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New records of fifteen species of Fulgoromorpha (Insecta: Hemiptera) in Bulgaria

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Abstract

Background

Bulgarian planthopper fauna (Hemiptera: Fulgoromorpha) are relatively well studied, with 164 known species from 77 genera and 11 families. Data for some species from previous studies were reported without any localities, or were incomplete and need to be updated.

New information

In the present study, 13 species of planthoppers are recorded for the first time in Bulgaria - *Hyalesthes mlokosiewiczi* Signoret, 1879 (Cixiidae), *Delphax armeniacus* Anufriev, 1970, *Euides speciosa* (Boheman, 1845), *Eurysula lurida* (Fieber, 1866), *Florodelphax paryphasma* (Flor, 1861), *Jassidaeus lugubris* (Signoret, 1865), *Metropis aris* Asche, Drosopoulos & Hoch, 1983, *Oncodelphax pullula* (Boheman, 1852), *Ribautodelphax imitans* (Ribaut, 1953), *R. pungens* (Ribaut, 1953), *Stenocranus major* (Kirschbaum, 1868) (Delphacidae), *Latilica maculipes* (Melichar, 1906) and *Tshurtshurnella extrema* Dlabola (Issidae), 1980. Species from the following five genera are recorded in Bulgaria for the first time: *Euides* Fieber, 1866, *Eurysula* Vilbaste, 1968, *Jassidaeus* Fieber, 1866, *Oncodelphax* Wagner, 1963 (Delphacidae) and *Latilica* Emeljanov, 1971 (Issidae). As a result, the total numbers of known planthopper species and genera in Bulgaria become 177 species and 82 genera. The dataset of all records presented in this work was published separately through Global Biodiversity Information Facility (GBIF). Detailed distribution of the species and comments on those from the European red lists are also provided.

Keywords

Fulgoroidea, fauna, the Balkans, Cixiidae, Delphacidae, Issidae, Dictyopharidae

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Introduction

Fulgoromorpha (planthoppers) are hemimetabolous insects belonging to the order Hemiptera. They are widespread throughout the world, but most families are richer in the tropics. About 14,000 species of fulgoromorphs have been described worldwide, belonging to 31 families (including fossils) (Bourgoin 2019), and about 730 species from 13 families are known in Europe (Hoch 2013). In Bulgaria, as well as on the Balkan Peninsula as a whole, insects of the infraorder Fulgoromorpha have been insufficiently studied from faunal, taxonomic and biological points of view. Data from older studies are incomplete and often need to be confirmed. There are no faunal lists, monographs, identification keys or other overview publications. This, as well as the economic importance of the group, necessitates a comprehensive and up-to-date study of the Fulgoromorpha species in Bulgaria.

Materials and methods

The material was collected in Bulgaria between 2003 and 2021 by using sweeping nets and light towers. After collection, they were preserved in dry conditions on cotton mattresses. The specimens were dry-mounted on paper boards after humidification with water vapours. Dissections were performed if necessary for identification, and the dissected genitalia were glued to the boards. Due to the lack of identification keys for Balkan Fulgoromorpha, identification data were used from various publications (Holzinger et al. 2003, Biedermann and Niedringhaus 2009, Emeljanov 2015). The specimens are digitized and stored at the Zoological Collection of Sofia University (BFUS). The dataset of all records has been published separately through Global Biodiversity Information Facility (GBIF) (Gjonov 2022).

Fulgoromorpha

Family Cixiidae Spinola, 1839

Genus *Hyalesthes* Signoret, 1865

Hyalesthes mlokosiewiczi Signoret, 1879

Distribution: Greece (Rhodos), Georgia (Melichar 1914), Cyprus, Lebanon, Irak, Israel as *H. mavromoustakisi* and *H. aither* (Dlabola 1959, Hoch 1990), Turkey (Demir 2007, Demir and Demirsoy 2009), Iran (Dlabola 1981), Turkmenistan, Uzbekistan, Kyrgyzstan (Dlabola 1958), Armenia (Lindberg 1960), Azerbaijan, Russia (Krasnodar, Dagestan) (Emeljanov 2015).

Notes: First record for Bulgaria; 17 ♂♂, 7 ♀♀ and 1 nymph; Western Danube plain (Fig. 1), Western and Eastern Rhodopes Mts. All specimens were collected on *Salix* shrubs. Detailed occurrence data: Gjonov (2022).

This species is recorded as a pest in the Caucasus (Emeljanov 2015) and Iran (Mozaffarian 2014, Mozaffarian 2018). Although it is hardly a danger to crops in Bulgaria (being found only on willow bushes), it should be monitored in the future.

Family Delphacidae Leach, 1815

Genus *Delphax* Fabricius, 1789

Delphax armeniacus Anufriev, 1970

Distribution: Ukraine (Nast 1987), Greece (Drosopoulos 1982b, Drosopoulos et al. 1983), Armenia, North-Western Caucasus, Kazakhstan (Mitjaev 2015).

Notes: First record for Bulgaria; 1 ♂; Southern Black Sea coast. Detailed occurrence data: Gjonov (2022).

Genus *Euides* Fieber, 1866

Euides speciosa (Boheman, 1845)

Nomenclature:

Della Giustina (2019) doesn't support the synonymy of *E. basilinea* (Germar, 1821) under *E. speciosa* proposed by Nast (1986).

Distribution: Norway, Denmark, Sweden, Finland, Estonia, Latvia, Lithuania, Russia (Karelia) (Söderman et al. 2009), Germany, Austria, Switzerland (Mühlethaler et al. 2018), Luxembourg (Niedringhaus et al. 2010a), as *E. basilinea* (Germar, 1821), synonimization is refused by Della Giustina (2019) for the North of Europe, France (Della Giustina 2019), Hungary (Asche 1982a), ex-Yugoslavia (Asche 1982b), Belarus (Borodin 2004), Kazakhstan (Mitjaev 1971), Korea (Park and Jung 2020), Japan (Hayashi and Fujinuma 2016).

Notes: New record for Bulgaria; 2 ♂♂; Southern Black Sea coast and Western Danube plain. Detailed occurrence data: Gjonov (2022).

The species (under the name *E. basilinea*) is included in the following red lists as vulnerable: Bavaria (Nickel 2003), Tyrphobionts and Tyrphophils of Hanoverian Moor Geest (Nickel and Gärtner 2009), Watercourses and Springs on the Hoher Trauchberg, Eastern Allgäu/Bavarian Alps (Bückle and Guglielmino 2011) and Germany (Nickel et al. 2016). On the Saxony's Red list (Walter et al. 2003), it is treated as endangered.

Genus *Eurysula* Vilbaste, 1968

Eurysula lurida (Fieber, 1866)

Distribution: Norway, Denmark, Sweden, Finland, Estonia, Lithuania, Latvia, Russia (Karelia) (Söderman et al. 2009), Great Britain (Le Quesne and Payne 1981), Ireland, Belgium, France (Della Giustina 2019), Netherlands (Gravestein 1976), Luxembourg (Niedringhaus et al. 2010a, Niedringhaus et al. 2010b), Germany (Nickel and Remane 2002), Poland (Walczak 2016), Ukraine (Logvinenko 1975), Spain (Aguin-Pombo et al. 2007, Aguin-Pombo et al. 2008, Italy (Sicily) (D'Urso 1995), Switzerland (Mühlethaler et al. 2018), Austria (Holzinger 1996a, Holzinger 1996b, Kahapka and Kunz 2011, Kunz and Kahapka 2012, Holzinger et al. 2017), Czech Republic (Malenovský 2006, Malenovský et al. 2011, Malenovský and Lauterer 2012), Hungary (Asche 1982a, Orosz 2008, Orosz 2009), Slovenia (Seljak 2016), Kazakhstan (Mitjaev 2015), Mongolia (Mitjaev 2015), ex-Yugoslavia (Asche 1982b).

Notes: First record for Bulgaria; 13 ♂♂, 3 ♀♀ and 9 nymphs; Western Rhodopes Mts and the eastern Sub-Balkan Basins. Detailed occurrence data: Gjonov (2022).

Genus *Florodelphax* Vilbaste, 1968

Florodelphax paryphasma (Flor, 1861)

Distribution: Sweden, Finland, Estonia, Lithuania, Latvia, Russia (Karelia) (Söderman et al. 2009), Luxembourg (Niedringhaus et al. 2010a), Belgium (Baugnée 2004), France (Della Giustina and Remane 2001), Austria (Holzinger and Kunz 2006), Czech Republic (Preisler and Lauterer 2003, Malenovský and Lauterer 2010), Slovenia (Holzinger and Seljak 2001), ex-Yugoslavia (Asche 1982b2), Kazakhstan, Kyrgyzstan, Baikal (Irkutsk) (Mitjaev 2015).

Notes: First record for Bulgaria; 2 ♂♂; Sarnena Sredna Gora Mt. Detailed occurrence data: Gjonov (2022).

The species is included as critically endangered on the Saxon red list of leaf- and planhoppers (Walter et al. 2003) and the red list of threatened species in the Czech Republic (Malenovský and Lauterer 2017) it is listed as endangered on the red lists of Bavaria (Nickel 2003), Saxony-Anhalt (Witsack and Nickel 2004) and Thuringia (Nickel and Sander 2016).

Genus *Jassidaeus* Fieber, 1866

Jassidaeus lugubris (Signoret, 1865)

Distribution: Belgium, France (Della Giustina 2019), Luxembourg (Niedringhaus et al. 2010a), Germany (Nickel and Remane 2003), Poland (Gębicki et al. 2013), Ukraine (Logvinenko 1975), Russia (European parts) (Emel'yanov 1967, Smirnova and Anufriev 2014), Spain, Portugal (Remane and Fröhlich 1994), Italy (Sicily) (D'Urso 1995), Austria (Holzinger 1996b, Holzinger and Kunz 2006), Czech Republic, Slovakia (Dlabola 1977, Malenovský and Lauterer 2012), Hungary (Asche 1982a, Orosz 2009), Romania (Orosz and Tóth 2016), Greece (Drosopoulos et al. 1983).

In the General Catalogue of the Hemiptera (Metcalf 1943) is mistakenly recorded for Ceylon based on Fieber (1872) where such record doesn't exist.

Notes: First record for Bulgaria; 8 ♂♂ and 4 ♀♀; Belasitsa Mt (Fig. 2) and Western Pre-Balkan. Detailed occurrence data: Gjonov (2022).

This species is included as vulnerable on the red list of the Czech Republic (Malenovský and Lauterer 2017); it is considered endangered on the lists of Bavaria (Nickel 2003), Saxony-Anhalt (Witsack and Nickel 2004), and as critically endangered on the red lists of Saxony (Walter et al. 2003) Turingia (Nickel and Sander 2016) and Germany (Nickel et al. 2016).

Genus *Metropis* Fieber, 1866

Metropis aris Asche, Drosopoulos & Hoch, 1983

Distribution: Greece (Drosopoulos et al. 1983), Slovenia (Seljak 2004, Seljak 2016)

Notes: First record for Bulgaria; 1 ♂; Strandzha Mt. Detailed occurrence data: Gjonov (2022).

Genus *Oncodelphax* Wagner, 1963

Oncodelphax pullula (Boheman, 1852)

Distribution: Norway, Denmark, Sweden, Finland, Estonia, Lithuania, Latvia, Russia (Karelia and Leningrad region) (Söderman et al. 2009), Germany (Nickel and Remane 2003), Great Britain, Ireland, France, Belgium, Switzerland (Della Giustina 2019), Belarus (Borodin 2004), Austria (Kunz and Plank 2002), Czesh Republic (Malenovský et al. 2014), Slovenia (Seljak 2016), Hungary (Asche 1982a), Romania (Orosz and Tóth 2016).

Notes: First record for Bulgaria; 6 ♂♂ and 1 ♀; Strandzha Mt. (Fig. 3). Detailed occurrence data: Gjonov (2022).

This species is included as vulnerable on the Czech Republic's red list (Malenovský and Lauterer 2017), as endangered on the red lists of Carinthia (Austria) (Holzinger 1999), Bayer (Nickel 2003), Saxony (Walter et al. 2003), Sxaony-Anhalt (Witsack and

Nickel 2004), Germany (Nickel et al. 2016) and of the Watercourses and Springs on the Hoher Trauchberg, Eastern Allgäu/Bavarian Alps (Bückle and Guglielmino 2011).

Genus *Ribautodelphax* Wagner, 1963

Ribautodelphax imitans (Ribaut, 1953)

Distribution: Great Britain (Le Quesne and Payne 1981), Belgium (Della Giustina 2019), Luxembourg (Niedringhaus et al. 2010a), Switzerland (Mühlethaler et al. 2018), Germany (Nickel and Remane 2002), Poland (Gębicki et al. 2013), Spain (Aguin-Pombo et al. 2007), France (den Bieman 1987), Italy (Guglielmino et al. 2005, Guglielmino and Bückle 2008, Carl 2008), Austria (Holzinger 1996b), Czech Republic (Malenovský and Lauterer 2010, Malenovský and Lauterer 2012), Hungary (Györffy et al. 2009), Romania (Orosz and Tóth 2016), Slovenia (Holzinger and Seljak 2001), Croatia (Nast 1987), Greece (den Bieman 1987), Kazakhstan (Mitjaev 2015).

Notes: First record for Bulgaria; 1 ♂; Sarnena Sredna Gora Mt. Detailed occurrence data: Gjonov (2022).

This species is included as extremely rare (vulnerable) on the red list of Bavaria (Nickel 2003).

Ribautodelphax pungens (Ribaut, 1953)

Distribution: Sweden (Söderman et al. 2009), Netherlands, Belgium, Germany, France, Slovenia, Croatia, Bosnia and Herzegovina, Serbia (Della Giustina 2019), Luxembourg (Niedringhaus et al. 2010a), Poland (Gębicki et al. 2013), Russia (European parts) (Smirnova and Anufriev 2014), Great Britain (Le Quesne and Payne 1981), Switzerland (Mühlethaler et al. 2018), Spain (Aguin-Pombo et al. 2007), France (Corsica) (Bonfils and Della Giustina 1978), Italy (Guglielmino et al. 2005, Guglielmino and Bückle 2008), Austria (Holzinger 1996b, Kunz and Plank 2002), Czech Republic (Malenovský 2006, Malenovský et al. 2011), Hungary (Orosz 2009), Greece (den Bieman 1988).

Notes: First record for Bulgaria; 4 ♂♂ and 2 ♀♀; Sarnena Sredna Gora Mt, Eastern Rhodopes Mts and Strandzha Mt. Detailed occurrence data: Gjonov (2022).

This species is included as endangered on the red list of Saxony (Walter et al. 2003).

Genus *Stenocranus* Fieber, 1866

Stenocranus major (Kirschbaum, 1868)

Distribution: Norway, Denmark, Sweden, Finland, Latvia (Söderman et al. 2009), Ireland, Great Britain, Belgium, Netherlands, Switzerland, Ukraine, Spain, France (Della Giustina 2019), Russia (European parts) (Anufriev and Bayanov 2002, Söderman

et al. 2009), Belarus (Borodin 2004), Luxembourg (Niedringhaus et al. 2010a), Poland (Gębicki et al. 2013), Czech Republic (Dlabola 1954), Germany (Nickel and Remane 2003), Italy (D'Urso 1995, Guglielmino et al. 2005), Austria (Holzinger 1996b, Kunz 2010), Hungary (Asche 1982a), Romania (Popa and Popa 2002), Slovenia (Holzinger and Seljak 2001), ex-Yugoslavia (Asche 1982b), Serbia (Cvrković et al. 2010, Cvrković et al. 2011), Iran (Mozaffarian and Wilson 2011), Kyrgyzstan (Anufriev 2002), Malaysia (Bartlett 2009).

Notes: First record for Bulgaria; 6 ♂♂ and 11 ♀♀; Western Stara Planina Mts. Detailed occurrence data: Gjonov (2022).

Genus *Tropidocephala* Stal, 1853

Tropidocephala andropogonis Horváth, 1895

Distribution: Slovakia (Dlabola 1950), Hungary (Horváth 1895), Czech Republic (Dlabola 1977), ex-Yugoslavia (Nast 1972), Bulgaria (Asche 1982b), Greece (Drosopoulos 1982b, Drosopoulos 1982a), Turkey (Dlabola 1981).

Notes: First exact locality data for Bulgaria; 4 ♂♂ and 6 ♀♀; Vlahina Mt, Lozenska Mt, Eastern Rhodopes Mts and Strandzha Mt (Fig. 4). Detailed occurrence data: Gjonov (2022).

Family Dictyopharidae Spinola, 1839

Genus *Dictyophara* Germar, 1833

Dictyophara pannonica (Germar, 1830)

Distribution: Italy (doubtful) (D'Urso 1995, Lessio and Alma 2008), Slovakia (Dlabola 1977), Hungary (Guglielmino et al. 2013), Romania (Orosz and Tóth 2016), Bulgaria (Nast 1987), Russia (South European Russia, Western Siberia), Kazakhstan, Kyrgyzstan, Mongolia, (Mitjaev 2015), Ukraine (Logvinenko 1975), Georgia (Dlabola 1958), Turkey (Dlabola 1957), NW China (Song and Liang 2008).

Notes: First exact locality data for Bulgaria; 3 ♂♂, 4 ♀♀ and 2 nymphs; Kozhuh hill (Fig. 5), Western and Eastern Rhodopes Mts. Detailed occurrence data: Gjonov (2022) .

Family Issidae Spinola, 1839

Genus *Latilica* Emeljanov, 1971

Latilica maculipes (Melichar, 1906)

Distribution: Bosnia and Herzegovina, Croatia, Cyprus, France, Greece, Israel, Italy including the islands, Palestine, Russia (South European parts), Slovenia, Turkey, Crimea (Gnezdilov et al. 2014). Detailed occurrence data: Gjonov (2022)

Notes: First record for Bulgaria; 10 ♂♂, 3 ♀♀ and 1 nymph; Black Sea coast and Strandzha Mt. (Fig. 6). Detailed occurrence data: Gjonov (2022).

Genus *Tshurtshurnella* Kusnezov, 1927

Tshurtshurnella extrema Dalbola, 1980

Distribution: Turkey, near Ankara (Dlabola 1980, Kartal 1985) and Sinop (Tanyeri and Zeybekoğlu 2021)

Notes: First record for Bulgaria and Europe; 2 ♂♂, 2 ♀♀ and 3 nymphs; eastern Sub-Balkan Basins (Fig. 7); on *Astracantha arnacantha* subsp. *aitosensis* (Ivan.) Reer & Podlech. Detailed occurrence data: Gjonov (2022).

Discussion

In the current study a list of 13 Fulgoromorpha species recorded for the first time for Bulgaria has been compiled. They are members of the families Cixiidae (1 species) - *Hyalesthes mlokosiewiczi*, Delphacidae (10 species) - *Delphax armeniacus*, *Euides speciosa*, *Eurysula lurida*, *Florodelphax paryphasma*, *Jassidaeus lugubris*, *Metropis aris*, *Oncodelphax pullula*, *Ribautodelphax imitans*, *R. pungens*, *Stenocranus major* and Issidae (2 species) - *Latilica maculipes* and *Tshurtshurnella extrema*. Additionally, the first exact localities for two species, *Tropidocephala andropogonis* (Delphacidae) and *Dictyophara pannonica* (Dictyopharidae), are reported for Bulgaria. Species of the following five genera have not been previously known in Bulgaria: *Euides*, *Eurysula*, *Jassidaeus, Oncodelphax* (Delphacidae) and *Latilica* (Issidae).

As a result of the study, the total numbers of known planthopper species, genera and families in Bulgaria are now 177, 82 and 13, respectively.

The new data significantly expand the known ranges of several species, such as *Hyalesthes mlokosiewichi, Oncodelphax pullula, Delphax armenicaus* and *Tshurtshurnella extrema*. The easternmost distribution of *Hyalesthes mlokosiewichi* (which has been found for the first time on the Balkan Peninsula), and the southernmost distribution of *Oncodelphax pullula* have been established. The species *Delphax armenicaus*, which has been found mainly in Central Asia and the Caucasus but is also known in Greece, is found on the Bulgarian Black Sea coast. *Tshurtshurnella extrema* was first recorded outside of Anatolia, along with the first data on its host plant.

Seven of the listed species have conservation status in Central Europe, where such assessments have been carried out. This emphasises the need to assess the conservation status of Fulgoromorpha in Bulgaria.

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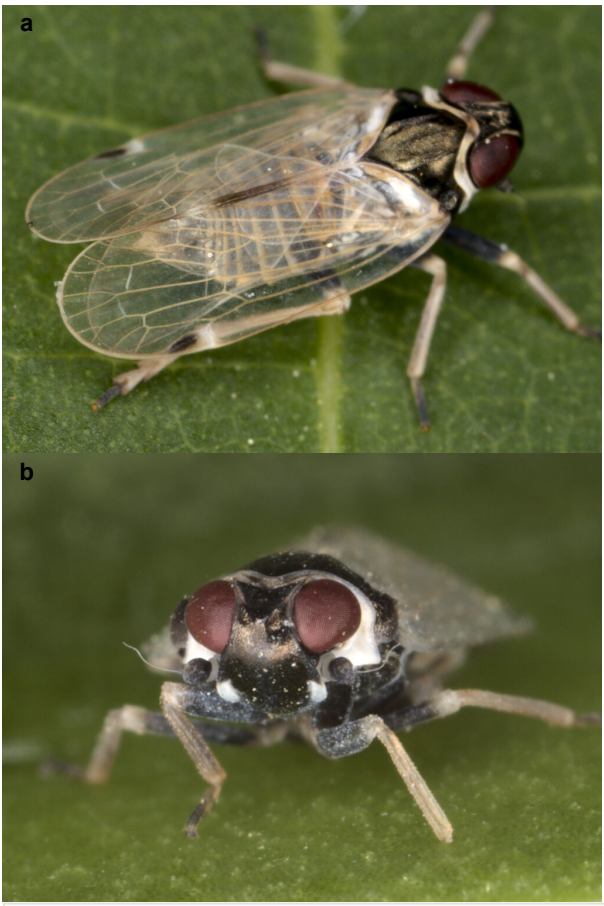

Figure 1.

Hyalesthes mlokosiewiczi Signoret, 1879 - Danube Plane.

a: dorsal view
b: frontal view

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Figure 2.

Jassidaeus lugubris (Signoret, 1865) - Belasitsa Mt.

a: male
b: female

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Figure 3.

Oncodelphax pullula (Boheman, 1852), male, Strandzha Mt.

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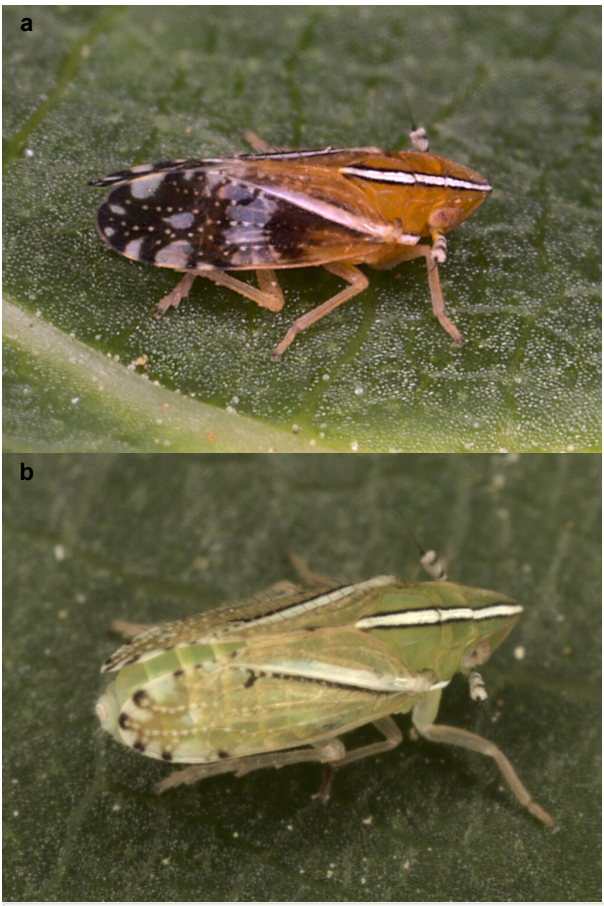

Figure 4.

Tropidocephala andropogonis Horváth, 1895 - Eastern Rhodopes Mts.

a: male
b: female

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Figure 5.

Dictyophara pannonica (Germar, 1830) - Struma river valley.

a: lateral view
b: dorsal view

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Figure 6.

Latilica maculipes (Melichar, 1906) - Varna

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Figure 7.

Tshurtshurnella extrema Dlabola, 1980 - Aytos

a: lateral view
b: dorsal view of the head