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### **Some additions to the Scale insect fauna (Hemiptera: Coccoidea) of Crete with a check list of the species known from the island**

**Abstract** - A list of the scale insects (Homoptera: Coccoidea) recorded by the authors for the Greek island of Crete is reported. This includes twenty-seven species new to the island. The most interesting records are *Kermes palestiniensis* Balachowsky (Kermesidae), only recorded previously from Israel, and *Getulaspis bupleuri* (Marchal) (Diaspididae), only known previously from North Africa and the Middle East. With the present additions, the number of scale insect species recorded on Crete has reached 82. A revised check list of the scales presently known from the island is also provided.

**Riassunto** - *Nuovi reperti per la fauna di Homoptera Coccoidea di Creta e check list delle specie note nell'isola*

Viene riportato l'elenco di cocciniglie (Hemiptera, Coccoidea) raccolte dagli autori, in periodi diversi, nell'isola di Creta (Grecia). Di queste, 27 sono le specie non ancora note per l'isola. Di particolare interesse biogeografico è il reperimento di *Kermes palestiniensis*, Balachowsky (Kermesidae), noto finora solo per Israele e di *Getulaspis bupleuri* (Marchal) (Diaspididae), nota per Nordafrica e Medio Oriente. Viene presentata una check list delle cocciniglie finora note per l'isola.

**Key words:** Greece, *Kermes palestiniensis*, *Getulaspis bupleuri*

This paper deals with the scale insect species collected by the authors on Crete at different periods. These records stimulated a deeper study on the scale insect fauna of this Mediterranean island, as it was apparent that the present knowledge on this subject was poor and largely incomplete. According to ScaleNet (Ben-Dov *et al.*, 2010), there are only 43 scale insect species recorded from Crete. Recently Jansen *et al.* (2011) added six species to this list, raising to 49 the total number of species known to occur on the island. This number is much lower than expected. Even very common, widely distributed species in the Mediterranean basin, and significant agricultural and forestry pest species had not been recorded there, although they are generally listed for the Greek fauna.

Several authors (Podsiadlo, 1983; Kozár *et al.*, 1991; Kozár & Nagy, 1998) have provided valuable contributions to the knowledge of Greek scale insects, but many

records from Crete were either overlooked or had been included in the Greek mainland fauna (Ben-Dov *et al.*, 2010). On the other hand, Milonas *et al.* (2008) list 168 scale insect species for the whole of Greece. This list includes also species only known to occur in Crete.

Argyriou (1984), in her paper dealing with scales of agricultural plants in Greece, only mentions explicitly *Lichtensia viburni* Signoret, *Filippia follicularis* Targioni Tozzetti, *Marchallina hellenica* Gennadius and *Pollinia pollini* (A. Costa) as being present in Crete. Other common agricultural scale pests are reported as being “widely distributed all over the country” (i.e. *Sphaerolecanium prunastri* (Fonscolombe) and *Planococcus ficus* (Signoret)), possibly inferring that they are present also in Crete.

From a biogeographic point of view, the flora and fauna of the larger Mediterranean islands (Corsica, Sardinia, Sicily, Crete, Cyprus) are kept in separated lists from their mainland country of pertinence as they often host endemic species.

Due to the uncertainty of the occurrence of some species in Crete, each bibliographic source recorded in ScaleNet, as being present in Crete, has been checked by reading the original paper. This has led to the discovery of several trivial mistakes, so that species clearly referred in the original papers as being present on the Greek mainland only, have been listed for Crete, (i.e. *Eumyrmococcus corinthiacus* Williams (Williams, 1993), *Eulecanium ciliatum* Douglas and *Scythia festuceti* (Šulc) (Kozár *et al.*, 1991)). In addition, species recorded from Crete only have been listed for mainland Greece (i.e. *Rhizococcus agropyri* Borchsenius), whilst other species are not known from either mainland Greece or Crete (i.e. *Atrococcus arakeliana* (Ter-Grigorian) (Kozár & Nagy, 1998)).

The present paper lists the species collected by the authors in Crete, along with the localities, collecting dates and host plants. Species newly recorded from the island are marked with an asterisk. A provisional check-list of the scale insects now known from Crete, along with bibliographic sources, is given in Table 1. Erroneous and uncertain previous records have been omitted.

Among the collected species, *Diaspidiotus lenticularis* and *Lepidosaphes flava* were infected by *Septobasidium* sp., a fungus often associated with armoured scale insects, and which changes the scale morphology (Couch, 1938).

#### **Fam. Ortheziidae**

\**Orthezia urticae* (Linnaeus): Knossos, 25.ix.2009, undetermined plant (F. Kozár).

#### **Fam. Monophlebidae**

*Gueriniella serratulae* (Fabricius): Vai, 10.iv.2010, *Genista acanthoclada* (G. Pellizzari). Previously recorded in Crete (Stalis) by Podsiadlo (1983).

*Icerya purchasi* Maskell: Iraklion, 21-26.ix.2009, Citrus (F. Kozár); Chania, 8.iv.2010, *Pittosporum tobira* (G. Pellizzari).

#### **Fam. Marchalinidae**

*Marchalina hellenica* Gennadius: High infestations were observed at Agios Ioannis, 7.iv.2010, *Pinus brutia* (G. Seljak); Anopoli, 7.iv.2010, Cupressus sp., *Pinus halepensis*

Table 1 - Species recorded in Crete and validation source

**Fam. Ortheziidae**

Species	Validation source
<i>Orthezia urticae</i> (Linnaeus)	Present paper

**Fam. Monophlebidae**

Species	Validation source
<i>Gueriniella serratulae</i> (Fabricius)	Podsiadlo, 1983; present paper
<i>Icerya purchasi</i> Maskell	Ayoutantis, 1940; Podsiadlo, 1983

**Fam. Marchalinidae**

Species	Validation source
<i>Marchalina hellenica</i> Gennadius	Argyriou, 1984; Hodgson & Gounari, 2006

**Family Matsucoccidae**

Species	Validation source
<i>Matsucoccus josephi</i> Bodenheimer & Harpaz	Mendel, 1998

**Fam. Pseudococcidae**

Species	Validation source
<i>Atrococcus arakelianae</i> (Ter-Grigorian)	Kozár & Nagy, 1998
<i>Coccidohystrix</i> sp. n.?	Present paper
<i>Chorizococcus rostellum</i> Lobdell	Present paper
<i>Heliooccus bohemicus</i> Šulc	Jansen <i>et al.</i> , 2010
<i>Heterococcus nudus</i> Green	Present paper
<i>Peliococcus kimmericus</i> (Kiritshenko)	Kozár <i>et al.</i> , 1991
<i>Phenacoccus bicerarius</i> Borchsenius	Kozár <i>et al.</i> , 1991
<i>Phenacoccus madeirensis</i> Green	Jansen <i>et al.</i> , 2010
<i>Planococcus citri</i> (Risso)	Ayoutantis, 1940
<i>Planococcus ficus</i> (Signoret)	Argyriou, 1984,
<i>Planococcus vovae</i> (Nasonov)	Williams & Moghaddam, 2000; present paper
<i>Pseudococcus longispinus</i> (Targioni Tozzetti)	present paper
<i>Spilococcus halli</i> (McKenzie & Williams)	Present paper
<i>Trionymus aberrans</i> Goux	Kozár <i>et al.</i> , 1991
<i>Trionymus multivorus</i>	Present paper

**Fam. Eriococcidae**

Species	Validation source
<i>Acanthococcus</i> sp. n.,	Present paper
<i>Acanthococcus desertus</i> (Matesova)	Present paper
<i>Acanthococcus munroi</i> Boratynski	Kozár <i>et al.</i> , 1991
<i>Rhizococcus agropyri</i> Borchsenius	Kozár <i>et al.</i> , 1991
<i>Rhizococcus cynodontis</i> Kiritchenko	Kozár <i>et al.</i> , 1991

**Family Kermesidae**

Species	Validation source
<i>Kermes palestiniensis</i> Balachowsky	present paper
<i>Kermes vermilio</i> Planchon	Lindinger, 1912; Hoy, 1963; Present paper

**Fam. Cerococcidae**

Species	Validation source
<i>Cerococcus cistarum</i> Balachowsky	Kozár & Nagy, 1998

**Fam. Coccidae**

Species	Validation source
<i>Ceroplastes floridensis</i> Comstock	Present paper
<i>Ceroplastes rusci</i> (Linnaeus)	Ayoutantis, 1940; Podsiadlo, 1983; present paper
<i>Ceroplastes sinensis</i> Del Guercio	Present paper
<i>Coccus hesperidum</i> Linnaeus	Ayoutantis, 1940 Podsiadlo, 1983
<i>Filippia follicularis</i> (Targioni Tozzetti)	Argyriou, 1984
<i>Lecanopsis formicarum</i> (Newstead)	Present paper
<i>Lichtensia viburni</i> Signoret	Argyriou, 1984
<i>Parthenolecanium corni</i> (Bouché)	Kozár <i>et al.</i> , 1991
<i>Poaspis intermedia</i> (Goux)	Kozár & Nagy, 1998
<i>Protopulvinaria pyriformis</i> (Cockerell)	Jansen <i>et al.</i> , 2010; present paper
<i>Pulvinariella mesembryanthemi</i> (Vallot)	Kozár <i>et al.</i> , 1991
<i>Saissetia coffeae</i> (Walker)	Podsiadlo, 1983
<i>Saissetia oleae</i> (Olivier)	Ayoutantis, 1940; Argyriou & Michelakis, 1975
<i>Sphaerolecanium prunastri</i> (Boyer de Fonscolombe)	Argyriou & Paloukis, 1976; Podsiadlo, 1981; Kozár <i>et al.</i> , 1991; present paper

**Fam Asterolecaniidae**

Species	Validation source
<i>Pollinia pollini</i> (A. Costa)	Alexandrakis, 1980a

## Fam. Diaspididae

Species	Validation source
<i>Abgrallaspis cyanophylli</i> (Signoret)	Kozár <i>et al.</i> (1991); present paper
<i>Acanthomytilus intermittens</i> (Hall)	Kozár <i>et al.</i> , 1991
<i>Adiscodiaspis ericicola</i> (Marchal)	Present paper
<i>Aonidia mediterranea</i> (Lindinger)	Present paper
<i>Aonidia lauri</i> (Bouché)	Present paper
<i>Aonidiella aurantii</i> (Maskell)	Ayoutantis, 1940; DeBach & Argyriou, 1967; present paper
<i>Aonidiella yehudithae</i> Ben-Dov	Ben-Dov, 2006; Jansen <i>et al.</i> , 2010
<i>Aspidiotus nerii</i> Bouché	Koronéos, 1934; Ayoutantis, 1940
<i>Aulacaspis rosae</i> (Bouché)	Kozár <i>et al.</i> , 1991
<i>Carulaspis minima</i> (Signoret)	Present paper
<i>Chrysomphalus dictyospermi</i> (Morgan)	Ayoutantis, 1940
<i>Diaspidiotus lenticularis</i> (Lindinger)	Present paper
<i>Diaspidiotus osborni</i> (Newell & Cockerell)	Kozár <i>et al.</i> 1991
<i>Duplachionaspis berlesii</i> Leonardi	Present paper
<i>Duplachionaspis natalensis</i> (Maskell)	Kozár <i>et al.</i> , 1991
<i>Dynaspidiotus britannicus</i> (Newstead)	Koronéos, 1934
<i>Dynaspidiotus greeni</i> Balachowsky)	Kozár <i>et al.</i> , 1991
<i>Getulaspis bupleuri</i> (Marchal)	Present paper
<i>Gonaspidiotus minimus</i> (Leonardi)	Jansen <i>et al.</i> , 2010; present paper
<i>Hemiberlesia lataniae</i> (Signoret)	Rosen & DeBach, 1979; Podsiadlo,1983
<i>Koroneaspis aegilopos</i> (Koroneos)	Present paper
<i>Lepidosaphes beckii</i> Newman	Ayoutantis, 1940
<i>Lepidosaphes conchiformis</i> (Gmelin)	Kozár <i>et al.</i> , 1991
<i>Lepidosaphes flava</i> (Signoret)	Present paper
<i>Lepidosaphes ulmi</i> (Linnaeus)	Podsiadlo, 1983; present paper
<i>Leucaspis löwi</i> Colvée	Kozár <i>et al.</i> , 1991
<i>Leucaspis pusilla</i> Löw	Podsiadlo, 1983; Jansen <i>et al.</i> , 2010
<i>Leucaspis riccae</i> Targioni Tozzetti	Lindinger, 1912; present paper
<i>Lineaspis striata</i> (Newstead)	Panis, 1981; present paper
<i>Mercetaspis halli</i> (Green)	Podsiadlo, 1983
<i>Oceanaspidiotus spinosus</i> (Comstock)	Present paper
<i>Odonaspis ruthae</i> Kotinsky	Present paper
<i>Parlatoria oleae</i> (Colvée)	Argyriou, 1967; present paper
<i>Parlatoria parlatoriae</i> (Šulc)	Jansen <i>et al.</i> , 2010
<i>Parlatoria ziziphi</i> (Lucas)	Ayoutantis, 1940 present paper;
<i>Pseudaulacaspis pentagona</i> (Targioni Tozzetti)	Kozár <i>et al.</i> , 1991; present paper
<i>Prodiaspis tamaricicola</i> (Malenotti)	Present paper
<i>Rhizaspidiotus donacis</i> (Leonardi)	Kozár <i>et al.</i> , 1991
<i>Unaspis euonymi</i> (Comstock)	Present paper

(C.J. Hodgson). Its presence in the island was previously generally recorded by Argyriou (1984) and later confirmed by Hodgson & Gounari (2006).

#### Fam. Pseudococcidae

\**Chorizococcus rostellum* Lobbell: Iraklion, 21-26.ix.2009, *Sorghum halepense*, unidentified Asteracea; Knossos, 25.ix.2009, *Piptatherum miliaceum* (F. Kozár).

\**Coccidohystrix* sp. n.: Knossos, 25.ix.2009, *Rosmarinus* sp. (F. Kozár).

\**Heterococcus nudus* Green: *Sorghum halepense*, Knossos, 25.9.2009 (F. Kozár).

*Planococcus citri* (Risso): Iraklion, 21-26.ix.2009, *Parietaria* sp., *Cynodon dactylon*, unidentified Asteracea (F. Kozár); collected also by pheromone traps in Iraklion.

*Planococcus vovae* (Nasonov): Chania, 23.iii.1997, *Cupressus* sp. (G. Pellizzari).

\**Pseudococcus longispinus* (Targioni Tozzetti): Chania, 8.iv.2010, *Pittosporum* sp. (G. Pellizzari).

*Rhizococcus albidus* Goux: Iraklion, 21-26.ix.2009, *Cynodon dactylon* (F. Kozár).

\**Spilococcus halli* (McKenzie & Williams): Iraklion, 21-26.ix.2009, *Cynodon*; Knossos, 25.ix.2009, *Piptatherum miliaceum* (F. Kozár). Previously reported for the Greece mainland by Kozár (1985) as *Chorizococcus viktorinae*.

*Trionymus aberrans* Goux: Knossos, 25.ix.2009, *Piptatherum miliaceum* (F. Kozár). Previously recorded in Iraklion by Kozár *et al.* (1991).

\**Trionymus multivorus* (Kiritchenko): Iraklion, 21-26.ix.2009, undetermined Asteracea (F. Kozár).

#### Fam. Eriococcidae

\**Acanthococcus* sp. n.: Knossos, 25.ix.2009, host plant unknown (F. Kozár).

\* *Acanthococcus desertus* (Matesova): Knossos, 25.ix.2009, *Piptatherum miliaceum* (F. Kozár)

#### Fam. Kermesidae

\**Kermes palestiniensis* Balachowsky: Aradena, 35°13'22"N 24°03'42"S, 7.iv.2010; 04.vi.2011 *Quercus coccifera* (G. Pellizzari, F. Porcelli, S. Convertini).

*Kermes vermilio* Planchon: Aradena, 35°13'22"N 24°03'42"S, 04.vi.2011 *Quercus coccifera* (S. Convertini).

#### Fam. Coccidae

\**Ceroplastes floridensis* Comstock; Iraklion, 35°20'16"N, 25°08'06"E, 10.iv.2010, *Citrus* sp., *Laurus nobilis*, *Ficus microcarpa* (G. Pellizzari, G. Seljak, F. Kozár).

*Ceroplastes rusci* (Linnaeus): Iraklion, 21-26.ix.2009, *Pittosporum* sp. (F. Kozár); Chania, 9.iv.2010, *Ficus carica*, *Nerium oleander* (G. Pellizzari); Aptaera, 11.iv.2010, *Nerium oleander* (C.J. Hodgson).

\**Ceroplastes sinensis* Del Guercio: Chania – MAICh, 9.iv.2010, *Myrtus communis* (G. Pellizzari).

*Coccus hesperidum* Linnaeus: Iraklion, 21-26.ix.2009, *Citrus* sp. (F. Kozár); Kissamu, 7.iv.2010, *Ficus microcarpa*; Iraklion 10.iv.2010, *Ficus* sp., *Laurus nobilis* (G. Pellizzari). This very common species was first generically reported for Crete by Ayoutantis (1940) and later recorded in Knossos on *Iris craetensis* by Kozár *et al.* (1991).

\**Lecanopsis formicarum* (Newstead): Iraklion, 23.ix.2009, *Koeleria* sp. (F. Kozár).

*Lichtensia viburni* Signoret: Episkopi, 3.iv.2010, *Olea europea* (C.J. Hodgson).

*Protopulvinaria pyriformis* (Cockerell): Chania, 35°31'00"N, 24°00'54"E, 8.iv.2010, *Hedera helix* ssp. *canariensis*; Chania –MAICh 35°29'41"N, 24°03'01"E, 12.iv.2010, *Hedera helix* (G. Seljak).

*Pulviniella mesembryanthemí* (Vallot): Chania, 8.viii.1975, *Mesembryanthemum* sp. (G. Pellizzari).

*Sphaerolecanium prunastri* Fonscolombe: Chania, 9.iv.2010, *Ficus carica*, (G. Pellizzari); Knossos, 35°17'50"N, 25°09'48"E, 10.iv.2010, *Prunus dulcis* (G. Seljak, F. Porcelli).

#### Fam. Diaspididae

*Abgrallaspis cyanophylli* (Signoret): Chania – MAICh 35°29'41"N, 24°03'01"E, 6.iv.2010, *Opuntia ficus-indica* (G. Seljak, G. Pellizzari). Previously recorded in Iraklion, on *Mesembryanthemum* sp., by Kozár *et al.* (1991).

*Acanthomytilus intermittens* (Hall): Iraklion, 21-26.ix.2009, *Cynodon dactylon*, *Piptatherum miliaceum* (F. Kozár). Previously recorded in Iraklion and Knossos on *Cynodon dactylon* and *Oryzopsis* sp. by Kozár *et al.* (1991).

\**Adiscodiaspis ericicola* (Marchal): Elafonisi, 10.viii.2000, *Erica manipuliflora*, (F. Porcelli).

\**Aonidia mediterranea* (Lindinger): Chania, 23.iii.1997, *Cupressus* sp., (G. Pellizzari); Iraklion, *Cupressus* sp., *Thuja* sp., 21-26.9.2009 (F. Kozár).

\**Aonidia lauri* (Bouché): Iraklion, 21-26.ix.2009, *Laurus nobilis* (F. Kozár).

*Aonidiella aurantii* (Maskell): Chania, 9.iv.2010, *Euonymus* sp. (G. Pellizzari)

*Aspidiotus nerii* Bouché: Aghia Sophia Cave - Topolia gorge, 01.viii.2000, *Lavatera cretica* & *Euphorbia* sp. (woody shrubs); Agria Gramvousa, 28.vii.2000, *Thymelaea hirsuta*; Bali, 29.vii.2000, *Ceratonia siliqua* (F. Porcelli). Iraklion, 21-26.ix.2009, *Pittosporum tobira*, *Cercis* sp., (F. Kozár). Previously recorded at Iraklion and Knossos, on *Capparis spinosa*, *Nerium oleander*, *Pittosporum tobira*, *Sedum* sp., *Agave americana*, *Convolvulus* sp., *Eucaypus* sp., *Iris craetensis*, *Malva silvestris*, *Vitis* sp. by Kozár *et al.* (1991).

\**Carulaspis minima* (Signoret): Iraklion, 21-26.ix.2009, *Cupressus* sp., *Thuja* sp. (F. Kozár).

\**Diaspidiotus lenticularis* (Lindinger): Potamida, 1.viii.2000, *Olea europea*, associated with and infected by *Septobasidium* sp. (F. Porcelli).



\**Duplachionaspis berlesii* Leonardi: Chania – MAICH, 9.iv.2010, *Asparagus acutifolius* (G. Pellizzari).

\**Getulaspis bupleuri* (Marchal): Elafonisi, 15.vii.2000, *Juniperus oxycedrus* (F. Porcelli). *Gonaspidiotus minimus* (Leonardi in: Berlese & Leonardi): Aradena, 35°13'22"N 24°03'42"S, 04.vi.2011 *Quercus coccifera* (S. Convertini).

\**Koroneaspis aegilopos* (Koroneos): Aradena, 7.iv.2010, *Quercus coccifera* (G. Pellizzari).

\**Lepidosaphes flava* (Signoret): Potamida, 1.viii.2000, *Olea europaea*, associated with and infected by *Septobasidium* sp. (F. Porcelli).

*Lepidosaphes ulmi* (Linnaeus): Agyos Nicolaos, 8.viii.1975, *Cerantoniasiliqua* (G. Pellizzari). Elafonisi, 15.vii.2000, *Pistacia lentiscus* (F. Porcelli).

\**Leucaspis riccae* Targioni Tozzetti: Aghia Sophia Cave - Topolia gorge, 1.viii.2000, *Euphorbia* sp. (woody shrub); Agria Gramvousa, 28.viii.2000, *Euphorbia dendroides*; Elafonisi, 01.viii.2000, *Erica manipuliflora*; Bali, 29.vii.2000, *Olea europaea* (F. Porcelli).

*Leucaspis pusilla* Löw: Chania, 9.iv.2010, *Pinus halepensis* (G. Pellizzari).

*Lineaspis striata* (Newstead): Agyos Nikolaos, 10.viii.1975, *Cupressus sempervirens* (G. Pellizzari); Iraklion, 21-26.9.2009, *Cupressus* sp. (F. Kozár).

\**Oceanaspidiotus spinosus* (Comstock): Iraklion, 29.vii.2000, *Opuntia* sp. (F. Porcelli).

\**Odonaspis ruthae* Kotinsky: Iraklion, 21-26.ix.2009, *Sorghum halepensis*, *Cynodon dactylon* (F. Kozár).

*Parlatoria oleae* Colvée: Iraklion, 21-26.ix.2009, *Pyrus* sp. (F. Kozár); Chania, 9.iv.2010, *Prunus* sp. (G. Pellizzari); Bali, 29.vii.2000, *Pyrus pyraeaster* (F. Porcelli).

*Parlatoria ziziphi* (Lucas): Potamida, 1.viii.2000, *Citrus aurantium* (F. Porcelli); Aptera, 12.iv.2010, *Citrus lemon* (C. J. Hodgson).

*Pseudaulacaspis pentagona* Targioni Tozzetti: Chania, 9.iv.2010; Chania- MAICH, by pheromone traps (F. Kozár); Aptera, 12.iv.2010, *Morus* sp. (C. J. Hodgson).

\**Prodiaspis tamaricicola* (Malenotti): Iraklion, 30.vii.2000, Elafonisi, 15.vii.2000, *Tamarix gallica* (F. Porcelli). Agyos Nektarios, 35°11'35"N, 24°12'56"E, 7.iv.2010, *Tamarix gallica* (G. Seljak).

\**Unaspis euonymi* (Comstock): Iraklion, 01.viii.2000, *Euonymus japonicus* (F. Porcelli).

According to the new collections and including the revised list from previous records, the total number of species recorded from the island is now 82 (table 1). Twenty-seven of them are new to the Crete fauna. Some new records refer to species widely distributed in the Mediterranean basin (i.e. *Aonidia lauri*, *Carulaspis minima*), whilst others are common introduced pests (i.e. *Pseudococcus longispinus*, *Ceroplastes floridensis*, *Unaspis euonymi*), so that their presence on the island was predictable. Significant records of interest are *Kermes palestiniensis*, previously only known to occur in Israel (Balachowsky, 1953) and *Getulaspis bupleuri*, previously known only from the Canary islands, North African countries (Morocco, Tunisia, Algeria, Lybia) and Saudi Arabia



(Balachowsky, 1954; Matile Ferrero, 1984). The present list should be considered as a starting point for future biogeographic studies on the scale insects fauna of Crete.

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