

The family Ceratopogonidae (Diptera, Nematocera) in Malta

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ABSTRACT. An account is given of the 21 species in the family Ceratopogonidae that occur in the Maltese Islands, including 13 new records.

KEY WORDS. Mediterranean, *Culicoides*, *Dasyhelea*, *Atrichopogon*, *Forcipomyia*.

INTRODUCTION

The Ceratopogonidae (commonly known as biting midges) is a large family of diptera that occurs worldwide except for Antarctica. Over 6000 species are known to occur (BORKENT & WIRTH, 1997; BORKENT, 2014) of which 567 occur in Europe (SZADZIEWSKI *et al.*, 2013). The immature stages of most species require moisture in order to survive. Some are fully aquatic, developing in ponds, lakes, streams and saltmarshes. Others are semi-aquatic, developing in mud, wet meadows, leaf litter, moss, under bark, in tree holes, in sap runs and in ungulate dung. Adult flies may be flower-feeders or predatory on other insects and the females of many species suck the blood of vertebrates, mainly mammals and birds. A few of the blood sucking species are important vectors of zoonotic infections, the most significant of which are bluetongue disease of sheep and cattle, and African horse sickness of equines. In areas where biting activity is intense human and animal activity may be rendered impossible. The family is therefore of veterinary and economic importance.

The biting midge fauna of the Maltese archipelago has been very little investigated and is very poorly known. No species from Malta are cited in the Catalogue of Palaearctic Diptera (REMM, 1988). The first published records appear to be those of GOFFREDO *et al.* (2004) who between May and October 2002 ran traps (the nature of which is not specified) on cattle, sheep and goat farms in six fixed localities: four were on the island of Malta (Mellieħa, Rabat, San Gwann and Zejtun) and two on the island of Gozo (Gharb and Sannat). The purpose was to find whether *Culicoides imicola* Kieffer, 1913, the principal vector of bluetongue virus in the Mediterranean, was present in Malta. The survey was directed towards species of *Culicoides* Latreille, 1809 of which nine species were recorded, all for the first time: *C. imicola*, *C. paolae* Boorman, 1996, *C. cataneii* Clastrier, 1957, *C. circumscriptus* Kieffer, 1918, *C. jumineri* Callot & Kremer, 1969, *C. kingi* Austen, 1912, *C. newsteadi* Austen, 1921, *C. maritimus* Kieffer, 1924 and *C. submaritimus* Dzhafarov, 1962 (here treated as a synonym of *maritimus* Kieffer). All, apart from *paolae* and *kingi*, were found in very small numbers. One (*C. imicola*) is the only species in the family cited from Malta by SZADZIEWSKI *et al.* (2013) in the online database of Fauna Europaea.

Thirteen species have been known to occur on the Maltese Islands by the author since 1996 following examination of adult material hand swept in suitable habitats by the author and Dr Martin J. Ebejer between 1992 and 1995 and identified by Dr John Boorman of the Natural History Museum, London. This data is reported here for the first time. Reference is made to the species reported by GOFFREDO *et al.* (2004). Species are listed in alphabetical order following BORKENT

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(2014). Species newly recorded from Malta are marked with an *. An abbreviated geographical distribution culled from several publications including REMM (1988) and SZADZIEWSKI *et al.* (2013) is given for each species. Comments (including poorly known or recently established synonymies) are given for some species.

Specimens, including slide mounts in Canada balsam on which identifications were made are deposited in the author's private collection and in the Natural History Museum, London.

ANNOTATED SPECIES LIST

Subfamily **Ceratopogoninae** Newman, 1834

Culicoides cataneii Clastrier, 1957

Literature records: GOFFREDO *et al.* (2004). No collection data was given.

Material examined: Malta, Chadwick Lakes, 20.iv.1994, 1 ♂; Fiddien, 8.ix.1992, 1 ♂; Ghadira, 9.iv.1993, 1 ♂, 5.v.1993, 1 ♂; Rabat, ix.1994, 4 ♂♂ & 1 ♀, 5.xi.1994, 1 ♂; Wied Incita, 27.ii.1994, 1 ♂.

Distribution: A Palaearctic species widely distributed in Europe and the Mediterranean and extending to the Near East and North Africa.

Culicoides circumscriptus Kieffer, 1918

Literature records: GOFFREDO *et al.* (2004). No collection data was given.

Material examined. Malta, Rabat, ix.1994, 2 ♀♀.

Distribution: A very widely distributed species in the Palaearctic, also occurring in West Africa and the Oriental region.

Culicoides imicola Kieffer, 1913

Literature records: GOFFREDO *et al.* (2004). Collected from cattle farms in San Gwann (Malta) and Sannat and Gharb (Gozo) and a sheep and goat farm in Mellieha (Malta). The species was found in very low abundance (< 0.1% of the total *Culicoides* collected).

Distribution: An Afrotropical and Oriental species known in the Palaearctic from southern Europe and the Mediterranean (Portugal, Spain including the Balearic Islands, France including Corsica, Italy including Sardinia and Sicily, Malta, the Greek Islands and Cyprus), the Near East and North Africa.

Culicoides jumineri Callot & Kremer, 1969

Literature records: GOFFREDO *et al.* (2004). No collection data was given.

Distribution: A predominantly Mediterranean species recorded from Portugal, Spain, France including Corsica, Sardinia and Malta. Also recorded from the Near East and North Africa.

Culicoides kingi Austen, 1912

Literature records: GOFFREDO *et al.* (2004). Collected in abundance in October from a sheep and goat farm in Mellieha (Malta).

Distribution: An Afrotropical species also recorded from the Mediterranean (Sardinia, Malta), North Africa and the Arabian Peninsula.

Culicoides maritimus Kieffer, 1924

Literature records: GOFFREDO *et al.* (2004). No collection data given. The authors also record *C. submaritimus* Dzhanfarov, 1962 which was synonymised with *maritimus* by KREMER & DELÉCOLLE (1974). This synonymy was accepted by REMM (1988), BORKENT & WIRTH (1997) and SZADIEWSKI *et al.* (2013).

Material examined: Malta, Marfa Ridge, 17.iv.1992, 2 ♂♂; Rabat, ix.1994, 1 ♂.

Distribution: A Palaearctic species widely distributed in Europe and extending as far East as Uzbekistan. Also known from the Near East and North Africa.

Culicoides newsteadi Austen, 1921

Literature records: GOFFREDO *et al.* (2004). No collection data was given.

Material examined: Malta, Rabat, ix.1994, 1 ♀. Gozo, Wied il-Lunzjata, 11.xii.1993, 1 ♀.

Distribution: A Palaearctic species widely distributed in Europe and extending as far East as Tajikistan. Also known from the Near East and North Africa.

Culicoides paolae Boorman, 1996

Literature records: GOFFREDO *et al.* (2004). This was by far the most abundant and widespread species of *Culicoides* collected by the authors, representing more than 80% of the total number of specimens collected.

Distribution: A recently described species from southern Italy where it was suspected to feed on horses (BOORMAN *et al.*, 1996) although its antennal and palpal morphology have led other authors (MEISWINKEL *et al.*, 2004) to speculate that it feeds preferentially on birds. The species was subsequently reported from Malta, Corsica, Sardinia, Croatia, Tunisia, France, Algeria, Greece and Spain in chronological order (references in ESTRADA *et al.*, 2011).

Culicoides punctatus (Meigen, 1804)*

Material examined: Malta, Rabat, ix.1994, 1 ♀.

Distribution: A widely distributed Palaearctic species.

Culicoides univittatus (Vimmer, 1932)*

Culicoides agathensis Callot, Kremer & Rioux, 1963 was synonymised with *C. univittatus* by KREMER *et al.* (1981).

Material examined: Malta, Fiddien, 5.iii.1991, 5 ♀♀, 8.ix.1992, 1 ♂, 23.i.1993, 1 ♂ & 2 ♀♀, 3.iii.1994, 1 ♀; Rabat, ix.1994, 2 ♂♂; Wied Ghajn Rihana, 5.ii.1994, 1 ♂.

Distribution: A predominantly southern European and Mediterranean species known from Portugal, Spain, France including Corsica, Italy including Sardinia, and Albania, extending to the Near East.

Culicoides vidourensis Callot, Kremer, Molet & Bach, 1968*

Material examined: Malta, Rabat, ix.1994, 4 ♀♀.

Distribution: A central European species extending into the Mediterranean (Corsica, Malta and North Africa) and the Near East.

Subfamily **Dasyheleinae** Lenz, 1934*Dasyhelea flavifrons* (Guérin-Méneville, 1833)*

Dasyhelea dufouri (Laboulbène, 1869) was synonymised with *D. flavifrons* by SZADZIEWSKI & DOMINIAK (2006).

Material examined: Malta, Balzan, 8.ix.1991, 7 ♂♂, 7 pupal exuviae; Buskett, 9.vii.1993, 1 ♀, 11.iv.1994, 1 ♂ & 1 ♀; Fiddien, 3.iii.1994, 2 ♂♂; Ghadira, 9.iv.1993, 2 ♀♀; Marfa Ridge, 22.iii.1992, 2 ♂♂ & 5 ♀♀, 17.iv.1992, 1 ♂; Mistra, 19.iii.1993, 2 ♂♂ & 1 ♀; Salina, 23.viii.1992, 2 ♂♂ & 1 ♀; Wied Ghajn Rihana, 1.iv.1994, 14 ♂♂; Wied Incita, 27.ii.1994, 2 ♂♂ & 4 ♀♀.

Distribution: Widely distributed in the Palaearctic as far East as Japan.

Dasyhelea flavoscutellata (Zetterstedt, 1850)*

Material examined: Malta, Marfa Ridge, 22.iii.1992, 1 ♂ & 1 ♀.

Distribution: A widely distributed Palaearctic species.

Subfamily **Forcipomyiinae** Lenz, 1934*Atrichopogon (Psammopogon) albiscapula* Kieffer, 1918*

Material examined: Malta, Bahrija, 11.viii.1992, 2 ♀♀, 13.vi.1993, 2 ♂♂ & 3 ♀♀; Buskett, 15.viii.1992, 14 ♂♂ & 14 ♀♀, 9.vii.1993, 18 ♂♂ & 6 ♀♀; Fiddien, 8.vii.1992, 1 ♂ & 1 ♀, 8.ix.1992, 1 ♂, 8.xi.1992, 2 ♀♀, 21.ix.1994, 1 ♂. Gozo, Gharb, Wied il-Mielah, 1 ♂ & 1 ♀, 29.xi.1991.

Distribution: A southern Palaearctic species known from Spain, Algeria and Tunisia.

Forcipomyia (Euprojoannisia) alacris (Winnertz, 1852)*

Material examined: Malta, Bahrija, 11.viii.1992, 2 ♂♂; Delimara, 24.iv.1993, 1 ♂; Fiddien, 8.ix.1992, 2 ♂♂, 21.ix.1994, 1 ♂; Mistra, 19.iii.1993, 1 ♂; Mizieb, 31.iii.1993, 1 ♂ & 1 ♀, 8.xii.1993, 3 ♂♂; Rabat, 24.xii.1993, 1 ♂ & 1 ♀, ix.1994, 25 ♂♂ & 5 ♀♀, 5.xi.1994, 1 ♂; Wied Ghajn Rihana, 5.ii.1994, 1 ♂, 1.iv.1994, 3 ♂♂; Wied Incita, 27.ii.1994, 26 ♂♂ & 10 ♀♀, 19.ii.1995, 6 ♂♂ & 2 ♀♀; Wied Qannotta, 20.ii.1994, 2 ♂♂, 1.iv.1994, 1 ♂.

Distribution: A central and eastern European species extending as far East as Siberia. Also recorded from North Africa and the Near East.

Forcipomyia (Forcipomyia) bipunctata (Linnaeus, 1767)*

Material examined: Malta, Ghadira, 5.v.1993, 2 ♂♂; Rabat, iii.1994, 2 ♂♂, 5.xi.1994, 1 ♂; Mizieb, 31.iii.1993, 7 ♂♂ & 4 ♀♀; Wied Ghomor, 17.vi.1992, 3 ♂♂. Gozo, Mgarr ix-Xini, 23.iv.1992, 7 ♂♂.

Distribution: A widely distributed Holarctic species extending as far east as Japan. Also known from the Near East and North Africa.

Forcipomyia (Forcipomyia) ciliata (Winnertz, 1852)*

Material examined: Gozo, Dwejra, 10.iv.1992, 1 ♂.

Distribution: A widely distributed Holarctic species extending as far East as Mongolia.

Forcipomyia (Forcipomyia) nigra (Winnertz, 1852)*

Material examined: Malta, Marfa Ridge, 22.iii.1992, 7 ♂♂ & 6 ♀♀, 17.iv.1992, 8 ♂♂ & 6 ♀♀, 19.iii.1994, 3 ♂♂ & 1 ♀; Mistra, 19.iii.1993, 1 ♂ & 1 ♀; Rabat, ix.1994, 1 ♂; Wied Incita, 19.ii.1995, 1 ♂ & 1 ♀. Gozo, Dwejra, 28.ix.1993, 7 ♂♂ & 1 ♀; Ramla dunes, 10.iv.1993, 2 ♂♂.

Distribution: A Palaearctic species widely distributed in Europe extending as far East as Kyrgyzstan. Also recorded from North Africa.

Forcipomyia (Lepidohelea) pulcherrima Santos Abreu, 1918*

Forcipomyia marsafae Ghonaim, Ibrahim & Ali, 2001 described from Egypt was synonymised with *F. pulcherrima* by SZADZIEWSKI *et al.* (2011). More recently, GROGAN *et al.* (2013) synonymised *F. chrysolopha* (Kieffer, 1911) described from the Seychelles with *F. pulcherrima*.

Material examined: Malta, Marfa Ridge, 17.iv.1992, 1 ♂; Rabat, 5.xi.1994, 1 ♂ & 1 ♀.

Distribution: A widely distributed Old World Afrotropical and Oriental species first described from the Canary Islands. Recorded in the southern Palaearctic from Spain, Algeria, Tunisia, Egypt and the Caucasus. GROGAN *et al.* (2013) recently recorded it from the United States where it was introduced with shipments of soil potted orchids from Asia.

Forcipomyia (Synthyridomyia) murina (Winnertz, 1852)*

Material examined: Malta, Balzan, vii–x.1993, 2 ♂♂; Delimara, 24.iv.1993, 2 ♂♂; Ghadira, 9.iv.1993, 2 ♂♂.

Distribution: A widely distributed species in the Holarctic, Afrotropical and Oriental regions.

Forcipomyia (Thyridomyia) frutetorum (Winnertz, 1852)*

Material examined: Malta, Ghadira, 9.iv.1993, 4 ♂♂; Manikata, 9.iv.1993, 2 ♂♂ & 1 ♀; Marfa Ridge, 19.iii.1994, 2 ♂♂; Mizieb, 31.iii.1993, 2 ♂♂. Gozo, Dwejra, 10.iv.1992, 1 ♂.

Distribution: Widely distributed in the Holarctic and Afrotropical regions.

DISCUSSION

Twenty one species of Ceratopogonidae are here recorded from Malta, 13 for the first time. This compares favourably with the 22 species that were recorded by BOORMAN (1995) from neighbouring Sicily, which is much larger and more ecologically diverse. Having said that, the fauna of Sicily, with the exception of species of *Culicoides* remains poorly known. Many species reported here are known from a very small number of specimens. It is expected that more intensive collecting and trapping will result in the discovery of yet more species on the islands.

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