



Fulgoromorpha (Hemiptera) records from Southwestern Turkey

EMINE DEMIR

*Düzce University, Faculty of Agriculture and Natural Sciences,
Department of Field Crops, 81620 Konuralp/Düzce, Turkey*

ABSTRACT

In the present study Fulgoromorph species collected from Gevne Valley and the surroundings located in southwest of Turkey were evaluated faunistically, ecologically and zoogeographically. In the surveys 43 species were identified to belong to 27 genera and 9 families. Herein, new records for the Mediterranean (4 species) and Central Anatolia (5 species) regions are reported. The species identified in the study area belong to 14 different zoogeographical elements of endemism and the endemism ratio of the area is 23.3%. Issidae is the most dominant family in the area since 74.0% of the specimens collected belong to this family.

KEY WORDS: ecological assessment, endemism, faunistic assessment, zoogeographical assessment.

Introduction

Faunistic records from Turkey belonging to Fulgoromorpha were previously given by Stål (1861), Bergevin (1918), Horvath (1905), Melichar (1914), Gnezdilov (2002, 2004), Gnezdilov and Mazzoni (2004), Gnezdilov and Drosopoulos (2005), Gnezdilov et al. (2004), Gnezdilov and Wilson (2007) and Demir (2008). In the following years, Gnezdilov (2008, 2010, 2011, 2016), Demir (2009), Demir and Demirsoy (2009), Kartal and Dursun (2009), Kartal and Miroğlu (2009), Kartal and Karavin (2010), Yılmaz et al. (2009), Önder et al. (2011), Koçak and Kemal (2012), Tezcan et al. (2013), Gnezdilov et al. (2014), Demirel and Hasbenli (2015), Asche (2015), Dursun and Fent (2016) gave Fulgoromorpha records from Turkey in their

studies and identified species new to science.

According to the current literature, Turkey Fulgoromorpha fauna is represented by 219 species belonging to 12 families.

The surveyed area is located in the southwest part of Turkey including Gevne Valley and its surrounding area (including Geyik Mountain, Ak Mountain, Yıldız Mountain and Seytan Mountain). It is in Antalya of the Mediterranean Region (Antalya part: Burdur, Isparta, Antalya Province) and Konya part of the Central Anatolian Region (Konya part: Konya, Aksaray, Karaman provinces) and located in the northeastern part of Antalya province and on the southwestern part of Konya province. It lies between 31° 30'- 32° 45' east latitudes and 37° 30'- 36° 30'.

In the study area, a total of 86 species are known, 69 from Antalya and 18 from Konya

*Corresponding author: eminedemird@yahoo.com

(Demir 2008). Although the Fulgoromorpha suborder has a large number of species, the number of species in Turkey has not yet been sufficiently explored.

The aim of the current study was to increase our awareness of the Turkish Fulgoromorpha fauna. To achieve this, a detailed work has been carried out in a large area in the southwest part of Turkey.

Materials and Methods

A field expedition was carried out in the study area from April to August of 2006, 2007 and 2008. Planthopper specimens were collected by swept net from plants of the study area in daytime and then, were sampled with an aspirator. Additionally, sampling was conducted with an aspirator through the plants while specimens had been also collected on plants by hand capture. During the night, light trapping was used. The specimens from the trap were collected with an aspirator.

All the collected specimens were transferred into ethyl acetate jars and numbered on standard insect envelopes. The specimens were classified in the laboratory and prepared according to standard museum practice for identification. The location from which specimens were collected and the altitude from sea level as well as collection date were recorded together with the GPS coordinates.

The species identification was based on the keys of Zachvatkin (1946), Dlabola (1957, 1981), Linnavuori (1965), Asche (1982), Kartal (1986, 1987), Kalkandelen (1987-2000) and Gnezdilov et al. (2014). The chorotype of the identified species was defined by using the following studies: Palearctic region lists by Nast (Nast 1972, 1982, 1987), Fulgoromorpha section in the European fauna website (Hoch 2013) and

Fulgoromorpha Lists on the Web (Bourgoin 2017).

Results and Discussion

Order: HEMIPTERA

Suborder: FULGOROMORPHA

Family: CIXIIDAE

Subfamily: CIXIINAE

Tribe: CIXIINI

***Cixius (Ceraticixius) simplex* (Herrich-Schaeffer, 1835)**

Material examined: Antalya: Alanya, Çayrası-Sarımut, 36.38 N, 32.23 E, 1110 m, 11.06.2008, 1♂, on *Tamarix*. **Chorotype:** European or W-Palaeartic.

***Tachycixius creticus* Dlabola, 1974**

Material examined: Konya: Bozkır, Yalnızca, 37.08 N, 32.15 E, 1460 m, 13.06.2007, 1♂ on herbaceous plants. **Chorotype:** E-Mediterranean (Aegean).

Tribe: PENTASTIRINI

Subtribe: PENTASTIRINA

***Eumecurus gyaurus* (Dlabola, 1957)**

Material examined: Antalya: Akseki-Gündoğmuş, 36.46 N, 39.46 E, 460 m, 11.07.2007, 1♀, on maquis. **Chorotype:** Anatolian.

***Pentastira superans* Logvinenko, 1976**

Material examined: Konya: Hadim-Bozkır, Korualan, 36.59 N, 32.21 E, 1489 m, 19.07.2006, 2♂, on *Quercus*. **Chorotype:** SW-Asiatic (Caucaso-Anatolian).

Reptalus (Reptalus) melanochaetus

(Fieber, 1876) Material examined: Antalya: Akseki-Gündoğmuş, 36.46 N, 39.46 E, 460 m, 11.07.2007, 1♂, on maquis. **Chorotype:** European.

***Reptalus oleae* Dlabola, 1987**

Material examined: Antalya: İbradı, 37.07 N, 31.34 E, 1190 m, 10.06.2008, 1♂1♀, on *Verbascum*; Konya: Beyreli-Taşkent, 36.53

N, 32.22 E, 1961 m, 17.07.2006, 1♂, on herbaceous plants. **Chorotype:** Anatolian.

Reptalus (Reptalus) horridus (Linnavuori, 1962)

Material examined: Konya: Taşkent-Alanya, Gevne, 1298 m, 09.07.2007, 1♂, on *Quercus*; Taşkent, 36.57 N, 32.28 E, 1610 m, 19.07.2006, 1♂1♀ on *Quercus*; Seydişehir, Tepearası, 37.29 N, 31.408 E, 1522 m, 20.07.2006, 3♀ on *Quercus*. **Chorotype:** E-Mediterranean.

Hyalesthes hani Hoch, 1985

Material examined: Antalya: Akseki, 36.57 N, 31.45 E, 681 m, 11.07.2007, 1♂1♀ on *Vitex agnus-castus*. **Chorotype:** E-Mediterranean (Palaestino-Taurian).

Hyalesthes mlokosiewiczzi Signoret, 1879

Material examined: Konya: Hadim-Bozkır, 36.58 N, 32.24 E, 1650 m, 12.06.2008, 2♀ on herbaceous plants. **Chorotype:** Turano-Mediterranean (Turano-Anatolian).

Hyalesthes obsoletus Signoret, 1865

Material examined: Konya: Bozkır-Korualan, 37.01 N, 32.194 E, 1315 m, 10.07.2007, 9♂3♀ on herbaceous plants. **Chorotype:** Palaearctic.

Family: DELPHACIDAE
Subfamily: DELPHACINAE
Tribe: DELPHACINI

Eurybregma nigrolineata Scott, 1875

Material examined: Konya: Hadim-Beyreli, 36.56 N, 32.23 E, 1866 m, 13.06.2007, 1♀; Derebucak, 37.22 N, 31.29 E, 1222 m, 10.06.2008, 1♀ on herbaceous plants. **Chorotype:** European.

Laodelphax striatellus (Fallen, 1826)

Material examined: Konya: Taşkent, Afşar, Feslikan Yaylası, 36.51 N, 32.31 E, 1726 m, 17.07.2006, 1♀ on herbaceous; Afşar, Çamdibi, 36.53 N, 32.32 E, 1509 m, 17.07.2006, 1♀ on herbaceous; Bozkır-Korualan, 37.01 N, 32.194 E, 1315 m, 10.07.2007, 1♀ on herbaceous plants.

Chorotype: Palaearctic + Afro-tropical + Oriental.

Muirodelphax aubei (Perris, 1857)

Material examined: Konya: Seydişehir, Fasıllar, 37.38 N, 31.56 E, 1215 m, 13.05.2006, 1♀ on herbaceous **Chorotype:** Palaearctic.

Toya propinqua (Fieber, 1866)

Material examined: Antalya: Alanya, Sarımut, 36.38 N, 32.23 E, 1114 m, 24.08.2006, 2♂4♀ on light trap. **Chorotype:** Holarctic + Ethiopian + Oriental or subcosmopolitan.

Javasella (Javasella) dubia (Kirschbaum, 1868)

Material examined: Antalya: Alanya, Sarımut, 36.38 N, 32.23 E, 1114 m, 24.08.2006, 1♂ on light trap. **Chorotype:** W-Palaearctic.

Dicranotropis (Leimonodite) beckeri Fieber 1866

Material examined: Konya: Hadim-Beyreli, 36.56 N, 32.23 E, 1866 M, 13.06.2007, 1♀ on herbaceous. **Chorotype:** Palaearctic.

Family: MEENOPLIDAE

Meenoplus albosignatus Fieber, 1866

Material examined: Antalya: Akseki-Gündoğmuş, 36.46 N, 39.46 E, 460 m, 11.07.2007, 1 ♀, on maqius; Konya: Seydişehir, Fasıllar, 37.38 N, 31.56 E, 1215 m, 13.05.2006, 2♂2♀. **Chorotype:** Turano-European (Ponto-Pannonian).

Family: DERBIDAE
Subfamily: CEDUSINAE
Tribe: CEDUSINI

Subtribe: CEDUSINA

Malenia bosnica (Horvath, 1907)

Material examined: Konya: Huğlu, 37.28 N, 31.37 E, 1404 m, 11.07.2007, 2♂3♀, on light trap. **Chorotype:** Turano-European.

Family: ACHILIDAE
Subfamily: ACHILINAE
Tribe: ACHILINI
Subtribe: CIXIDIINA

Cixidia (Eiptera) mersinica (Dlabola, 1987)

Material examined: Konya: Taşkent-Alanya, Gevne, 1298 m, 09.07.2007, 3♀ on *Quercus*. **Chorotype:** Anatolian.

Family: DICTYOPHARIDAE

Subfamily: DICTYOPHARINAE

Tribe: DICTYOPHARINI

Callodictya krueperi (Fieber, 1876)

Material examined: Antalya: Akseki-Gündoğmuş, 36.46 N, 39.46 E, 460 M, 11.07.2007, 8♂8♀ on *Quercus*; Konya: Taşkent-Alanya, Gevne, 36.46 N, 32.27 E, 1482 m, 24.08.2006, 1♂ on *Quercus*. **Chorotype:** Turano-Mediterranean (Turano-E-Mediterranean).

Dictyophara (Dictyophara) europaea (Linnaeus, 1767)

Material examined: Konya: Seydişehir, Yenice, 37.31 N, 31.45 E, 1202 m, 20.07.2006, 2♀ on herbaceous; 1♀; Bozkır-Korualan, 37.01 N, 32.194 E, 1315 m, 10.07.2007, 2♂3♀ on herbaceous; Taşkent, Afşar, Feslikan Yaylası, 36.51 N, 32.31 E, 1726 m, 17.07.2006, 1♀ on herbaceous plants. **Chorotype:** SW-Asiatic.

Dictyophara (Dictyophara) lindbergi Metcalf, 1955

Material examined: Konya: Seydişehir, Yenice, 37.31 N, 31.45 E, 1202 m, 20.07.2006, 1♀ on herbaceous plants. **Chorotype:** S-European.

Dictyophara (Euthremma) multireticulata Mulsant et Rey, 1855

Material examined: Konya: Karapınar, 36.36 N, 32.24 E, 1146 m, 09.07.2007, 1♀ on shrubs; Taşkent-Alanya, Gevne, 1298 m, 12.08.2007, 1♀ on *Quercus*. **Chorotype:** S-European + E-European.

Subfamily: ORGERIINAE

Tribe: RANISSINI

Ranissus punctiger (Horvath, 1905)

Material examined: Konya: Huğlu, Bakaran, 37.24 N, 31.40 E, 1232 m,

10.06.2008, 1♂ on *Quercus*; Dikmetaş, 36.36 N, 32.25 E, 1109 m, 11.06.2008, 1♂ on herbaceous plants under *Quercus*. **Chorotype:** Anatolian.

Nymphorgerius (Isocurus) cyprius (Lindberg, 1948)

Material examined: Konya: Taşkent, Afşar, Akçapınar, 36.52 N, 32.34 E, 1664 m, 18.07.2006, 4♂3♀ on light trap; Seydişehir, Fasıllar, 37.38 N, 31.56 E, 1215 m, 13.05.2006, 1♀ on herbaceous; Taşkent-Alanya, Gevne, 36.46 N, 32.27 E, 1482 m, 24.08.2006, 1♂ on *Quercus*; Karapınar, 36.36 N, 32.25 E, 1154 m, 12.08.2007, 1♀ on herbaceous plants. **Chorotype:** E-Mediterranean (Palaestino-Cyprioto-Taurian).

Family: TETTIGOMETRIDAE

Tettigometra (Hystrigonia) hexaspina Kolenati, 1857

Material examined: Konya: Seydişehir, 37.24 N, 31.54 E, 1108 m, 12.06.2007, 3♂4♀ on herbaceous plants. **Chorotype:** S-European + E-European.

Tettigometra (Metroplaca) longicornis (Signoret, 1866)

Material examined: Antalya: Akseki, Cemerler, 36.57 N, 31.45 E, 717 m, 16.04.2007, 1♀ on herbaceous plants. **Chorotype:** Palaearctic.

Tettigometra (Mitricephalus) leucophaea (Preyßler 1792)

Material examined: Antalya: Alanya, Gökbel Yaylası, 36.39 N, 32.22 E, 1494 m, 09.07.2007, 2♀; Konya: Taşkent-Alanya, Gevne, 36.46 N, 32.27 E, 1482 m, 24.08.2006, 1♂ on *Quercus*. **Chorotype:** Palaearctic.

Tettigometra (Tettigometra) sulphurea Mulsant et Rey, 1855

Material examined: Konya: Seydişehir, Yenice, 37.31 N, 31.45 E, 1202 m, 20.07.2006, 1♀ on herbaceous plants. **Chorotype:** E-Palaearctic + Centralasiatic-European-Mediterranean.

***Tettigometra (Tettigometra) virescens* (Panzer, 1799)**

Material examined: Konya: Huğlu, 37.28 N, 31.37 E, 1404 m, 11.07.2007, 1♂2♀ on light trap. **Chorotype:** Palaearctic.

Family: ISSIDAE
Subfamily: ISSINAE
Tribe: ISSINI
Subtribe: ISSINA

***Mycterodus (Aegaeum) capitatus* Dlabola, 1982**

Material examined: Konya: Huğlu, Bakaran, 37.24 N, 31.40 E, 1232 m, 10.06.2008, 1♀ on *Quercus*; Derebucak, 37.08 N, 31.33 E, 1319 m, 10.06.2008, 1♂ on *Quercus*. **Chorotype:** Anatolian.

***Mycterodus (Aegaeum) lesbicum* Dlabola, 1980**

Material examined: Konya: Taşkent-Alanya, Gevne, 36.46 N, 32.27 E, 1482 m, 24.08.2006, 2♀ on *Quercus*; Karapınar, 36.36 N, 32.25 E, 1154 m, 12.08.2007, 1♀ on *Quercus*; Taşkent-Alanya, Gevne, 1298 m, 12.08.2007, 1♂4♀ on *Quercus*; Taşkent-Alanya, Gevne, 1298 m, 09.07.2007, 1♂ on *Quercus*. **Chorotype:** E-Mediterranean (Aegean).

***Mycterodus (Aegaeum) spinicordatus* Dlabola, 1983**

Material examined: Antalya: Akseki, Güzelsu, 36.54 N, 31.49 E, 970 m, 09.06.2008, 2♂ on *Spartium junceum*. **Chorotype:** Anatolian.

***Mycterodus (Aegaeum) tekneticus* Dlabola, 1982**

Material examined: Antalya: Gündoğmuş, 36.46 N, 32.00 E, 627 m, 15.05.2006, 1♂1♀ on *Arbutus andrachne*. **Chorotype:** Anatolian.

***Tshurtshurnella alanyana* Dlabola, 1982**

Material examined: Antalya: Akseki, Güzelsu, 36.47 N, 31.45 E, 409 m, 22.04.2008, 4♂3♀ on herbaceous; Konya: Huğlu, 37.28 N, 31.37 E, 1404 m, 11.07.2007, 1♂1♀ on light trap; Seydişehir,

Ağılönü, 37.39 N, 31.46 E, 1193 m, 13.05.2006, 1♂ on herbaceous plants; Seydişehir, Fasıllar, 37.38 N, 31.56 E, 1215 m, 13.05.2006, 1♂1♀ on herbaceous plants.

Chorotype: Anatolian.

***Tshurtshurnella campestre* (Lindberg, 1948)**

Material examined: Konya: Seydişehir, Yenice, 37.31 N, 31.45 E, 1202 m, 20.07.2006, 19♂17♀ on herbaceous; Seydişehir, Çavuş, 37.37 N, 31.55 E, 1186 m, 13.05.2006, 5♂ on herbaceous; Seydişehir, Yenice, 37.31 N, 31.45 E, 1202 m, 20.07.2006, 4♂1♀ on herbaceous plants; Taşkent, Afşar, Akçapınar, 36.52 N, 32.34 E, 1664 m, 18.07.2006, 2♂ on light trap; Seydişehir, Fasıllar, 37.38 N, 31.56 E, 1215 m, 13.05.2006, 1♂ on herbaceous plants. **Chorotype:** E-Mediterranean (Palaestino-Cyprioto-Taurian).

***Bubastia (Acrestia) suturalis* (Fieber, 1877)**

Material examined: Konya: Taşkent-Alanya, Gevne, 36.46 N, 32.27 E, 1482 m, 24.08.2006, 1♂ on *Quercus*. **Chorotype:** E-Mediterranean.

***Kervillea campanuliforme* (Dlabola, 1979)**

Material examined: Konya: Seydişehir, Fasıllar, 37.38 N, 31.56 E, 1215 m, 13.05.2006, 20♂25♀ on herbaceous; Seydişehir, Çavuş, 37.37 N, 31.55 E, 1186 m, 13.05.2006, 6♂13♀ on herbaceous; Seydişehir, Ufacık, 37.39 N, 31.58 E, 1409 m, 13.05.2006, 23♂22♀ on herbaceous plants; Seydişehir, 37.35 N, 31.54 E, 1144 m, 13.05.2006, 8♂8♀ on herbaceous plants. **Chorotype:** Anatolian.

***Kervillea beysehiricum* (Dlabola, 1983)**

Material examined: Konya: Beyreli-Taşkent, 36.53 N, 32.22 E, 1961 m, 17.07.2006, 5♂2♀ on herbaceous; Hadim-Bozkır, 36.58 N, 32.24 E, 1650 m, 12.06.2008, 4♂1♀ on herbaceous plants; Seydişehir, Ağılönü, 37.39 N, 31.46 E, 1193 m, 13.05.2006, 1♂ on herbaceous plants; Antalya: Akseki, Bademlibeli, 37.23 N, 31.42 E, 1450 m, 14.05.2006, 2♀ on herbaceous plants; Akseki-Huğlu, 37.29 N,

31.35 E, 1357 m, 13.05.2006, 1♂6♀ on herbaceous plants. **Chorotype:** Anatolian.

***Scorlupella montana* (Becker, 1865)**

Material examined: Konya: Seydişehir, Ufacık, 37.39 N, 31.58 E, 1409 m, 13.05.2006, 1♀ on herbaceous plants; Seydişehir, Ağılönü, 37.39 N, 31.46 E, 1193 m, 13.05.2006, 2♀ on herbaceous plants; Seydişehir, Fasıllar, 37.38 N, 31.56 E, 1215 m, 13.05.2006, 1♀ on herbaceous plants. **Chorotype:** Turano-European.

***Agalmatium bilobum* (Fieber, 1877)**

Material examined: Antalya: Gündoğmuş, Senir, 36.49 N, 31.57 E, 1013 m, 10.06.2007, 1♀; Akseki, 36.57 N, 31.45 E, 681 m, 11.07.2007, 1♂ on maquis+ herbaceous; Akseki-Huğlu, 37.29 N, 31.35 E, 1357 m, 13.05.2006, 3♂ on herbaceous plants; Akseki-Gündoğmuş, 36.46 N, 39.46 E, 460 m, 11.07.2007, 20♂17♀ on herbaceous plants; Alanya, Karapınar-Sarımut, 36.36 N, 32.24 E, 1097 m, 14.06.2007, 16♂8♀; Konya: Bozkır-Hadim, 37.06 N, 32.18 E, 1372 m, 13.06.2007, 1♀; Seydişehir, 37.35 N, 31.54 E, 1144 m, 13.05.2006, 34♂13♀ on herbaceous plants; Seydişehir, Ağılönü, 37.39 N, 31.46 E, 1193 m, 13.05.2006, 2♀ on herbaceous plants; Seydişehir, Yenice, 37.31 N, 31.45 E, 1202 m, 20.07.2006, 2♀ on herbaceous plants; Huğlu, 37.28 N, 31.37 E, 1404 m, 11.07.2007, 1♀ on light trap. **Chorotype:** W-Palaearctic.

***Agalmatium flavescens* (Oliver, 1791)**

Material examined: Konya: Seydişehir, Çavuş, 37.37 N, 31.55 E, 1186 m, 13.05.2006, 2♂ on herbaceous plants. **Chorotype:** Mediterranean.

Family: FLATIDAE
Subfamily: FLATINAE
Tribe: PHANTIINI

***Phantia subquadrata* (Herrich-Schaeffer, 1838)**

Material examined: Konya: Seydişehir, Yenice, 37.31 N, 31.45 E, 1202 m, 20.07.2006, 2♂5♀ on herbaceous plants; Seydişehir, Çavuş, 37.37 N, 31.55 E, 1186 m, 13.05.2006, 1♀ on herbaceous plants

Chorotype: Turano-Mediterranean (Turano-Apenninian).

Faunistic evaluation

In this study, 470 Fulgoromorpha specimens were collected and 43 species were identified that belonged to 27 genera and 9 families. As a result, specimens belonging to 6 genera (22,2%) from each of Cixiidae, Delphacidae and Issidae families, 1 genus (3,7%) from Meenoplidae, Derbidae, Achilidae, Tettigometridae and Flatidae families and 4 genera (14,8%) from Dictyopharidae families were found (Table 1).

Considering the distribution of the total number of species by family, 10 species (23,3%) belonged to the family Cixiidae, 6 species (14,0%) to Delphacidae and Dictyopharidae, 1 species (2,3%) to Meenoplidae, Derbidae, Achilidae and Flatidae, 5 species (11,6%) to Tettigometridae and 12 species (27,9%) to Issidae family (Table 1).

Five species found in the Antalya province, 4 in the Mediterranean region, 27 in the Konya province and 5 in the Central Anatolian Region are new records. According to this, Fulgoromorpha fauna of Antalya province increased to 73 from 68 and Fulgoromorpha fauna of the Konya province from 18 to 45 species.

Zoogeographical evaluation

The chorotypes of the species determined were defined by considering the geographical distribution areas based on current literature data (Nast 1972, 1982, 1987, Hoch 2013, Bourgoin 2017). Accordingly, 7 species were placed into the East-Mediterranean chorotype, 3 species into the Turano-Mediterranean, 1 species into the Mediterranean, 2 species into Southwestern-Asiatic, 10 species into the Anatolian, 6 species into the Palearctic, 3 species into the W-Palearctic, 1 species into the Palearctic + Afrotropical + Oriental, 1 species into the Holarctic + Ethiopian + Oriental, 3 species into the Turano-

European, 2 species into the European, 1 species into the South-European, 2 species into the South-European + East-European and 1 species into the East-Palaearctic + Centralasiatic + Europeo-Mediterranean.

TABLE 1: Distribution of Fulgoromorpha genera and species by family in the study area.

Family	Number of genera recorded (%)	Number of species identified (%)
Cixiidae	6 (22.2%)	10 (23.3%)
Delphacidae	6 (22.2%)	6 (14.0%)
Meenoplidae	1 (3.7%)	1 (2.3%)
Derbidae	1 (3.7%)	1 (2.3%)
Achilidae	1 (3.7%)	1 (2.3%)
Dictyopharidae	4 (14.8%)	6 (14.0%)
Tettigometridae	1 (3.7%)	5 (11.6%)
Issidae	6 (22.2%)	12 (27.9%)
Flatidae	1 (3.7%)	1 (2.3%)

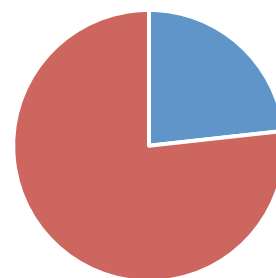
Among these species, *E. gyaurus* R. oleae, *C. mersinica*, *R. anatolicus*, *M. spinicordatus*, *M. tekneticus*, *M. capitatus*, *T. alanyana*, *K. campanuliforme* and *K. beysehiricum* belong to the Anatolian chorotype. Thus, among the 43 identified species, 10 are endemic (Fig. 1).

Considering the distribution of the examined species in the 7 geographic regions of Turkey, 16 species (37.2%) are distributed in the Marmara region, 13 (30.2%) in the Black Sea region, 18 (41.9%) in the Aegean region, 35 (81.4%) in Central Anatolia region, 35 (81.4%) in the Mediterranean region, 23 (53.5%) in East Anatolia, and 16 species (37.2%) in Southeastern Anatolia.

Ecological evaluation

The families Cixiidae, Delphacidae, Meenoplidae, Derbidae, Achilidae, Dictyopharidae, Tettigometridae, Issidae and Flatidae families are represented by 31(6.6%), 14 (3.0%), 5 (1.1%), 3 (0,6%), 41 (8.7%), 15 (3.2%), 348 (74.0%) and 8 individuals (1.7%), respectively. Issidae family had the greatest density of individuals in the study area (74.04%).

Two (4.7%), 12 (27.9%), 12 (27.9%), 25 (58.1%) and 8 (18.6%) of the species identified were collected during each month from April-August, respectively (Fig. 2).



■ endemic species % 23,25

■ other species % 76,75

FIG. 1. Endemism ratio according to the total number of species identified in the study area.

Altitude above sea level of the study area is between 409-2.877m. Considering the vertical distribution of the species identified, 6 (13.6%), 5 (11.6%), 35 (81.4%), and 10

species (23.3%) were collected from between 0-500, 501-1,000, 1,001-1,500 and 1,501-2,000 m, respectively.

Furthermore, 23 (45.1%), 11 (21.6%), 9 (17.6%) and 8 species (15.7%) were collected from herbaceous plants, bushes and maquis, trees and light trap, respectively (Fig. 3). Among these species *T. propinqua*, *J. dubia*, *M. bosnica*, *N. cyprius*, *T. virescens*, *T. alanyana*, *T. campestre* and *A. Bilobum* were collected with a light trap.

Cixius simplex, *H. hani*, *D. multireticulata*, *M. spinicordatus*, *E. gyaurus*, *R. melanochaetus*, *M. albosignatus* and *M. tekneticus* were collected from maquis and bushes.

Pentastira superans, *R. horridus*, *C. mersinica*, *C. krueperi*, *D. multireticulata*, *R. punctiger*, *N. cyprius*, *T. leucophaea*, *M. capitatus*, *M. lesbicum* and *B. suturalis* were collected from trees and woody plants.

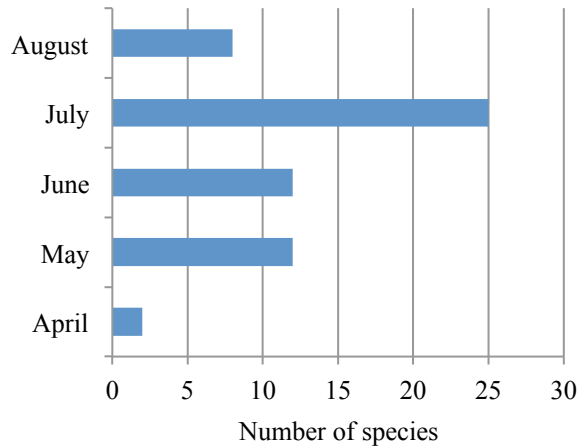


FIG. 2. Number of species determined in the study area per month.

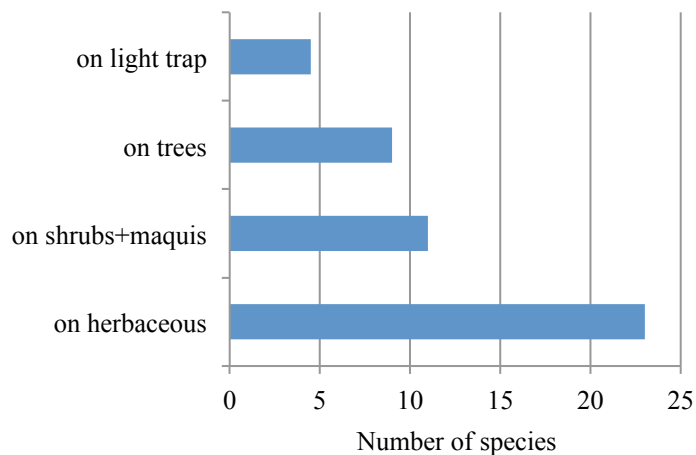


FIG. 3. Number of species collected with each sampling method used in the study.

following species were collected from herbaceous plants by sweeping: *T. creticus*, *R. oleae*, *H. mlkosiewiczzi*, *H. obsoletus*, *E. nigrolineata*, *L. striatellus*, *M. aubei*, *D. beckeri*, *D. europaea*, *D. lindbergi*, *R. punctiger*, *N. cyprius*, *T. hexaspina*, *T. longicornis*, *T. sulphurea*, *T. alanyana*, *T. campestre*, *K. campanuliforme*, *K. beysehiricum*, *S. montana*, *A. bilobum*, *A. flavescens* and *P. subquadrata*.

To conclude, Turkish Fulgoromorpha fauna is represented by 219 species belonging to 12 families. Since many regions in Turkey have not been studied in detail there is a lack of information about the fauna as well as the ecological and geographical distribution data. Similar studies are required to be performed in the future so as the Fulgoromorpha fauna of Turkey to be accurately determined.

Acknowledgements

This study was supported by TUBITAK (The Project number: TBAG-105T329). The present work includes only Fulgoromorpha (Hemiptera) part of the project.

References

- Akman, Y. 1995. Türkiye Orman Vejetasyonu. Ankara Üniv. Fen Fak. Yayınları, Ankara, 326 pp.
- Asche, M. 1982. Beiträge zur Delphaciden-Fauna der Türkei (Anatolien) (Homoptera: Cicadina Delphacidae). Marburg. Ent. Publ. 7: 71-98.
- Asche, M. 2015. The West Palaearctic Achilidae (Hemiptera, Fulgoromorpha: Fulgoroidea): A review with description of five new species from the Mediterranean. Nova suppl. ent. 25: 1-135.
- Bergevin, E. 1918. Description d'un nouveau genre et d'une nouvelle espèce d'Hysteropterinae (Hem. Issidae) d'Asie Mineure. Bull. Soc. Entomol. Fr. 5: 104-108.
- Bourgoin, T. 2017. FLOW (Fulgoromorpha Lists on The Web): a world knowledge base dedicated to Fulgoromorpha. Version 8, updated, last update: 06.02.2017. <http://hemiptera-databases.org/flow/>
- Demir, E. 2008. Fulgoromorpha and Cicadomorpha of Turkey. Part I: Mediterranean Region (Hemiptera). Mun. ent. Zool. 3: 447-522.
- Demir, E. 2009. *Ricania* Germar, 1818 species of western Palaearctic Region (Hemiptera: Fulgoromorpha: Ricaniidae). Mun. ent. Zool. 4: 271-275.
- Demir, E. and A. Demirsoy. 2009. Preliminary report on the Fulgoromorpha (Hemiptera) fauna of Kemaliye (Erzincan) with a new record for Turkey. Mun. ent. Zool. 4: 280-286.
- Demirel, E. and A. Hasbenli. 2015. Contributions to the Bolkar Mountains Cixiidae Fauna with a new record and an identification key for Turkey's *Tachycixius* (Hemiptera: Auchenorrhyncha). Pakistan J. Zool. 47: 1341-1346.
- Dlabola, J. 1957. Results of the Zoological Expedition of the National Museum in Prague to Turkey. 20 Homoptera, Auchenorrhyncha. Acta ent. Mus. Nat. Pra. 31(469): 19-68.
- Dlabola, J. 1981. Ergebnisse der Tschechoslowakisch-Iranischen Entomologischen Expeditionen nach dem Iran (1970 und 1973). Acta ent. Mus. Nat. Pra. 40: 127-311.
- Dursun, A. and M. Fent. 2016. Contributions to the Cicadomorpha and Fulgoromorpha (Hemiptera) fauna of Turkish Thrace Region. Trakya Univ. J. Nat. Sci. 17: 123-128.
- Gnezdilov, V.M. 2002. Morphology of the ovipositor in members of the subfamily Issinae (Homoptera, Cicadina, Issidae). Ent. Obozr., 81: 605–626 (in Russian). [Translation, Ent. Rev. 2004, 82: 957–974].

- Gnezdilov, V.M. 2004. New combinations and data on distribution for some Mediterranean Issidae (Homoptera, Fulgoroidea). *Zoosyst. Ross.*, 13: 80.
- Gnezdilov, V.M. 2008. New and little known species of the genus *Mycterodus* Spinola (Homoptera, Issidae) from the Eastern Mediterranean. *Ent. Obozr.*, 87: 575–580 (in Russian). [Translation, *Ent. Rev.* 88: 808–814].
- Gnezdilov, V.M. 2010. New synonyms, combinations, and faunistic records of Western Palaearctic planthoppers of the family Issidae (Homoptera, Fulgoroidea). *Ent. Obozr.*, 89: 413–422 (In Russian). [Translation, *Ent. Rev.* 2010, 90: 1024–1030].
- Gnezdilov, V.M. 2011. New records for some Western Palaearctic Issidae (Hemiptera: Fulgoroidea). *Acta Ent. Slov.* 19: 187–192.
- Gnezdilov, V.M. 2016. Notes on phylogenetic relationships of planthoppers of the family Issidae (Hemiptera, Fulgoroidea) of the Western Palaearctic fauna, with description of two new genera. *Ent. Obozr.* 95: 362–382. [Translation, *Ent. Rev.* 2016, 96(3): 332–347].
- Gnezdilov, V.M. and S. Drosopoulos 2005. Review of the subgenus *Semirotus* Dlabola of the genus *Mycterodus* Spinola (Homoptera, Fulgoroidea, Issidae). *Ann. Soc. Entomol. Fr.* 40: 235–241
- Gnezdilov, V.M., S. Drosopoulos and M.R. Wilson. 2004. New data on taxonomy and distribution of some Fulgoroidea (Homoptera, Cicadina). *Zoosyst. Ross.* 12: 217–223.
- Gnezdilov, V.M. and V. Mazzoni. 2004. Notes on the *Latilica maculipes* (Melichar, 1906) species group (Homoptera, Issidae). *Redia* 86: 147–151.
- Gnezdilov, V.M. and M.R. Wilson. 2007. A new genus and new combinations in the family Issidae (Homoptera, Fulgoroidea). *Zoosyst. Ross.* 15: 301–303.
- Gnezdilov, V.M., W.E. Holzinger and M.R. Wilson. 2014. The western Palaearctic Issidae (Hemiptera, Fulgoroidea): an illustrated checklist and key to genera and subgenera. *Proceed. Zool. Inst. RAS.* 318, suppl. I, 1-126.
- Hoch, H. 2013. Hemiptera, Fulgoromorpha. *Fauna Europaea* version 2.6.2. last update 29.08.2013. <http://www.faunaeur.org>
- Horváth, G. 1905. Hemipteren. In: *Ergebnisse einer naturwissenschaftlichen Reise zum Erdschias-Dagh (Kleinasien)*. Ausgeführt von Dr. Arnold Penzler und Dr. Emerich Zederbauer. *Ann. K. K. Naturhist. Hofmus.* 20: 179-189.
- Kalkandelen, A. 1987-2000. Türkiye Cixiidae (Homoptera) türleri üzerine taksonomik çalışmalar I-VIII. *Bit. Kor. Bült.* 27(3-4); 119-146, 28(3-4), 113-140; 29(1-2), 1-17; 29(3-4), 117-132; 30(1-4), 3-27; 33(3-4), 65-82; 34(1-2), 1-21; 40(3-4). 91-123.
- Kartal, V. 1986. Wenig bekannte und für die Türkei neue Nymphorgerius-Arten (Homoptera, Auchenorrhyncha, Dictyopharidae). *Türk. Bitki kor. Derg.* 10: 99-103.
- Kartal, V. 1987. Eine neue und wenig bekannte Arten der Gattung *Ranissus* aus der Türkei (Homoptera, Auchenorrhyncha, Dictyopharidae). *Türk. Entomol. Derg.* 11: 145-150.
- Kartal, V. and M. Karavin. 2010. Two new species of the genus *Bubastia* Emeljanov, 1975 from Turkey (Hemiptera, Fulgoromorpha, Issidae). *Zool. Mid. East.* 49: 73-78.
- Kartal, V. and A. Miroğlu. 2009. First records of *Mycterodus (Aconosimus) goricus* (Dlabola, 1958) (Hemiptera, Fulgoromorpha, Issidae) from Turkey, with redescription of the species. *Ent. News* 120: 87-90.
- Kartal, V. and A. Dursun. 2009. First records of *Mycterodus (Comporodus) mutuus* Logvinenko, 1968 (Hemiptera,

- Fulgoromorpha, Issidae) from Turkey, with redescription of the species. Tr. J. Zool. 33: 207-210.
- Koçak, A.Ö. and M. Kemal. 2012. List of the hitherto recorded Pterygot taxa of Turkey (Insecta). Cent. Ent. Stud. Ankara Memoirs 6: 1-1654.
- Linnavuori, R. 1965. Studies on the South and East-Mediterranean Hemipterous fauna. Acta Ent. Fennica1: 1-70.
- Melichar, L. 1914. Zweiter Beitrag zur Kenntnis der kaukasischen Homopterenfauna. Izv. Kavkaz. Muz. 8: 127-137.
- Nast, J. 1972. Palaearctic Auchenorrhyncha (Homoptera) an Annotated Check List. Polish Academy of Sciences, Institute of Zoology, Warszawa. 550 pp.
- Nast, J. 1982. Palaearctic Auchenorrhyncha (Homoptera) Part 3. New taxa and replacement names introduced till 1980. Annl. Zool. 36: 289-362.
- Nast, J. 1987. The Auchenorrhyncha (Homoptera) of Europe. Annl. Zool. 40: 535-661.
- Önder, F., S. Tezcan, Y. Karsavuran and Ü. Zeybekoğlu. 2011. Türkiye Cicadomorpha, Fulgoromorpha ve Stenorrhyncha (Insecta: Hemiptera) Kataloğu. Meta Basım, İzmir. 209 pp.
- Stål, C. 1861. Nova methodus familias quasadam *Hemipterorum disponendi*. Öfversigt af Kongl. Vetenskaps-akademiens förhandlingar. 18: 195-212.
- Tezcan, S., N. Gülperçin, Ü. Zeybekoğlu and M. Karavin. 2013. Contribution to the Fulgoromorpha (Cixiidae, Delphacidae) and Cicadomorpha (Aphrophoridae, Cicadidae, Cicadellidae) (Insecta: Hemiptera) fauna of farming terraces in Aspat (Strobilos) ancient city and its territorium, Bodrum, Muğla western Turkey. Linzer Biol. Beitr. 45: 2149-2153.
- Yılmaz, E., Y. Karsavuran and Ü. Zeybekoğlu. 2009. Investigations on species belonging to Cixiidae and Delphacidae (Homoptera) families determined in maize fields in Aydın, İzmir and Manisa provinces. Türk. Entomol. Derg. 33: 63-71.
- Zachvatkin, A.A. 1946. Studies on the Homoptera of Turkey. Trans. R. Ent. Soc. London 97: 149-176.

Καταγραφή ειδών Fulgoromorpha (Hemiptera) στη Νοτιοδυτική Τουρκία

EMINE DEMIR

*Düzce University, Faculty of Agriculture and Natural Sciences,
Department of Field Crops, 81620 Konuralp/Düzce, Turkey*

ΠΕΡΙΛΗΨΗ

Στην παρούσα μελέτη, τα είδη Fulgoromorpha που συλλέχθηκαν από την κοιλάδα Genve και σε περιοχές της νοτιοδυτικής Τουρκίας αξιολογήθηκαν από ταξινομικής, ζωογεωγραφικής και οικολογικής άποψης. Εντοπίστηκαν 43 είδη που ανήκουν σε 27 γένη και 9 οικογένειες. Στην παρούσα μελέτη παρουσιάζονται νέες καταγραφές για τις περιοχές της Μεσογείου (4 είδη) και της Κεντρικής Ανατολίας (5 είδη). Τα είδη που καταγράφηκαν ανήκουν σε 14 διαφορετικές ζωογεωγραφικές περιοχές και ο λόγος ενδημισμού της περιοχής είναι 23,3%. Η Issidae είναι η κυρίαρχη οικογένεια στην περιοχή καθώς το 74,0% των δειγμάτων ανήκουν σε αυτήν την οικογένεια.