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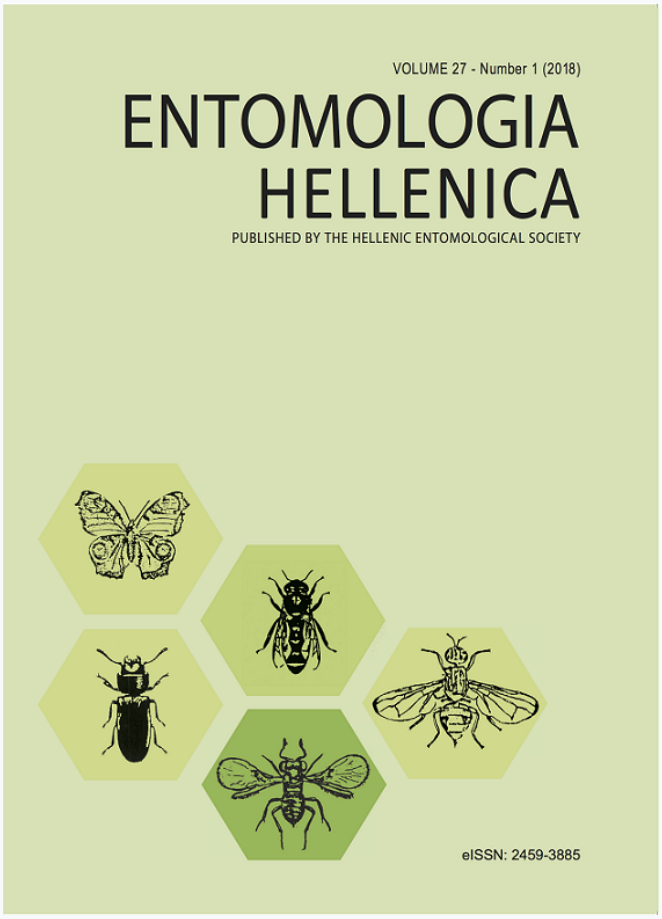

Πρώτη αναφορά του Thaumastocoris peregrinus στην Ελλάδα

Panos V. Petrakis

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SHORT COMMUNICATION

First record of the bug *Thaumastocoris peregrinus* in Greece

P.V. PETRAKIS

Hellenic Agricultural Organization – "Demeter", Institute for Mediterranean Forest Ecosystem Research, Laboratory of Entomology, Athens, Greece

ABSTRACT

The Australian bug species *Thaumastocoris peregrinus* Carpineto et Dellapè (Hemiptera: Thaumastocoridae) is reported for the first time in Greece. This is a sap-sucking consumer (mesophyll feeder) of *Eucalyptus* spp. foliage. Feeding damage and the egg batches of the insect were found in several locations in 2016. This invasive species recently has been recorded from Portugal, Spain, and Italy. Although in Greece there are no currently forest plantations of eucalypts (experimental plantations exempted), this insect is a serious pest of these trees in roadside verges and city parks.

KEY WORDS: pest distribution, *Eucalyptus*, invasive species, *Thaumastocoris peregrinus*.

Introduction

Thaumastocoris peregrinus Carpineto et Dellapè (Hemiptera: Thaumastocoridae) (bronze bug) is a pest of several *Eucalyptus* and *Corymbia* species. This insect is native to The Australian state of New South Wales (Cassis and Gross 1995), and is now widespread in Queensland and South Australia (Noack et al. 2011). It is spreading through Africa, Europe and South and Central America (FAO 2012). CABI (2017) lists its current distribution, highlighting its invasion to most continental regions of the world. Laudonia and Sasso (2012) and Garcia et al. (2013) document its European distribution. *T. peregrinus* is found in Portugal, Spain (Vivas et al. 2015), Italy including Sicily and Sardinia (Laudonia and Sasso 2012), Israel (Novoselsky and Freiberg 2016) and Albania (van der Heyden 2017). The insect has been moved in the 'Alert list' of EPPO (2012a,b). It was considered rare (Cassis et al. 1999) but over the past twenty years, it has exploded to become a serious pest (Noack and Rose 2007, Noack et al. 2011, EPPO 2014). The cause of the expansion of the geographical range of *T. peregrinus* is not known but in all likelihood, its invasion is mediated by human commerce and travel.

In this paper I report the first occurrence of *T. peregrinus* in Greece.

Materials and Methods

A search of invasive insects, including *T. peregrinus*, was based on examination of plant material from across, mostly in central and southern Greece. Plant material consisted of branches above 3m, with a length of *ca.*50 cm, which were packed and sealed in paper bags to prevent escape of this insect and simultaneously to avoid decay. The material was collected by two

**Corresponding author: pvpetrakis@fria.gr*

foresters (authorized prefecture plant sanitary inspectors) in each forest and roadside locale, who forwarded the material to the Entomology laboratory in Athens, in the Institute for the Mediterranean Forest Ecosystems (IMFE). Many roadside planted eucalypts in all prefectures, mostly in central and southern Greece were sampled in this way. Our laboratory is authorized to examine eucalypts in Greece for the presence of *Gonipterus scutellatus* Gyllenhal (Coleoptera: Curculionidae), under the auspices of the EU program "National survey program for the recognition and maintenance of protected zones against organisms harmful to plants (quarantine pests)".

When the bronze appearance of leaves was detected together with feeding damage of *T. peregrinus* then the site revisited to search for this invasive insect. Further sites were inspected with *Eucalyptus camaldulensis* Dehnh., *E. sideroxylon* A.Cunn. ex Woolls, *E. viminalis* Labill. in the garden of IMFE (Athens, Attica), and *Corymbia citriodora* Hook. on the island of Corfu. One to five infested trees per site were sampled two or three times between April and June. Also, insects were collected by fumigating eucalypt trees with summer oil (Vicol, Vicchem, Australia) using a 4 x 4 meters cloth panel spread on the ground underneath fumigated trees to collect the insects that dislodge from the foliage.

In places with substantial eucalypt vegetation (Corinth, Patras [Achaea], Vonitsa [Aitolia/Akarnania], Marathon, Philothei, Maroussi, and Metamorphosis [Attica]) we sought the presence of *T. peregrinus*, and other insects as well, by means of delta traps bearing the artificial attractant 3-methylbut-2-enyl butanoate (Gonzalez et al. 2012) together with three 30 x 20 cm sticky boards, bearing no attractant, made by plywood and hung on the same tree at a height above 3 meters. In these sites, eucalypt trees without sticky traps, were sprayed with summer oil. The trees bearing sticky traps were not treated with summer oil. In general these traps are proved to be efficient method for the sampling of *T. peregrinus* even for detailed studies (e.g. population dynamics in Nadel et al. 2014).

The identification of the insect was based on morphological characters given in the identification key of Noack et al. (2011) and photomicrographs of Garcia et al. (2013) and Laudonia and Sasso (2012). Voucher specimens are deposited in the insect collection at IMFE, Athens.

Results

We examined more than 350 samples (Fig. 1). The insect was first found on road margin trees from Itea, Fokis prefecture and later in the city park at Peristeri, Attica. The insect body is dorso-ventrally compressed with length 2-3.5 mm. The head is broad and bears pedicellate eyes (Fig. 2A and B). The mandibular plates are very conspicuous, elongate, and easily seen in the field. The color varies from yellow to yellow-greenish and brownish with sporadically darker areas. The eggs are black and are laid in the underside of eucalypt leaves where the insect is usually found. The neonate and young nymphs of the insect are straw yellow in color.

The number of insects found at Itea is showed in Table 1 as an example. Many leaves of the tree are damaged and in a few days, they will become the characteristic bronze color (Fig. 3). No measurement of leaf photosynthesis or stomatal conductance was made but presumably the photosynthetic rate at these leaves is reduced (Wilcken et al. 2010).

Positive records of *T. peregrinus* where fumigation took place are the abandoned eucalypt plantation in Aitolia/Akarnania (Vonitsa, Menidi), Corinth, Cyclades (Sifnos, Syros, and Tenos), and Attica (Peristeri, Philothei, Metamorphosi, Lavrio) (Fig. 1). The fumigations of trees with no signs of leaf damage did not reveal any *T. peregrinus* individual despite the fact that several insect species were found in the catch of the ground collection clothes.

FIG. 1. Sampling sites in Greece with eucalypts. Examined sites are represented by empty circles and full circles are sites with eucalypt foliage bearing with *Thaumastocoris peregrinus*. A symbol may correspond to more than one site of examination. The site at Itea, Fokis where the insect was found for first time is indicated with an arrow.

TABLE 1. Excerpt from the table listing the individuals of *Thaumastocoris peregrinus* found on *Eucalyptus camaldulensis* branches grown at roadsides at one of the sites searched in Itea, Fokis. Each line represents one sample corresponding to one branch on a specific date.

Sample (*sn*)	**Date (*yyyymmdd*)**	**Tree number**	**Branch number**	**Branch mass (*g*)**	***T.* males**	***peregrinus* females**	**Nymphs**
1	20170612	1	1	452	13	8	0
2	20170925	1	2	568	25	37	0
3	20170925	2	1	268	2	8	0
4	20170925	3	1	374	8	12	0
5	20170925	3	3	455	11	10	0

(A)

(B)

FIG. 2. Adult male (A) and penultimate instar nymph (B) of *Thaumastocoris peregrinus*. The right hemelytron of the adult is removed. Both individuals have been collected from a city park in Peristeri, Attica.

FIG. 3. The underside of the leaf blade and the associated leaf damage (chlorotic leaf areas and areas with initiation of bronzing) caused by *Thaumastocoris peregrinus* is shown. The leaf in a few days becomes bronze in color, hence the vernacular name of the insect 'bronze bug'.

Discussion

This work reports *T. peregrinus* for first time in Greece. This species was recorded at several areas and in some cases at high population densities. In the 'Invasive Species Compendium' CABI (2017) is stated that there is a risk of introduction of *T. peregrinus* in Greece since the climate of Greece is very similar to that of Sydney, Australia where *T. peregrinus* originated and gave outbreaks since 2002. Similarly, *T. peregrinus* has been established in South Africa where it is active throughout the year (Nadel et al. 2014).

We speculate that the main invasion pathway of this insect is through its egg masses on eucalypt timber and seedlings (as speculated by Souza et al. (2012) for the introduction of the insect in Brazil). An additional pathway could be the compost of ornamental plants.

The occurrence of natural enemies, such many species of Eupelmidae and Trichogrammatidae egg parasitoids and adult feeders in Mymaridae may prevent the spread of *T. peregrinus* in several Greek sites. Moreover, quite common native natural enemies such as *Nabis viridis* Brullé, (Heteroptera: Nabidae) and the introduced Nearctic species *Zelus renardii* Kolenati (Heteroptera: Reduviidae) (Petrakis and Moulet 2011) were seen to predate upon caged *T. peregrinus* (PVP personal observation). The latter species feeds by sticking the prey on its front legs or impeding the movements of *T. peregrinus* in a way very similar to the reduviid bug *Atopozelus opsimus* Elkins, which predates the same insect in Brazil (Wilcken et al. 2010). The predatory bug *Supputius cincticipes* Stal (Heteroptera, Pentatomidae, Asopinae) has been reported as an efficient native natural enemy of *T. peregrinus* in Brazil (Souza et al. 2012). Although the densities of natural enemies in Greece at a unit area basis are considered high, usually biological control results in difficulties in but not the preclusion of the establishment of invasive insects (Mattson et al. 2007).

The insect was recorded at high numbers and thus, in certain cases management measures might be required that should be fully decided by Phytosanitary Authorities. Trade-offs associated with the impacts of *T. peregrinus* and the consequences of any regulatory action such as the sprayings of road verges, restriction of importation from countries where the insect is already established or intensification of inspections associated with imported eucalypts have to be carefully designed. Any application of

insecticides should be weighed against the increase of the implementation costs together with the suppression of the activity of native natural enemies (Aukema et al. 2010).

Further search may focus on testing delta traps loaded with the synthetic artificial attractant (Gonzalez et al. 2012) 3-methylbut-2-enyl butanoate. The attractant was applied in cellulose acetate microfibers for slow release, which is expected to last for 8 weeks (Iliou 2017). Our preliminary results using a nanotechnology-based formulation of the above-mentioned insect attractant supplied by Professor V. Roussis (National Capodistrian University of Athens, School of Pharmacy, Sector of Pharmacognosy) are very promising. Suggestions for future research on this insect also include DNA barcoding on several populations to reveal the origin and the time passed since its establishment in Greece, according to Nadel et al. (2010).

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Πρώτη αναφορά του *Thaumastocoris peregrinus* στην Ελλάδα

Π.Β. ΠΕΤΡΑΚΗΣ

Ελληνικός Γεωργικός Οργανισμός – «ΔΗΜΗΤΡΑ», Ινστιτούτο Μεσογειακών Δασικών Οικοσυστημάτων, Εργαστήριο Εντομολογίας, Αθήνα

ΠΕΡΙΛΗΨΗ

Το Αυστραλιανό έντομο *Thaumastocoris peregrinus* Carpineto et Dellapè (Hemiptera: Thaumastocoridae) αναφέρεται πρώτη φορά στην Ελλάδα. Το έντομο απομυζά τα φύλλα του ευκαλύπτου. Η προσβολή των φύλλων και οι ωομάζες βρέθηκαν σε αρκετές περιοχές της χώρας. Το εισβλητικό αυτό είδος έχει αναφερθεί επίσης από την Πορτογαλία, Ισπανία και Ιταλία. Αν και στην Ελλάδα δεν υπάρχουν πλέον φυτείες ευκαλύπτου (με εξαίρεση τις πειραματικές φυτείες), το έντομο αποτελεί σοβαρό παράσιτο αυτών των δένδρων σε παρόδια βλάστηση και σε αστικά πάρκα. Στην παρούσα εργασία παρουσιάζονται όλες οι περιοχές αναζήτησης του εντόμου και οι αναφορές παρουσίας / απουσίας. Επίσης παρουσιάζονται φωτογραφίες μερικών βιολογικών σταδίων του εντόμου.

