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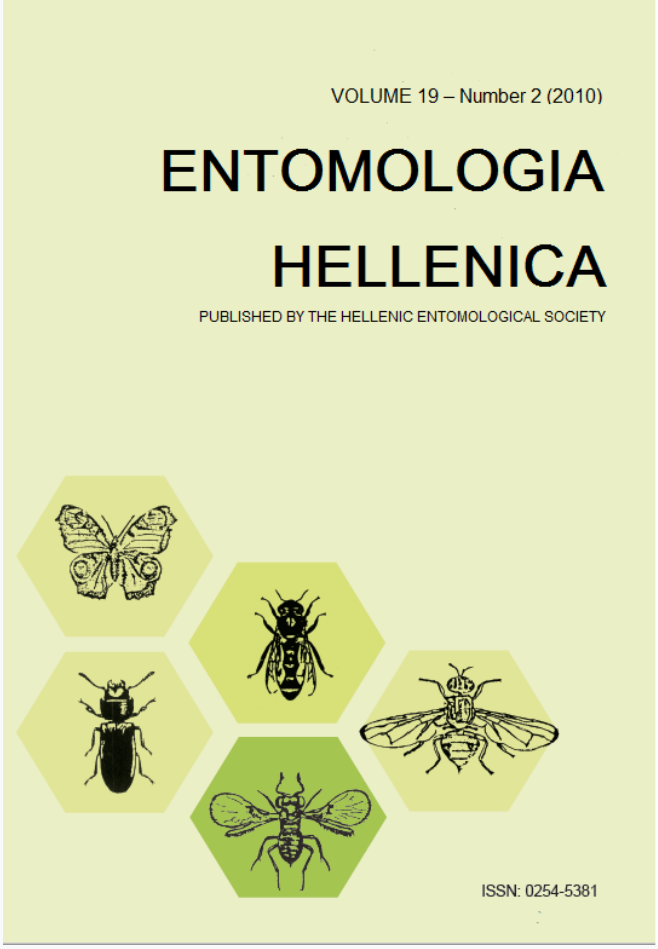

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The Bougainvillea mealybug *Phenacoccus peruvianus*, a rapid invader from South America to Europe

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ABSTRACT

Scale insects are frequent invaders of new territories. The Bougainvillea mealybug, *Phenacoccus peruvianus* Granara de Willink, 2007, was recorded in Europe for the first time in 1999 in Spain (Almeria) and later in 2002 in Italy (Sicily). Initially, this unknown species was identified provisionally as *Phenacoccus* sp. Records of this species became frequent later when it was found in other localities in Spain (including the Balearic Islands), Great Britain, France (including Corsica), Monaco, and Portugal. The host plants of this mealybug were in most cases species of *Bougainvillea*.

KEYWORDS: Alien species, Pseudococcidae, *Phenacoccus peruvianus*, *Bougainvillea glabra*, invasive species, ornamental plants.

Introduction

In the last few decades, mealybugs (Hemiptera: Pseudococcidae) have been involved in several pest outbreaks in the tropics, causing severe damage to agricultural crops and ornamental plants: *Phenacoccus manihoti* Matile-Ferrero on cassava throughout tropical Africa and *Rastrococcus invadens* Williams on fruit trees in West Africa (Herren and Neuenschwander 1991, Han et al. 2007), *Maconellicoccus hirsutus* (Green) in the Caribbean region (Matile-Ferrero et al. 2000), *Paracoccus marginatus* Williams and

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Granara de Willink in the Caribbean and Pacific region (Matile-Ferrero et al. 2000, Muniappan et al. 2008), and *Phenacoccus solenopsis* Tinsley damaging cotton in India and Pakistan (Hodgson et al. 2008). Biological control is an efficient method for the management of these pests, and many of these outbreaks are now under control by natural enemies imported from the countries of origin of each species.

The increase of worldwide trade of plants has facilitated the introduction and spread of many pests in Europe and in the Mediterranean Basin. Scale insects represent the second largest group of alien insects in Europe after aphids (DAISIE 2008). This is especially true of mealybugs which are typical invasive species (Miller et al. 2005) due to their little size and cryptic behaviour. Since the 1990s, several mealybug species have invaded the Mediterranean area, such as *Phenacoccus solani* Ferris (Mazzeo *et al.* 1999), *Phenacoccus parvus* Morrison (Ben-Dov et al. 2005) and *Pseudococcus comstocki* (Kuwana) (Pellizzari 2005). In the present communication we report for the first time the presence of *Phenacoccus peruvianus* Granara de Willink causing problems on ornamental plants in different countries in Europe.

Materials and Methods

Mealybug specimens were collected from diverse host plants of Portugal, Spain, France, Italy and UK. Samples were slide-mounted (Fig. 1) according to the procedure detailed by Williams and Granara de Willink (1992) with a few modifications made by the different authors depending on their own preferences. Specimens were identified using the keys of Granara de Willink and Szumick (2007). Communication between European specialists was entailed during the identification process.

FIG. 1. Microscopic permanent slide of adult female of *Phenacoccus peruvianus*.

Results and Discussion

Records of the *Bougainvillea* mealybug in Europe

The *Bougainvillea* mealybug was first reported in 1999 in Almeria, Spain. Since then, this insect has been recorded in several areas of the Mediterranean coast of Spain, including the Balearic Islands, the south coasts of Portugal and France, including Corsica, and Sicily in Italy. It was also discovered in England (Wisley) under glass (Table 1). The fast dispersal of this insect indicates that the ornamental trade might be involved.

Mealybug identification

The systematic position of the *Phenacoccus* species found in the survey was studied by several specialists and finally clarified in 2008, after Granara de Willink

TABLE 1. First records of *P. peruvianus* in the different European countries and regions.

Year	Country	Region	Host-plants	Host-plant family
1999	Spain	Andalusia	*Bougainvillea glabra*	Nyctaginaceae
2002	Italy	Sicily	*Bougainvillea glabra*	Nyctaginaceae
2004	Spain	Valencian Community	*Bougainvillea glabra*	Nyctaginaceae
2005	Great Britain	South East England	*Bougainvillea* sp.	Nyctaginaceae
	France	Corsica	*Bougainvillea* sp.	Nyctaginaceae
2006	Portugal	Algarve	*Bougainvillea* sp.	Nyctaginaceae
	Portugal	Lisbon	*Bougainvillea* sp.	Nyctaginaceae
	Spain	Catalonia	*Bougainvillea glabra*	Nyctaginaceae
2008	France	Provence-Alpes-Côte d'Azur	*Bougainvillea glabra*	Nyctaginaceae
	Spain	Valencian Community	*Araujia sericifera,* *Aucuba japonica,* *Myoporum laetum*	Asclepiadaceae Aucubaceae Myoporaceae
	Monaco	Monaco	*Bougainvillea* sp.	Nyctaginaceae
	France	Languedoc-Roussillon	*Buddleja* sp.	Scrophulariaceae
2009	Spain	Majorca	*Justicia suberecta,* *Solanum vespertilio*	Acanthaceae Solanaceae

and Szumik (2007) had published a comprehensive paper on the Phenacoccinae of Central and South America, with descriptions of several new species. According to their identification key, description and illustration, the species recorded in Europe on *Bougainvillea* sp. is *Phenacoccus peruvianus* Granara de Willink, 2007, described from Peru and two provinces of Argentina (Santiago del Estero and Tucumán). This identification was confirmed by M.C. Granara de Willink (pers. commun.). Preliminary molecular studies demonstrate that the populations from Spain and France belong to the same species (Beltrà, unpublished work). Further studies are in progress to compare Neotropical populations with the European ones.

Phenacoccus peruvianus can be added to the list of 29 species (Ben-Dov et al. 2009) of the genus *Phenacoccus* reported from the western European Mediterranean area (Table 2). Although most of them are native to this area, species such as *P. madeirensis* Green

TABLE 2. List of *Phenacoccus* species identified in the Western European Mediterranean Basin, with location and year of first record (according to Ben-Dov et al. 2009).

Species	**Country**	**Date**
P. aceris (Signoret)	France	1875
P. asphodeli Goux	France	1942
P. avenae Borchsenius	Italy	1990
P. balagnus Balachowsky	Corsica	1933
P. defectus Ferris	France	2006
P. eschscholtziae McKenzie	Italy	1987
P. evelinae (Tereznikova)	Italy	1989
P. ferulae Borchsenius	Italy	1984
P. formicarum Leonardi	Italy	1908
P. gossypii Townsend & Cockerell	Spain	1946
P. graminicola Leonardi	Italy	1908
P. hordei (Reuter)	France	1933
P. hystrix (Baerensprung)	Spain	1985
P. incertus (Kiritshenko)	Sardinia	1992
P. interruptus Green	France	1935
P. longoi Russo	Italy	1994
P. madeirensis Green	Italy	1990
P. meridionalis Gómez-Menor Ortega	Spain	1965
P. neohordei Marotta	Italy	1992
P. parietariae (Lichtenstein)	France	1881
P. parietaricola Goux	France	1938
P. phenacoccoides (Kiritchenko)	France	1941
P. piceae (Low)	France	1931
P. pumilus Kiritshenko	France	1948
P. quadricaudata (Signoret)	France	1875
P. silvanae Longo & Russo	Italy	1989
P. solani Ferris	Sicily	1999
P. yerushalmi Ben-Dov	Sicily	1994

TABLE 3. List of *Phenacoccus peruvianus* host plant species in Europe.

Family	Plant species
Acanthaceae	*Justicia suberecta*
Amaranthaceae	*Alternanthera sp.*
Asclepiadaceae	*Araujia sericifera*
Asteraceae	*Baccharis sp.*
	Eupatorium sp.
Aucubaceae	*Aucuba japonica*
Myoporaceae	*Myoporum lateum*
Nyctaginaceae	*Bougainvillea spp.*
Scrophulariaceae	*Buddleja sp.*
Solanaceae	*Cestrum sp.*
	Solanum vespertillo

and *P. solani* are exotic and have a Neotropical origin (Granara de Willink and Szumik 2007).

Host plants

Phenacoccus peruvianus feeds mainly on plant species of the genus *Bougainvillea,* which are native to tropical and subtropical regions of South America. These plants are widely grown in gardens in the Mediterranean region and are traded frequently as potted plants. However, the mealybug has been reported on many other plant species in the region and therefore must be regarded as a polyphagous species (Table 3).

Acknowledgements

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Εισβολή του κοκκοειδούς *Phenacoccus peruvianus* από την Νότια Αμερική στην Ευρώπη

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ΠΕΡΙΛΗΨΗ

Τα κοκκοειδή έντομα εμφανίζονται συχνά ως εισβολείς σε νέες περιοχές. Το είδος *Phenacoccus peruvianus* Granara de Willink, 2007, γνωστό και ως ψευδόκοκκος της βουκαμβίλιας παρατηρήθηκε για πρώτη φορά στην Ευρώπη το 1999 στην Ισπανία (Αλμερία) και αργότερα το 2002 στην Ιταλία (Σικελία). Αρχικά το είδος είχε αναγνωριστεί ως *Phenacoccus* sp. Καταγραφές του είδους έγιναν συχνότερες και σε άλλες περιοχές της Ισπανίας (συμπεριλαμβανομένων και των Βελεαρίδων νήσων), στη Μ. Βρετανία, τη Γαλλία (συμπεριλαμβανομένης και της Κορσικής), το Μονακό και την Πορτογαλία. Τα φυτά ξενιστές ήταν στις περισσότερες περιπτώσεις του γένους *Bougainvillea*.