

The Pselaphinae (Coleoptera, Staphylinidae) of the Maltese Archipelago

Giorgio SABELLA¹ & David MIFSUD²

ABSTRACT: Fourteen pselaphines are recorded from the Maltese Islands three of which are recorded for the first time: *Rybaxis longicornis*, *Tychus jacquelinii*, and *T. pici*. *Tychus pici*, a North African species that is so far known only from Algeria and Tunisia, is here recorded for the first time for the European territory. Locality and collecting data that were lacking for three other species recorded from Malta in the recently published catalogue of Palaearctic Coleoptera, is also provided. The record of *Euplectus brunneus* is incorrect and most likely should refer to *E. corsicus*. An illustrated dichotomous key is included to facilitate identification of Maltese pselaphines.

KEY WORDS: Malta, Gozo, new records, dichotomous key.

INTRODUCTION

This insect group, commonly referred to as ant-like litter beetles, has maintained a family status since the early 1800's, but some 20 years ago it was placed as a subfamily within the Staphylinidae (NEWTON & THAYER, 1995). The group is currently represented by just over 10,000 described species worldwide, whereas the Palaearctic fauna is represented by 243 genera and more than 2,000 species (SCHÜLKE & SMETANA, 2015).

Adult and larval stages of pselaphines are predatory, feeding on small invertebrates such as mites, springtails, worms, and symphylans. Immature stages are poorly known. Adults are typically associated with leaf litter and woody debris of forests, and while their greatest species diversity and richness is reached in forest type habitats, species can be found in all types of wetland, grassland, desert oasis, coastal, cave, and arboreal habitats. As long as organic debris, moss, root mats, or seepage through rocks maintain a zone of high humidity where prey exists, pselaphine species may be found. All members of one subtribe, the Clavigeritae, are believed to be obligate myrmecophiles. These species feed on living or dead larvae of the host ants, and may also be fed by trophallaxis (CHANDLER, 2001).

The first citation of pselaphine species from Malta was made by BAUDI (1889), who recorded *Brachygluta hipponensis* (Saulcy, 1876). POGGI (1980), besides confirming the identity of this material, mentioned also the presence of *Brachygluta perforata* (Aubé, 1833) from Malta on the basis of the signed catalogue of Baudi's collection. CAMERON & CARUANA GATTO (1907) recorded four species of pselaphines from the Maltese Islands. Of these, one species, *Euplectus brunneus* (Grimmer, 1841) was collected by James John Walker between 1874 and 1876. POGGI (1980) reviewed earlier citations and recorded a total of eight species. After almost 20 years, POGGI (1999) described an endemic species, *Amaurops mifsudi* from material collected in Malta. In the Catalogue

¹ Dipartimento di Scienze Biologiche, Geologiche ed Ambientali, Università di Catania, Italy. E-mail: sabellag@unict.it

² Institute of Earth Systems, Division of Rural Sciences and Food Technology, University of Malta, Msida MSD 2010, Malta. E-mail: david.a.mifsud@um.edu.mt

of Palaearctic Coleoptera (LÖBL & BESUCHET, 2004) all previous records of pselaphines recorded from Malta were cited again as occurring in the aforementioned territory, and three further records were reported based on museum material collected from Malta and housed at the Natural History Museum of Geneva in Switzerland.

The current work is intended to: (i) collate all information available to-date on the pselaphines recorded from the Maltese Islands, (ii) record three additional species new for the Maltese pselaphine fauna of which one represents a new record for the European territory; (iii) provide habitus photographs or drawings of all genera represented and provide drawings of male genitalia for the new records; (iv) provide collecting data for all species when available; (v) provide global distributions; (vi) provide mapped distributions for the Maltese archipelago, and (vii) provide an illustrated dichotomous key to facilitate species identification.

MATERIAL AND METHODS

Pselaphines were collected using various methods such as careful examination under stones or under bark, processing of leaf litter or rotten wood samples with a Berlese/Tullgren funnel apparatus, flotation method for endogean species, and use of UV light traps. Adults were either killed in 75% alcohol or in ethyle acetate vapour. Specimens were then dry-mounted on cards. About 40 dry-mounted historical specimens of pselaphines used by CAMERON & CARUANA (1907) for their pselaphine list in the coleoptera catalogue for Malta, were available for the present study. In these last 40 years pselaphines were collected from 22 localities in Malta and 6 in Gozo (Fig. 1). Table 1 provides a brief description of the habitat type in each of these locations and figures 17-28 provide the mapped distribution of all pselaphines recorded from the Maltese Islands. These maps are based on published records and material examined during the present study. No maps were included for *Brachygluta perforata* and *Euplectus corsicus* Guillebeau, 1888 as these published records were based on historical specimens with no further collecting data other than 'Malta'. The general distribution of the species is given according to POGGI & SABELLA (2005) and SCHÜLKE & SMETANA (2015).

The initials of those who collected material are given in parentheses as follows: Antonio Alicata (AA); Charles Farrugia (CF); David Mifsud (DM); Giorgio Sabella (GS); Henry Borg Barthet (HBB); James L. Schembri (JLS); Paul Sammut (PM); Rosario Grasso (RG); Rudolf Schuh (RS); Stephen P. Schembri (SPS), and Volker Mahnert (VM). The material is housed in the following private collections and public institutions: BMNH – The Natural History Museum, London, UK; CDM – private collection D. Mifsud, Malta; CSS – private collection S. Schembri, Malta; DBUC – Dipartimento di Scienze Biologiche, Geologiche ed Ambientali, Università di Catania, Italy; MHNG – Museum d'Histoire Naturelle Genève, Switzerland; MSNG – Museo di Storia Naturale di Genova, Italy; NHMB – Naturhistorisches Museum Basel, Switzerland; NMNH – National Museum of Natural History, Mdina, Malta.

Habitus photographs were produced for representative species of all genera of pselaphines recorded from the Maltese Islands. This was done using a Leica M60 dissecting microscope and using the multi-focus Leica software, different photographs of one specimen were combined into a single fully focused image. For *Amaurops mifsudi* a habitus drawing was instead provided. For the new records published in the present study and for those cited in the Palaearctic Coleoptera Catalogue (LÖBL & BESUCHET, 2004) we also provide drawings of the male genitalia when males were available.

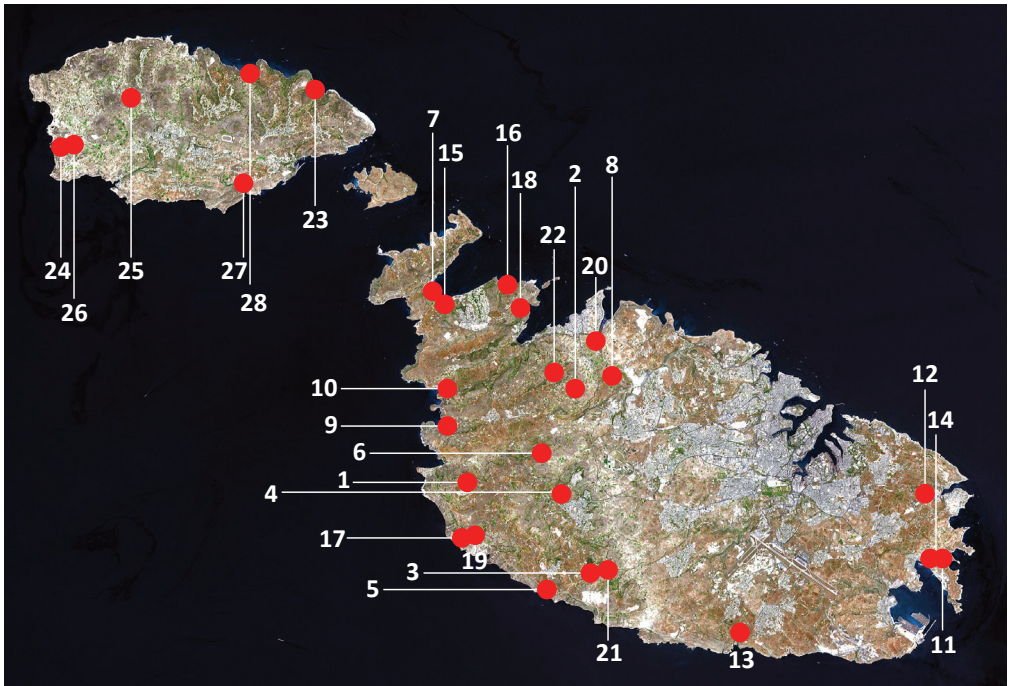


Figure 1: Map of the Maltese Islands indicating locality numbers (see table 1) from where pselaphines were collected or recorded.

Table 1: Brief description of habitat types for localities in Malta and Gozo from where pselaphines were collected or recorded.

Localities in Malta	Habitat type
Bahrija (1)	Permanent freshwater valley system.
Bidnija (2)	Open fields dominated by old trees of <i>Olea europaea</i> .
Buskett (3)	Wooded area dominated by <i>Pinus halepensis</i> , some <i>Quercus ilex</i> and high maqui trees such as <i>Olea</i> , <i>Pistacia</i> , <i>Ceratonia</i> , <i>Ulmus</i> and <i>Populus</i> .
Chadwick Lakes (4)	A semi-permanent water course surrounded by agricultural fields.
Dingli Cliffs (5)	Coastal cliffs.
Dwejra (6)	Agricultural fields.
Ghadira (7)	Saltmarsh surrounded by coastal sand-dunes.
Għajn Rihana (8)	Semi-permanent water course surrounded by agricultural fields.
Gnejna (9)	Coastal sand-dune.
Golden Bay (10)	Coastal sand-dune.
Il-Ballut in Marsaxlokk (11)	A degraded saltmarsh.
Il-Magħluq in Marsaskala (12)	A heavily degraded saltmarsh.

Maqluba in Qrendi (13)	A natural depression (doline) with several high maquis trees.
Marsaxlokk (14)	Coastal fisherman's village.
Mellieħa (15)	Coastal area dominated by coastal dunes.
Mgiebah (16)	Coastal area dominated by clay substratum.
Migra Ferħa (17)	Coastal cliffs.
Mistra Bay (18)	Coastal area surrounded by agricultural fields.
Mtahleb (19)	Agricultural fields.
Salina (20)	A degraded saltmarsh which was used for sea-salt production.
Wied il-Luq in Buskett (21)	Semi-permanent water course in the wooded area of Buskett.
Wied Qannotta (22)	Semi-permanent water course surrounded by agricultural fields.
Localities in Gozo	
Dahlet Qorrot (23)	Semi-permanent valley dominated by old <i>Tamarix</i> trees and close to the coast.
Dwejra (24)	A coastal area dominated by garigue habitats.
Għasri (25)	Agricultural fields.
Il-Qattara in Dwejra (26)	Permanent freshwater pool close to coastal area.
Mgarr ix-Xini (27)	A deep valley system close to coastal area.
Ramla (28)	Coastal sand dune system.

Species names of pselaphines in the following annotated species list are arranged in alphabetical order, whereas Appendix I provides a check-list of the Maltese pselaphines following the classification scheme of LÖBL & BESUCHET (2004) and BOUCHARD *et al.* (2011).

ANNOTATED SPECIES LIST

Amaurops mifsudi Poggi, 1999

(Figs. 2 & 17)

Material examined: Malta, Buskett, 3.xii.1997, 1 ♂ (holotype), DM (MSNG), 27.xi.1997, 2 ♀♀ (paratypes), DM (MSNG, CDM), 3.xii.1997, 1 ♂ (paratype), DM (MSNG); Il-Maqluba (Qrendi), 19.i.1996, 2 ♂♂ (paratypes), DM (NHMB, CDM), 27.i.1996, remains of 1 ♀ (paratype), DM (MSNG); Buskett, Wied il-Luq, 150 m, 29.xi.1997, 1 ♂, under stones, GS & AA (DBUC). Gozo, Mgarr ix-Xini, 100 m, 29.xi.1997, 2 ♀♀, GS & AA (DBUC).

Comments: *Amaurops mifsudi* was so far known only from the island of Malta (POGGI, 1999) but is here recorded also from the nearby island of Gozo. The type material was collected following the methodology outlined by PACE (1984), whereas the other material was collected under large stones following heavy rainfall. The genus is endemic to Sicily and the Maltese Islands.

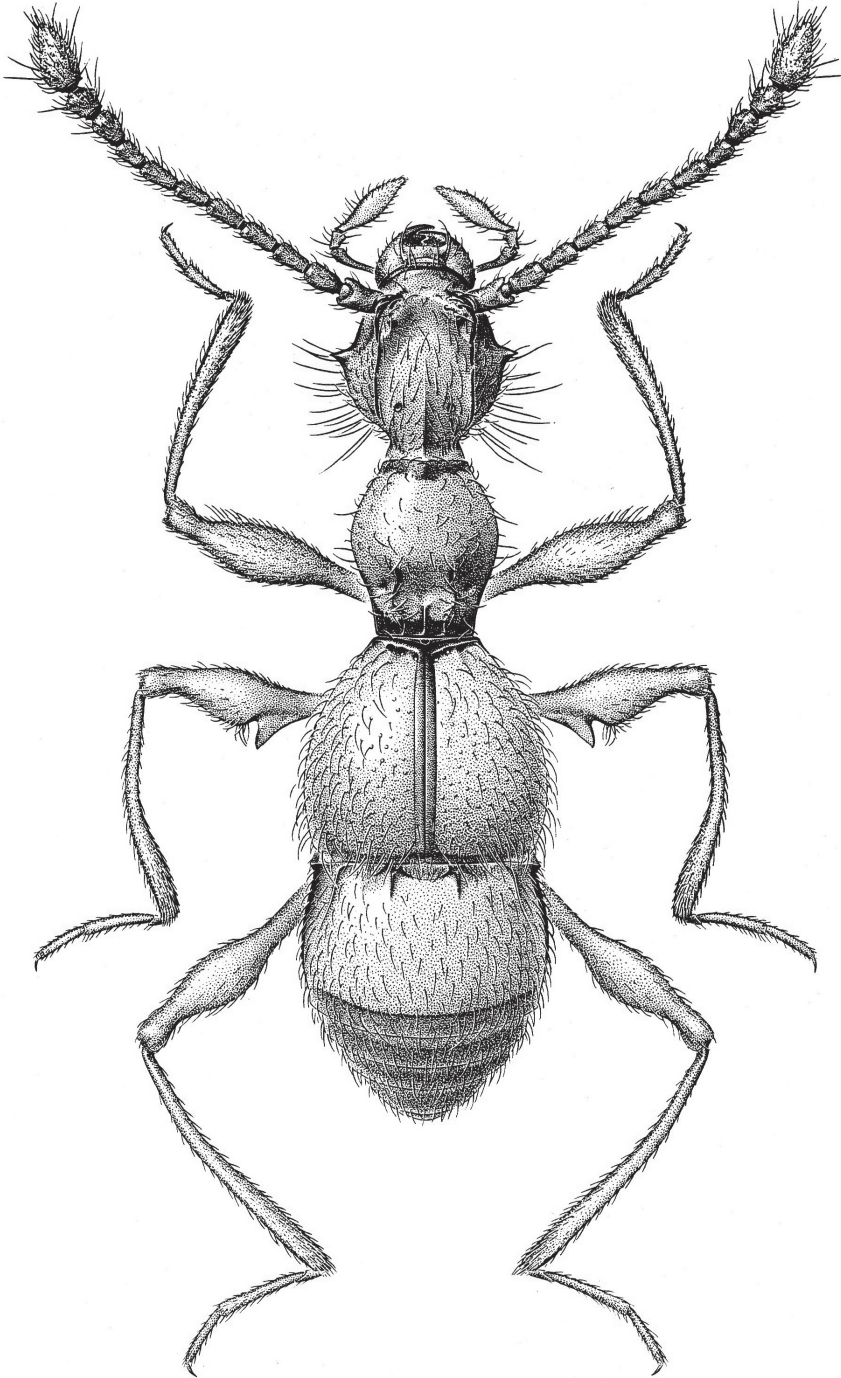
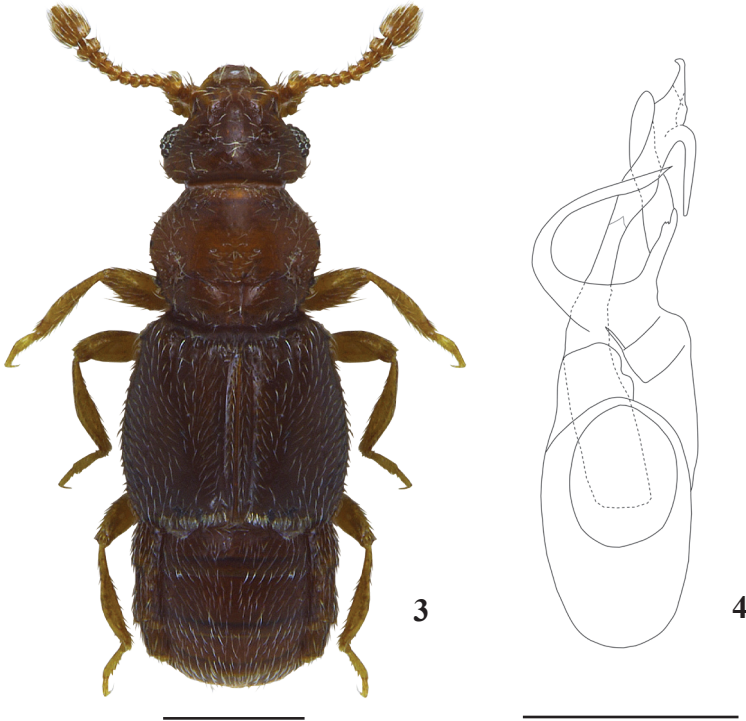


Figure 2: *Amaurops mifsudi* – habitus drawing. Scale bar = 1 mm

Biblopectus (Biblopectus) limatus Normand, 1939

(Figs. 3, 4 & 18)

Material examined: Malta, Chadwick Lakes, 6.v.1974, 1 ♂, under stone, VM (MHNG); Buskett, Wied il-Luq, 100 m, 29.xi.1997, 1 ♀, GS & AA (DBUC).



Figures 3–4: *Biblopectus limatus*. 3: Habitus photograph; 4: Male genitalia, dorsal view, of the specimen from Chadwick Lakes. Scale bar for figure 3 = 0.2 mm and for figure 4 = 0.1 mm.

Comments: This species was recorded from Malta by LÖBL & BESUCHET (2004) on the basis of the male specimen cited above. The male genitalia of this specimen are shown in figure 4. Female specimens of this genus are difficult to identify to species level, but we are of the opinion that the female from Wied il-Luq could be attributed to this species. *Biblopectus limatus* is known from Spain, southern France including Corsica, Italy (including Sardinia and Sicily), Malta, Greece, European Turkey, Algeria and Morocco.

Brachygluta (Brachygluta) aubei (Tournier, 1868)

(Figs. 5 & 19)

Material examined: Malta, 1901, 2 ♂♂ & 3 ♀♀, M. Cameron Coll. B.M. 1936-555 (BMNH, CDM); 1 ♀, E. Reitter (MHNG); 1 ♀, J. Clermont (MHNG); Marsaxlokk, Il-Ballut, 28.iv.1990 /6.v.1990/14.v.1994/12.i.1999/15.viii.2003, 5 ♂♂ & 5 ♀♀, DM (CDM, MSNG); Marsaskala, Il-Magħluq, 7.v.1990/1.vi.1990/14.xi.1993, 9 ♂♂ & 2 ♀♀, DM (CDM, MSNG).



Figure 5: *Brachygluta aubei* – habitus photograph. Scale bar = 0.2 mm

Comments: CAMERON & CARUANA GATTO (1907) recorded this species as *Bryaxis globulicollis* Mulsant & Rey, 1861. Material of this species was reported from two localities in Malta, namely Salina and Marsaskala (Malta) (CAMERON & CARUANA GATTO, 1907; POGGI, 1980). *Brachygluta aubei* is known to occur in Portugal, Spain, France (Atlantic coast), Italy (only in Reggio Calabria, Sicily, Sardinia and Pantelleria), Malta, Algeria, Morocco and Tunisia.

***Brachygluta (Brachygluta) dentiventris* (Saulcy, 1876)**
(Figs. 6 & 20)

Material examined: Malta, x.1901, 7 ♂♂ & 10 ♀♀, M.C. [Malcom Cameron], G. Bryant Coll., B.M. 1926-86 (BMNH); 1 ♂ & 1 ♀ (MHNG); Chadwick Lakes, 24.viii.1979, 1 ♀, SPS (CSS); Wied Qannotta, 9.iii.1979, 1 ♀, SPS (CSS); Ghajn Rihana, 16.vii.1990, 2 ♂♂ & 1 ♀, DM (CDM, MSNG); Marsaskala, Il-Magħluq, 1.vi.1990/20.iv.1991, 8 ♂♂ & 3 ♀♀, DM (CDM, MSNG); Marsaxlokk, Il-Ballut, 22.viii.1989/16.ix.1989/6.v.1990/21.xi.1993/19.ii.1996/26.x.1996/4.v.1997/15.viii.2003, 49 ♂♂ & 49 ♀♀, DM (CDM, MSNG); Dwejra, 21.vi.2002, 1 ♂, UV light trap, PS (NMNH). Gozo, Dwejra, Il-Qattara, 9.vii.1989/7.vi.1990, 3 ♂♂ & 3 ♀♀, DM (CDM, MSNG); Għasri, 15.ix.1994/20.vi.1995, 3 ♂♂, CF (CDM).



Figure 6: *Brachygluta dentiventris* – habitus photograph. Scale bar = 0.2 mm

Comments: CAMERON & CARUANA GATTO (1907) recorded this common species as *Bryaxis cameroni* Reitter, 1903. POGGI (1980) recorded a single male from Chadwick Lakes. *Brachygluta dentiventris* has a typical West-Mediterranean distribution, being recorded from Portugal, Spain, France including Corsica, Italy (including Sardinia, Sicily and Pantelleria), and throughout northern Africa.

***Brachygluta (Brachygluta) helferi helferi* (Schmidt-Göbel, 1836)**
(Figs. 7 & 21)

Material examined: Malta, Chadwick Lakes, 6.v.1974, 2 ♀♀, VM (MHNG), 24.viii.1979, 1 ♀, JLS (CSS).

Comments: This species was recorded from Malta by LÖBL & BESUCHET (2004) on the basis of the above mentioned female specimens collected in 1974. *Brachygluta helferi helferi* has a West European distribution, being replaced by *B. helferi longispina* (Reitter, 1884) in eastern Europe.



Figure 7: *Brachygluta helferi helferi* – habitus photograph. Scale bar = 0.2 mm

***Brachygluta (Brachygluta) hipponensis* (Saulcy, 1876)**
(Fig. 22)

Material examined: Malta, x.1901, 4 ♂♂, M.C. [Malcom Cameron], G.C. Champion Coll., B.M. 1927-409 (BMNH); Ghadira, 21.v.1989, 5 ♂♂, on coastal dune, SS (CSS, MSNG); Marsaxlokk, 8.iii.1990, 1 ♂, RG (CGS); Salina, 9.i.1994, 2 ♂♂ & 1 ♀, DM (CDM, MSNG); Marsaskala, Il-Maghluq, 14.xi.1993, 1 ♀, DM (CDM); Marsaxlokk, 17.iii.1984, 1 ♂, SPS (CSS); Marsaxlokk, Il-Ballut, 26.i.1990/28.iv.1990/23.ii.1992/11.vi.1993/21.xi.1993/14.v.1994/16.v.1995/19.ii.1996/12.i.1999/15.viii.2003, 30 ♂♂ & 20 ♀♀, DM (CDM, MSNG); Mellieha, near Mellieha Holiday Centre, 28.xi.2004/5.xii.2004/8.i.2005, 1 ♂ & 6 ♀♀, HBB (NMNH).

Comments: Originally, material of this species was recorded from Malta by BAUDI (1889) and identification of this historical material was confirmed by POGGI (1980). *Brachygluta hipponensis* is recorded from Greece, Southern Italy (including Sardinia, Sicily and Pantelleria and Lampedusa), Malta, Algeria, Morocco and Tunisia.

Brachygluta (Brachygluta) perforata (Aubé, 1833)

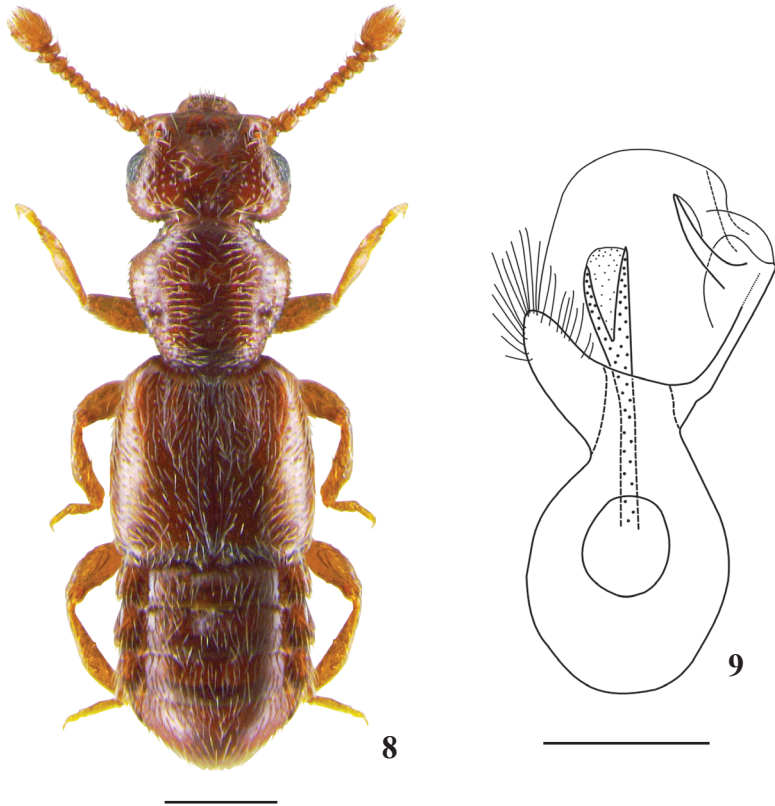
Material examined: None.

Comments: *Brachygluta perforata* was reported from Malta by POGGI (1980) on the basis of material from Baudi's collection. The species is known from Central Europe, Spain, France (including Corsica), Italy (including Sicily), Malta, and the Balkan Peninsula.

Euplectus bonvouloiri siculus Raffray, 1910

(Figs. 8, 9 & 23)

Material examined: Malta, Buskett, 31.iii.2002, 2 ♂♂, in decayed wood in hollowed *Fraxinus* tree, RS (MHNG). Gozo, Dahlet Qorrot, 5.ii.2015, 1 ♂ and 1 ♀, shifting leaf litter under *Tamarix* trees, GS & DM (CDM).



Figures 8–9: *Euplectus bonvouloiri siculus*. 8: Habitus photograph. 9: Male genitalia, dorsal view, of a specimen from Buskett. Scale bar for figure 8 = 0.2 mm and for figure 9 = 0.05 mm

Comments: This species was reported from Malta by LÖBL & BESUCHET (2004) on the basis of the above cited material from Buskett. The male genitalia are shown in figure 9. *Euplectus bonvouloiri siculus* is known only from Sicily and the Maltese Islands.

Euplectus corsicus Guillebeau, 1888

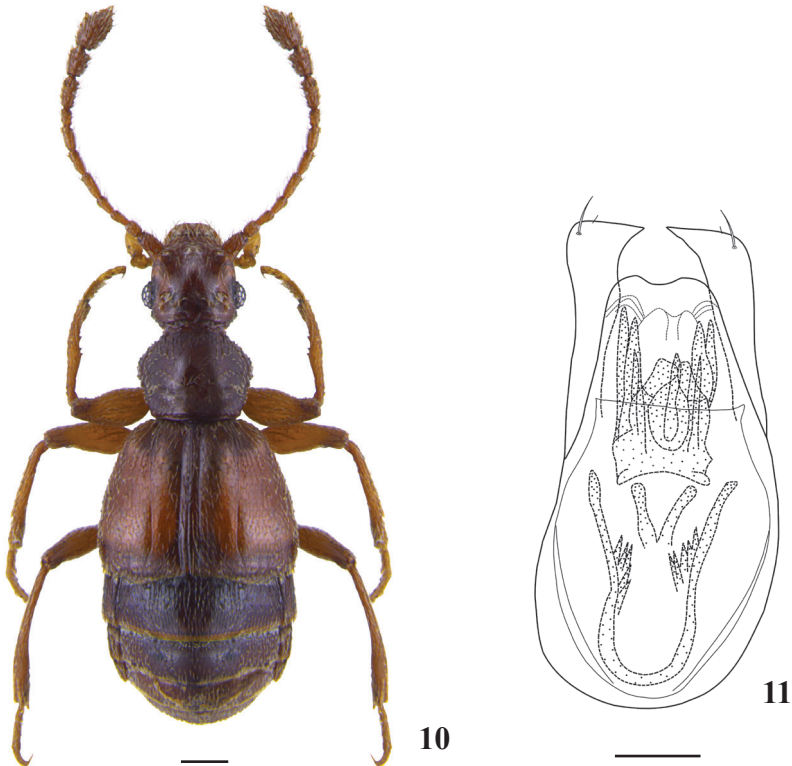
Material examined: Malta, 1 ♂ (MHNG).

Comments: This species was recorded by POGGI (1980) on the basis of a single male collected from Malta without further data and re-examined by us. We are of the opinion that the record of CAMERON & CARUANA GATTO (1907) of *Euplectus brunneus* (Grimmer, 1841) is incorrect and should refer to this species. Most likely this species was collected only once in Malta by James John Walker between 1874 and 1876 almost exclusively between the months of October and March. *Euplectus corsicus* is known from Italy (including Sardinia and Sicily), France (Corsica), and Malta.

Rybaxis longicornis (Leach, 1817)

(Figs. 10, 11 & 24)

Material examined: Malta, Chadwick Lakes, 4.ii.2015, 3 ♂♂ & 16 ♀♀, GS & DM (CDM).
Gozo, Ramla, 8.v.1990, 1 ♀, SPS (CSS).



Figures 10–11: *Rybaxis longicornis*. **10:** Habitus photograph; **11:** Male genitalia, dorsal view, of a specimen from Chadwick Lakes. Scale bar for figure 10 = 0.2 mm and for figure 11 = 0.1 mm

Comments: New record for the Maltese Islands. The male genitalia of this species are shown in figure 11. *Rybaxis longicornis* is widely distributed throughout Europe, North Africa, Asia Minor and Central Asia.

Trissemus (Trissemus) olivieri (Raffray, 1871)

(Figs. 12 & 25)

Material examined: Malta, x.1901, 3 ♂♂ & 6 ♀♀, M.C. [Malcom Cameron], G. Bryant Coll., B.M. 1926-86 (BMNH); Bahrija, 6.iv.1985, 1 ♂, SPS (CSC); Ghajn Rihana, 26.vi.1989, 1 ♀, DM (CDM); Mgiebah, 24.ii.1990, 1 ♀, SPS (CSS); Bidnija, 23.ii.1997/13.i.1999, 7 ♂♂ and 6 ♀♀, DM (CDM; MSNG); Golden Bay, 31.xi.1997, 2 ♂♂ and 1 ♀ on meadow, GS & PA (DBUC); Mistra Bay, 31.xi.1997, 3 ♂♂ and 3 ♀♀ on meadow, GS & PA (DBUC); Chadwick Lakes, 4.ii.2015, 2 ♂♂, DM & GS (CDM). Gozo, Ramla, 8.v.1990, 1 ♂, SPS (MSNG), 1 ♀, DM & GS (CDM); Ghasri, 19.ix.1994, 1 ♂, CF (CDM); Dwejra, Il-Qattara, 7.vi.1990/18.i.1999, 2 ♀♀, DM (CDM); Dahlet Qorrot, 5.ii.2015, 1 ♀, shifting leaf litter under *Tamarix* trees, DM & GS (CDM).



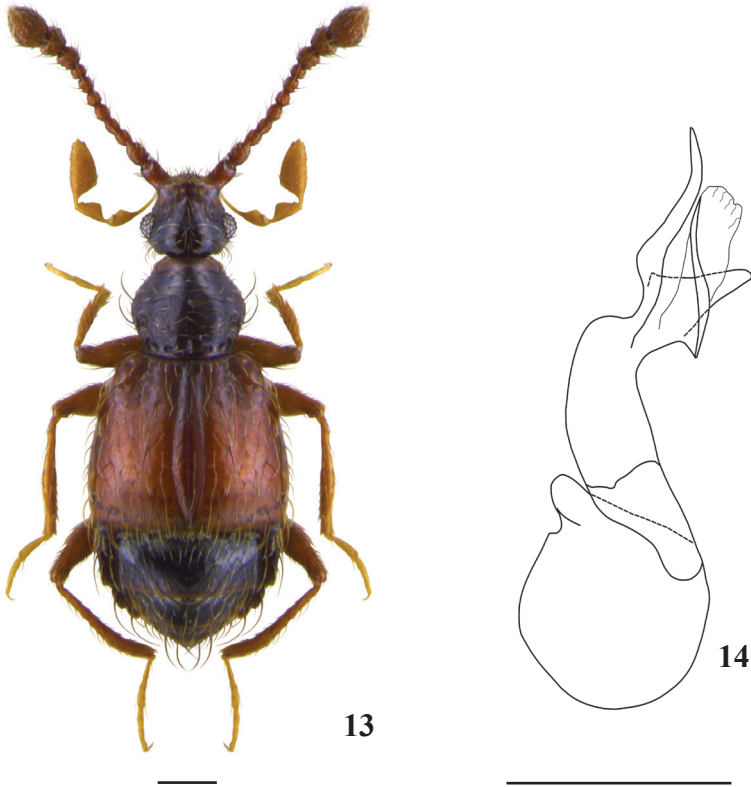
Figure 12: *Trissemus olivieri* – habitus photograph. Scale bar = 0.2 mm

Comments: *Trissemus olivieri* was previously recorded from Gnejna in Malta by CAMERON & CARUANA GATTO (1907) under the name of *Bryaxis opuntiae* Schmidt-Göbel. The species is known from Portugal, Spain, Canary Islands, France including Corsica, Italy (including Sardinia and Sicily), Malta, and North Africa.

Tychus jacquelinii Boieldieu, 1859

(Figs. 13, 14 & 26)

Material examined: Malta, Mistra Bay, 31.xi.1997, 2 ♂♂, on meadow, GS & PA (DBUC); Buskett, 150 m, 29.xi.1997, 1 ♀ under stones, GS & PA (DBUC); Chadwick Lakes, 250 m, 29.xi.1997, 1 ♂, GS & PA (DBUC).



Figures 13–14: *Tychus jacquelinii*. **13:** Habitus photograph; **14:** Male genitalia, lateral view, of a specimen from Mistra Bay. Scale bar for figure 13 = 0.2 mm and for figure 14 = 0.1 mm

Comments: New record for the Maltese Islands. The male genitalia of this species are shown in figure 14. *Tychus jacquelinii* is known from central-southern France (including Corsica), Italy (including Sicily), Malta, Tunisia, and Algeria.

Tychus opuntiae (Schmidt-Göbel, 1836)

(Fig. 27)

Material examined: Malta, Mtaħleb, 12.iv.1998, 1 ♂, DM (CDM); Migra Ferħa, 13.i.1999, 1 ♂, DM (CDM); Dingli Cliffs, 31.iii.2002, 1 ♂, RS (CDM). Gozo, Għasri, v.1990, 1 ♂, under stone near *Leptothorax niger*, SPS (CSS); Dwejra, 21.ii.2000, 1 ♀, DM (CDM); Ramla, 5.ii.2015, 1 ♂ & 1 ♀, DM & GS (CDM); Dahlet Qorrot, 5.ii.2015, 1 ♂, sifting leaf litter under *Tamarix* tree, DM & GS (CDM).

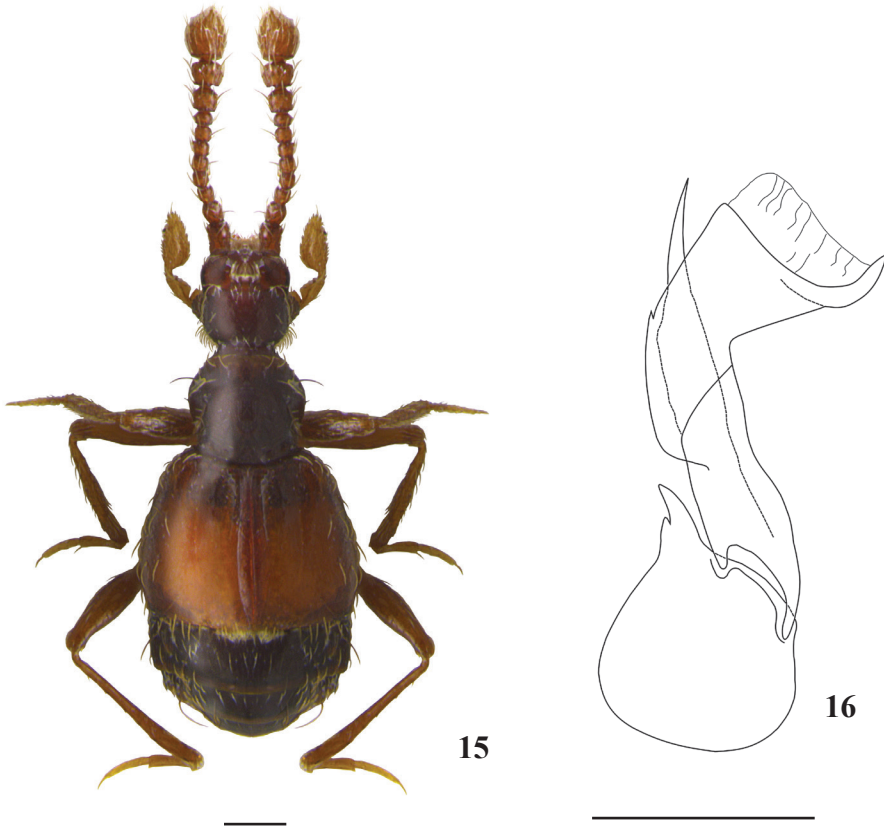
Comments: *Tychus opuntiae* was first reported from Malta on the basis of a single male from Wardija (POGGI, 1980) under the name of *Tychomorphus integer* (Reitter, 1882). This species is endemic to Malta and Sicily.

***Tychus pici* Croissandeau, 1893**

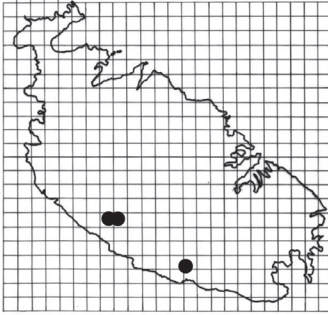
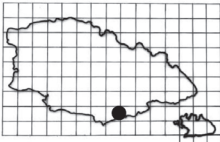
(Figs. 15, 16 & 28)

Material examined: Malta, Buskett, 150 m, 29.xi.1997, 1 ♂, sifting leaf litter under *Quercus ilex* and *Ceratonia siliqua*, GS & AA (DBUC).

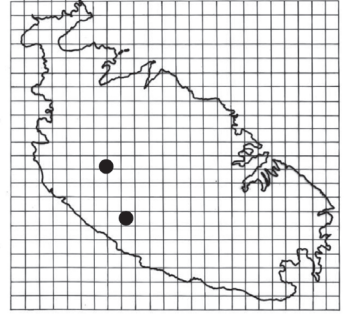
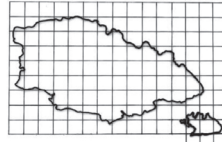
Comments: *Tychus pici* was known only from Algeria and Tunisia, and the above record is new for the Maltese fauna and thus for the European territory. The male genitalia of this specimen are shown in figure 16.



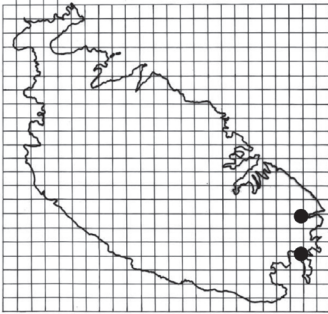
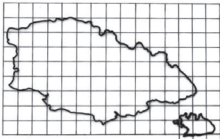
Figures 15–16: *Tychus pici*. **15:** Habitus photograph; **16:** Male genitalia, lateral view, of a specimen from Buskett. Scale bar for figure 15 = 0.2 mm and for figure 16 = 0.1 mm



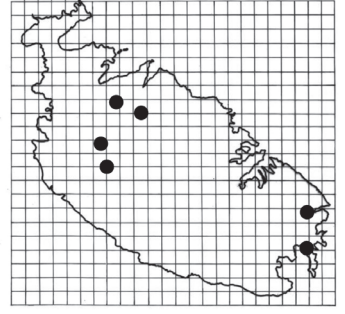
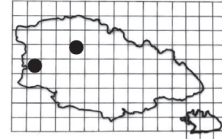
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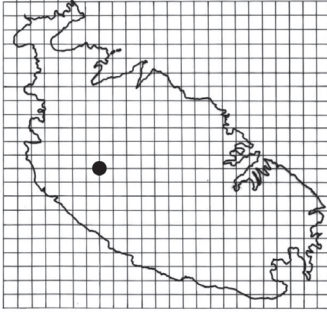
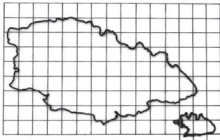


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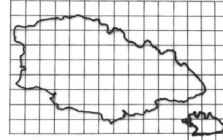


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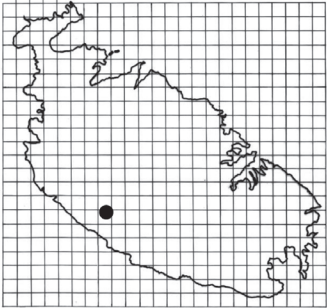
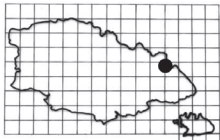
Figures 17–20: Distribution maps. 17: *Amaurops mifsudi*. 18: *Biblopectus limatus*. 19: *Brachygluta aubei*. 20: *Brachygluta dentiventris*.



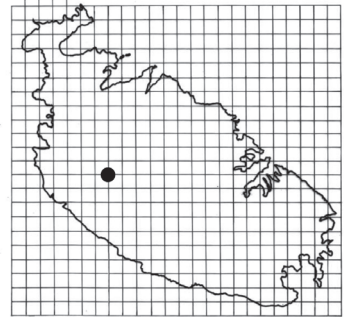
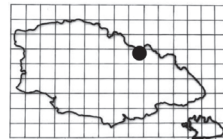
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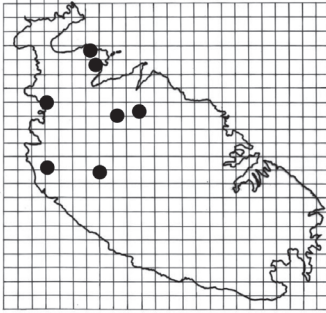
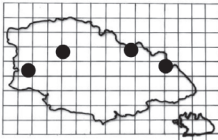


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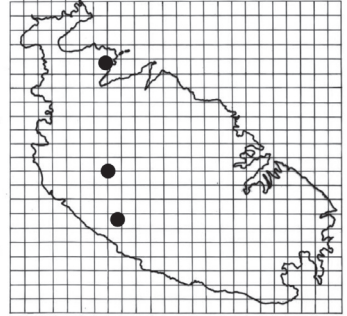
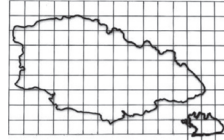


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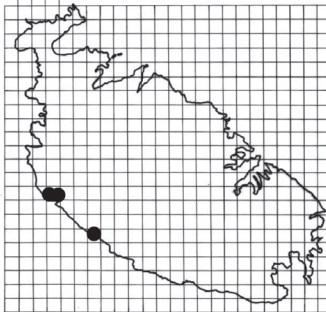
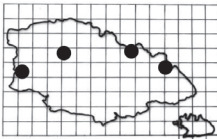
Figures 21–24: Distribution maps. 21: *Brachygluta helferi helferi*. 22: *Brachygluta hipponensis*. 23: *Euplectus bonvouloiri siculus*. 24: *Rybaxis longicornis*.



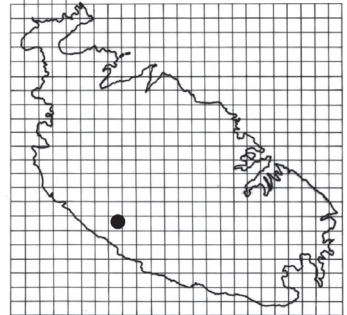
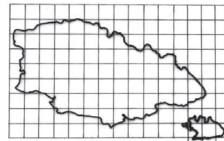
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26



27

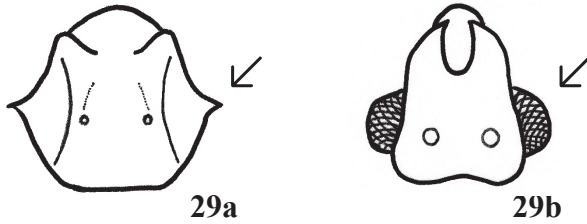


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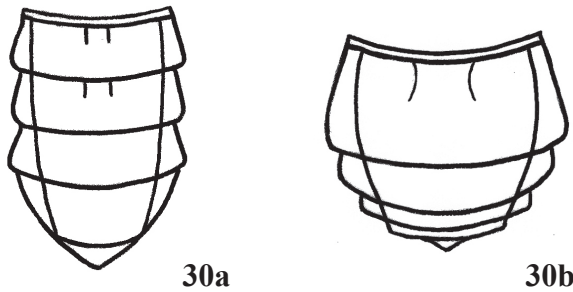
Figures 25–28: Distribution maps. 25: *Trissemus olivieri*. 26: *Tychus jacquelinii*. 27: *Tychus opuntiae*. 28: *Tychus pici*.

DICHOTOMOUS KEY FOR THE IDENTIFICATION OF MALTESE PSELAPHINES

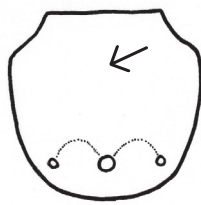
- 1. Compound eyes completely lacking from head and instead a prominent ocular spine is present (Fig. 29a) *Amaurops mifsudi*
 [Males of *A. mifsudi* are distinguished from females as follows: Median femora with a tooth on the basal third]
- Compound eyes always present on head (Fig. 29b) 2



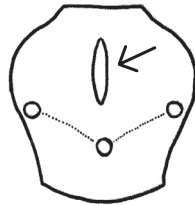
- 2. Abdomen longer than wide and dorso-ventrally flattened (Fig. 30a); maxillary palps very small and difficult to see from above 3
- Abdomen shorter than wide and convex (Fig. 30b), maxillary palps large and clearly visible from above 5



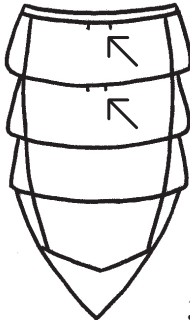
- 3. Disc of pronotum lacking median sulcus (Fig. 31a); basal carinae of 1st and 2nd abdominal tergites small and inconspicuous (Fig. 32a) *Biblopectus limatus*
 [Males of *B. limatus* are distinguished from females as follows: mesotibia with a small apical spur; last abdominal ventrite with an elongated penial plate with sub-parallel lateral sides]
- Disc of pronotum with short longitudinal median sulcus (Fig. 31b); basal carinae of 1st and 2nd abdominal tergites clearly visible (Fig. 32b) *Euplectus* ... 4
 [Males of *Euplectus* spp. are distinguished from females as follows: mesotibia with a small apical spur; last three abdominal ventrites modified with the last one always divided by a median longitudinal sulcus]



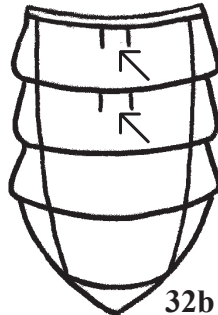
31a



31b



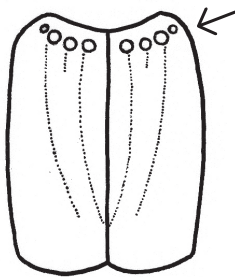
32a



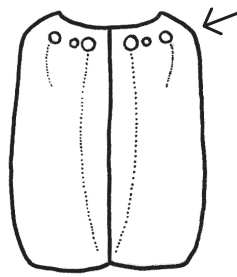
32b

4. Body length 1.55–1.85 mm; head (including eyes) slightly wider than pronotum; four clearly visible basal foveae present on each elytron (Fig. 33a); basal carinae of 1st and 2nd abdominal tergites reaching about half of tergite length *Euplectus corsicus*

- Body length 1.2–1.4 mm; head (including eyes) at most as wide as pronotum; two or three basal foveae present on each elytron (Fig. 33b); basal carinae of 1st and 2nd abdominal tergites not reaching half of tergite length *Euplectus bonvouloiri siculus*



33a

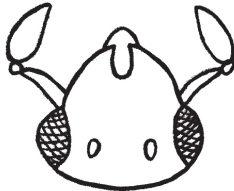


33b

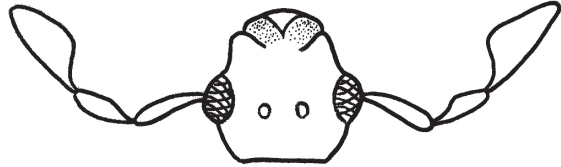
5. Maxillary palps distinctly shorter than head length with base of apical segment broad, never constricted to form a peduncle (Fig. 34a) 6

- Maxillary palps distinctly longer than head length with base of apical segment constricted to form a peduncle (Fig. 34b) *Tychus* ... 12

[Males of *Tychus* spp. are distinguished from females as follows: Head anteriorly modified by the presence of a transvers sulcus; more numerous ommatidia present on compound eye]



34a

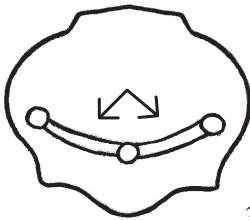


34b

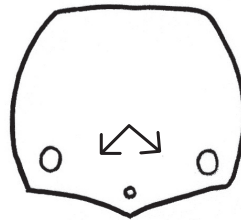
6. Pronotal basal foveae connected by a transverse sulcus (Fig. 35a); lateral margins of elytra with a deep longitudinal impression *Rybaxis longicornis*

[Males of *R. longicornis* are distinguished from females as follows: longer antennae with all antennal segments distinctly longer than wide; protibiae with a small spur in the centre; mesotibiae with a large apical spur]

- Pronotal basal foveae not connected by a transverse sulcus (Fig. 35b); lateral margins of elytra lacking longitudinal impression 7



35a



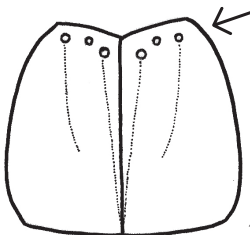
35b

7. Each elytron with three basal foveae (Fig. 36a) *Trissemus olivieri*

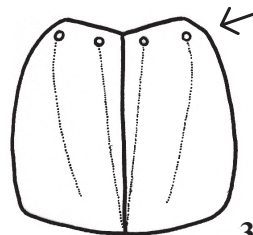
[Males of *T. olivieri* are distinguished from females as follows: Longer antennae with all antennal segments distinctly longer than wide; mesotibiae with a large apical spur]

- Each elytron with two basal foveae (Fig. 36b) *Brachygluta* ... 8

[Males of *Brachygluta* spp. are distinguished from females in having either an apical spur on mesotibiae, or modified abdominal tergites, or both]



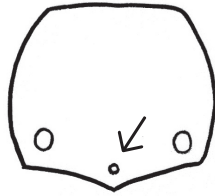
36a



36b

8. Pronotal median basal fovea smaller than lateral ones (Fig. 37a) *Brachygluta aubei*
 [Males of *B. aubei* are distinguished from females as follows: Metatibiae distinctly constricted at the centre, curved in distal half and with distinctly enlarged apex; abdomen with posterior margin of 1st tergite elevated and deeply incised, ventral margin of this incision with two large sclerotised teeth and two rows of yellow, long and thick hairs; base of 2nd tergite bearing a deep median impression with strongly setose lateral margins (Fig. 38a)]

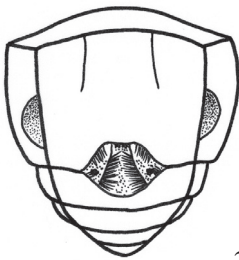
- Pronotal median basal fovea as large as or larger than lateral ones (Fig. 37b) 9



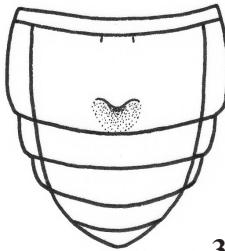
37a



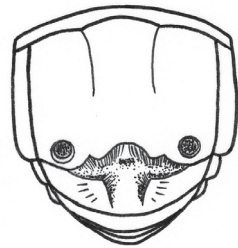
37b



38a



38b

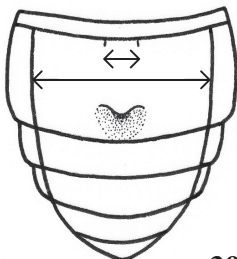


38c

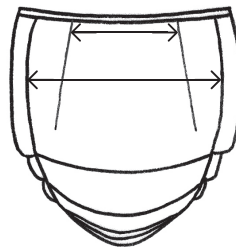
9. Distance between basal carinae of 1st abdominal tergite 1/4 (in males) to 1/5 (in females) of tergite width (Fig. 39a) *Brachygluta helferi helferi*

[Males of *B. helferi helferi* are distinguished from females as follows: Mesotibiae with a stout apical spur; abdomen with disc of 1st tergite marked by a slight median impression originating from posterior margin of tergite and limited anteriorly by a transverse S-shaped carina Fig. 38b)]

- Distance between basal carinae of 1st abdominal tergite at least 1/3 of tergite width (Fig. 39b) .. 10



39a



39b

- 10.** Body uniformly reddish or brown; basal carinae of 1st abdominal tergite sub-parallel and about half of its length *Brachygluta perforata*
 [Males of *B. perforata* are distinguished from females as follows: Abdomen with posterior margin of 1st tergite incised and sinuate in the centre; margins of incision with long yellowish hairs. Postero-lateral margins of 1st tergite slightly protruding posteriorly with a large circular setose fovea. Disc of 2nd tergite with a strong median impression defined laterally by a pair of longitudinal carinae Fig. 38c]
 - Body generally bicoloured (red elytra and blackish abdomen); basal carinae of 1st abdominal tergite diverging and more than half of its length **11**
- 11.** Head and pronotum distinctly punctate. Disc of 1st abdominal tergite not convex in the centre *Brachygluta dentiventris*
 [Males of *B. dentiventris* are distinguished from females as follows: Mesotibiae with a stout apical spur; metatibiae with a short apical spur; posterior margin of 2nd abdominal ventrite bearing a subtriangular, posteriorly protruding median tooth reaching about 1/2 of sternite length]
 - Head and pronotum impunctate. Disc of 1st abdominal tergite strongly convex in the centre *Brachygluta hipponensis*
 [Males of *B. hipponensis* are distinguished from females as follows: Mesotibiae with a long, stout apical spur]
- 12.** Anterior part of head above compound eyes with sub-parallel sides *Tychus pici*
 - Anterior part of head above eyes with sides slightly convergent **13**
- 13.** Length of antennal club (last three antennal segments) 0.32–0.36 mm; females with 11–15 ommatidia *Tychus opuntiae*
 - Length of antennal club 0.28–0.30 mm; females with 25–30 ommatidia *Tychus jacquelinii*

DISCUSSION

The present work is based on the study of about 300 specimens of pselaphines collected from the Maltese Islands in these last 40 years. Additionally, some 40 historical specimens mostly collected in the early years of the 1900's were also examined. The latter collection formed the basis upon which four species of pselaphines were reported in the Coleoptera list of the Maltese Islands (CAMERON & CARUANA GATTO, 1907).

As a result of these studies, 14 species of pselaphines belonging to 7 different genera are here recorded from the Maltese Islands, an archipelago with a total surface area of 316 km², about 80 km away from Sicily and 280 km from North Africa. Three species, namely *Rybaxis longicornis*, *Tychus jacquelinii* and *T. pici* are reported for the first time from the Maltese archipelago. Only one species, *Amaurops mifsudi*, is endemic to Malta and Gozo whereas another two taxa, *Tychus opuntiae*, and *Euplectus bonvouloiri siculus*, are endemic to Sicily and Malta. Seven species (*Biblopectus limatus*, *Brachygluta aubei*, *Brachygluta dentiventris*, *Brachygluta hipponensis*, *Rybaxis longicornis*, *Trissemus olivieri* and *Tychus jacquelinii*) are found in Sicily, Malta and North Africa, whereas one species (*Tychus pici*) is only known from Malta and North Africa (Tunisia and Algeria).

It is useful to compare the pselaphine fauna of Malta to that of two nearby islands, namely Pantelleria and Sicily. Pantelleria has a total surface area of about a quarter of that of the Maltese

Islands whereas Sicily has a surface area of about 80 times that of the Maltese archipelago. For Pantelleria, seven species of pselaphines belonging to four genera are currently recorded, with *Tychus cossyrensis* Doderò, 1919 being the only endemic species (POGGI, 1995). However, from an entomological perspective, Pantelleria represents a less investigated territory than that of the Maltese Islands. On the other hand, the pselaphine fauna of Sicily is composed of 83 species belonging to 30 different genera, of which 27 species are considered endemic to this territory (SABELLA, 1998).

The relatively poor pselaphine fauna of the Maltese archipelago can be attributed to various factors. One important aspect is the fact that the Maltese archipelago consists of low-lying islands with the highest altitude attaining a maximum of only 253 meters above sea level. Thus several taxa usually associated with the upper level of hills or mountains are completely lacking. Loss of natural habitats, particularly Mediterranean sclerophyllous forests, has been presumably very high shortly after human settlement which took place as early as some 7,000 years ago (CARROLL *et al.*, 2012). Permanent freshwater bodies are almost completely lacking, with most valley systems drying up completely during the hot summer months. Moreover, human impact on the rather fragmented natural environment of the Maltese Islands is quite severe. The overall human population density is currently of c.1,350 per km² (NATIONAL STATISTICS OFFICE, 2015), making the archipelago one of the most densely populated regions in the world. In addition to all this, one should also take into consideration that c.1.5 million tourists visit these islands every year, inevitably augmenting the negative impact on the natural environment of Malta and Gozo, especially in the coastal regions.

Of the 14 species of pselaphines recorded from the Maltese archipelago six are paludicolous. Of these, four are halophiles, mainly found in coastal salt marshes (*Brachygluta aubei*, *B. dentiventris*, *B. helferi helferi*, *B. hipponensis*) while the other two (*Biblopectus limatus* and *Rybaxis longicornis*), even though having some tendency towards salty environments, are mainly found in freshwater habitats. All these species can be collected among the roots of riparian plants and also by sifting leaf litter accumulated at the base of such plants. Two species (*Euplectus bonvouloiri siculus* and *E. corsicus*) are saproxylic, since they are collected by sifting rotten wood. Five species (*Brachygluta perforata*, *Trissemus olivieri*, *Tychus jacquelinii*, *T. opuntiae* and *T. pici*) are generally found under stones in humid meadows, even though sporadically they can be found in leaf litter. Only one species (*Amaurops mifsudi*) is strictly endogean and can be collected either by sifting soil at the base of trees in woody habitats, or under large and well embedded stones in maquis or at the bottom of shaded and deep valleys.

It is possible that some additional pselaphines may be found in future, in particular on the island of Gozo, where rural areas are generally much better conserved than those of Malta. This is particularly so if specialised collecting techniques such as the use of light-traps, car-net method and others are employed in addition to the classical ones used for the present work. Notwithstanding all this, the absence of certain pselaphines from the Maltese archipelago is often difficult to justify as shown below.

Species of the genus *Faronus* Aubé, 1844 were not found in the Maltese Islands. Such species are mainly associated with Mediterranean maquis and garigue habitat types, both well-represented in the Maltese archipelago. In general, species of *Faronus* are relatively common throughout the Mediterranean Region with several species present in North Africa, Sicily and the circum-Sicilian islands. It is therefore difficult to explain why the genus is not represented in the Maltese entomofauna. On the other hand the complete absence of Bythinini can be partially explained by the extreme rarefaction of nemoral environments, which are all fragmentary and characterized

by considerably dry conditions. Targeted field work may eventually reveal the presence of two halophilous species of *Brachygluta*: *B. foveola foveola* (Motschulsky, 1840) and *B. guillemardi* (Saulcy, 1876). Both are associated with humid coastal regions and are widely distributed in the Mediterranean basin. Finally, it is also difficult to comprehend the absence of representatives of the tribe Ctenistini (particularly species within the genus *Ctenistes* Reichenbach, 1816) which are associated with meadows, sublithic and subxerophilic environments (such as *Ctenistes kiesewetteri* Saulcy, 1874, which is particularly common in both North Africa and Sicily).

Despite the limited number of pselaphines recorded from the Maltese Islands, it is still possible to present some zoogeographical considerations. Table 2 provides the chorological categories (following VIGNA TAGLIANTI *et al.*, 1993) of all pselaphines recorded from the Maltese Islands. The Mediterranean component is represented by about 71%, of which a substantial part is composed of West Mediterranean species whereas the European component is represented by two species.

Table 2: Chorological categories and codes of Pselaphinae recorded from the Maltese Islands following VIGNA TAGLIANTI *et al.* (1993).

Taxon	Chorological category	Code
<i>Biblopectus limatus</i> Normand	W-Mediterranean	WME
<i>Euplectus bonvouloiri siculus</i> Raffray	Endemic	END (Sicily and the Maltese Archipelago)
<i>Euplectus corsicus</i> Guillebeau	W-Mediterranean	WME
<i>Amaurops mifsudi</i> Poggi	Endemic	END (only the Maltese Archipelago)
<i>Brachygluta aubei</i> (Tournier)	W-Mediterranean	WME
<i>Brachygluta dentiventris</i> (Saulcy)	W-Mediterranean.	WME
<i>Brachygluta helferi helferi</i> (Schmidt-Göbel)	W-European	WEU
<i>Brachygluta hipponensis</i> (Saulcy)	W-Mediterranean	WME
<i>Brachygluta perforata</i> (Aubé)	S-European	SEU
<i>Rybaxis longicornis</i> (Leach)	Central-Asiatic-Mediterranean	CAM
<i>Trissemus olivieri</i> (Raffray)	W-Mediterranean	WME
<i>Tychus jacquelinii</i> Boieldieu	W-Mediterranean	WME
<i>Tychus opuntiae</i> (Schmidt-Göbel)	Endemic	END (Sicily and the Maltese Archipelago)
<i>Tychus pici</i> Croissandeau	N-African	NAF

These data are entirely consistent with the geographical and ecological context of the study area. As previously indicated, the sub-endemic taxa (present in both Sicily and the Maltese archipelago) are represented by *Euplectus bonvouloiri siculus* and *Tychus opuntiae*, whereas the genus *Amaurops* is

entirely endemic to both Sicily and the Maltese Islands, with *A. mifsudi* restricted to the latter. This provides further evidence of an Ibleo-Maltese territory during the Quaternary as proposed by LA GRECA (1957) and sustained by subsequent workers (e.g. GIUSTI & MANGANELLI, 1995; SABELLA, 1998).

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APPENDIX I - Check-list of the Maltese pselaphines following the classification scheme of LÖBL & BESUCHET (2004) and BOUCHARD *et al.* (2011).

Subfamily PSELAPHINAE Latreille, 1802

Supertribe EUPLECTITAE Streubel, 1839

Tribe Euplectini Streubel, 1839

Euplectus bonvouloiri siculus Raffray, 1910

Euplectus corsicus Guillebeau, 1888

Tribe Trichonychini Reitter, 1882

Biblopectus (Biblopectus) limatus Normand, 1939

Supertribe BATRISITAE Reitter, 1882

Tribe Amauropini Jeannel, 1948

Amaurops mifsudi Poggi, 1999

Supertribe GONIACERITAE Reitter, 1882

Tribe Brachyglutini Raffray, 1904

Brachygluta (Brachygluta) aubei (Tournier, 1868)

Brachygluta (Brachygluta) dentiventris (Saulcy, 1876)

Brachygluta (Brachygluta) helperi helperi (Schmidt-Göbel, 1836)

Brachygluta (Brachygluta) hipponensis (Saulcy, 1876)

Brachygluta (Brachygluta) perforata (Aubé, 1833)

Rybaxis longicornis (Leach, 1817)

Trissemus (Trissemus) olivieri (Raffray, 1871)

Tribe Tychini Raffray, 1904

Tychus jacquelinii Boieldieu, 1859

Tychus opuntiae (Schmidt-Göbel, 1836)

Tychus pici Croissandeau, 1893