Introduction

The family Thaumastocoridae includes about 26 species of small phytophagous Heteroptera, 2 to 4.6 mm long.

Two subfamilies are recognized: Xylastodorinae with the genera *Discocoris* Kormilev (South America) and *Xylastodoris* Barber (Cuba and Florida), and Thaumastocorinae with the genera *Baclozygum* Bergroth (Tasmania and Australia), *Onymocoris* Drake et Slater (Australia), *Thaumastocoris* Kirkaldy (Australia) and *Wechina* Drake et Slater (southern India) (Schuh and Slater, 1995).

The genus *Thaumastocoris* Kirkaldy, 1908 is typically Australian and includes 14 species, one of which, *Thaumastocoris peregrinus*, is spreading to other parts of the world, where it infests several species of *Eucalyptus*. The first reports from Italy date back to 2011 (Laudonia and Sasso, 2012).

Records

The first specimen was collected in Reggio Calabria, Modena district, 103 m a.s.l., coordinates Lat 38°5'31.04" N, Lon 15°39'25.93" E, in September 2019 (specimen found by an unusual circumstance: on the head of a pupil, during an environmental education activity in a school).

The surrounding area was subsequently explored to look for Eucalyptus trees, finding out a small group of plants, about 150 m from the point of the first discovery.

A sampling was then carried out on site and many specimens were collected (both nymphs and adults) using a sweeping net.

Numerous leaves were also sampled, bearing on the surface many clusters of eggs (Figure 1), also already hatched, and anchored exuviae. The specimens were collected on *E. camaldulensis* and *E. globulus*.

Further checks were also carried out in the areas of the city where other groups of *Eucalyptus* are present, as well as along the Reggio Calabria coastline; unfortunately, the presence of the pest was verified in several sites, by visual sampling and by shaking of the terminal part of the branches.

The possible planning of a systematic sampling in the whole interested area will be evaluated later.

Morphology

Adults are light brown with darker areas and with an elongated and dorso-ventrally flattened body (2-3.5 mm long), broad head, antennae with four segments, the apical ones darks, pedicellated eyes and characteristic elongated jaws, with curved and broad outer margin (Figure 2) (Noack *et al.*, 2011).

The young nymphs are essentially orange, with black spots on the thorax and on the first abdominal segments (Figure 3).

A detailed description of *T. peregrinus* has been provided by Carpintero and Dellapé (2006) and, more recently, a new description of the species has been published by Noack *et al.* (2011).

Distribution and diffusion

Thaumastocoris peregrinus was described in 2006 on specimens found in Argentina and recognized as a species of Australian origin, although still unknown.

To date, it is reported for: i) Australia, native; ii) New Zealand, allochthonous; iii) Africa (allochthonous in Kenya, Malawi, South Africa, Zimbabwe, Uganda); iv) Europe (allochthonous in Italy, Portugal, Spain, Greece); v) South America (allochthonous in Argentina, Brazil, Chile, Uruguay, Paraguay). The current distribution is, probably, mainly due to accidental passive diffusion (Suma et al. 2014).

Locally, the species is fostered by its ability to identify hosts not yet attacked and, consequently, to rapidly expand in the planted trees.

This is possible thanks to its reception of volatile substances produced by the plants, that are quantitatively and qualitatively different from those produced by already infested trees (Martins and Zarbin, 2013).

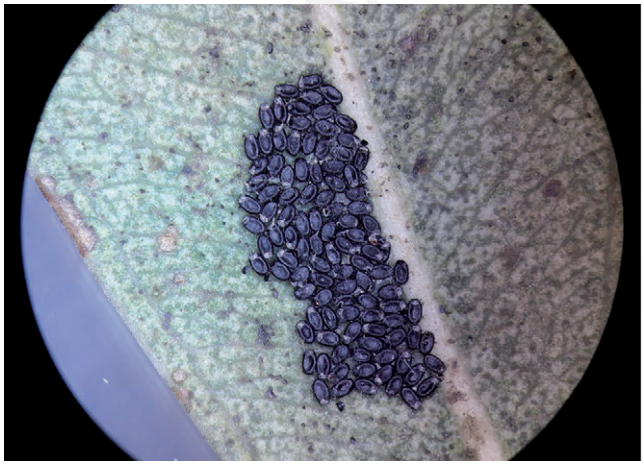

Figure 1. Ovation of *Thaumastocoris peregrinus* on the leaf of *Eucalyptus camaldulensis* with detail of the opened operculum in some eggs.

Figure 2. Adult of *Thaumastocoris peregrinus*.

Figure 3. Nymph of *Thaumastocoris peregrinus*.

Biology

T. peregrinus feeds from the mesophyll of Eucalyptus leaves, particularly from the palisade parenchyma (chlorenchyma) (Santadino *et al*., 2017).

The male produces an aggregation pheromone (González *et al.*, 2012) and numerous adults of both sexes and juvenile stages are generally found on the same leaf.

To date, there are no known volatile substances produced by the species for the purpose of sexual communication (González *et al.*, 2012).

Females of *T. peregrinus* prefer to feed on mature leaves compared to juvenile ones.

However, they use different criteria for selecting the host plant for oviposition (Martinez *et al.* 2017).

The eggs are dark, oval, with an average size of 0.5 mm long - 0.2 mm wide, with a well-defined depression on the dorsal side, with a carved chorion and a round and carved operculum (Carpineto and Dellapé, 2006).

Females can lay up to 60 eggs (about 2 eggs per day) individually or in groups on the leaves or on the young branches, mainly in correspondence with cracks, depressions. Eggs take 4-8 days to hatch.

The life cycle of *T. peregrinus* is between 30 and 60 days, comprising five nymphal stages (16-20 days) and one adult stage (14-42 days) (Noack and Rose, 2007).

All stages can be present on the same leaf.

Due to the short life cycle, multiple generations are possible in just one year, being a generation cycle of about 20 days (Noack and Rose, 2007).

Lower temperatures reduce development and increase the life stage duration; the optimal temperatures for the development and reproduction are 18 and 25 ° C, respectively (Barbosa *et al.,* 2019).

In the sampled areas in the Calabrian coast area, it is possible to find all the stages in the autumn months.

Previous studies in Sardinia show that eggs are mainly present in the summer months, whilst the adults are present starting from August and in the following autumn months. Several natural enemies are among predators and parasitoids (Deiana *et al.,* 2018).

Among the predators are reported the Neuroptera *Hemerobius bolivari* Banks (Hemerobiidae) and *Chrysoperla externa* (Hagen) (Chrysopidae) (Nadel and Noack, 2012; Garcia *et al.,* 2013) and the Hemiptera *Atopozelus opsimus* (Reduviidae) and *Supputius cincticeps* (Pentatomidae) (Souza *et al.,* 2012; Dias *et al.,* 2014).

Among the parasitoids, some success is achieving in the biological control by the egg parasite *Cleruchoides noackae* Lin and Huber (Hymenoptera: Mymaridae) (Mutitu *et al.* 2013; Barbosa *et al.* 2019).

Furthermore, the entomopathogenic fungi *Beauveria bassiana* (Bals.-Criv.) Vuill. and *Metarhizium anisopliae* (Metsch.) Sorokin could provide excellent results in biological control (Soliman *et al.,* 2012).

Damage

The specific host of *T. peregrinus* is *Eucalyptus*, a tree introduced in our country since the 19th century as ornamental plant and widely used in the post-war period for industrial purposes and reforestation.

It is a melliferous plant, of considerable importance for the remarkable nectariferous flow and the abundance of pollen.

T. peregrinus is causing considerable damage and threatening economic losses by feeding on over 40 *Eucalyptus* species and hybrids.

Three other species within the genus *Thaumastocoris* are possible threats to *Eucalyptus* trees (for more details see Nadel and Noack, 2012).

The damage caused by the insect is of different impact, depending on the infestation intensity.

The trophic activity is carried out both by nymphs and adults, on the parenchymatic palisade of the leaf mesophyll (Santadino *et al.*, 2017), causing discoloration of the leaves (tanning, redness, yellowing), early senescence, stunted growth and early fall (Sasso *et al.*, 2014).

In the early stage, the attacked leaves show symptoms of silvering and, subsequently, take on a very characteristic reddish-brown color, visible even from a distance, hence the common name "bronze bug" (Figure 4).

Damaged leaves show a progressive reduction of photosynthetic activity, often followed by drying and consequent phylloptosis (Crawford and Wilkens, 1996).

Heavy infestations can lead to severe defoliation, branch decline and eventually tree death within 2-3 years.

The effects of *T. peregrinus* on the plant are often associated with the attacks of xylophagous insects, such as *Phoracantha recurva* Newman (Coleoptera: Cerambycidae).

Serious damage has been observed on urban trees (*E. scoparia and E. nicholii*) in Sydney and tree mortality cases have been reported from South Africa and Brazil.

However, studies on the economic impact are not available.

T. peregrinus is also considered a possible health nuisance, with reports of cases of bites to people in urban parks and recreational areas, due to the possibility that it may give rise to erythematous phenomena (Jacobs and Neser, 2005).

Leaves stressed by factors of biotic or abiotic origin, including phytophagous insects, may be subject to different types of lesions, in which the extent and severity of the damage can vary (Stone *et al.*, 2001).

The progressive loss of photosynthetic tissues and/or the reduction of the leaf area due to insects, causes a decrease in photosynthetic activity, reducing biomass production and plant performance (Edwards and Wratten, 1981; Sagers and Coley, 1995).

In order to monitor the evolution of infestations within *Eucalyptus* planted trees, it is possible to integrate the WorldView-2 satellite data information with the field data, integrated with environmental variables, in order to improve the mapping of the species distribution and the pullulations size in the planted trees (Oumar and Mutanga, 2014).

Figure 4. ***Thaumastocoris peregrinus*** **damage on** ***Eucalyptus*** **leaves.**

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