DOI: 10.17387/BULLENTSOCMALTA.2016.04

A preliminary check-list of the Chalcidoidea (Hymenoptera) of the Maltese Islands

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ABSTRACT. A list of 147 species of Chalcidoidea from the Maltese Islands is presented 73 of which are here reported for the first time from this territory. They belong to 15 families as follows: Agaonidae (3); Aphelinidae (20 including 3 new records); Azotidae (1 new record); Chalcididae (3 new records); Encyrtidae (23 including 13 new records); Eulophidae (35 including 19 new records); Eupelmidae (7 including 2 new records); Eurytomidae (5 including 4 new records); Leucospidae (4); Mymaridae (2); Ormyridae (1 new record); Pteromalidae (33 including 21 new records); Signiphoridae (2); Tetracampidae (1 new record); Torymidae (7 including 5 new records). Out of the 73 new records, 55 were exclusively found in Malaise trap samples at Verdala Palace near Buskett, a semi-natural wooded area dominated by *Pinus halepensis*. Thirty species mentioned in the present study were reared from plant-galls, either during the present study or in former studies pertaining to Malta. Of these 8 are gall inducers and the rest are primary or secondary parasitoids of the gall inducers. This list must represent only a small proportion of the actual species richness expected to be found in the Maltese Islands since absolutely no field work was carried out in other diverse and potentially rich habitats, such as steppe, garigue, maquis, coastal habitats and valley systems, present on these islands.

KEY WORDS. Chalcids, Mediterranean, Malta, new records.

INTRODUCTION

The Chalcidoidea is an extremely large superfamily of small parasitic wasps. About 25,000 described species are listed in the Universal Chalcidoidea Database (Noyes, 2016), but many more must await discovery. The actual total number of world species is estimated at half a million. Biologically chalcids are very varied. Whilst a relatively small number are phytophagous, most feed as larvae on the bodies of other insects (or rarely Arachnida and even Nematoda), for instance on immature stages of Lepidoptera, particularly on caterpillars of micro-moths, on the larvae of Diptera, especially those mining leaves or living in stems and fruits, on Coleoptera grubs in dead wood, in scale insects (Coccoidea), in eggs of both exopterygotes and endopterygotes, and on the inhabitants of plant galls. Such biological diversity ensures that chalcids play a major role in terrestrial ecosystems, and they are increasingly being successfully employed in the biological control of a range of insect pests. However, although so important, chalcids are relatively poorly known, undoubtedly a consequence of their small size and great number of species which often make identification difficult.

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The chalcid fauna of the Maltese Islands is poorly known with only a few published records scattered throughout the entomological literature. In total, we managed to find 74 records for Malta. Some of these records were published in obscure journals, often difficult to access, and it was for this reason that most of these published records are missing in the Fauna Europaea database and only 22 chalcid records from Malta are currently included in the Universal Chalcidoidea database (Noyes, 2016). The present check-list of Maltese chalcids must include only a very small fraction of the species actually present on the islands. However it provides a base upon which future studies can be built.

MATERIAL AND METHODS

Data for chalcid records from the Maltese Islands were searched for in the entomological literature and whenever found such records were included in the present check-list with their bibliographic details.

A considerable proportion of the check-list is comprised of chalcids captured in a Malaise trap sampling programme undertaken by one of us (DM). The Malaise trap was located in the private grounds of the Verdala Palace, close to Buskett (35.86198°N, 14.40162°E; altitude 220m). This area represents one of the otherwise rare semi-natural woodlands found on the Maltese Islands. The trap is mainly surrounded by *Pinus halepensis* trees but other conifers, such as *Cupressus sempervirens* and *Tetraclinis articulata*, are also present within a range of about 300 meters from the site of the Malaise trap. Other trees and woody shrubs include *Olea europaea*, *Ceratonia siliqua*, *Pistacia lentiscus*, *Rhamnus alaternus* and *R. oleoides*. Under 'material examined' the chalcid species collected in the Malaise trap from Verdala Palace are marked 'VP', followed by a lower case letter indicating the sampling dates as follows:

VPa 1.viii. – 15.ix.2014
VPb 16.ix. – 30.x.2014
VPc 31.x. – 15.xii.2014
VPd 30.vii. – 30.ix.2015
VPe 1.i. – 30.iii.2016

Several of the species in the check-list are chalcids reared from plant galls collected in the Maltese Islands. Fresh plant galls were generally collected in the field and kept in ventilated plastic containers until insect emergence had ceased.

Most of the chalcid material collected during the present study was initially conserved in 75% ethanol but was eventually card-mounted after dehydration in absolute ethanol and then hexamethyldisilazene (HMDS), using the method outlined in Noyes (2016). Most of the material is conserved in the private collection of one of us (RA) with a few representatives housed in the private collection of the other author.

Family and subfamily names in this check-list are those in Noyes (2016: 'taxonomic tree'). Of special note are the recent elevation of Azotidae to family rank (formerly a subfamily in Aphelinidae) and the recognition of Opheliminae as a subfamily in Eulophidae (Burks *et al*., 2011; Heraty *et al*., 2013). Families and any included subfamilies are conventionally arranged, progressing very roughly from the less to more morphologically specialised. Within each family, genera and species are arranged alphabetically. Species newly added to the known fauna of Malta are indicated by an asterisk (*).

ANNOTATED CHECK-LIST OF MALTESE CHALCIDOIDEA

Family **Chalcididae** Latreille, 1817
Subfamily **Haltichellinae** Ashmead, 1904

***Hockeria bifasciata* Walker, 1834**

Material examined: Malta, VPb, 1 ♂.

***Hockeria* sp.**

Material examined: Malta, VPa, 1 ♂; VPb, 2 ♂♂.

***Proconura nigripes* Fonscolombe, 1832**

Material examined: Malta, Msida, near Wied Għollieqa, 25.v.2016, 1 ♂, in water trap, DM.

Family **Leucospidae** Walker, 1834

***Leucospis brevicauda* Fabricius, 1804**
[recorded by Farrugia (1999)]

***Leucospis dorsigera* Fabricius, 1775**
[recorded by Farrugia (1999)]

***Leucospis gigas* Fabricius, 1793**
[described by Schembri (1847) from material collected from Malta as *L. costae* and subsequently recorded by Bytinski-Salz (1963), Farrugia (1999) and Baur & Amiet (2000)]

***Leucospis intermedia* Illiger, 1807**
[recorded by Farrugia (1999)]

Family **Eurytomidae** Walker, 1832
Subfamily **Eurytominae** Walker, 1832

***Eurytoma* (?) *inulae* Domenichini, 2002**

Material examined: Malta, Zabbar, Xgħajra, 15-30.iii.2014, 44 ♂♂ & 32 ♀♀, emerged from flower galls of *Dittrichia viscosa* induced by *Myopites stylata*, M. Zammit.

***Eurytoma* sp. near *laserpitii* Mayr, 1882**
(Fig. 1)

Material examined: Malta, Zejtun, 4-8.vii.2013 and 16-21.x.2013, numerous specimens reared from pod galls of *Diplotaxis erucoides* induced by *Asphondylia stefani*, DM.

Figure 1: Habitus photograph of *Eurytoma* sp. near *laserpitii.*

***Eurytoma* sp. near *dentata* Mayr, 1878**
[recorded by Dorchin *et al*. (2014)]

****Sycophila iracemae* Nieves-Aldrey, 1983**

Material examined: Malta, VPb, 1 ♀; VPe, 1 ♀.

****Tetramesa stipae* (De Stefani, 1901)**

Material examined: Malta, Majjistral Nature & History Park, about 120 galls on *Stipa capensis* (Fig. 2) collected on 25.v.2014 from which 26 ♂♂ & 22 ♀♀ emerged between 20.ii.-25.iii.2015 and 5 ♂♂ & 3 ♀♀ emerged between 28.ii.-10.iv.2016, DM.

Family **Torymidae** Walker, 1833

Subfamily **Megastigminae** Thomson, 1876

***Megastigmus wachtli* Seitner, 1916**
[recorded by Roques & Skrzypczynska (2003)]

Subfamily **Toryminae** Walker, 1833

****Idiomacromerus* sp.**

Material examined: Malta, Majjistral Nature & History Park, 27-30.v.2014, 1 ♀, emerged from galls on *Stipa capensis* induced by *Tetramesa stipae*, DM.

Figure 2: Galls on *Stipa capensis* induced by *Tetramesa stipae.*

***Monodontomerus obscurus* Westwood, 1833**

Material examined: Malta, VPb, 1 ♀.

***Podagrion splendens* Spinola, 1811**
[recorded by Cassar (2016)]

***Pseudotorymus napi* (Ameiling & Kircher, 1860)**

Material examined: Malta, Mgarr, 20.x.2013 and 26-28.x.2013, 12 ♂♂ & 4 ♀♀, emerged from flower galls of *Diplotaxis erucoides* induced by cecidomyiids, DM; Zejtun, 16-21.x.2013, 1 ♂ & 1 ♀, emerged from pod galls of *Diplotaxis erucoides* induced by cecidomyiids, DM.

***Torymoides kiesenwetteri* (Mayr, 1874)**

Material examined: Malta, Zabbar, Xgħajra, 15-30.iii.2014, 11 ♂♂ & 9 ♀♀, emerged from flower galls of *Dittrichia viscosa* induced by *Myopites stylata*, M. Zammit; VPa, 1 ♀.

***Torymus curtisi* Graham & Gijswijt, 1998**

Material examined: Malta, Delimara, 5-25.vi.2016, 4 ♂♂ & 2 ♀♀, emerged from flower galls induced by cecidomyiid on *Daucus* sp., DM.

Family **Ormyridae** Förster, 1856

***Ormyrus orientalis* Walker, 1871**

Material examined: Gozo, roadside near Victoria, 17.iii.1980, 1 ♀, emerged from flower galls on (?) *Dittrichia viscosa* induced by *Myopites* sp., M. Boness.

Family **Agaonidae** Walker, 1846

Subfamily **Agaoninae** Walker, 1846

***Eupristina verticillata* Waterston, 1921**
[recorded by Mifsud *et al*. (2012)]

***Pleistodontes* sp.**
[recorded by Mifsud *et al*. (2012)]

Subfamily **Blastophaginae** Kirchner, 1867

***Blastophaga psenes* (Linnaeus, 1758)**
[recorded by Caruana Gatto (1926) as *B. grossorum* Gravenhorst, 1827 and by Mifsud *et al*. (2012)]

Family **Pteromalidae** Dalman, 1820

Subfamily **Cleonyminae** Walker, 1837

***Cleonymus laticornis* Walker, 1837**

Material examined: Malta, VPa, 6 ♂♂; VPd, 1 ♂ & 1 ♀; VPe, 1 ♂ & 2 ♀♀.

***Notanisus* (*Amarisca*) *oulmesiensis* (Delucchi, 1962)**

Material examined: Malta, VPa, 2 ♀♀.

***Notanisus versicolor* Walker, 1837**

Material examined: Malta, VPa, 3 ♂♂; VPb, 2 ♂♂.

Subfamily **Epichrysomallinae** Hill & Riek, 1967

***Josephiella microcarpae* Beardsley & Rasplus, 2001**
[recorded by Mifsud *et al*. (2012)]

***Odontofroggatia galili* Wiebes, 1980**
[recorded by Lo Verde & Porcelli (2010) and Mifsud *et al*. (2012)]

Subfamily **Cerocephalinae** Gahan, 1946

***Cerocephala rufa* (Walker, 1833)**

Material examined: VPa, 1 ♀.

Subfamily **Eunotinae** Ashmead, 1904

***Scutellista caerulea* (Fonscolombe, 1832)**
[recorded by Borg (1922a, 1932b) as *Scutellista cyan*ea Motschulsky, 1859
and by Thompson (1958) and Farrugia (1998a)]

Material examined: Malta, VPa, 2 ♀♀.

Subfamily **Ormocerinae** Walker, 1833

***Systasis encyrtoides* Walker, 1834**

Material examined: Malta, Mgarr, 26-28.x.2013, 6 ♂♂ & 3 ♀♀, emerged from flower galls of *Diplotaxis erucoides* induced by cecidomyiids, DM.

Subfamily **Miscogasterinae** Walker, 1833

***Halticoptera* sp. near *circulus* (Walker, 1833)**

Material examined: Malta, VPc, 1 ♂; VPd, 1 ♀.

***Miscogaster hortensis* Walker, 1833**

Material examined: Malta, VPe, 1 ♂ & 3 ♀♀.

Subfamily **Pireninae** Haliday, 1844

***Gastrancistrus* sp. (*vagans* group)**

Material examined: Malta, VPe, 1 ♀.

Subfamily **Pteromalinae** Dalman, 1820

***Callitula bicolor* Spinola, 1811**

Material examined: Malta, VPb, 1 ♂.

***Catolaccus crassiceps* (Masi, 1911)**

Material examined: Malta, VPa, 2 ♀♀.

***Cyrtoptyx latipes* (Rondani, 1874)**

Material examined: Malta, Zejtun, 12-17.ix.2013, 9 ♂♂ & 4 ♀♀, emerged from pupae of *Apanteles galleriae*, DM.

***Dibrachys* sp.**

Material examined: Malta, VPb, 3 ♀♀.

***Dinarmoides spilopterus* Masi, 1924**

Material examined: Malta, VPa, 1 ♀.

***Dinarmus acutus* (Thomson, 1878)**

['Malta' is mentioned in the distribution of this species by Garrido Torres & Nieves-Aldrey (1999) and Andriescu & Mitroiu (2004) but without data or source for original material examined]

Material examined: Malta, VPa, 1 ♀.

***Homoporus* (?) *subniger* (Walker, 1835)**

Material examined: Malta, VPa, 2 ♂♂.

***Meraporus graminicola* Walker, 1834**

Material examined: Malta, VPa, 6 ♀♀; VPb, 1 ♀.

***Mesopolobus melitensis* Askew, 2014**

[recorded by Dorchin *et al*. (2014)]

***Norbanus scabriculus* (Nees, 1834)**

Material examined: Malta, VPa, 1 ♂; VPc, 1 ♂.

***Pachycrepoideus vindemmiae* (Rondani, 1875)**

[recorded by Farrugia (2016)]

Material examined: Malta, VPa, 2 ♂♂ & 4 ♀♀.

***Pachyneuron muscarum* (Linnaeus, 1758)**

[recorded by Farrugia (1998a) as *P. concolor* (Förster, 1841)]

Material examined: Malta, VPa, 1 ♂ & 1 ♀.

***Pseudocatolaccus nitescens* (Walker, 1834)**

Material examined: Malta, St. Thomas Bay, 10-14.x.2013 and Zejtun, 16-21.x.2013, 6 ♂♂ & 7 ♀♀, emerged from flower and pod galls of *Diplotaxis erucoides* induced by cecidomyiids, DM.

***Pteromalus* sp. near *bedeguaris* (Thompson, 1878)**
[recorded by Mifsud (2016)]

****Pteromalus* sp. near *brachygaster* (Graham, 1969)**

Material examined: Malta, VPa, 1 ♂ & 17 ♀♀.

****Pteromalus myopitae* (Graham, 1969)**

Material examined: Malta, Selmun, 20.ii.2014, 16 ♂♂ & 20 ♀♀, emerged from flower galls on *Dittrichia viscosa* induced by *Myopites stylata*, M. Zammit.

***Pteromalus puparum* (Linnaeus, 1758)**
[recorded by Borg (1932a) and Mifsud (1997a)]

***Rhaphitelus maculatus* Walker, 1834**
[recorded by Mifsud *et al*. (2012)]

***Stenomalina* sp.**
[recorded by Mifsud (1997a)]

****Stenoselma nigrum* Delucchi, 1956**

Material examined: Malta, VPa, 1 ♀.

****Trychnosoma punctipleura* (Thomson, 1878)**

Material examined: Malta, VPa, 2 ♂♂ & 3 ♀♀; VPd, 1 ♀; VPe, 1 ♂ & 1 ♀.

Subfamily **Sycoryctinae** Wiebes, 1966

***Philotrypesis caricae* (Linnaeus, 1762)**
[recorded by Mifsud *et al*. (2012)]

Family **Eupelmidae** Walker, 1833
Subfamily **Calosotinae** Bouček, 1958

****Calosota aestivalis* Curtis, 1836**

Material examined: Malta, VPa, 1 ♀.

Subfamily **Eupelminae** Walker, 1833

***Eupelmus* (*Episolindelia*) *hartigi* Förster, 1841**
[recorded by Haber & Mifsud (2007)]

***Eupelmus* (*Eupelmus*) *lanceolatus* Gibson & Fusu, 2016**
[recorded by Gibson & Fusu (2016)]

***Eupelmus* (*Eupelmus*) *microzonus* Förster, 1860**
[recorded by Gibson & Fusu (2016)]

Material examined: Malta, VPa, 1 ♀.

***Eupelmus* (*Eupelmus*) (?) *urozonus* Dalman, 1820**
[recorded by Haber & Mifsud (2007)]

Material examined: Malta, Majjistral Nature & History Park, 27-30.v.2014, 2 ♀♀, emerged from galls on *Stipa capensis* induced by *Tetramesa stipae*, DM.

***Eupelmus* (*Macroneura*) *muellneri* Ruschka, 1921**
[recorded by Dorchin *et al*. (2014) and Mifsud (2016)]

Material examined: Malta, St. Thomas Bay, 7.xi.2013, 1 ♀, emerged from flower and pod galls of *Diplotaxis erucoides* induced by cecidomyiids, DM; Zabbar, Xgħajra, 15-30.iii.2014, 3 ♀♀, emerged from flower galls of *Dittrichia viscosa* induced by *Myopites stylata*, M. Zammit; VPa, 4 ♀♀; VPb, 3 ♀♀; VPd, 3 ♀♀; VPe, 1 ♀.

Subfamily **Neanastatinae** Kalina, 1984

****Neanastatus turneri* Ferrière, 1938**

Material examined: Malta, St. Thomas Bay, 10-14.x.2013, 1 ♀, emerged from flower and pod galls of *Diplotaxis erucoides* induced by cecidomyiids, DM.

Family **Encyrtidae** Walker, 1837

Subfamily **Encyrtinae** Walker, 1837

***Anicetus italicus* (Masi, 1917)**
[recorded by Farrugia (1998a)]

***Cerapterocerus mirabilis* Westwood, 1833**
[recorded by Farrugia (1998a)]

****Cheiloneurus claviger* Thomson, 1876**

Material examined: Malta, VPa, 2 ♀♀.

****Cheiloneurus elegans* (Dalman, 1820)**

Material examined: Malta, VPa, 1 ♀.

***Comperiella bifasciata* Howard, 1906**
[recorded by Farrugia (1998a)]

****Copidosoma* sp.**

Material examined: Malta, VPa, 1 ♂ & 8 ♀♀.

***Encyrtus aurantii* (Geoffroy, 1785)**
[recorded by Farrugia (1998a) as *E. lecaniorum* Mayr, 1876]

****Homalotyloidea dahlbomii* (Westwood, 1837)**

Material examined: Malta, VPd, 1 ♀.

****Metaphycus asterolecanii* (Mercet, 1923)**

Material examined: Malta, VPa, 2 ♀♀.

***Metaphycus flavus* (Howard, 1881)**
[recorded by Borg (1919, 1922a, 1932b) as *Aphycus flavus* and by Farrugia (1998a)]

****Metaphycus hirtipennis* (Mercet, 1921)**

Material examined: Malta, VPa, 1 ♀.

***Metaphycus* sp. near *stanleyi* Compere, 1940**
[recorded by Farrugia (1998a)]

****Microterys masii* Silvestri, 1919**

Material examined: Malta, VPd, 1 ♀.

***Microterys nietneri* (Motschulsky, 1859)**
[recorded by Borg (1919, 1922a) as *Encyrtus flavus* Howard, 1881 and by Farrugia (1998a)]

****Ooencyrtus* (?) *fulvipes* Hoffer, 1963**

Material examined: Malta, VPa, 1 ♀.

****Ooencyrtus telenomicida* (Vassiliev, 1904)**

Material examined: Malta, VPa, 2 ♀♀; VPb, 1 ♀.

****Prochiloneurus bolivari* Mercet, 1919**

Material examined: Malta, VPa, 2 ♀♀; VPb, 1 ♀.

****Syrphophagus aphidivorus* (Mayr, 1876)**

Material examined: Malta, VPa, 1 ♀.

Figure 3: Habitus photograph of a female specimen of *Tineophoctonus armatus.*

***Tineophoctonus armatus* (Ashmead, 1888)**

Material examined: Malta, VPa, 7 ♂♂ & 40 ♀♀; VPb, 7 ♀♀.

Notes: *Tineophoctonus armatus* (Fig. 3) represents a North American species, first reported from Europe by Mercet (1932) in Spain and later found also in Italy (Viggiani, 1966). It is a parasitoid of Anobiidae. The male was unknown, but its description based on material collected from Malta will be provided in a subsequent publication.

Subfamily **Tetracneminae** Howard, 1892

***Anagyrus matritensis* (Mercet, 1921)**
(= *orbitalis* (Ruschka, 1923))

Material examined: Malta, VPa, 1 ♂ & 2 ♀♀; VPb, 1 ♂ & 7 ♀♀; VPe, 1 ♀.

***Anagyrus pseudococci* (Girault, 1915)**
[recorded by Farrugia (1998a)]

***Gyranusoidea advena* Beardsley, 1969**
[recorded by Farrugia (1998a)]

***Leptomastidea abnormis* (Girault, 1915)**
[recorded by Farrugia (1998a)]

Material examined: Malta, VPa, 1 ♂ & 2 ♀♀; VPb, 1 ♀; VPd, 2 ♀♀.

Family **Tetracampidae** Förster, 1856
Subfamily **Tetracampinae** Förster, 1856

***Foersterella reptans* (Nees, 1834)**

Material examined: Malta, VPa, 1 ♀.

Family **Eulophidae** Westwood, 1829
Subfamily **Eulophinae** Westwood, 1829

***Cirrospilus pictus* (Nees, 1834)**
[recorded by Schauff *et al*. (1998)]

***Diglyphus isaea* (Walker, 1838)**
[recorded by Mifsud (1997a)]

Material examined: Malta, VPb, 1 ♀.

***Diglyphus minoeus* (Walker, 1838)**
[recorded by Mifsud (1997a)]

***Diglyphus poppoea* Walker, 1848**

Material examined: Malta, VPe, 1 ♀.

***Elachertus bisurmanus* Erdös, 1966**

Material examined: Malta, VPa, 2 ♀♀; VPe, 2 ♀♀.

***Elasmus rufiventris* Ferrière, 1947**

Material examined: Malta, VPa, 1 ♀.

***Elasmus platyedrae* Ferrière, 1935**

Material examined: VPb, 1 ♀; VPd, 1 ♀.

***Hemiptarsenus* sp. near *wailesellae* Nowicki, 1929**

Material examined: Malta, VPa, 1 ♂; VPd, 1 ♀.

***Miotropis unipuncta* (Nees, 1834)**

Material examined: Malta, VPa, 1 ♀.

***Pnigalio agraules* (Walker, 1839)**
[recorded by Haber & Mifsud (2007)]

***Zagrammosoma variegatum* (Masi, 1907)**

Material examined: Malta, Verdala Palace, 1 ♀, DM (no other data).

Subfamily **Opheliminae** Ashmead, 1904

***Ophelimus maskelli* (Ashmead, 1900)**
[recorded by Mifsud (2012)]

Subfamily **Entedoninae** Förster, 1856

***Chrysocharis pubicornis* (Zetterstedt, 1838)**
[recorded by Hansson (1985)]

***Euderomphale* sp.**
[recorded by Mifsud *et al*. (1995)]

***Neochrysocharis violaceus* Askew, 1999**
[recorded by Dorchin *et al*. (2014)]

***Pediobius epigonus* (Walker, 1839)**

Material examined: Malta, VPd, 1 ♂.

Subfamily **Tetrastichinae** Förster, 1856

***Aprostocetus dauci* Graham, 1987**

Material examined: Malta, Delimara, 5-25.vi.2016, 12 ♀♀, emerged from cecidomyiid flower galls on *Daucus* sp., DM.

***Aprostocetus* sp. near *epicharmus* (Walker, 1839)**

Material examined: Malta, Mgarr, 26-28.x.2013, 10 ♀♀, emerged from cecidomyiid flower galls of *Diplotaxis erucoides*, DM; Zejtun, 16-21.x.2013, 5 ♀♀, emerged from cecidomyiid pod galls of *D. erucoides*, DM; Mgarr, 26-28.x.2013, 15 ♂♂, emerged from cecidomyiid flower galls of *D. erucoides*, DM.

***Aprostocetus* sp. near *toddaliae* (Risbec, 1958)**
[recorded by Farrugia (1998a)]

***Baryscapus* sp. (*evonymellae* group)**

Material examined: Malta, St. Thomas Bay, 10-14.x.2013, 1 ♀, emerged from flower and pod galls of *Diplotaxis erucoides* induced by ceccidomyiids, DM.

***Baryscapus* n. sp.**
[recorded by Cassar *et al*. (2016)]

***Baryscapus impeditus* (Nees, 1834)**

Material examined: Malta, VPa, 4 ♀♀; VPb, 1 ♂ & 1 ♀.

***Leptocybe invasa* Fisher & La Salle, 2004**
[recorded by Mifsud (2012)]

***Melittobia acasta* (Walker, 1839)**

Material examined: Malta, VPa, 3 ♀♀; VPd, 5 ♀♀; VPe, 1 ♀.

***Minotetrastichus* sp. near *frontalis* (Nees, 1834)**

Material examined: Malta, VPb, 1 ♀.

***Neotrichoporoides viridimaculatus* (Fullaway, 1955)**

Material examined: Malta, VPa, 1 ♀; VPd, 1 ♀.

***Oomyzus sempronius* (Erdös, 1954)**

Material examined: Malta, VPa, 2 ♀♀; VPb, 2 ♀♀.

***Pronotalia carlinarum* (Szelényi & Erdös, 1951)**

Material examined: Malta, VPa, 2 ♀♀.

***Puklina* sp.**

Material examined: Malta, VPa, 1 ♂.

***Stepanovia eurytomae* (Nees, 1834)**
[recorded by Mifsud (2016)]

***Tamarixia actis* (Walker, 1839)**

Material examined: Malta, VPa, 1 ♀; VPb, 1 ♀.

***Tamarixia pronomus* (Walker, 1839)**
[recorded by Mifsud (1997b)]

***Tamarixia tremblayi* (Domenichini, 1965)**
[recorded by Mifsud (1997b)]

***Tamarixia* sp.**
[recorded by Mifsud (1997b)]

Subfamily **Entiinae** Hedqvist, 1974

***Astichus bachmaieri* Doğanlar, 1992**
[recorded by Mifsud *et al*. (2012)]

Material examined: Malta, VPa, 1 ♀.

Family **Aphelinidae** Thomson, 1876
Subfamily **Aphelininae** Thomson, 1876

****Aphelinus chaonia* Walker, 1839**

Material examined: Malta, VPd, 1 ♀.

****Aphelinus humilis* Mercet, 1927**

Material examined: Malta, VPa, 1 ♀.

***Aphelinus mali* (Haldeman, 1851)**
[recorded by Borg (1934) and Thompson (1953)]

***Aphytis diaspidis* (Howard, 1881)**
[recorded by Borg (1919, 1922a, 1932b) as *Aphelinus fuscipennis* Howard, 1881]

***Aphytis hispanicus* (Mercet, 1912)**
[recorded by Farrugia (1998a)]

***Aphytis lepidosaphes* Compere, 1955**
[recorded by Farrugia (1998a)]

***Aphytis melinus* DeBach, 1959**
[recorded by Farrugia (1998a)]

***Marietta leopardina* Motschulsky, 1863**
[recorded by Farrugia (1998a) as *M. exitiosa* Compere, 1936]

Subfamily **Coccophaginae** Förster, 1878

***Coccophagus lycimnia* (Walker, 1839)**
[recorded by Borg (1919, 1922a) as *Coccophagus lecanii* (Fitch, 1859) and *C. cognatus* Howard, 1881 and by Farrugia (1998a)]

Material examined: Malta, VPe, 1 ♀.

***Coccophagus* sp. near *rusti* Compere, 1828**
[recorded by Farrugia (1998a)]

***Coccophagus scutellaris* (Dalman, 1826)**
[recorded by Farrugia (1998a)]

***Encarsia brimblecombei* (Girault, 1933)**
[recorded by Farrugia (1998a) as *E. herndoni* (Girault, 1935)]

***Encarsia citrina* (Craw, 1891)**
[recorded by Farrugia (1998a)]

***Encarsia formosa* Gahan, 1924**
[recorded by Mifsud *et al*. (1995) and Mifsud (1997a)]

****Encarsia inaron* (Walker, 1839)**

Material examined: Malta, Iklin (private garden), 28.vii-10.viii.2016, numerous ♂♂ & ♀♀ emerged from puparia of *Siphoninus phillyreae* on *Punica granatum*, DM.

Notes: The above mentioned material fits very well with the description of *Encarsia partenopea* Masi, 1909 which is currently a synonym of *E. inaron* (Polaszek, A., *pers. comm*., 2016). Future studies may however resurrect *E. partenopea* from synonymy and if this is the case the Maltese population will fit with this taxon.

***Encarsia lutea* (Masi, 1909)**
[recorded by Mifsud *et al*. (1995)]

***Encarsia tricolor* Förster, 1878**
[recorded by Borg (1935) and Mifsud *et al*. (1995)]

Subfamily **Calesinae** Mercet, 1929

***Cales noacki* Howard, 1907**
[recorded by Mifsud *et al*. (1995) and Mifsud (1997a)]

Subfamily **Eretmocerinae** Shafee & Khan, 1978

***Eretmocerus californicus* Howard, 1895**
[recorded by Mifsud (1997a)]

***Eretmocerus mundus* Mercet, 1931**
[recorded by Mifsud *et al*. (1995) and Mifsud (1997a)]

Family **Azotidae** Nikol'skaya & Yasnosh, 1966

****Ablerus perspeciosus* Girault, 1916**

Material examined: Malta, VPc, 1 ♀.

Family **Mymaridae** Haliday, 1833

***Arescon aspidioticola* (Ashmead, 1879)**
[recorded by Borg (1922b) as *Aphelinus* (?) *aspidioticola* and *A. aspidioticola* by Borg (1932b)]

***Dicopus citri* Mercet, 1912**
[recorded by Farrugia (1998a)]

Family **Signiphoridae** Howard, 1894

***Chartocerus kurdjumovi* (Nikol'skaya, 1950)**
[recorded by Farrugia (1998a)]

***Signiphora flavopalliata* Ashmead, 1880**
[recorded by Borg (1932b) as *Signiphora flavo-palliata* Howard, 1894]

DISCUSSION

A total of 147 species of Chalcidoidea from the Maltese Islands are presented in the above checklist. Of these, only 74 were previously recorded from this archipelago. They belong to 15 different families and table 1 summarises the number of species recorded for each family and the new records for each. The families Azotidae, Chalcididae, Ormyridae and Tetracampidae are reported for the first time from Malta in the present study.

Table 1: Number of species for each Chalcidoidea family reported for the Maltese Islands.

Chalcidoidea families	Total number of species currently known from Malta	Number of new records added in the present work
Agaonidae	3	0
Aphelinidae	20	3
Azotidae	1	1
Chalcididae	3	3
Encyrtidae	23	13
Eulophidae	35	19
Eupelmidae	7	2
Eurytomidae	5	4
Leucospidae	4	0
Mymaridae	2	0
Ormyridae	1	1
Pteromalidae	33	21
Signiphoridae	2	0
Tetracampidae	1	1
Torymidae	7	5
	147	73

Out of the 147 recorded species, biological data pertaining to Malta is only available for about 80 species. No biological data is available for the 55 species which were exclusively collected in the Malaise trap at the Verdala Palace. This is also the case for some other species recorded for the first time in this work. Global information for some of these species can be found in Noyes (2016).

Only eight species of Chalcidoidea were recorded from Malta as plant gall inducers. These include *Tetramesa stipae* (Eurytomidae) inducing galls on *Stipa capensis* (recorded in the present study - Fig. 2); *Josephiella microcarpae* (Pteromalidae) (Mifsud *et al*., 2012) inducing leaf galls on *Ficus atrocarpae*; *Ophelimus maskelli* and *Leptocybe invasa* (Eulophidae) inducing leaf and stem galls on *Eucalyptus* (Mifsud, 2012); *Eupristina verticillata*, *Pleistodontes* sp., *Blastophaga psenes* (Agaonidae) and *Odontofroggatia galili* (Pteromalidae) inducing galls in the florets of syconia of *Ficus* spp. (Lo Verde & Porcelli, 2010; Mifsud *et al*., 2012). The list of chalcids associated with plant galls (which are often parasitic on the gall inducers and between themselves) is much longer (22 species); table 2 provides a summary of such findings.

Table 2: Biological information on Chalcidoidea associated with plant galls as found on the Maltese Islands.

Plant gall	Associated Chalcidoidea	Reference
Cynipid gall induced by *Diplolepis eglanteriae* on *Rosa sempervirens*	*Stepanovia eurytomae*, *Pteromalus* sp. near *bedeguaris*	Mifsud, 2016
Agaonid gall induced by *Blastophaga psenes* on *Ficus carica*	*Philotrypesis caricae*	Mifsud *et al*., 2012
Cecidomyiid gall induced by *Asphondylia scopuli* on *Atriplex lanfrancoi*	*Eurytoma* sp. near *dentata*, *Mesopolobus melitensis*, *Eupelmus* (*Macroneura*) *muellneri*, *Neochrysocharis violaceus*	Dorchin *et al*., 2014
Cecidomyiid gall induced by *Kiefferia pericarpiicola* on *Daucus* sp.	*Aprostocetus dauci*, *Torymus curtisi*	Present work
Cecidomyiid galls on *Diplotaxis erucoides*. Flower galls: (i) gall induced by *Gephyraulus diplotaxis* having a regular cone- shaped structure and externally smooth, and (ii) gall induced by *G. diplotaxis* with *Contarinia* sp. (inquiline) which is slightly bigger and having an irregular shape. Pod gall (deformed siliquas) induced by *Asphondylia stefanii*	*Eurytoma* sp. near *laserpitii*, *Pseudotorymus napi*, *Systasis encyrtoides*, *Pseudocatolaccus nitescens*, *Eupelmus* (*Macroneura*) *muellneri*, *Neanastatus turneri*, *Aprostocetus* sp. near *epicharmus*, *Baryscapus* sp. (*evonymellae* group)	Present work
Eurytomid gall induced by *Tetramesa stipae* on *Stipa capensis*	*Idiomacromerus* sp., *Eupelmus* (*Eupelmus*) (?) *urozonus*	Present work
Tephritid gall induced by *Myopites stylata* on *Dittrichia viscosa*	*Eurytoma* (?) *inulae*, *Torymoides kiesenwetteri*, *Ormyrus orientalis*, *Pteromalus myopitae*, *Eupelmus* (*Macroneura*) *muellneri*	Present work

Other biological information is available for some 50 additional species of Chalcidoidea which are not associated with plant galls and this data is summarised in table 3. Most of this information was retrieved from studies carried out on whitefly parasitoids (Mifsud *et al*., 1995), psylloid parasitoids (Mifsud, 1997) and scale insects. Parasitic associations and host plant data for the chalcids associated with scale insects were mainly retrieved from Farrugia (1998b). In this latter contribution two additional chalcids are mentioned: (i) an undescribed species of *Neastymachus* and (ii) *Encyrtus infelix* (Embleton, 1902) which he reared from *Saissetia coffeae* on *Periploca angustifolia*. These two records are not included in the current check-list since no diagnostic features and no additional data was provided. Borg (1922b) stated that Prof. F. Silvestri (Portici, Italy) promised to send him a colony of *Prospaltella berlesei* (Howard, 1906) (=*Encarsia berlesei*) for the control of *Pseudaulacaspis pentagona*, but since we found no further evidence that such an introduction did materialise, we are not including this record in the present work.

Table 3: Parasitic and host plant associations of Chalcidoidea as found in the Maltese Islands.

Chalcidoidea	**Parasitoid association**	**Host plant association**	**Reference**
Podagrion splendens	*Mantis religiosa*		Cassar, 2016
Scutellista caerulea	*Ceroplastes floridensis*, *C. rusci*, *Parthenolecanium persicae*, *Saissetia oleae*, *S. coffeae* and *Coccus hesperidum*	*Citrus*, *Ficus carica*, *Morus alba*, *Olea europaea*	Borg, 1922a; Borg, 1932b; Farrugia, 1998b
Cyrtoptyx latipes	*Apanteles galleriae*		Present work
Pachycrepoideus vindemmiae	*Drosophila* spp.		Farrugia, 2016
Pachyneuron muscarum	*Planococcus citri* through *Anagyrus pseudococci* and *Leptomastidea abnormis*; *Coccus herperidum* through unknown primary parasitoid; *Aclerda berlesei* through *Neastymachus* sp.; *Parthenolecanium persicae* through *Metaphycus* sp.; *Planococcus ficus* through *Leptomastidea abnormis* and *Anagyrus pseudococci*	*Citrus*, *Arundo donax*, *Morus alba*, *Cupressus sempervirens*	Farrugia, 1998b

Pteromalus puparum	*Pieris brassicae*, *Papilio machaon melitensis*		Borg, 1932a; Mifsud, 1997
Rhaphitelus maculatus	*Hypoborus ficus*	*Ficus carica*	Mifsud *et al*., 2012
Stenomalina sp.	*Chromatomyia horticola*	*Brassica*	Mifsud, 1997
Eupelmus (*Episolindelia*) *hartigi*	*Resseliella oleisuga*	*Olea europaea*	Haber & Mifsud, 2007
Eupelmus (*Eupelmus*) (?) *urozonus*	*Bactrocera oleae*	*Olea europaea*	Haber & Mifsud, 2007
Anicetus italicus	*Ceroplastes floridensis*	*Citrus*, *Ficus carica*	Farrugia, 1998b
Cerapterocerus mirabilis	*Saissetia oleae*, *Aclerda berlesei* through *Neastymachus* sp.	*Citrus*, *Arundo donax*	Farrugia, 1998b
Comperiella bifasciata	*Aonidiella aurantii*	*Citrus*	Farrugia, 1998b
Encyrtus aurantii	*Coccus hesperidum*	*Citrus*, *Morus alba*	Farrugia, 1998b
Metaphycus flavus	*Lepidosaphes beckii*, *L. gloverii*, *Coccus hesperidum*	*Citrus*, *Laurus nobilis*, *Morus alba*, *Nerium oleander*, *Olea europaea*	Borg, 1919, 1922a, 1932b; Farrugia, 1998b
Metaphycus sp. near *stanleyi*	*Coccus hesperidum*	*Citrus*, *Laurus nobilis*	Farrugia, 1998b
Microterys nietneri	*Ceroplastes rusci*, *Coccus hesperidum*, *Saissetia oleae*	*Citrus*	Borg, 1919, 1922a; Farrugia, 1998b
Anagyrus pseudococci	*Planococcus citri*, *P. ficus*	*Citrus*, *Cupressus sempervirens*	Farrugia, 1998b
Gyranusoidea advena	*Planococcus citri*	*Citrus*	Farrugia, 1998b
Leptomastidea abnormis	*Planococcus citri*, *P. ficus*	*Citrus*, *Cupressus sempervirens*, *Vitis vinifera*	Farrugia, 1998b
Cirrospilus pictus	*Phyllocnistis citrella*	*Citrus*	Schauff *et al*., 1998

Diglyphus isaea	*Liriomyza* spp.		Mifsud, 1997a
Diglyphus minoeus	*Chromatomyia horticola*	*Brassica*	Mifsud, 1997a
Pnigalio agraules	*Bactrocera oleae*	*Olea europaea*	Haber & Mifsud, 2007
Euderomphale sp.	*Tetralicia ericae*	*Erica multiflora*	Mifsud *et al*., 1995
Aprostocetus sp. near *toddaliae*	*Ceroplastes floridensis*	*Citrus*	Farrugia, 1998b
Baryscapus n. sp.	*Henosepilachna elaterii*	*Ecballium elaterium*	Cassar *et al.*, 2016
Tamarixia pronomus	*Bactericera crithmi*	*Ferula communis*	Mifsud, 1997b
Tamarixia tremblayi	*Bactericera crithmi*	*Ferula communis*	Mifsud, 1997b
Tamarixia sp.[1]	(?) *Trioza chenopodii*	*Atriplex* sp.	Mifsud, 1997b
Astichus bachmaieri	*Hypoborus ficus*	*Ficus carica*	Mifsud *et al*., 2012
Aphelinus mali	*Eriosoma lanigerum*	*Malus domestica*	Borg, 1934[2]; Thompson, 1953
Aphytis diaspidis	*Lepidosaphes beckii*		Borg, 1919, 1922a, 1932b
Aphytis hispanicus	*Parlatoria pergandii*	*Citrus*	Farrugia, 1998b
Aphytis lepidosaphes	*Lepidosaphes beckii*	*Citrus*	Farrugia, 1998b
Aphytis melinus	*Aonidiella aurantii*	*Citrus*	Farrugia, 1998b
Marietta leopardina	*Aphytis lepidosaphes* through *Lepidosaphes beckii*	*Citrus*	Farrugia, 1998b

[1] This *Tamarixia* keyed out to what Graham (1991) referred to as '*Tamarixia* sp. indet' known from Canary Islands and Turkey.

[2] *A. mali* was introduced in Malta in 1934 for the control of *Eriosoma lanigerum*.

Coccophagus lycimnia	*Coccus hesperidum, Ceroplastes floridensis*, *C. rusci*, *Saissetia oleae*	*Citrus*, *Ficus carica*, *Laurus nobilis*, *Morus alba*, *Nerium oleander*, *Olea europaea*	Borg, 1919, 1922a; Farrugia, 1998b
Coccophagus sp. near *rusti*	*Coccus hesperidum*	*Citrus*, *Morus alba*, *Nerium oleander*	Farrugia, 1998b
Coccophagus scutellaris	*Ceroplastes rusci*, *Saissetia oleae*	*Citrus*	Farrugia, 1998b
Encarsia brimblecombei	*Lepidosaphes beckii*, *L. gloverii*	*Citrus*	Farrugia, 1998b
Encarsia citrina	*Parlatoria ziziphi*, *P. pergandii*, *Lepidosaphes beckii*, *L. gloverii*, *L. ulmi*, *Aspidiotus nerii*, *Carulaspis juniper*	*Citrus*, *Ficus carica*, *Laurus nobilis*, *Morus alba*, *Nerium oleander*, *Olea europaea*, *Cupressus sempervirens*	Farrugia, 1998b
Encarsia formosa	*Trialeurodes vaporariorum*	*Solanum lycopersicum*	Mifsud *et al*., 1995; Mifsud, 1997a
Encarsia inaron	*Siphoninus phillyreae*	*Punica granatum*	Present work
Encarsia lutea	*Trialeurodes vaporariorum*, *Bemisia tabaci*	*Mentha spicata*, *Solanum nigrum*	Mifsud *et al*., 1995
Encarsia tricolor	*Aleyrodes proletella*	*Brassica*	Borg, 1935; Mifsud *et al*., 1995
Cales noacki	*Aleurothrixus floccosus*	*Citrus aurantium*	Mifsud *et al*., 1995; Mifsud, 1997a
Eretmocerus californicus			Mifsud, 1997a
Eretmocerus mundus	*Bemisia tabaci*	*Helianthus tuberosus*, *Brassica*	Mifsud *et al*., 1995; Mifsud, 1997a
Arescon aspidioticola[3]			Borg, 1922a, 1932b
Dicopus citri[4]	(?) *Lepidosaphes beckii,* (?) *Parlatoria ziziphi*	*Citrus*	Farrugia, 1998b

[3] This record is most likely incorrect

[4] Farrugia (1998b) recorded this taxon as *Dicopus* sp.

Chartocerus kurdjumovi	*Planococcus citri* and *P. ficus* through *Leptomastidea abnormis* and/or *Anagyrus pseudococci*	*Citrus*, *Cupressus sempervirens*	Farrugia, 1998b
Signiphora flavopalliata[5]	*Hemiberlesia rapax* through *Aphytis* sp., *Hemiberlesia rapax* through *Aphytis diaspidis*	*Citrus*, *Morus alba*	Borg, 1932b; Farrugia, 1998b

Chalcids in general are highly dispersive insects, seemingly readily transported by their own powers of flight, by wind and by human agency to widespread localities. The ability of many species to exploit novel hosts facilitates colonisation of new territories, as does the fact that females usually mate very soon after emergence and are then able to produce progeny of both sexes for most of their lives by laying fertilised and unfertilised eggs. Thus the physical isolation of islands tends not to be a barrier to the spread of chalcids, and endemism in the group is very low. The only two species currently known only from the Maltese archipelago are *Mesopolobus melitensis* and *Baryscapus* n. sp. Similarly, several species found in Malta have a broad distribution, and some New World elements, such as *Tineophoctonus armatus*, are included in the Maltese fauna

ACKNOWLEDGEMENTS

We would like to thank Mark Zammit and Thomas Cassar for donating chalcid material used for the present work. We thank Dr Andrew Polaszek (The Natural History Museum, London, UK) for the identification of *Encarsia inaron* and Dr John Noyes (The Natural History Museum, London, UK) and Dr John La Salle (CSIRO, Canberra, Australia) for reviewing the present work.

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[5] Farrugia (1998b) recorded this taxon as *Signiphora* sp. (*flavopalliata* species group)

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Received: February 10, 2016
Accepted: August 20, 2016