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New records of Auchenorrhyncha (Insecta: Hemiptera) from the Maltese archipelago with an updated checklist

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ABSTRACT. Twenty-four new records of Auchenorrhyncha are reported from the Maltese Islands. Up to now 71 species are known from the territory. Among the new recorded species, 1 belongs to Cixiidae, 5 to Delphacidae, 2 to Tettigometridae, 1 to Issidae and 15 to Cicadellidae.

KEY WORDS. Malta, Mediterranean, Planthoppers, Leafhoppers.

INTRODUCTION

Specific field studies for collecting Auchenorrhyncha from the Maltese archipelago were only recently conducted. Up till now, 47 species were recorded from the mentioned territory (D'URSO & MIFSUD, 2012; D'URSO, 2016). Material studied from additional field work added 24 new records bringing the number of known species to 71. The present study was undertaken on material collected mainly by the authors (DM - David Mifsud; IG – Ilia Gjonov; VD - Vera D'Urso; RZM – Rachel Zammit-Mangion) which is housed in their respective private collections. The main part of the material was collected between 2014 and 2017 from both Malta and Gozo by malaise traps and sweep nets. The collecting points are visualized on the map (Fig. 1). In the annotated species list which follows, the sequence of families and species within each family follows the one used by D'URSO & MIFSUD (2012). Appendix I provides a complete checklist of all Auchenorrhyncha recorded so far from Malta. The 24 new records reported in this study are marked with an asterisk. Families are arranged taxonomically and species therein are listed alphabetically.

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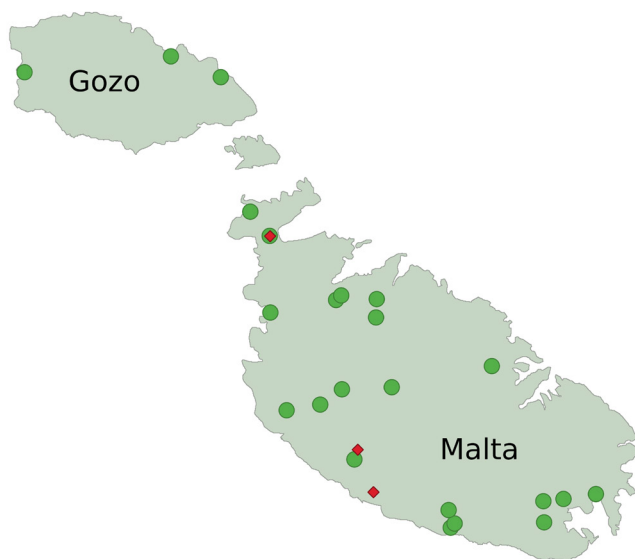


Figure 1: Collecting points in Malta and Gozo – green circle – sweeping net; red triangle – malaise trap.

ANNOTATED SPECIES LIST

CIXIIDAE Spinola, 1839

Tachycixius cf. *osellai* (Dlabola, 1980)

Material examined: Malta, Ghajn Tuffieha Bay, 24.xi.2017, 3 ♂♂ & 2 ♀♀, IG.

Notes: Among *Tachycixius* species, *T. osellai* is recognizable by the shape of the wings. The species was described from Sicily. The specimens collected from Malta belong to the *T. osellai* species group, but more specimens are needed to better understand the range of variability of the male genitalia.

General distribution: Sicily (DLABOLA, 1980; D'URSO, 1995).

DELPHACIDAE Leach, 1815

Iubsoda stigmatica (Melichar, 1897)

Material examined: Malta, Qannotta Valley, 27.iv.1985, 1 ♂, VD.

Notes: This species is known from the North and East of the Mediterranean. It is also recorded from the Ethiopian Region. It is widespread in Sicily and southern peninsular Italy and is associated with *Hyparrhenia hirta* (L.) Stapf.

General distribution: Southern Europe, Mediterranean islands and Ethiopian Region (MELICHAR, 1897; D'URSO & GUGLIELMINO, 1995; D'URSO, 1986; ASCHE, 1982).

***Kelisia brucki* Fieber, 1878**

Material examined: Malta, Rabat, L-Andrijiet, 24.xi.2017, 1 ♂ & 1 ♀, IG.

Notes: The species lives on *Juncus* spp. in humid biotopes. It is present in southern Europe and in the regions along the northern Mediterranean Sea (included peninsular Italy and Sicily).

General distribution: Southern and eastern Europe, Near East (HOLZINGER *et al.*, 2003).

***Kelisia ribauti* W. Wagner, 1938**

Material examined: Malta, Ghajn Rihana, on the hygrophilous vegetation with *Jucus* sp. and *Typha* sp., 3.ii.2015, 1 ♂ & 1 ♀, VD; Rabat, L-Andrijiet, 24.xi.2017, 5 ♂♂, IG.

Notes: The specimens collected in Malta belong to the Mediterranean morph after ASCHE (1986), living on *Juncus* sp.. DROSOPoulos (1982) recorded this species also on *Deschampsia cespitosa* (L.) P. Beauv. The species has a Palearctic distribution and is widespread in the Mediterranean basin.

General distribution: Palearctic (HOLZINGER *et al.*, 2003).

***Kelisia sulcata* Ribaut, 1934**

Material examined: Malta, Chadwick lakes, along the valley, on *Juncus* sp., 4.ii.2015, 1 ♂ & 3 ♀♀, VD.

Notes: *Kelisia sulcata* lives in humid biotopes and feeds on *Jucus* sp. It represents a western Mediterranean species widespread in the Iberian Peninsula, France and Sardinia, but has not been recorded from peninsular Italy and Sicily.

General distribution: West Mediterranean (RIBAUT, 1934; ASCHE, 1982a).

***Sogatella vibix* (Haupt, 1927)**

Material examined: Malta, Wardija Hilltop vill., 22.xi.2017, 2 ♂♂ & 1 ♀, IG. Gozo, Ramla Bay, 23.xi.2017, 1 ♂, IG.

Notes: This species feeds on Poaceae including barley, maize and rice. It is a vector of the Maize Rough Dwarf Virus, Maize Sterile Stunt Virus and Finger Millet Mosaic Virus (WILSON, 2005).

General distribution: Palearctic, Ethiopian Region, Oriental Region, Australia and the Western Pacific (ASCHE & WILSON, 1990).

TETTIGOMETRIDAE Germar, 1821***Tettigometra impressifrons* Mulsant & Rey, 1855**

Material examined: Malta, Żejtun, 15.xi.2017, 1 ♂ parasitized by dryinid, IG.

Notes: In France, BOURGOIN (1985) reported this species and *Tettigometra sulfurea* Mulsant & Rey as attended by the ants *Tetramorium* spp., *Camponotus aethiops* (Latreille, 1798), *Tapinoma* spp. and *Formica rufibarbis* Fabricius, 1793. The distribution of this species is Mediterranean-Atlantic and recently the species was also recorded from Iran.

General distribution: Northern Africa, western and southern Europe and western Asia (MOZAFFARIAN *et al.*, 2018).

***Tettigometra laeta* Herrich-Schäffer, 1835**

Material examined: Malta, Buskett, Verdala Palace, malaise trap, 1.x.2014 – 30.xi.2014, 1 ♂, DM; Ta' Qali National Park, 16.xi.2017, 1 ♀, IG.

Notes: This species is known from dry grassland in the Mediterranean region and the southern parts of central Europe (HOLZINGER *et al.*, 2003). In a costal dune area of Belgium, LEHOUCQ *et al.* (2004) reported this species as associated with the ants *Lasius psammophilus* Seifert, 1992, *Tetramorium caespitum* (Linnaeus, 1758) and *Formica cunicularia* Latreille, 1798.

General distribution: Southern Europe and northern Africa (LINNAVUORI, 1971; HOLZINGER *et al.*, 2003).

ISSIDAE Spinola, 1839***Latilica tunetana* (Matsumura, 1910)**

Material examined: Malta, Żurrieq Valley, 20.xi.2017, 2♂♂ & 1 ♀, IG. Gozo, Dwejra, on *Euphorbia dendroides* L., 23.xi.2017, 2 ♂♂ & 3 ♀♀, IG.

Notes: *Latilica tunetana* is mainly found in Mediterranean bush biotopes dominated by *Pistacia lentiscus* L., *Quercus ilex* L. and *Phillyrea* sp. (GNEZDILOV & MAZZONI, 2003). The species was recorded from Italy (southern peninsular Italy, Sicily, Linosa and Pantelleria) and Tunisia.

General distribution: South-western Europe, Mediterranean islands and northern Africa (GNEZDILOV *et al.*, 2014).

CICADELLIDAE Latreille, 1825***Asymmetrasca decedens* (Paoli, 1932)**

Material examined: Malta, Buskett, Verdala Palace, malaise trap, 1.ix.2014 – 30.ix.2014, 1 ♂, DM.

Notes: The species is known from the North and East Mediterranean reaching also Germany. It is present in the Afrotropical region and was also reported from California and Central America. It is a polyphagous species on weeds and fruit plants (FREITAS & AGUIN POMBO, 2005). It was also recorded as causing damage to citrus fruit (ABDUL-NOUR, 1985; BASPINAR *et al.*, 2011) and other plants of economic importance (e.g. cotton, grapevine, beans, etc.) (ATAKAN, 2009). It is also a vector of phytoplasmas (PASTORE *et al.*, 2003). In fact, in Lebanon it causes almond witches' broom, associated with '*Candidatus Phytoplasma phoenicium*', which is a lethal disease of almond (*Prunus dulcis*), peach (*P. persica*) and nectarine (*P. persica* var. *nucipersica*) (ABOU-JAWDAH *et al.*, 2014; EPPO, 2018).

General distribution: Southern Europe, northern Africa, Near Middle and Far East (DLABOLA, 1957; BOUKHRIS-BOUHACHEM, 2007; ZAHNISER, 2007-present; RADOVIĆ & PEŠIĆ, 2014, MOZAFFARIAN & WILSON, 2016).

Balclutha frontalis (Ferrari, 1882)

Material examined: Malta, Buskett, Verdala Palace, malaise trap, 1.viii.2014 – 31.viii.2014, 1 ♂ & 1 ♀, DM; Żejtun, 15.xi.2017, 5 ♂♂ & 1 ♀, IG; Birżebbuġa, 15.xi.2017, 3 ♂♂ & 1 ♀, IG; Żurrieq Valley, 20.xi.2017, 3 ♂♂, IG; Għar Dalam, 21.xi.2017, 2 ♂♂ & 5 ♀♀, IG; Wardija Hilltop vill., 22.xi.2017, 1 ♂ & 1 ♀, IG; Għajn Tuffieħa Bay, 24.xi.2017, 1 ♂, IG.

Notes: A widespread cosmopolitan species with many records from central and southern Europe and associated with grasses.

General distribution: Palaearctic Region, Oriental Region, Ethiopian Region, Nearctic Region and Neotropical Region (ZAHNISER, 2007-present).

Bugraia ocularis (Mulsant & Rey, 1855)

Material examined: Malta, Buskett, Verdala Palace, malaise trap, 30.vi.2015 – 30.ix.2015, 1 ♀, DM; Mellieħa, malaise trap, 2.i.2017–23.i.2017, 15 ♂♂ & 12 ♀♀, RZM; 24.i.2017 – 14.ii.2017, 7 ♂♂ & 7 ♀♀, RZM; 14.ii.2017 – 7.iii.2017, 2 ♂♂ & 5 ♀♀, RZM; Żurrieq, 15.xi.2017, 1 ♀, IG; Żurrieq Valley, 20.xi.2017, 1 ♂ & 1 ♀, IG, in both cases on *Pistacia lentiscus* L.

Notes: A Mediterranean-Atlantic species, feeding on *Pistacia lentiscus* L.

General distribution: Europe, northern Africa and Anatolia (DMITRIEV, 2003-present; ÖNDER *et al.*, 2011; GĘBICKI *et al.*, 2013).

Circulifer dubiosus (Matsumura, 1908)

Material examined: Gozo, Ramla Bay, 23.xi.2017, 1 ♂ & 2 ♀♀, IG.

Notes: A rare species with a Turranic-Mediterranean distribution and associated with grasses.

General distribution: Southern Europe, European Russia, Near and Middle East (LINNAVUORI, 1965; MITJAEV, 1971; LODOS & KALKANDELEN, 1985; NOVIKOV *et al.*, 2006; ZAHNISER, 2007-present; MOZAFFARIAN & WILSON, 2016).

Empoasca decipiens Paoli, 1930

Material examined: Malta, Buskett, Verdala Palace, malaise trap, 1.viii.2014 – 31.viii.2014, 1 ♂, DM; 1.ix.2014 – 30.ix.2014, 1 ♂, DM; Fawwara, malaise trap, 24.iii.2017 – 27.iii.2017, 3 ♀♀; 27.iii.2017 – 3.iv.2017, 1 ♂ & 7 ♀♀, DM; Ta' Qali National Park, 16.xi.2017, 3 ♂♂ & 1 ♀, IG; Żurrieq Valley, 20.xi.2017, 1 ♂, IG; Qrendi, Il-Maqluba, 22.xi.2017, 1 ♂, IG.

Notes: Species with a Turranic-Euro-Mediterranean distribution. It is a polyphagous grass taxon with adults living also on several shrubs and trees. *Empoasca decipiens* damages leaves and shoots by producing punctures on several plants of economic importance (e.g. soybeans, cotton, potato) (FATHI *et al.*, 2009). According to BASPINAR *et al.* (2011), *E. decipiens* adults were reported as causing serious damage to citrus fruits in Turkey. In addition, the species proved to be an experimental vector of “*Candidatus* Phytoplasma asteris”, 16SrI-B, the chrysanthemum yellow phytoplasma, affecting *Chrysanthemum carinatum* Schousboe (GALETTI *et al.*, 2011).

General distribution: Europe, northern Africa, Near and Middle East and Ethiopian Region (DMITRIEV, 2003-present).

Exitianus taeniaticeps (Kirschbaum, 1868)

Material examined: Malta, Ghadira Natural Reserve, 19.xi.2017, 1 ♂, IG. Gozo, Ramla Bay, 23.xi.2017, on *Panicum repens* L., 3 ♂♂ & 1 ♀, IG.

Notes: Species feeding on *Cynodon dactylon* (L.) Pers. and other herbaceous plants.

General distribution: Southern Europe and northern Africa (RIBAUT, 1952; NAST, 1987).

Hauptidia distinguenda (Kirschbaum, 1868)

Material examined: Malta, Buskett, Verdala Palace, malaise trap, 1.x.2014 – 30.xi.2014, 1 ♀; 30.vii.2015 – 30.ix.2015, 1 ♂ & 2 ♀♀, DM; Fawwara, malaise trap, 27.iii.2017 – 3.iv.2017, 1 ♀, DM.

Notes: Species widespread in Europe and in the eastern Mediterranean. Polyphagous species on herbaceous plants, especially Geraniaceae.

General distribution: Europe and the Near East (DMITRIEV, 2003-present).

Hauptidia provincialis (Ribaut, 1931)

Material examined: Malta, Buskett, Verdala Palace, malaise trap, 30.vi.2015 – 30.ix.2015, 1 ♂, DM; Fawwara, malaise trap, 27.iii.2017 – 3.iv.2017, 1 ♀, DM; Dingli, Buskett Gardens, 16.xi.2017, 1 ♂, 21.xi.2017, 3 ♂♂ & 2 ♀♀, IG; Qrendi, Il-Maqluba, 22.xi.2017, 2 ♂♂ & 2 ♀♀, IG.

Notes: A widespread species in central and South-eastern Europe. Polyphagous on grasses.

General distribution: Southern Europe, Germany (DMITRIEV, 2003-present).

***Liguropia juniperi* (Lethierry, 1876)**

Material examined: Malta, Buskett, Verdala Palace, malaise trap, 1.viii.2014 – 31.viii.2014, 4 ♂♂ & 4 ♀♀; 1.ix.2014 – 30.ix.2014, 2 ♀♀, 30.vi.2015 – 30.ix.2015, 12 ♂♂ & 1 ♀, DM.

Notes: Mediterranean species reaching central Europe, southern England and also Sweden (SÖDERMAN *et al.*, 2009). It is associated with Cupressaceae.

General distribution: Europe, northern Africa and the Near East (DMITRIEV, 2003-present).

***Macropsis fuscula* (Zetterstedt, 1828)**

Material examined: Malta, Dingli, Buskett Gardens, 16.xi.2017, on *Rubus* sp. 1 ♂ & 1 ♀, IG.

Notes: This species has a Turranic-Euro-Mediterranean distribution but is also recorded from North America; it lives on *Rubus* spp. According to NICKEL (2003), *M. fuscula* is a potential vector of *Rubus* Stunt Disease (RSD) in several European countries.

General distribution: Europe, Middle and Far East, Nearctic region (TISHECHKIN, 2002).

***Macrosteles ramosus* Ribaut, 1952**

Material examined: Malta, Ghajn Rihana, on the hygrophilous vegetation with *Jucus* sp. and *Typha* sp., 3.ii.2015, 17 ♂♂ & 9 ♀♀, VD.

Notes: Species with a Turranic-Mediterranean distribution. Associated with Poaceae in humid biotopes.

General distribution: Southern Europe, northern Africa and Kazakhstan (ZAHNISER, 2007-present).

***Maistas schmidtgeni* (Wagner, 1939)**

Material examined: Malta, Buskett, Verdala Palace, malaise trap, 1.ix.2014 – 30.ix.2014, 1 ♂ & 1 ♀, DM; Ghadira Natural Reserve, 19.xi.2017, 1 ♂ & 1 ♀, IG. Gozo, Ramla Bay, 23.xi.2017, 3 ♂♂, IG.

Notes: A widespread species distributed from central Asia to central Europe and the Mediterranean basin and associated with *Cynodon dactylon* L.

General distribution: Southern and Central Europe, United Kingdom, Near and Middle East, China (DLABOLA, 1954, 1957, 1961 and 1977; HOLZINGER, 1996; HOLZINGER & SELJAK, 2001; DEMIR, 2006; ZAHNISER, 2007-present; RADOVIĆ & PEŠIĆ, 2014; MOZAFFARIAN & WILSON, 2016; OROSZ & TÓTH, 2016).

***Melillaia desbrochersi* (Lethierry, 1899)**

Material examined: Malta, Wardija, 3.ii.2015, 10 ♂♂ & 3 ♀♀, VD; Ta' Qali National Park, 16.xi.2017, 1 ♂, IG; Paradise Bay, 19.xi.2017, 1 ♂, IG; Ghar Dalam, 21.xi.2017, 1 ♂ & 1 ♀, IG; Dingli, Buskett Gardens, 21.xi.2017, 1 ♂, IG; Wardija Hilltop vill., 22.xi.2017, 1 ♂ & 1 ♀, IG; Ghajn Tuffieha Bay, 24.xi.2017, 2 ♂♂, IG. Gozo, Dahlet Qorrot Bay, clay cliffs with *Limbarda critimoides* (L.) Dumort, 5.ii.2015, 24 ♂♂, 4 ♀♀ & many juvenes, VD; Ramla, 5.ii.2015, costal sandy dunes with *Ononis* sp., *Matthiola* sp., etc, 24 ♂♂, 10 ♀♀ & many juvenes, VD; Dwejra, 23.xi.2017, 2 ♂♂, IG.

Notes: This species has a scattered Mediterranean distribution. It is mainly found in open herbaceous environments.

General distribution: Southern Europe and northern Africa (DELLA GIUSTINA, 1989; MIFSUD *et al.*, 2010).

***Orosius orientalis* (Matsumura, 1914)**

Material examined: Malta, Ta' Qali National Park, 16.xi.2017, 1 ♂, IG.

Notes: This polyphagous species is of economic importance in Japan as a vector of the witch's broom of some legumes and in India as a vector of the sesame-phyllody (ISHIHARA, 1982). It is known from the Oriental region, India, Australia and Ethiopian region; in the Mediterranean area *O. orientalis* is a rather rare species known from the South-western regions. Up till now, the synonymy of this species with *O. albicinctus* Distant, 1918 and *O. filigranus* (Haupt, 1927) is not clear.

General distribution: Madeira, northern Africa, Near and Far East, Oriental Region and Australian Region (ZAHNISER, 2007-present).

***Ribautiana tenerrima* (Herrich-Schäffer, 1834)**

Material examined: Malta, Dingli, Buskett Gardens, 21.xi.2017, 1 ♂ & 1 ♀, IG.

Notes: This species is widespread in Europe and in the eastern Mediterranean region. It was also introduced in the Australian and the Nearctic Region. It is reported for *Rubus* spp. and also, but in low numbers, on some woody plants (e.g. *Corylus*, *Quercus*, etc.) (NICKEL, 2003).

General distribution: Western Palaearctic, Nearctic region, Australian region (DMITRIEV, 2003-present).

DISCUSSION

Even though recent collecting trips in Malta and Gozo allowed us to add new records to the Auchenorrhyncha fauna of Malta, the total number of 71 recorded species will surely increase again. It is however possible to make a preliminary comparison with the Auchenorrhyncha fauna of the nearby islands of Sicily in order to know what we can expect to find in the future. The Auchenorrhyncha fauna of Sicily is very rich with about 400 recorded species (in comparison with that for Italy which counts over 900 species). However, the Sicilian territory is more than 50 times larger than that of the Maltese archipelago; it is less affected by anthropogenic pressures; presents

a wider range of habitat types and as a direct consequence of this, the floral biodiversity which can host Auchenorrhyncha is also much more diverse. Nevertheless, we expect that at least 100 different species could potentially occur in Malta.

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APPENDIX I – Checklist of the Auchenorrhyncha of the Maltese Archipelago (species marked with an asterisk represent new records)

CIXIIDAE Spinola, 1839

- Hyalesthes obsoletus* Signoret, 1865
- Reptalus* cf. *panzeri* (Löw, 1883)
- Tachycixius remanei* D'Urso, 1999
- Tachycixius* cf. *osellai* (Dlabola, 1980)*

DELPHACIDAE Leach, 1815

- Asiraca clavicornis* (Fabricius, 1794)
- Chloriona unicolor* (Herrich-Schäffer, 1835)
- Distantinus putoni* (A. Costa, 1888)
- Flastena fumipennis* (Fieber, 1866)
- Iubsoda stigmatica* (Melichar, 1897)*
- Kelisia brucki* Fieber, 1878*
- Kelisia ribauti* W. Wagner, 1938*
- Kelisia sulcata* Ribaut, 1934*
- Pseudaraeopus lethierryi* (Mulsant & Rey, 1879)
- Sogatella vibix* (Haupt, 1927)*
- Toya obtusangula* (Linnavuori, 1957)
- Toya propinqua* (Fieber, 1866)

MEENOPLIDAE Fieber, 1872

- Nisia nervosa* (Motschulsky, 1863)

DICTYOPHARIDAE Spinola, 1839

- Dictyophara europaea* (Linnaeus, 1767)

TETTIGOMETRIDAE Germar, 1821

- Tettigometra atra* Hagenbach, 1822
- Tettigometra impressifrons* Mulsant & Rey, 1855*
- Tettigometra laeta* Herrich-Schäffer, 1835*
- Tettigometra picta* Fieber, 1865

ISSIDAE Spinola, 1839

- Clybeccus declivum* (Dlabola, 1986)
- Falcidius ebejeri* Gnezdilov & Wilson, 2008
- Latilica tunetana* (Matsumura, 1910)*

CICADIDAE Leach, 1815

- Cicada orni* Linnaeus, 1758

APHROPHORIDAE Amyot & Serville, 1843

- Aphrophora alni* (Fallen, 1805)
- Philaenus spumarius* (Linnaeus, 1758)

CICADELLIDAE Latreille, 1825

- Anaceratagallia laevis* (Ribaut, 1935)
Anoscopus gr. *albifrons* (Linnaeus, 1758)
Asymmetrasca decedens (Paoli, 1932)*
Austroagallia avicula (Ribaut, 1935)
Austroagallia sinuata (Mulsant & Rey, 1855)
Balclutha brevis Lindberg, 1954
Balclutha frontalis (Ferrari, 1882)*
Balclutha punctata (Fabricius, 1775)
Balclutha saltuella (Kirschbaum, 1868)
Bugraia ocularis (Mulsant & Rey, 1855)*
Empoasca alsiosa Ribaut, 1933
Empoasca decipiens Paoli 1930*
Eupelix cuspidata (Fabricius, 1775)
Eupteryx andalusiaca Ferrari, 1882
Eupteryx melissae Curtis, 1837
Eupteryx salviae Arzone & Vidano, 1994
Euscelis lineolatus Brullé, 1832
Exitianus taeniaticeps (Kirschbaum, 1868)*
Ficocyba ficaria (Horvath, 1897)
Fruticidia bisignata (Mulsant & Rey, 1855)
Grypotes staurus Ivanoff, 1885
Hauptidia distinguenda (Kirschbaum, 1868)*
Hauptidia lapidicola (Vidano, 1964)
Hauptidia provincialis (Ribaut, 1931)*
Hecalus sp.
Liguropia juniperi (Lethierry, 1876)*
Macropsis fuscula (Zetterstedt, 1828)*
Macrosteles ramosus Ribaut, 1952*
Maiestas schmidtgeni (Wagner, 1939)*
Megophthalmus scabripennis Edwards, 1915
Melillaia desbrochersi (Lethierry, 1899)*
Neoliturus dubiosus (Matsumura, 1908)*
Neoliturus fenestratus (Herrich-Schäffer, 1834)
Opsius lethierryi Wagner, 1942
Opsius stactogalus Fieber, 1866
Orosius orientalis (Matsumura, 1914)*
Psammotettix alienus (Dahlbom, 1850)
Ribautiana tenerrima (Herrich-Schäffer, 1834)*
Synophropsis lauri (Horvath, 1897)
Tamaricella complicata Dworakowska, 1971
Tamaricella tamaricis (Puton, 1872)
Zygina flammigera (Fourcroy, 1785)
Zyginidia serpentina (Matsumura, 1908)