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The bronze bug *Thaumastocoris peregrinus*: a new insect recorded in Italy, damaging to *Eucalyptus* trees

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Abstract

The bronze bug *Thaumastocoris peregrinus* Carpintero et Dellape (Heteroptera Thaumastocoridae) is reported for the first time from Italy infesting *Eucalyptus* spp. in several urban and rural sites of the Latium region. The host plants are very common in Italy as ornamental and forest trees. This is the first record of a member of the family Thaumastocoridae from Europe and the Mediterranean region. Preliminary observations on general biological aspects and distribution of *T. peregrinus* have been conducted.

Key words: Europe new record, *Eucalyptus*, invasive species.

Introduction

In September 2011, heavy infestations of *Thaumastocoris peregrinus* Carpintero et Dellape (Heteroptera Thaumastocoridae) were found on several *Eucalyptus* species in the Italian region of Latium. This is the first record of a member of the family Thaumastocoridae from Europe and Mediterranean regions. The original description by Carpintero and Dellapé (2006) and the redescription with the diagnostic dichotomous key by Noack *et al.* (2011) were used to identify *T. peregrinus.*

T. peregrinus is a small sap-feeding insect in the family Thaumastocoridae. The family includes three subfamilies of cimicomorpha bugs: the monotypic Thaicorinae from Thailand (Heiss and Popov, 2002), Xylastodorinae from South America and New Caledonia (Van Doesburg *et al.*, 2010) and the Thaumastocorinae. The subfamily Thaumastocorinae includes four genera: the monotypic genus *Wechina*, which is restricted to southern India and the Australian genera *Baclozygum*, *Onymocoris*, each containing four species, and *Thaumastocoris* with 14 species (Noack *et al.*, 2011).

Host plant associations are documented for 12 of the 14 species of *Thaumastocoris*, these plants are predominantly dicotyledonous. Only two species of *Thaumastocoris* are not associated with Myrtaceae: *Thaumastocoris hackeri* Noack, Cassis et Rose is recorded from Elaeocarpaceae, Cunoniaceae, and Rubiaceae, and *Thaumastocoris roy* Noack, Cassis et Rose from the Malvaceae (Noack *et al.*, 2011).

Until recently, the Australian group was considered rare (Cassis *et al*., 1999). However, over the past 10 years, *T. peregrinus* has rapidly established as a severe pest on 13 species of *Eucalyptus* and *Corymbia citriodora* subsp. *citriodora* in Australia (Noack and Rose, 2007; Noack *et al.* 2009), South America (Martinez-Crosa, 2008, Carpintero and Dellapé 2006; Noack and Coviella, 2006; Wilcken *et al.*, 2010b; Savaris *et al*., 2011) and South Africa (Jacobs and Neser, 2005; Giliomee, 2011). Since then, populations have attained an almost ubiquitous distribution in several regions in South Africa on 26 *Eucalyptus* species. Barcoding mitochondrial DNA (COI) sequence diversity was used to characterize the populations of this insect from Australia, South America and South Africa (Nadel *et al.*, 2010).

In southern Europe (Italy, Spain and Portugal) *Eucalyptus* spp. are the only large scale and economically successful short rotation tree plantations (Facciotto and Mughini, 2003; Tolosana *et al.*, 2010; Tomé *et al*., 2001) also used for industrial purposes, such as sawmilling, wood pulp, charcoal and biomass fuel. The nectar from flowers of some eucalypts produces high-quality of monofloral honey. *T. peregrinus* is a serious pest of *Eucalyptus* species in the southern hemisphere and its occurrence in southern Europe may be have an economic major impact. This alien species, like other invasive species, could become a forest and urban pest in southern Europe and in the Mediterranean basin.

Identification of *Thaumastocoris peregrinus*

The genus *Thaumastocoris* is recognized by a strongly dorso-ventrally compressed and elongate body between 2-3.5 mm in length, a broad head, pedicellate eyes, and elongate conspicuous mandibular plates (Noack *et al*., 2011).

The adults of *T. peregrinus* are light brown with darker areas, and have a flattened body (figure 1a-b). This species can be diagnosed by the strongly tuberculate antero-lateral angle of the pronotal callosite region, by the long mandible plates which are curved and broad on the outer margin, and by the antennae with segments three and four dark apically (figure 1g). On the legs neither parempodia nor pulvilli are present, while tibiae have a flattened structure: the fossula spongiosa (Noack *et al*., 2011) (= tibial appendix *sensu* Cassis *et al*., 1999; = lobate sensory appendage *sensu* Drake and Slater, 1957). This structure is present on the tibial apex of all

Figure 1. *T. peregrinus*: a) adult: female; b) adult: male; c) female: ventral view of abdomen; d) male: ventral view of abdomen; e) tibia with fossula spongiosa and tarsum; f) male genitalia; e) head and pronotal callosite region.

species of Thaumastocorinae, but absent on the other two Thaumastocoridae subfamilies, *Xylastodorinae* and *Thaicorinae* (figure 1e). The labium of the species is short. The male genital capsule is asymmetrical and can be oriented to either the right or left, although the right orientation occurs more frequently (figure 1b-d). The paramere is subquadrate (figure 1f). A detailed description of *T. peregrinus* has been published by Carpintero and Dellapé (2006), and more recently a redescription of the species has been published by Noack *et al.* (2011).

Developmental stages, biology and damage of *Thaumastocoris peregrinus*

The eggs are dark, oval, with a sculptured chorion and a round operculum. A deep and obvious depression is present on dorsal side (figure 2d). On average eggs are 0.5 mm long and 0.2 mm wide.

The crawlers and young nymphs are essentially orange (figure 2c), with black spots on the thorax and first abdominal segments.

Figure 2. *T. peregrinus*: a) winter bronzing on *E. grandis*; b) silver leaves on *Eucalyptus* sp.; c) nymphal stages on heavily infested eucalyptus tree, along with a colony of *Glycaspis brimblecombei*; d) eggs.

The developmental time of *T. peregrinus* is about 20 days at a temperature between 17 to 20 °C, with 5 instars (Noack and Rose, 2007). Under laboratory conditions the average daily production rate of eggs by mated females of *T. peregrinus* ranged from 1.8 to 2.1 eggs per day. Longevity of females under the same conditions ranged from 4 to 40 days (mean 15 ± 12 days) (Noack and Rose, 2007).

Adults and immature bronze bugs are gregarious on leaves (figure 2c) and the damage caused is due to there feeding activity. All instars can be present on the same leaf, and because there life cycle is short several generations can develop in a year. The eggs are laid on the leaves either singularly or in a cluster, clusters are easily identifiable as a large black mark on the leaf (Carpintero and Dellapé, 2006).

Infested trees show leaf silvering, ranging from chlorosis to bronzing if heavily infested, whereas leaves become red/brown when defoliation occurs. These symptoms are sometimes referred to as "winter bronzing" or "winter die-back" and they are particularly serious and evident on *Eucalyptus grandis* (figure 2a), while the prevalent symptoms on other *Eucalyptus* species are silver leaves (figure 2b) (Noack *et al*., 2009; Wilcken *et al*., 2010 b).

The bronze bugs are also considered annoying and irritating, having been reported to ‘sting’ human bodies at urban parks, playgrounds etc. (Jacobs and Neser, 2005).

Distribution in Italy

T. peregrinus has been collected for the first time in Rome (Latium) on *Eucalyptus camaldulensis*, *Eucalyptus gomphocephala*, *Eucalyptus bridgesiana* and on 7 hybrids: 6 *E. camaldulensis* X *E. bicostata* and 1 *E. camaldulensis* X *E. grandis* in 8 ha of eucalypts plantation of Council for Agricultural Research - Research Unit for Intensive Wood Production in Rome (41°54'59"N; 12°21'48"E 73 m asl) and, at lower infestation levels, on *E. camaldulensis* in urban garden in locality Santa Maria di Galeria (42°02'35"N; 12°17'59"E 148 m asl). All developmental stages of the insect pest have been found at each sampling site during the collected period from September until December, but research on the pest phenology is currently ongoing.

Management and natural control

Currently, no effective strategies exist to control *T. peregrinus*. A recent paper (Noack *et al*., 2009) concluded that trees treated with imidacloprid showed a significant reduction in populations of *T. peregrinus* when compared to untreated trees. Moreover, the authors suggest microinjection of this chemical at a rate of 3 to 5 ml/10 cm effectively controlled *T. peregrinus* for

two to three years. In Europe, chemical control, either by contact or systemic insecticides, is probably impracticable and uneconomical. Two species of Mymaridae wasps, *Cleruchoides noackae* Lin et Huber and *Stethynium* Enock have been established as egg parasites of *T. peregrinus* in Australia (Lin *et al*., 2007). A single wasp emerges from each parasitized thaumastocorid egg via the operculum (Noack *et al*., 2011). In Brazil a few natural enemies have been reported, such as green lacewings, a predatory bug (*Atopozelus opsimus* Elkins) (Rhynchota Reduviidae), along with entomopathogenic fungi, such as *Beauveria bassiana* and *Entomophtorales*, but no occurrence of parasitoids has yet been recorded (Wilcken *et al.*, 2010a).

Concluding remarks

The productivity of European *Eucalyptus* plantations has been negatively affected by the recent introduction of exotic pests, such as the red gum lerp psyllid, *Glycaspis brimblecombei* Moore (Rhynchota Psyllidae) (Valente and Hodkinson, 2009; Borrajo *et al.*, 2009; Prieto-Lillo *et al.*, 2009; Laudonia and Garonna, 2010; Garonna *et al.*, 2011; Lo Verde *et al*., 2011) and the gall wasps, *Leptocybe invasa* Fisher et LaSalle and *Ophelimus maskelli* (Ashmead) (Hymenoptera Eulophidae) (Arzone and Alma, 2000; Viggiani and Nicotina, 2001; Viggiani *et al.*, 2002; Bella and Lo Verde, 2002; Sánchez, 2003; Pujade-Villar and Riba-Flinch, 2004; Branco *et al.*, 2006; EPPO, 2006). The recent introduction of so many exotic and invasive pests shows the vulnerability of phytosanitary measures at Italian ports and airports. The bronze bug has been collected in different localities of the Latium region (Italy) over a very short period of time (September-December 2011). The origin of the introduction has not been elucidated. A possible pathway could have been the importation of wood for biomass from South America and South Africa where this insect is a serious introduced pest. Difficulties in conducting accurate inspections of this material during export may have facilitated its introduction.

As the highly susceptible species of *Eucalyptus* are increasingly used for wood biomass and are additionally very common as ornamental and forest species in Italy and in the whole Mediterranean region, attention must be given to occurrence of the bronze bug. This insect may become a serious pest for the eucalypt plantation industry, as well as in parks and urban areas. Research on pest bioecology and host range preference is in progress. Barcoding mitochondrial DNA sequences (COI) could be used to characterize the Italian populations, and to identify the source of the introduction. In regard to control, with the increasing population of *T. peregrinus* there are no effective strategies to reduce the predictable negative impact of such invasive species. Therefore, it might be necessary to introduce a complex of natural enemies, predators and parasitoids from Australia and South America.

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