



The bees (Hymenoptera: Apoidea) of the Maltese Islands

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Abstract

This study presents the first checklist of the bees of the Maltese Islands and includes notes on the distribution of each species. A total of 95 species belonging to five bee families are recorded: Andrenidae (17 species), Apidae (34 species), Colletidae (6 species), Halictidae (15 species) and Megachilidae (23 species). *Lasioglossum callizonium* (Pérez, 1896) is recorded for the first time from the Maltese Islands. Records of three previously reported species are listed as dubious. The bee fauna of the Maltese Archipelago is dominated by widespread West-Palaeartic species, and most of the species recorded are also found in the Western Mediterranean Basin. Bees that have been recorded from Malta are also known from Southern Europe. The study provides a biogeographical analysis of the Maltese bee fauna, and discusses the conservation of this group and their important role in the delivery of ecosystem services in the Maltese Islands.

Key words: biogeography, islands, *Lasioglossum callizonium*, Mediterranean, pollinators, wild bees, Malta

Introduction

The bee fauna of the Maltese Islands remains relatively poorly studied despite the importance of this group for the pollination of crops and wild plants. The earliest documented records are those of Alfken (1929) who published a list of Hymenoptera, which included 20 species of bees. More recent records of the bees of Malta were described by Valletta (1971, 1979), who recorded 50 bee species. The latest publication on the bee fauna of Malta was by Schembri (1982), who listed 40 species, of which 16 had not been previously recorded by the contributions of Valletta (1971, 1979).

The aim of this article is to review the literature on the bee fauna in the Maltese Islands, to add some more recent observations, and to finally provide an updated check-list.

Materials and methods

Study area. The Maltese archipelago is a group of low-lying, small islands situated in the Central Mediterranean Sea at 96 km south of Sicily, almost 300 km east of Tunisia and some 350 km north of the Libyan coast. The archipelago is made up of three inhabited islands (Malta, Gozo and Comino) and several uninhabited islets, with a total land area of 316km². The relatively high plant diversity in the Maltese Islands (Schembri 1993), and the fact that the highest diversity of European bees is recorded within the Mediterranean region (Nieto *et al.* 2014), a biodiversity hotspot of global importance (Myers *et al.* 2000), suggests that the Archipelago may have a diverse bee community.

The Maltese archipelago has an interesting biogeography, and harbours considerable biodiversity (Schembri 1993). The Islands are part of the African tectonic plate and consist of Globigerina Limestone formed from sedimentation in shallow seas during the Tertiary period. The Maltese and Pelagian Islands and the Hyblean plateau of Southern Sicily are the emerged parts of the Pelagian Block. This is the foreland margin of the African plate, and was originally colonised by species from the European and African mainlands during the Messinian Salinity Event (Hunt & Schembri 1999). At the beginning of the Pliocene, species that had colonised the different islands became isolated as the Mediterranean basin was inundated. This was followed by a long period of isolation during the Pliocene and Lower to Middle Pleistocene. The Maltese Islands still host a number of palaeoendemic species that occupied the pre-Quaternary Pelagian Block during the Messinian Salinity Event, and were subsequently isolated following the inundation. During the Quaternary Period, the Maltese Islands experienced several colonisation episodes from Sicily during some of the marine regressions associated with the Pleistocene glaciations (Hunt & Schembri 1999). A number of neoendemic species reached the islands by dispersing from Sicily, across land bridges or by crossing a narrow sea barrier, then became cut off when the land connection was severed during interglacials and evolved in relative isolation. These Quaternary colonisations explain the presence of a large number of endemic forms that are less strongly differentiated from their Sicilian counterparts (Hunt & Schembri 1999), and the close resemblance of the Maltese biota to that of Sicily (Thake 1985; Hunt & Schembri 1999; Schembri 2003). These observations have also been confirmed for a number of insect groups. For example, the Maltese Lepidoptera fauna shows similarities to Sicily and circum-Sicilian islands (Dapporto *et al.*, 2014) and most of the Maltese endemics appear to be closely related to Southern European species while only 7% of the Maltese Lepidoptera are found in North Africa but not in Sicily or mainland Europe (Schembri, 2003). Ants (Hymenoptera: Formicidae) have also been extensively studied, and a total of 50 species have been recorded with the bulk of these being widespread in the Mediterranean region. Seven of these species have a North African affinity while two ant species are endemic to the Maltese Islands (Schembri 2003). The Curculionioidea (Coleoptera) of Malta are a relatively diverse insect group on the Maltese Islands. Most (45.45%) are widespread euryoecious species, while a total 16.97% are widespread in the Mediterranean region, 12.72% and 1.82% are recorded from the Western and Eastern Mediterranean Basins respectively, while 11.52% are European species, 3.03% have a North African affinity, 2.42% have an Italian subendemic distribution, 1.22% are recorded only in Malta and Sicily and 4.85% of the recorded species are endemic to Malta (Mifsud and Colonnelli, 2010).

The Maltese Islands also have a long cultural history and the earliest evidence of settlement dates back to around 7000 BP (Schembri 1993). With agriculture being as old as humankind's remote origins on the archipelago, the landscapes of the Maltese Islands have been highly modified over the millennia. The first settlements were associated with deforestation for agriculture, the introduction of livestock and grazing activities (Schembri 1993). Agricultural remains Malta's predominant land cover to date, occupying around 51% of the territory. Built-up, industrial and urban areas today occupy more than 30% of the Maltese Islands (MEPA 2010). In 2013, the total human population of the Maltese Islands stood at 425,384, that is a population density of 1,346 persons per km², which effectively makes the Archipelago one of the most densely populated countries in the world. The resident population is augmented significantly by tourist arrivals, which stood at 1.6 million in 2013 (NSO 2014). Thus the Maltese Islands' biodiversity would be expected to be subject to substantial pressure from urban and tourism development. However, the Islands also host a number of designated protected areas, which had a total of 21.5% of land area in 2011 and, support habitats and species of ecological importance.

Methods

The personal collections of the authors and their field notes were used to develop this updated check-list. Additionally, the collection at the National Museum of Natural History (NMNH) at Mdina, Malta, was also studied. Full details of the examined specimens are published here. The name of the species was given first followed by the locality, date of capture and collector. Specimens located at the National Museum of Natural History in Mdina, Malta, were indicated in square brackets [NMNH]. Notes on the distribution of each species were also included. Reference was made to previous records on the bee fauna of Malta, including the preliminary list by Valletta (1971), and the following additions by Valletta (1979) and Schembri (1982). In addition, we made reference to the taxonomic catalogue of the Palaearctic bees of the tribe Osmiini by Ungricht *et al.* (2008) and the

online check-list of Western Palearctic Bees (Hymenoptera: Apoidea: Anthophila) by Kuhlmann *et al.* (2015). The nomenclature used in this paper follows Michener (2007) for supra-specific taxa and Nieto *et al.* (2014) for species names.

Results

The present work compiles records from previous publications and collections of the authors and provides a first check-list of the bee fauna of the Maltese Islands. A total of 95 species were recorded from the Maltese Islands (Table 2). These belong to the following five bee families: Andrenidae (17 species), Apidae (34 species), Colletidae (6 species), Halictidae (15 species) and Megachilidae (23 species). *Lasioglossum callizonium* is recorded for the first time from the Maltese Islands.

The records of the 95 species of bees from locations within the Maltese Islands (Figure 1), and a description of their distribution, with a particular focus on the Mediterranean region, are included below.

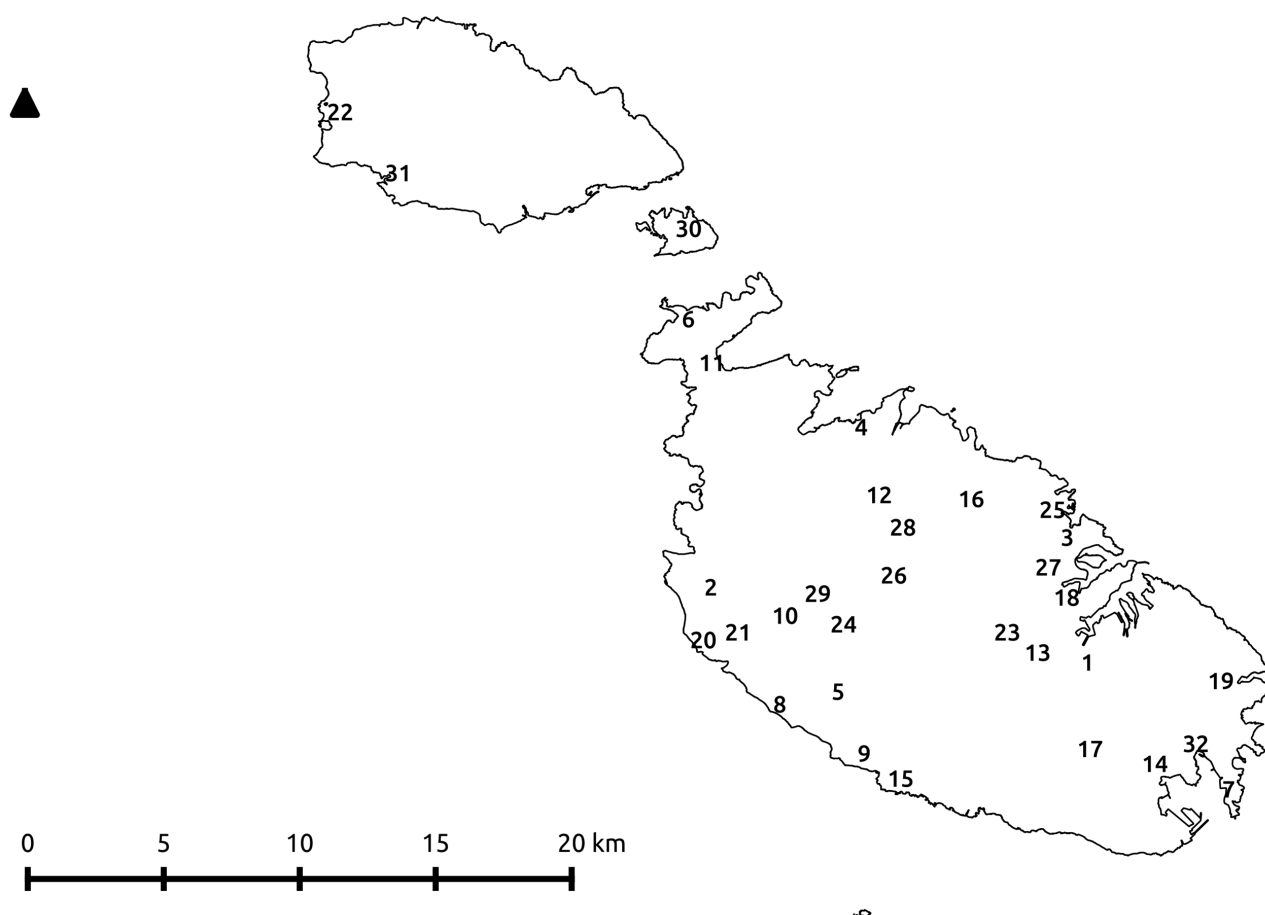


FIGURE 1. A map of the Maltese Islands showing locations from where the specimens included in this paper were collected: 1—Addolorata Cemetery; 2—Bahrija; 3—Balluta; 4—Bugibba; 5—Buskett; 6—Ċirkewwa; 7—Delimara; 8—Had-Dingli; 9—Fawwara; 10—Fiddien; 11—Ghadira; 12—Għajn Rihana; 13—Għammieri, Hal Qormi; 14—Għar Dalam, Birzebbuga; 15—Għar Lapsi; 16—Għarghur; 17—Hal Għaxaq; 18—Gwardamangia; 19—Marsascala; 20—Miġra l-Ferha; 21—Imtahleb; 22—Qattara (Gozo); 23—Hal Qormi; 24—Rabat; 25—St. Julian's; 26—Ta' Qali; 27—Tal-Qroqq, Msida; 28—Wied il-Ghasel, il-Mosta; 29—Wied il-Qlejgha, Rabat; 30—Wied l-Ahmar (Comino); 31—Xlendi (Gozo); 32—Marsaxlokk.

Andrenidae

Andrena agilissima (Scopoli, 1770):

Determined as *Andrena flessae* (Panzer, 1805) by IHH Yarrow in NMNH collection but this is synonymised with *A. agilissima* (see Gusenleitner & Schwarz 2002)

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982); Kuhlmann *et al.* (2015):

Examined Specimen: 1 ♀ [NMNH]

Distribution: Continental Europe and Northern Africa, and the islands of Corsica, Sardinia and Sicily, and the Balearic Islands.

Andrena miegiella (Dours, 1873)

Previous Reports: Schembri (1982)

Distribution: Mediterranean basin including the islands of Corsica, Sardinia and Sicily.

Andrena aff. leucophaea (Lepelletier, 1841)

Previous Reports: Valletta (1971)

Distribution: Algeria, Spain, Sicily and the Balearic Islands.

Andrena binominata (Smith, 1853)

Previous Reports: Schembri (1982); Kuhlmann *et al.* (2015)

Distribution: Western Mediterranean Basin, Sicily and the Balearic Islands.

Andrena nigroolivacea (Dours, 1873)

Previous Reports: Valletta (1971); Schembri (1982); Kuhlmann *et al.* (2015)

Distribution: Western Mediterranean Basin, Croatia and Greece, and the islands of Corsica, Sardinia, Sicily and the Balearic Islands.

Andrena bicolor (Fabricius, 1775)

Previous Reports: Valletta (1971); Kuhlmann *et al.* (2015)

Distribution: widespread in the western Palaearctic, including Europe, the Middle East and Northern Africa.

Andrena impunctata (Pérez, 1895)

Determined as *Andrena impunctata* ssp. *contusa* in Schembri (1982).

Previous Reports: Schembri (1982); Kuhlmann *et al.* (2015)

Distribution: Continental Europe, Northern Africa (Algeria, Tunisia, Egypt), Middle East (Israel, Lebanon, Turkey), Corsica, Sicily, and the Balearic and Canary Islands. Bees found in Israel into North Africa are referred as to *A. i. contusa* (Warncke 1980).

Andrena decipiens (Schenck, 1861)

Previous Reports: Schembri (1982); Kuhlmann *et al.* (2015)

Distribution: Continental Europe, North-western Africa (Morocco, Algeria), Sicily.

Andrena bimaculata (Kirby, 1802)

Previous Reports: Valletta (1971); Kuhlmann *et al.* (2015)

Distribution: widespread in the western Palaearctic, including Europe, Northern Africa and Middle East.

Andrena pilipes (Fabricius, 1781)

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982)

Examined specimens: 2 ♂, Ghajn Rihana, 25-v-1969, C De Lucca [NMNH]; 1 ♀, Wied il-Ghasel, 08-vi-1969, C De Lucca [NMNH]; 1 ♀, Wied il-Ghasel, 12-vi-1969, C De Lucca [NMNH]; 1 ♀, Wied il-Ghasel, 22-vi-1969, C De Lucca [NMNH]; 1 ♂, Wied il-Ghasel, 26-VI-1969, C De Lucca [NMNH]; 1 ♂, Buskett, 26-III-1970, C De Lucca [NMNH]; 1 ♀, 1 ♂, Wied il-Ghasel, 14-II-1976, P Sammut [NMNH]; 1 ♀, 1 ♂, Ghadira, 7-IV-1976, P

Sammut [NMNH]; 1♀, Imtahleb, 28-IV-1976, P Sammut [NMNH];
Distribution: widespread in Continental Europe. Recorded from Algeria, Corsica, Sardinia and Sicily.

Andrena tibialis (Kirby, 1802)

Previous Reports: Kuhlmann *et al.* (2015)
Distribution: widespread in Continental Europe.

Andrena morio Brullé, 1832

Previous Reports: Alfken (1929); Valletta (1971); Kuhlmann *et al.* (2015)
Distribution: widespread in Europe and Northern Africa.

Andrena nigroaenea (Kirby, 1802)

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982); Kuhlmann *et al.* (2015)
Distribution: Widespread in Europe and Northern Africa.

Andrena savignyi (Spinola, 1838)

Previous Reports: Schembri (1982)
Distribution: Northern Africa, Italy and Corsica.

Andrena cyanomicans (Pérez, 1895)

Previous Reports: Kuhlmann *et al.* (2015)
Distribution: North-western Africa, Portugal and Spain, and Israel and Jordan.

Andrena flavipes Panzer, 1799

Previous Reports: Valletta (1971); Kuhlmann *et al.* (2015)
Distribution: Widespread in Europe and Northern Africa.

Panurgus siculus (Morawitz, 1871)

Determined as *Panurgus dentipes siculus* (Morawitz, 1871) but this is synonymised with *P. siculus* (Patin 2001).

Previous Reports: Valletta (1971); Schembri (1982)

Examined Specimens: 13♀, 2♂, Ħal Ghaxaq, 15-iv-2014, MV Balzan; 2♀, MV Balzan; 1♂, Għar Lapsi (Siggiewi), 5-v-2014, Balzan.

Distribution: Central Mediterranean Basin (Corsica, Sardinia, Sicily, Southern Italy).

Apidae

Amegilla quadrifasciata (de Villers, 1789)

Determined as *Anthophora mediterranea* (Alfken, 1927) by Alfken (1929) but this is synonymised with *A. quadrifasciata* (Kuhlmann *et al.* 2015).

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982);

Specimens Examined: NMNH; 3♀, 1♂, Wied il-Għasel, 08-vi-1969, C De Lucca [NMNH]; 1♂, Wied il-Għasel, 08-vi-1969, P Portelli [NMNH]; 1♀, Għar Dalam, 08-vi-1969, P Portelli [NMNH]; 1♀, Wied il-Għasel, 16-vi-1969, C De Lucca [NMNH]; 1♀, Għargħur, 7-vii-1970, C De Lucca [NMNH]; 1♀, Miġra l-Ferħa, 19-v-2014, P Portelli [NMNH]; 1♀, San Ġiljan, 10-vi-2014, P Portelli [NMNH]; 3♀, Għammieri (Ħal Qormi), 01-vii-2014, MV Balzan; 2♀, 1♂, Għar Dalam, 11-viii-2014, P Portelli [NMNH]; 1♀ [NMNH]

Distribution: Continental Europe and Northern Africa, Corsica, Sardinia and Sicily.

Amegilla albigena (Lepeletier, 1841)

Determined as *Anthophora albigena* ssp. *albida* (Dours, 1869) in Valletta (1971) but this is synonymised with *A. albigena* (Kuhlmann *et al.* 2015).

Previous Reports: Alfken (1929); Valletta (1971)

Distribution: South and Eastern Continental Europe, North-western Africa, and the islands of Corsica, Sardinia and Sicily.

Ammobatooides luctuosus (Friese, 1911)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Italy, Eastern Europe (Lithuania, Moldova) and Mediterranean Basin (Macedonia, Turkey).

Anthophora dispar (Lepeletier 1841)

Previous Reports: Alfken (1929); Kuhlmann *et al.* (2015)

Distribution: North Africa, Iberian Peninsula, France, Italy and Hungary, Corsica, Sardinia, and Sicily.

Anthophora plagiata (Illiger, 1806)

Determined as *Anthophora parietina* (Fabricius, 1793) but this is synonymised with *A. plagiata* (Kuhlmann *et al.* 2015).

Previous Reports: Valletta (1971); Schembri (1982)

Specimens Examined: ; 1♀, 1♂, Buskett, 14-ii-1976, P Sammut [NMNH]; 1♀, Buskett, 28-ii-1976, P Sammut [NMNH];

Distribution: Continental Europe, Algeria, and Sicily.

Anthophora plumipes (Pallas, 1772)

Determined as *Anthophora acervorum* var *pennata* (Lepeletier, 1841) in the collection of the NMNH by IHH Yarrow, and in Valletta (1971), and determined as *Anthophora acervorum* L. in Schembri (1982) but these are synonymised with *A. plumipes* (Kuhlmann *et al.* 2015).

Previous Reports: Valletta (1971); Schembri (1982)

Specimens Examined: 1♀, Chadwick Lakes, 19-iii-1952 [NMNH]

Distribution: Continental Europe, North-western Africa (Morocco, Algeria, Tunisia), the islands of Corsica, Cyprus, Sardinia and Sicily.

Anthophora retusa (L., 1758)

Previous Reports: Valletta (1971)

Distribution: Continental Europe, Sardinia and Sicily.

Anthophora canescens (Brullé, 1832)

The specimen at the NMNH was determined as *Anthophora nigrocincta* (Lepeletier, 1841) by IHH Yarrow but this is synonymised with *A. canescens*. (Kuhlmann *et al.* 2015).

Previous Reports: Kuhlmann *et al.* (2015)

Specimens Examined: 1♀ [NMNH]

Distribution: Mediterranean Basin.

Apis mellifera (L., 1758)

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982); Sheppard *et al.* (1997)

Specimens Examined: NMNH; 3♀, Tal-Qroqq (Msida), 6-xi-1968, C De Lucca [NMNH]; 2♀, Gharghur, 6-ix-1970, C De Lucca [NMNH]; 1♀, Imtahleb, 28-iv-1976, P Sammut [NMNH]; 1♀, Buskett, 14-xi-1976, C De Lucca [NMNH]; 1♀, Hal Qormi, 25-v-1980 [NMNH]; 1♀, Ghar Lapsi (Siġġiewi), 5-v-2014, MV Balzan; 1♀, Ghajn Tuffieħa (Mellieħa), 12-v-2014, MV Balzan; 1♀, Miġra l-Ferħa, 19-v-2014, P Portelli; 1♀, Chadwick Lakes, 27-v-2014, P Portelli; 1♀, Balluta, 10-vii-2014, P Portelli; 2♀, Baħrija, 24-vii-2014, P Portelli.

Distribution: Global distribution - occurs naturally in Europe, the Middle East, and Africa but has been spread extensively beyond its range. Endemic honey bees of the Maltese Islands are a distinct geographical race, *Apis mellifera ruttneri* (Sheppard *et al.* 1997).

Bombus terrestris (L., 1758)

Previous Reports: Valletta (1971)

Specimens Examined: ; 1♀, Bugibba, 28-vii-1979, CJ Aquilina [NMNH]; 1♀, Buskett, ?/7/88, P Sammut [NMNH]; 2♀, Buskett, ?/8/81, P Sammut [NMNH]; 2♀, Chadwick Lakes, 27-v-2014, P Portelli [NMNH]; 2♂, Buskett, 17-vii-2014, P Portelli [NMNH]; 1♂ [NMNH]

Distribution: It has a Mediterranean-centred distribution but is not restricted to this region. It is widespread in Europe, middle and northern latitudes of Asia, and it has been introduced to Australasia and South America.

Ceratina cyanea (Kirby, 1802)

Previous Reports: Kuhlmann *et al.* (2015)

Specimens Examined: 1♀, 2♂, Delimara (Marsaxlokk), 26-v-2014, MV Balzan; 1♀, Għammieri (Ħal Qormi), MV Balzan; 23-vi-2014, 2♂, Għammieri (Ħal Qormi), 9-vii-2014, MV Balzan; 1♀, Għammieri (Ħal Qormi), 11-viii-2014, MV Balzan;

Distribution: Continental Europe, Maghreb (Algeria, Tunisia), Libya and central Asia, Corsica, Sardinia and Sicily.

Ceratina dallatorreana (Friese, 1896)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Mediterranean Basin.

Ceratina gravidula (Gerstäcker, 1869)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Mediterranean Basin. Rare and localised abundance in the North of the Balkans and the Black Sea.

Dioxys cincta (Jurine, 1807)

Previous Reports: Valletta (1971)

Distribution: Mediterranean Basin.

Eucera algira (Brullé, 1840)

Previous Reports: Valletta (1971); Kuhlmann *et al.* (2015)

Distribution: Southern Europe, North Africa, extends to Western Asia.

Eucera eucnemidea (Dours, 1873)

Previous Reports: Valletta (1971); Schembri (1982); Kuhlmann *et al.* (2015)

Distribution: Western Mediterranean Basin.

Eucera longicornis (L., 1758)

Previous Reports: Valletta (1971)

Specimens Examined: 1♀, 1♂, Buskett, 28-ii-1976, P Sammut; 1♂, Ħad Dingli, 20-ii-1977, CJ Aquilina; 1♀, 1♂, Tal-Qattara (Malta), 26-ii-1978, CJ Aquilina; 1♂, Tal-Qattara (Malta), 5-iii-1978, CJ Aquilina;

Distribution: Widespread in Europe, with its range extending to Siberia and China.

Eucera numida (Lepeletier, 1841)

Previous Reports: Valletta (1971); Kuhlmann *et al.* (2015)

Distribution: Western Mediterranean Basin, Corsica, Sardinia and Sicily.

Eucera oraniensis (Lepeletier, 1841)

Previous Reports: Schembri (1982); Kuhlmann *et al.* (2015)

Distribution: Western Mediterranean Basin.

Eucera rufa (Lepelletier, 1841)

Specimen at the NMNH determined as *Eucera ruficollis* (Brullé, 1832), while this was recorded as *Tetralonia berlandi* Dism. in Schembri (1982).

Previous Reports: Valletta (1971); Schembri (1982); Kuhlmann *et al.* (2015)

Specimens Examined: Examined Specimens: 1 ♀ [NMNH]

Distribution: Southern Europe and Northern Africa. Its distribution extends to the Middle East (Turkey, Israel, Lebanon, Jordan).

Habropoda zonatula (Smith, 1854)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Southern Europe, including the islands of Sardinia and Sicily and, extending to Western Asia.

Melecta albifrons (Forster, 1771)

Previous Reports: Valletta (1979)

Distribution: Continental Europe, Northern Africa, United Kingdom, and the islands of Cyprus, Corsica and Sardinia.

Melecta duodecimmaculata (Rossi, 1790)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Mediterranean Basin, Sicily and Cyprus.

Melecta leucorhyncha (Gribodo, 1893)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Mediterranean Basin, Cyprus, Corsica, Sardinia, and Sicily.

Melecta luctuosa (Scopoli, 1770)

Previous Reports: Valletta (1971)

Distribution: Europe and North-western Africa, Corsica, Cyprus and Sicily.

Nomada bifasciata (Olivier, 1811)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Continental Europe, North-western Africa (Morocco, Algeria, Tunisia), Sicily and Cyprus.

Nomada distinguenda (Morawitz, 1874)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Continental Europe, Morocco and the islands of Corsica, Sardinia, Sicily, Cyprus.

Nomada fulvicornis (Fabricius, 1793)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Continental Europe, Northern Ireland, Morocco and the islands of Corsica, Cyprus, Sardinia and Sicily.

Nomada kohli (Schmiedeknecht, 1882)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Southern Europe, Algeria, the islands of Cyprus and Sicily.

Nomada rufa (Rossi, 1790)

Previous Reports: Valletta (1971)

Distribution: Italy and Malta.

Nomada stigma (Fabricius, 1804)

Determined as *Nomada cinnaberina* (Morawitz 1871) but this is synonymised with *N. stigma* (Kuhlmann *et al.* 2015).

Previous Reports: Valletta (1971)
Distribution: Continental Europe, Cyprus, Sicily and Algeria.

Thyreus histrionicus (Illiger, 1806)

Determined as *Crocisa major* (Morawitz, 1875) by Alfken (1929) but this is synonymised with *T. histrionicus* (Kuhlmann *et al.* 2015).

Previous Reports: Alfken (1929); Schembri (1982); Kuhlmann *et al.* (2015)

Specimens Examined: 1♂, C De Lucca [NMNH]

Distribution: Continental Europe, Northern Africa, and the islands of Corsica, Cyprus, Sardinia, and Sicily.

Thyreus ramosus (Lepeletier, 1841)

Determined as *Crocisa circulata* (Alfken, 1929) and *Thyreus ramosa* (Lepeletier, 1841) but these are synonymised with *T. ramosus* (Kuhlmann *et al.* 2015).

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982)

Specimens Examined: 1♀, Wied il-Ghasel, 12-vi-1969, C De Lucca; 3♂, Wied il-Ghasel, 16-vi-1969, C De Lucca; 1♀ [NMNH]

Distribution: Southern Europe, Northern Africa, extending to Western Asia. Recorded from the islands of Corsica, Cyprus, Sardinia and Sicily.

Xylocopa violacea (L., 1758)

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982); Kuhlmann *et al.* (2015)

Specimens Examined: 2♀, 2♂, Buskett, 14-ii-1976, P Sammut; 1♀, Gwardamangia, 30-v-1976, CJ Aquilina; 1♂, Rabat, 30-x-1988, P Sammut; 1♀, Buskett, 17-vii-2014, P Portelli; 1♂, Dingli Cliffs, 5-x-2014, P Sammut; 1♀, vii-72, [NMNH]; 1♂, Marsascala, vii-1984, M Zammit.

Distribution: Continental Europe, Ireland, the Maghreb countries of Morocco, Algeria and Tunisia, and the islands of Corsica, Cyprus, Sardinia and Sicily.

Colletidae

Hylaeus imparilis (Förster, 1871)

Previous Reports: Kuhlmann *et al.* (2015)

Specimens Examined: 1♂, Ta' Ċenċ (Sannat), 7-iv-1999, B and G Degen; 3♂, Marfa Ridge (Mellieħa), 14-iv-1999, B and G Degen; 1♂, 1♀, Dingli Cliffs (Dingli), 17-iv-1999, B and G Degen; 1♂, Golden Bay (Mgarr), 21-iv-1999, B and G Degen; 1♂, Wied Qirda (Siggiewi), 26-iii-2012, Liston; 1♀, Għar Lapsi (Siggiewi), 5-v-2014, MV Balzan; 1♂, 3♀, Delimara (Marsaxlokk), 26-v-2014, MV Balzan;

Distribution: Mediterranean Basin, Eastern Europe and the islands of Cyprus, Sardinia and Sicily.

Hylaeus clypearis (Schenck, 1853)

Previous Reports: Kuhlmann *et al.* (2015)

Specimens Examined: 1♂, St. Julians, 12-vii-1970, Stockh; 1♀, St. Julians, 12-vii-1970, Stockh; 1♀, Buskett (Rabat), 12-vii-1977, Schembri

Distribution: Continental Europe and North Africa, and the islands of Cyprus, Corsica, Sardinia and Sicily.

Hylaeus taeniolatus (Förster, 1871)

Previous Reports: Kuhlmann *et al.* (2015)

Specimens Examined: 8♂, 7♀, St. Julians, 3-vii-1970, Stockh; 1♀, Marfa Ridge (Mellieħa), 14-iv-1999, B and G Degen; 1♀, Dingli Cliffs (Dingli), 17-iv-1999, B and G Degen; 1♀, Selmun (Mellieħa), 24-iv-1999, B and G Degen; 1♀, Marsaxlokk, 18-v-2003, W. Schedl; 1♀, 1♂, Delimara (Marsaxlokk), 26-v-2014, MV Balzan

Distribution: Mediterranean Basin and Central Europe (Austria, Germany, Netherlands, Switzerland) and the islands of Corsica, Cyprus, Sardinia, and Sicily.

Hylaeus signatus (Panzer, 1798)

Previous Reports: Kuhlmann *et al.* (2015)

Specimens Examined: 1♂, Delimara (Marsaxlokk), 17-v-2003, W Schedl; 1♂, Xlendi (Gozo), 17-v-2003, W Schedl.

Distribution: Continental Europe, the North African countries of Morocco and Tunisia, Sardinia.

Hylaeus hyperpunctatus (Strand, 1909)

Previous Reports: Valletta (1971); Kuhlmann *et al.* (2015)

Specimens Examined: 10♀, 4♂, Buskett (Rabat), 16-ix-1976, Schembri; 10♀, 2♂, Santa Marija (Comino), 26-ix-1977, Schembri; 2♂, Birzebbuga, 5-vii-1978, Richards

Distribution: Southern Europe and the islands of Corsica, Sardinia and Sicily.

Hylaeus punctatus (Brullé, 1832)

Previous Reports: Valletta (1971)

Distribution: Continental Europe, Corsica, Sicily and Sardinia.

Halictidae

Ceylalictus variegatus (Olivier, 1789)

Determined as *Nomioides variegata* (Olivier, 1789) but this is synonymised with *C. variegatus* (Kuhlmann *et al.* 2015).

Previous Reports: Valletta (1971)

Distribution: Mediterranean Basin, Eastern Europe, Middle East, Cyprus, Sardinia and Sicily.

Halictus brunnescens (Friese, 1916)

Determined as *Halictus aegyptiacus* (Friese, 1916) but this is synonymised with *H. brunnescens* (Kuhlmann *et al.* 2015).

Previous Reports: Schembri (1982)

Distribution: Continental Europe, North Africa and the islands of Corsica, Cyprus, Sardinia and Sicily.

Halictus fulvipes (Klug, 1817)

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982)

Specimens Examined: NMNH; 1♂, Wied il-Għasel, 16-vi-1969, C De Lucca [NMNH]; 1♀, 1♂, Buskett, 16-vi-1969, P Sammut [NMNH]; 1♂, Buskett, 16-vi-1969, P Portelli [NMNH]; 1♂, Buskett, 28-ii-1976, P Portelli [NMNH]; 1♂, Buskett, 7-iii-1976, P Portelli [NMNH]; 1♀, 1♂, Buskett, 7-iii-1976, P Sammut [NMNH]; 1♀, Buskett, 16-iii-1976, P Sammut [NMNH]; 2♂, Rabat, ?-vi-1981, P Sammut [NMNH]; 1♂, Rabat, ?-vii-1981, P Sammut [NMNH]; 1♂, Għar Lapsi, 3-viii-2001, P Sammut [NMNH]; 1♀, Għar Lapsi (Siggiewi), 5-v-2014, MV Balzan; 2♀, 1♂, Miġra l-Ferħa, 19-v-2014, P Portelli [NMNH]; 7♀, 4♂, Għammieri (Ħal Qormi), 23-vi-2014, MV Balzan; 9♀, 3♂, Għammieri (Ħal Qormi), 9-vii-2014, MV Balzan; 2♂, Buskett, 17-vii-2014, P Portelli [NMNH]; 2♂, Bahrija, 24-vii-2014, P Portelli [NMNH]; 1♀, Għammieri (Ħal Qormi), 25-vii-2014, MV Balzan; 1♂, Għammieri (Ħal Qormi), 11-viii-2014, MV Balzan; 1♀, Għar Dalam, 11-vii-2014, P Portelli [NMNH]; 1♀, 4♂, Għar Dalam, 11-vii-2014, P Portelli [NMNH];

Distribution: Western Mediterranean Basin, Ukraine and the islands of Corsica, Sicily, Sardinia.

Halictus rubicundus (Christ, 1791)

Previous Reports: Valletta (1971)

Distribution: Continental Europe, Sicily, Morocco.

Halictus scabiosae (Rossi 1790)

Previous Reports: Valletta (1971)

Distribution: Continental Europe, Morocco, Iraq, Sardinia, Sicily.

Lasioglossum malachurum (Kirby 1802)

Determined as *Halictus malachurus* (Kirby) by Alfken (1929) and Valletta (1971).

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982)

Specimens Examined: 1♀, Delimara (Marsaxlokk), 26-v-2014, MV Balzan

Distribution: Continental Europe, North Africa and the Middle East (Iran, Georgia and Azerbaijan), Cyprus, Sardinia, and Sicily.

Lasioglossum minutissimum (Kirby, 1802)

Determined as *Halictus minutissimum* (Kirby, 1802).

Previous Reports: Valletta (1971)

Specimens examined: 1♀, Għammieri (Hal Qormi), 9-vii-2014, MV Balzan

Distribution: Continental Europe and England and Northern Ireland, Northern Africa, and Cyprus, Sardinia and Sicily.

Lasioglossum limbellum (Morawitz, 1876)

Determined as *Halictus ventralis* (Pérez, 1903) but this is synonymised with *L. limbellum* (Kuhlmann *et al.*, 2015).

Previous Reports: Valletta (1971); Kuhlmann *et al.* (2015)

Distribution: Continental Europe, Northern Africa (Morocco and Algeria) and the islands of Cyprus, Corsica and Sicily.

Lasioglossum transitorium (Schenck, 1868)

Determined as *Halictus transitorius* (Schenck, 1868) *planulus* (Pérez, 1903) by Alfken (1929)

Previous Reports: Alfken (1929); Kuhlmann *et al.* (2015)

Specimens Examined: 1♀, Għar Lapsi (Siggiewi), 5-v-2014, MV Balzan

Distribution: The subspecies *L. transitorium planulum* is recorded from the Western Mediterranean, including the islands of Corsica and Sicily.

Lasioglossum callizonium (Pérez, 1896)

Specimens Examined: 1♂, Għammieri (Hal Qormi), 9-vii-2014, MV Balzan

Distribution: Western Mediterranean Basin, Corsica, Sardinia, Sicily, Egypt, Israel and Saudi Arabia.

Nomioides facilis (Smith, 1853)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Morocco, Algeria, Tunisia, Southern Europe, and Sicily.

Nomiapis bispinosa (Brullé, 1832)

Determined as *Pseudapis unidentata* (Olivier, 1812) but this is synonymised with *N. bispinosa* (Baker 2002).

Previous Reports: Schembri (1982)

Distribution: Mediterranean basin, Hungary, southern Russia. In Asia it occurs from Turkey to Pakistan.

Seladonia gemmea (Dours, 1872)

Determined as *Halictus gemmeus* (Dours, 1872).

Previous Reports: Valletta (1971)

Specimens Examined: 1♀, Għar Lapsi (Siggiewi), 5-v-2014, MV Balzan; 17♀, 1♂, Delimara (Marsaxlokk), 26-v-2014, MV Balzan; 1♀, Għammieri (Hal Qormi), MV Balzan; 23-vi-2014; 1♀, 1♂, Għammieri (Hal Qormi), 9-vii-2014, MV Balzan; 2♂, Għammieri (Hal Qormi), 11-viii-2014, MV Balzan;

Distribution: West Mediterranean, Corsica, Greece, Turkey and Syria.

Seladonia smaragdula (Vachal, 1895)

Specimens Examined: 2♀, 1♂, Delimara (Marsaxlokk), 26-v-2014, MV Balzan; 3♀, 2♂, Għammieri (Hal Qormi), MV Balzan; 23-vi-2014; 1♀, 1♂, Għammieri (Hal Qormi), 25-vii-2014, MV Balzan;

Distribution: The subspecies *S. smaragdula vinula* (Blüthgen, 1923) is recorded from Malta and Sicily.

Megachilidae

Anthidium florentinum (Fabricius 1775)

Determined as *Anthidium florentina* in Valletta (1979).

Previous Reports: Valletta (1979); Schembri (1982)

Specimens Examined: 1♂, Wied il-Ghasel, 08-vi-1969, C De Lucca [NMNH]; 1♀, 1♂, Wied il-Ghasel, 16-vi-1969, C De Lucca [NMNH]; 1♀, Wied il-Ghasel, 08-iv-1977, CJ Aquilina [NMNH]; 2♂, Fawwara, 15-v-1988, P Sammut [NMNH]; 1♂, Fiddien, 23-v-2014, P Portelli [NMNH]; 1♂ [NMNH]

Distribution: Continental Europe, Algeria, Middle East and the islands of Cyprus, Sardinia and Sicily.

Anthidium manicatum (L., 1758)

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982)

Specimens Examined: 1♂, Wied il-Ghasel, 08-vi-1969, C De Lucca [NMNH]; 1♀, 1♂, Wied il-Ghasel, 12-vi-1969, C De Lucca [NMNH]; 3♂, Wied il-Ghasel, 16-vi-1969, C De Lucca [NMNH]; 1♀ [NMNH]

Distribution: Continental Europe, North Africa, Middle East and the islands of Sardinia and Sicily.

Anthidiellum strigatum (Panzer, 1805)

Determined as *Anthidellum striuatum* (Latreille, 1802).

Previous Reports: Schembri (1982)

Distribution: Continental Europe, Maghreb, Middle East and the islands of Cyprus and Sicily.

Heriades crenulata (Nylander, 1856)

Previous Reports: Schembri (1982); Ungricht *et al.* (2008); Kuhlmann *et al.* (2015)

Specimens Examined: 1♀, 2♂, Għammieri (Hal Qormi), 23-vi-2014, MV Balzan; 1♀, Għammieri (Hal Qormi), 9-vii-2014, MV Balzan; 1♂, Għammieri (Hal Qormi), 11-viii-2014, MV Balzan;

Distribution: Continental Europe, Maghreb, Western Asia, Sardinia and Sicily.

Heriades rubicola (Pérez, 1890)

Previous Reports: Ungricht *et al.* (2008); Kuhlmann *et al.* (2015)

Distribution: Southern Europe, Maghreb, Western Asia, Corsica, Cyprus, Sardinia and Sicily.

Heriades punctulifera (Schletterer, 1889)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Eastern Mediterranean Basin, Italy, the islands of Cyprus and Sicily.

Lithurgus tibialis (Morawitz, 1875)

Previous Reports: Schembri (1982);

Distribution: Southern Europe, Turkey, Israel and Cyprus.

Megachile sicula (Rossi, 1792)

Determined as *Chalicodoma sicula* (Rossi, 1792).

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982)

Specimens Examined: 2♀, Buskett, 7-iii-1976, P Sammut; 1♀, Buskett, 11-iv-1976, P Sammut; 2♀, Ċirkewwa, 15-iv-1976, P Sammut; 1♀, Buskett, 14-iv-1976, P Sammut; 4♀, 2♂, Rabat, 15-iv-1988, P Sammut; 1♀, Fawwara, 15-v-1988, P Sammut; 1♀, Qattara (Gozo), 13-v-2014, P Portelli;); 1♂ [NMNH]

Distribution: Mediterranean Basin

Megachile fertoni (Pérez, 1896)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Southern Europe, Tunisia, Turkey, the islands of Sardinia and Sicily.

Megachile schmiedeknechti (Costa, 1884)

Determined as *Megachile xanthopyga* (Pérez, 1895) in Valletta (1971) but this is synonymised with *M. schmiedeknechti* (Schembri 1982).

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982)

Specimens Examined: 3♀, Ċirkewwa, 16-vi-1976, P Sammut; 1♀, Fawwara, 11-v-1988, P Sammut; 1♀, 1♂, Għar Dalam, 11-viii-2014, P Portelli

Distribution: France, Italy, Corsica, Sardinia.

Osmia rufohirta (Latreille 1811)

Previous Reports: Alfken (1929)

Distribution: Continental Europe, Northwestern Africa, Corsica, Sardinia and Sicily.

Osmia caeruleascens (Linnaeus, 1758)

Previous Reports: Schembri (1982); Kuhlmann *et al.* (2015)

Distribution: Continental Europe and Ireland, Northern Africa, Middle East and the islands of Cyprus, Corsica, Sardinia and Sicily.

Osmia frieseana (Ducke, 1899)

Previous Reports: Ungricht *et al.* (2008); Kuhlmann *et al.* (2015)

Distribution: Northern Africa, Italy, Spain and Sardinia.

Osmia latreillei (Spinola, 1806)

Previous Reports: Alfken (1929); Valletta (1971); Schembri (1982); Ungricht *et al.* (2008); Kuhlmann *et al.* (2015)

Distribution: Mediterranean Basin, Switzerland and Germany, and the islands of Cyprus, Corsica, Sardinia and Sicily.

Osmia notata (Fabricius, 1804)

Determined as *Osmia iosignata* (Radoszkowski, 1874) by Valletta (1971) but this is synonymised with *O. notata* (Schembri 1982).

Previous Reports: Valletta (1971); Schembri (1982); Ungricht *et al.* (2008); Kuhlmann *et al.* (2015)

Distribution: Western Mediterranean Basin, Northern Africa, the islands of Corsica, Sardinia and Sicily.

Osmia tunensis (Fabricius, 1787)

Previous Reports: Kuhlmann *et al.* (2015)

Distribution: Northern Africa, Portugal, Spain, Italy and Sicily.

Osmia kohlii (Ducke, 1899)

Determined as *Osmia rufa kohlii* (Ducke, 1899) in Valletta (1971).

Previous Reports: Valletta (1971); Schembri (1982); Kuhlmann *et al.* (2015)

Specimens Examined: 1♀, 1♂, Hal Għaxaq, 15-iv-2014, MV Balzan; 1♂, Wied l-Aħmar (Comino), 13-v-2014, P Portelli; 1♂ [NMNH]

Distribution: Southern Italy and Sicily.

Osmia ferruginea (Latreille, 1811)

Previous Reports: Schembri (1982); Ungricht *et al.* (2008); Kuhlmann *et al.* (2015)

Distribution: Western Mediterranean Basin, Northern Africa, Middle East (Israel, Jordan, Syria), Greece, Cyprus, Corsica, Sardinia and Sicily.

Osmia submicans (Morawitz, 1870)

Previous Reports: Valletta (1971); Schembri (1982); Ungricht *et al.* (2008); Kuhlmann *et al.* (2015)

Distribution: Northern Africa, Continental Europe, Middle East (Israel, Jordan, Lebanon, Syria, Turkey) and the islands of Cyprus, Corsica, Sardinia and Sicily.

Rhodanthidium septemdentatum (Latreille 1809)

Determined as *Anthidium septemdentatum* (Latreille, 1809) in Valletta (1971).

Previous Reports: Valletta (1971); Schembri (1982)

Distribution: Southern Europe.

Rhodanthidium siculum (Spinola, 1838)

Determined as *Anthidium fontanesii* (Lepelletier, 1841) by Valletta (1971) and *Anthidium siculum* (Spinola, 1838) by Schembri (1982) but these are synonymised with *R. siculum*.

Previous Reports: Valletta (1971); Schembri (1982)

Specimens examined: 1♂, Addolorata, ?/07/1948, collector? [NMNH]; 1♂ NMNH]

Distribution: Western Mediterranean Basin, including Sicily.

Dubious records

The following species records are considered as dubious.

Halictidae

Lasioglossum* aff. *nitidiusculus (Kirby, 1802)

Determined as *Halictus* aff. *nitidiusculus* (Kirby, 1802) in Valletta (1971).

Previous Reports: Valletta (1971)

Distribution: Continental Europe, Ireland, North Africa (Morocco and Algeria) Sicily and Sardinia.

This species is recorded from the South of Europe and Northern Africa at altitudes above 1000m (Pauly, 2011) and may have been confounded with the closely related species *L. transitorium*.

Megachilidae

Osmia* (*Osmia*) *tricornis (Latreille 1811)

Previous Reports: Alfken (1929)

Distribution: West Mediterranean Basin, Corsica, and Sardinia.

Osmia tricornis has often been confounded with closely related *O. kohlii*, which occurs in Malta and Sicily. However, these two species show an allopatric distribution (Müller, 2015).

Megachile argentata (Fabricius, 1793)

Previous Reports: Valletta (1971)

Distribution: Algeria, Hungary

The species *M. argentata* has often been confounded with *Megachile leachella* (Curtis, 1828) (Schwarz and Gusenleitner 2011), but the latter has not been recorded from the Maltese Islands. *M. leachella* is present in Continental Europe and North Africa.

Discussion

In general, the Mediterranean region and islands harbour a relatively high diversity and endemism for bee taxa. This is partly explained by the likely role of Mediterranean areas as refuges during Quaternary glaciations (Nieto *et al.* 2014). A comparison of the bee diversity of islands within the region shows that bee diversity is a function of the island surface area, and bee richness is higher in larger islands (Figure 2). However, these observations are likely to be influenced by the differences in the sampling intensity in different islands. For example, 13 bee species are recorded from Menorca but this is only based on a very limited sampling effort, while a total of 175 bee species were recorded from Mallorca from a cohort of around 1200 specimens (Baldock, 2014).

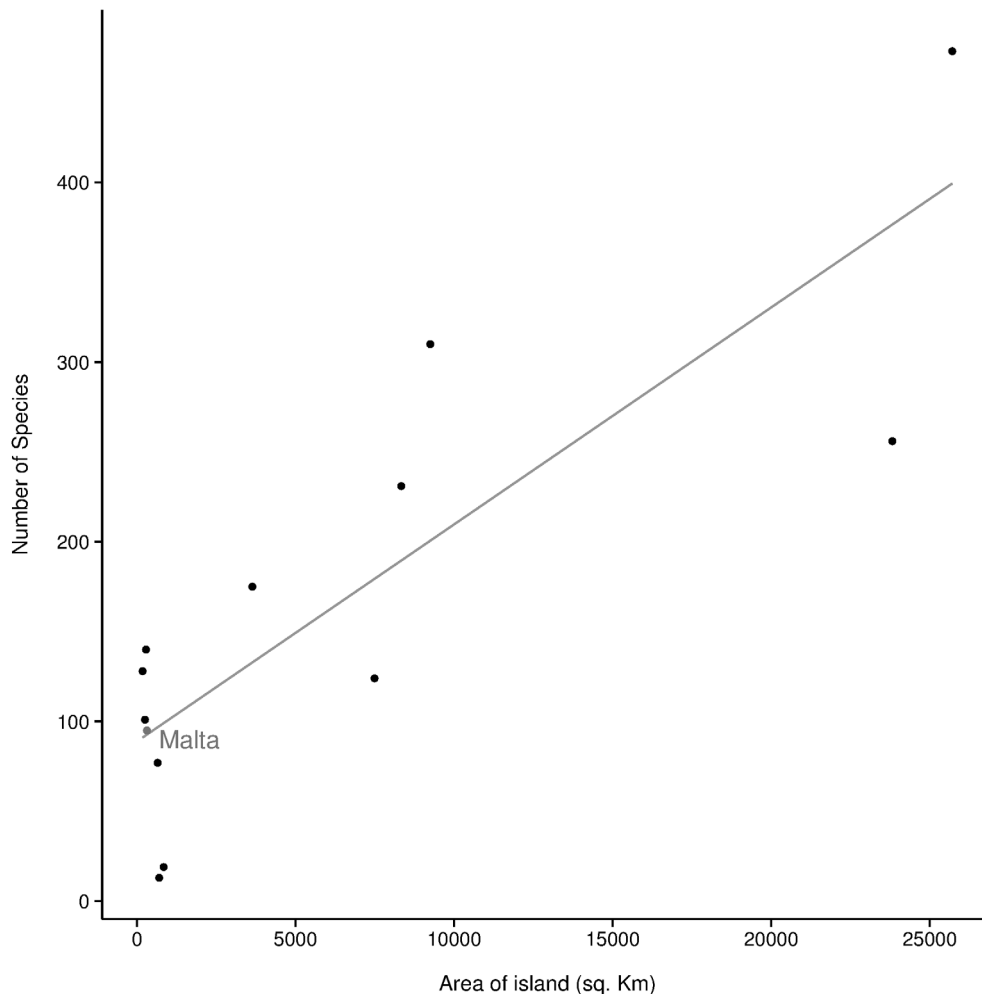


FIGURE 2. Diversity of bee fauna in Mediterranean islands as a function of island area. The point for bee species richness in Malta is shown in grey (data sources are shown in Table 2).

The recorded bee fauna of the Maltese Islands is dominated by widespread Palearctic species (70.5%), that is species recorded from Europe, Northern Africa and the Western and Eastern Mediterranean Basin (Table 1). Most of the bees recorded from the Maltese Islands are also distributed in the Western Mediterranean Basin (96.8%), and in particular in the South of Europe (99.0%). As expected, given the central position of the Maltese Islands in the Mediterranean region, a number of species are Eastern Mediterranean faunal elements (82.11%). In this study only *H. punctulifera* has a predominantly Eastern Mediterranean distribution, but is also recorded from the Italian mainland and Sicily (Ascher & Pickering 2015; Kuhlmann *et al.* 2015). Similar to previous observations for other invertebrate groups (Thake 1985; Hunt & Schembri 1999; Schembri 2003), the bee fauna of Malta also shows a relatively strong resemblance to that of neighbouring Sicily (83.2%). The mason bee *O. kohlii* and the subspecies *S. smaragdula vinula* are recorded from Malta and Sicily. Nearly all the bees recorded from Malta are known from Southern Europe, indicating that Quaternary marine regression events connecting the islands to Southern Europe are likely to have resulted in colonisation of the islands by bee species. A number of bee species, such as *A. retusa*, *C. gravidula*, *E. longicornis*, *H. zonatula*, *H. punctatus*, *L. tibialis* and *R. septemdentatum* are found in Southern Europe but have not been recorded from North Africa. On the other hand, some species such as *A. savignyi*, *A. cyanomicans*, *O. notata* and *O. friesana*, have a North African affinity but these are also recorded in few northern outposts in Southern Europe. The Maltese subspecies of honey bee *A. mellifera ruttneri* shows a closer relationship to the North African honey bee subspecies than to European subspecies (Sheppard *et al.* 1997). Similarly, for other terrestrial invertebrate groups, including Lepidoptera, Formicidae (Schembri 2003) and Curculionioidea (Mifsud and Colonnelli, 2010), a significant proportion of the recorded species recorded from the Maltese Islands have a North African affinity.

TABLE 1. The distribution of the bees recorded from the Maltese Islands. Source: Ascher & Pickering (2015); Rasmont & Haubruge (2015); and Kuhlmann *et al.* (2015).

Bee species	Northern Africa	Southern Europe	Western Mediterranean ^a	Eastern Mediterranean ^b	Sicily
<i>Andrena agilissima</i>	x	x	x		x
<i>Andrena miegiella</i>	x	x	x	x	x
<i>Andrena aff. leucophaea</i>	x	x	x		x
<i>Andrena binominata</i>	x	x	x		x
<i>Andrena nigroolivacea</i>	x	x	x		x
<i>Andrena bicolor</i>	x	x	x	x	x
<i>Andrena impunctata</i>	x	x	x	x	x
<i>Andrena decipiens</i>	x	x	x	x	x
<i>Andrena bimaculata</i>	x	x	x	x	x
<i>Andrena carbonaria</i>	x	x	x	x	x
<i>Andrena tibialis</i>		x	x	x	
<i>Andrena morio</i>	x	x	x	x	x
<i>Andrena nigroaenea</i>	x	x	x	x	x
<i>Andrena savignyi</i>	x	x	x	x	
<i>Andrena cyanomicans</i>	x	x	x	x	
<i>Andrena flavipes</i>	x	x	x	x	x
<i>Panurgus siculus</i>		x	x		x
<i>Amegilla quadrifasciata</i>	x	x	x	x	x
<i>Amegilla albigena</i>	x	x	x	x	x
<i>Ammobatoides luctuosus</i>		x	x	x	
<i>Anthophora dispar</i>	x	x	x	x	x
<i>Anthophora plagiata</i>	x	x	x	x	x
<i>Anthophora plumipes</i>	x	x	x	x	x
<i>Anthophora retusa</i>		x	x	x	x
<i>Anthophora canescens</i>	x	x	x	x	x
<i>Apis mellifera</i>	x	x	x	x	x
<i>Bombus terrestris</i>	x	x	x	x	x
<i>Ceratina cyanea</i>	x	x	x	x	x
<i>Ceratina dallatorreana</i>	x	x	x	x	x
<i>Ceratina gravidula</i>		x	x	x	
<i>Dioxys cincta</i>	x	x	x	x	x
<i>Eucera algira</i>	x	x	x	x	x
<i>Eucera eucnemidea</i>	x	x	x		x
<i>Eucera longicornis</i>		x	x	x	x
<i>Eucera numida</i>	x	x	x		x
<i>Eucera oraniensis</i>	x	x	x		x
<i>Eucera rufa</i>	x	x	x	x	x
<i>Habropoda zonatula</i>		x	x	x	x
<i>Melecta albifrons</i>	x	x	x	x	x
<i>Melecta duodecimmaculata</i>	x	x	x	x	
<i>Melecta leucorhyncha</i>	x	x	x	x	x

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TABLE 1. (Continued)

Bee species	Northern Africa	Southern Europe	Western Mediterranean	Eastern Mediterranean	Sicily
<i>Melecta luctuosa</i>	x	x	x	x	x
<i>Nomada bifasciata</i>	x	x	x	x	x
<i>Nomada distinguenda</i>	x	x	x	x	x
<i>Nomada fulvicornis</i>	x	x	x	x	x
<i>Nomada kohli</i>	x	x	x	x	x
<i>Nomada rufa</i>		x			x
<i>Nomada stigma</i>	x	x	x	x	x
<i>Thyreus histrionicus</i>	x	x	x	x	x
<i>Thyreus ramosus</i>	x	x	x	x	x
<i>Xylocopa violacea</i>	x	x	x	x	x
<i>Hylaeus imparilis</i>	x	x	x	x	x
<i>Hylaeus clypearis</i>	x	x	x	x	x
<i>Hylaeus taeniolatus</i>	x	x	x	x	x
<i>Hylaeus signatus</i>	x	x	x	x	
<i>Hylaeus hyperpunctatus</i>		x	x	x	x
<i>Hylaeus punctatus</i>		x	x	x	x
<i>Ceylalictus variegatus</i>	x	x	x	x	x
<i>Halictus brunnescens</i>	x	x	x	x	
<i>Halictus fulvipes</i>	x	x	x		x
<i>Halictus rubicundus</i>	x	x	x	x	x
<i>Halictus scabiosae</i>	x	x	x	x	x
<i>Lasioglossum malachurum</i>	x	x	x	x	x
<i>Lasioglossum minutissimum</i>	x	x	x	x	x
<i>Lasioglossum limbellum</i>	x	x	x	x	x
<i>Lasioglossum transitorium</i>	x	x	x	x	x
<i>Lasioglossum callizonium</i>	x	x	x	x	
<i>Nomioides facilis</i>	x	x	x	x	x
<i>Nomiapis bispinosa</i>	x	x	x	x	
<i>Seladonia gemmea</i>	x	x	x		x
<i>Seladonia smaragdula</i>	x	x	x	x	x
<i>Anthidium florentinum</i>	x	x	x	x	x
<i>Anthidium manicatum</i>	x	x	x	x	x
<i>Anthidiellum strigatum</i>	x	x	x	x	x
<i>Heriades crenulata</i>	x	x	x	x	x
<i>Heriades rubicola</i>	x	x	x	x	x
<i>Heriades punctulifera</i>		x		x	x
<i>Lithurgus tibialis</i>		x	x	x	
<i>Megachile sicula</i>	x	x	x	x	x
<i>Megachile fertoni</i>	x	x	x	x	x
<i>Megachile schmiedeknechti</i>	x	x	x		
<i>Osmia rufohirta</i>	x	x	x	x	x

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TABLE 1. (Continued)

Bee species	Northern Africa	Southern Europe	Western Mediterranean	Eastern Mediterranean	Sicily
<i>Osmia caerulea</i>	x	x	x	x	x
<i>Osmia frieseana</i>	x	x	x		
<i>Osmia latreillei</i>	x	x	x	x	x
<i>Osmia notata</i>	x	x	x	x	x
<i>Osmia tunensis</i>	x	x	x	x	x
<i>Osmia kohlii</i>	x	x	x		
<i>Osmia ferruginea</i>	x	x	x	x	x
<i>Osmia submicans</i>	x	x	x	x	x
<i>Rhodanthidium septemdentatum</i>		x	x	x	x
<i>Rhodanthidium siculum</i>	x	x	x		x
Dubious previous records					
<i>Lasioglossum</i> aff. <i>nitidiusculum</i>	x	x	x	x	x
<i>Osmia tricornis</i>	x	x	x		
<i>Megachile argentata</i>	x				
Total	82	94	92	78	79

a. Western Mediterranean countries include Italy, France, Iberian Peninsula, Morocco, Algeria, Tunisia.

b. Eastern Mediterranean countries include Slovenia, Croatia, Bosnia and Herzegovina, Albania, Greece, Turkey, Lebanon, Jordan, Israel, Egypt and Libya.

TABLE 2. Number of bee species in islands of the Mediterranean and West Palaearctic Region.

Island/Archipelago	Number of species	Area (Km ²)	Reference
Malta	95	316	
Sicily	473	25711	Comba and Comba (2006)
Sardinia	256	23821	Comba and Comba (2006)
Canary Islands	124	7493	Hohmann <i>et al.</i> (1993); Smit (2007)
Ibiza and Formentera	77	654.24	Baldock (2014)
Menora	13	702	Baldock (2014)
Mallorca	175	3640	Baldock (2014)
Madeira and Porto Santo	19	843.17	Fellendorf <i>et al.</i> (1999)
Cyprus	310	9250	Ascher & Pickering (2015)
Crete	231	8336	Ascher & Pickering (2015)
Kos	140	287.2	Petanidou (personal communication)
Icaria	101	254.4	Petanidou (personal communication)
Samothraki	128	178	Petanidou (personal communication)

Data relating to population sizes and trends, distribution and conservation of the bee fauna in the Maltese Islands is limited. The high human population density, a strong tourism sector, and associated urban sprawl and infrastructural developments, together with the long history of agricultural activities on the Islands, including the more recent intensification associated with increased mechanisation and agrochemical use, would be expected to pose significant threats to the conservation of bees of the Maltese Islands. The combined stress from parasites, pesticides, and lack of flowers has been shown to drive honey bee colony losses and declines of wild pollinators in continental Europe (Goulson *et al.* 2015). Concurrently, bees deliver important crop and wild plant pollination services. A total of 15% of the total crop economic value of the Maltese agricultural production of fruit and

vegetables, used for human consumption, depends on pollination services (Balzan, unpublished data). The loss of bee diversity from the Maltese Islands is likely to have negative consequences for agriculture and also for the maintenance of plant diversity associated with the Maltese Islands' cultural landscapes. The development of a research and monitoring program to develop a clear understanding of the population trends, and the taxonomy and the ecology of the species recorded, is critical for an effective conservation and management of the bee diversity and the wider benefits associated with pollination ecosystem services (Nieto *et al.* 2014).

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