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New records of Aquatic True Bugs (Hemiptera: Heteroptera: Nepomorpha) from Bulgaria

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Abstract: New and interesting records of aquatic true bugs species from Bulgaria are reported: *Lethocerus patruelis* (Stål, 1855); *Corixa panzeri* Fieber, 1848; *Hesperocorixa sahlbergi* (Fieber, 1848); *Sigara assimilis* (Fieber, 1848); *Sigara mayri* (Fieber, 1860); *Cymatia rogenhoferi* (Fieber, 1848); *Micronecta carpatica* Wróblewski, 1958; *Anisops sardeus* Herrich-Schaeffer, 1849; and *Ochterus marginatus* (Latreille, 1804). *Sigara assimilis* is confirmed for the Bulgarian fauna with the first reliable record. The vulnerable species *Ochterus marginatus* (Latreille, 1804) is rediscovered in the valley of Mesta River, South-western Bulgaria, after more than 60 years. First exact locality of *Hesperocorixa sahlbergi* (Fieber, 1848) in Bulgaria is given.

Key words: Corixidae, Ochteridae, Notonectidae, Micronectidae, distribution, Bulgaria

Introduction

Data on the diversity and distribution of aquatic bugs (Heteroptera, Nepomorpha) are important for the conservation of their diversity and habitats, as well as for holistic studies of aquatic ecosystems. Thirty-seven nepomorphan species of 14 genera and nine families are reported previously for Bulgaria (Josifov 1986b, Jansson 1995, Simov & Josifov 2004). Additional data on the distribution of three *Micronecta* spp. (Kment 2006, Grozeva *et al.* 2008) as well as of *Plea minutissima* Leach, 1817 (Grozeva *et al.* 2009) and *Lethocerus patruelis* (Stål, 1855) (Grozeva *et al.* 2013) have been published .

We present the first reliable record for one species and an update on the distribution of eight species that have been previously recorded from only one or few localities in Bulgaria.

Materials and Methods

The material was collected mainly with hydrobiological hand-net and using the adapted version of the multi-habitat sampling (Cheshmedjiev *et al.* 2011). One of the species, *Anisops sardeus* Herrich-Schaeffer, 1849, was collected using light trapping. Data about the distribution of *Lethocerus patruelis* (Stål, 1855) were based predominantly on individuals observed outside the water. Unpublished materials from the collection of the National Museum of Natural History, Sofia provided additional data for *Hesperocorixa sahlbergi* (Fieber, 1848) and *Sigara* (*Halicorixa*) *mayri* (Fieber, 1860), for which the collecting methods are unknown (probably collected using hydrobiological hand-net). The reported localities are given on a map with UTM grid 10×10 (Fig. 1) and with decimal degrees geographical coordinates in the text. Localities with aquatic habitats are given in Table 1; habitats classification is according to the European Nature Information System (EUNIS) and the Red Data Book of Bulgaria (for the habitats of conservation value). The material is deposited in the collection of the National Museum of Natural History, Sofia.

Results

Belostomatidae

***Lethocerus patruelis* (Stål, 1855)**

Material examined:

Sofia, Borisova Gradina City Park (532 m a. s. l., 42.6850° N, 23.3426° E), 1♂ on the ground 10 m from small pond, 24.IX.2014, leg. I. Obretenov;

Near Gelemenovo Vill. (235 m a. s. l., 42.2641° N, 24.3083° E), 1♂ on the ground, near a gas station, 25.IX.2013, leg. I. Gerassimova;

Varna, on the ground in the city, 1 alive specimen, IX.2014, obs. J. Barzov;

Sredna Gora Mts., near Oborishte Vill. (704 m a. s. l., 42.5353° N, 24.0895° E), 1 dead specimen, sifting leaf litter near bank of small lake close to Mechenskata River, V.2015, leg. R. Bekchiev;

Septemvri, 1 alive specimen on the ground in town, 3.X.2015, obs. C. Karacenov;

Sredna Gora Mts., Miromir Dam near Hisarya, 1 alive specimen on the ground near the water, 17.IX.2015, obs. S. Vorshilov;

Sredna Gora Mts., Pavel Banya Vill., 1♂ on the ground, attracted by street lights, 3.X.2015, leg. B. P. Nikolov;

Martinka River near Brod Vill. (106 m a. s. l., 42.0435° N, 25.7041° E), 27.IX.2015, 1♀, leg. T. Stefanov.

Note: The new records published here confirm the already registered tendency of spreading northwards of this Indo-Mediterranean species in the last ten years (Grozeva *et al.* 2013).

Ochteridae

***Ochterus marginatus* (Latreille, 1804)**

Material examined:

Mesta River bank near Gotse Delchev (500 m a. s. l., 41.5871° N, 023.7664° E), 3.V.2015, 1♂, 2♀, leg. N. Simov.

Note: *Ochterus marginatus* had been registered for the first time on the banks of Mesta River near Gotse Delchev in 1955 (Josifov 1960). Four other localities of the species have been reported for the territory of Bulgaria: Arda River bank near the town of Kurdzhali; Varbitsa River near Podkova Vill.; Strumeshnitsa River near the town of Petrich and in fens western from the town (Josifov 1960); Melnishka River after the town of Melnik (Göllner-Scheiding & Arnold 1988). Since the early 60s, *O. marginatus* has not been found at the above localities. Its probable extinction from the above localities was due to the habitat loss caused by water pollution, river corrections, hydrotechnical construction and altered water regime after the boom of industrial facility building in the 60s and the 70s of the XX century (Josifov in litt.; unpublished data). *Ochterus marginatus* was found only once in the 80s in Melnishka River. During the period 2000-2014, regardless of the sampling efforts, the species was not found in the above mentioned localities (second author's personal observations during the preparation of the Red Data Book of the Republic of Bulgaria (Golemanski, Peev 2015). *Ochterus marginatus* is enlisted as Endangered species in the Red Data Book of the Republic of Bulgaria (Josifov & Simov 2015).

Improvement of the ecological status of Mesta River since 1990 (Varadinova *et al.* 2013) is most likely the reason for the reappearance of *O. marginatus* on the banks of this river. After 1990 the level of industrial pollution has decreased significantly, likely resulting in recovery of suitable habitats for this species in the region. Potential habitats for *O. marginatus* could be found at the banks of Varbitsa and Krumovitsa Rivers (a tributary of Arda River, Southern Bulgaria).

Corixidae

***Corixa panzeri* Fieber, 1848**

Material examined:

Danube River Plane, Mominbrodsko blato, near the town of Lom (46 m a. s. l., 43.7773° N, 23.2189° E), 18.VI.2015, 1♀, leg. T. Trichkova, A. Cardeccia, M. Todorov, Z. Hubenov.

Note: There is only one other record of this species in Bulgaria: North-eastern Bulgaria, the town of Varna, Varna Aquarium (Josifov 1960).

***Hesperocorixa sahlbergi* (Fieber, 1848)**

Material examined:

Lozenska Mts., marshes near German Vill. (1035 m a. s. l., 42.5861° N, 23.4538° E), 7.VI. 2015, 2♂, leg. D. Stoianova, S. Lukanov;

Pancharevo Gorge, south from Pasarel Vill., 35 km from Sofia (714 m a. s. l., 42.5358° N, 23.5094° E), IX.1994, leg. M. Josifov;

Beglika Dam (1495 m a. s. l., 41.8241° N, 24.1283° E), IX.1963, leg. A. Valkanov.

Note: Only one record had been published for *H. sahlbergi* in Bulgaria: Vitosha Mts., near Cherni Vruh Peak (Joakimov 1909). Our findings confirm the concept of its affiliation to the Boreo-Montane group (Josifov 1986a, 1990; Gueorgiev *et al.* 1998).

***Sigara* (*Halicorixa*) *mayri* (Fieber, 1860)**

Material examined:

Black Sea coast, Nanevska Tuzla, near Sveti Nikola Vill. (3 m a. s. l., 43.4146° N, 28.5036° E), 22.IV.2015, 1♂, 2♀, leg. N. Simov, I. Dedov; 3.IV.2015, 1♂, 5♀, leg. M. Pavlova

Table 1. Description of the localities with aquatic habitats

Locality	**Habitats according to EUNIS**	**Habitats according to the Red Data Book of the Republic of Bulgaria. Volume 3. Natural habitats (Biserkov *et al.* 2015)**
Mominbrodsko blato	C1.22 Free floating vegetation of mesotrophic waterbodies, C1.23 Rooted submerged vegetation of mesotrophic waterbodies, C1.24 Rooted floating vegetation of mesotrophic waterbodies, C1.32 Free floating vegetation of eutrophic waterbodies, C1.33 Rooted submerged vegetation of eutrophic waterbodies	Natural or semi-natural mesotrophic to eutrophic lakes and marshes with macrophytic vegetation (04C1)
Lozenska Mts., marshes	C1.22 Free floating vegetation of mesotrophic waterbodies, C1.23 Rooted submerged vegetation of mesotrophic waterbodies, C1.24 Rooted floating vegetation of mesotrophic waterbodies, C1.32 Free floating vegetation of eutrophic waterbodies, C1.33 Rooted submerged vegetation of eutrophic waterbodies	Natural or semi-natural mesotrophic to eutrophic lakes and marshes with macrophytic vegetation (04C1)
Pasarel Vill. Old river beds and flooded rubble excavations	C1.22 Free floating vegetation of mesotrophic waterbodies	
Beglika dam	C1.22 Free floating vegetation of mesotrophic waterbodies, C1.23 Rooted submerged vegetation of mesotrophic waterbodies, C1.24 Rooted floating vegetation of mesotrophic waterbodies, C1.32 Free floating vegetation of eutrophic waterbodies, C1.33 Rooted submerged vegetation of eutrophic waterbodies	Natural or semi-natural mesotrophic to eutrophic lakes and marshes with macrophytic vegetation (04C1)
Nanevska Tuzla	C1.5113 Ponto-Pannonic salt lake	Hypersaline coastal lakes and swamps (07C1) and Submerged macrophytic communities in hypersaline water bodies (06A2)
Orsoya fishponds	C1.22 Free floating vegetation of mesotrophic waterbodies, C1.23 Rooted submerged vegetation of mesotrophic waterbodies, C1.24 Rooted floating vegetation of mesotrophic waterbodies, C1.32 Free floating vegetation of eutrophic waterbodies, C1.33 Rooted submerged vegetation of eutrophic waterbodies	Natural or semi-natural mesotrophic to eutrophic lakes and marshes with macrophytic vegetation (04C1)
Mouth of Lom River	C2.33 Mesotrophic vegetation of slow flowing rivers	Slow-flowing rivers with macrophytic vegetation (15C2)
Varbitsa River near bridge before Krilatitsa village	Permanent non-tidal, smooth-flowing watercourses (code C2.3)	
Martinka River near Brod vilage	Eutrophic vegetation of slow-flowing rivers (code C2.34)	Slow-flowing rivers with macrophytic vegetation (15C2)
Byala River, near Meden Buk village	C2.1A Mesotrophic vegetation of spring brooks,	Streams and small rivers with macrophytic vegetation of plain to mountain levels (10C2)
Mesta River bank near Gotse Delchev	Unvegetated or sparsely vegetated shores with soft or mobile sediments (code C3.6)	

Note: There are previous records of this species also from the Bulgarian part of the Black Sea coast but only from its southern parts (Josifov 1958, 1960, 1961, 1974, 1986b).

***Sigara* (s. str.) *assimilis* (Fieber, 1848)**

Material examined:

Black Sea coast, Nanevska Tuzla, near Sveti Nikola Vill. (3 m a. s. l., 43.4146° N, 28.5036° E), 22.IV.2015, 1♀, leg. N. Simov, I. Dedov; 3.IV. 2015, 1♂, 2♀, leg. M. Pavlova

Note: *Sigara assimilis* is a Ponto-Mediterranean species with wider distribution even outside the borders of the Mediterranean region (Josifov 1986b, Jansson 1995, Jorigtoo & Nonnaizab 1996, Hayashi *et al.* 2001, Kanyukova 2008, Fent *et al.* 2011). Until now, it has been reported for the territory of the Balkan Peninsula from the European part of Turkey, Romania, Serbia, Montenegro, and Croatia (Jansson 1995, Fent *et al.* 2011). Jansson (1986) reported *S. assimilis* from Western Bulgaria without exact local-

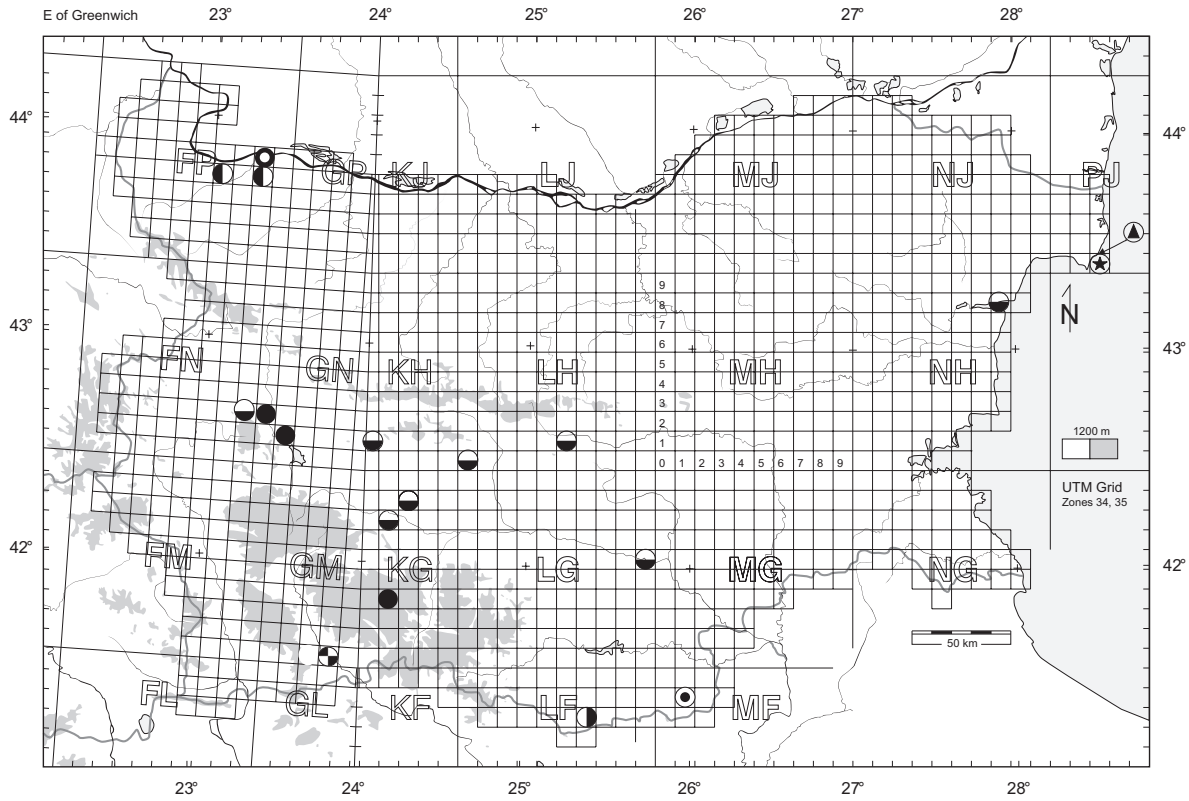

Fig. 1. Map with the new localities: ◒ *Lethocerus patruelis* (Stål, 1855); ◔ *Ochterus marginatus* (Latreille, 1804); ⭘ *Corixa panzeri* Fieber, 1848; ● *Hesperocorixa sahlbergi* (Fieber, 1848); ★ *Sigara* (*Sigara*) *assimilis* (Fieber, 1848); ▲ *Sigara* (*Halicorixa*) *mayri* (Fieber, 1860); ◐ *Cymatia rogenhoferi* (Fieber, 1848); ◑ *Micronecta* (s. str.) *carpatica* Wróblewski, 1958; ⦿ *Anisops sardeus* Herrich-Schaeffer, 1849

ity, based on data from a museum collection but without checking the material personally. The presence of the species in Bulgaria had been treated as doubtful (Jansson 1995) until now. This is the first reliable record for Bulgaria. It is very likely for the species to be found in other salt lakes near the Bulgarian Black Sea coast with similar habitat characteristics.

***Cymatia rogenhoferi* (Fieber, 1848)**

Material examined:

Danube Plane, Orsoya fishponds, near Orsoya Vill. (34 m a. s. l., 43.7932° N, 23.0944° E), 18.VIII.2010, 1♂ leg. S. Kazakov; mouth of Lom River (26 m a. s. l., 43.8375° N, 23.2494° E), 9.X.1992, leg. B. Rusev.

Note: The only previous record of this species is from Southern Bulgaria, Benkovski near Plovdiv, 18.X.1974, using light trapping (Josifov 1986a). The finding of localities in Northern Bulgaria of two Corixidae species (*Cymatia rogenhoferi* and *Sigara mayri*), previously known only from the southern parts of the country, is likely a result of recent increase in interest and funding for research in the Danube River Plain. Recent (in the last twenty years) broadening of the distribution of these species to the north on the territory of Bulgaria is not as plausible an explanation: both species have already been reported northern from the border between Bulgaria and Romania, in Northern Dobrudja region (Josifov 1986b).

Micronectidae

***Micronecta* (s. str.) *carpatica* Wróblewski, 1958**

Material examined:

Eastern Rhodopes Mts., Varbitsa River near the bridge before Krilatitsa Vill. (299 m a. s. l., 41.3595° N, 25.3375° E), 15.IX.2011, 1♂, 2♀, leg. M. Pavlova.

Note: There are only two previous records of *Micronecta carpatica* in Bulgaria: Eastern Rhodopes Mts., karst spring in Talashman Dere Protected Site (Simov & Josifov 2004) and Strandzha Mts., Fakijska River (Kment 2006).

Notonectidae

***Anisops sardeus* Herrich-Schaeffer, 1849**

Material examined:

Eastern Rhoropes Mts., Byala River, near Meden Buk Vill. (121 m a. s. l., 41.3800° N, 26.0277° E), 8.IX.2014, 1♂, 2♀, leg. S. Beshkov, light traps.

Note: Two other localities of this species have been published previously for the territory of Bulgaria: near Hissar Vill. (Josifov 1955), in warm mineral waters; near the outflow of Lebnitsa River in Struma River where the water slows its flow (Josifov 1986a). It is very likely more localities of *A. sardeus* to be found in Bulgaria (even in the northern parts of the country) since a northward range expansion for this species in Europe (Klementová & Svitok 2014) and a tendency of "Mediterranisation" of the European true bug fauna (Rabitsch 2008a) have been observed.

Discussion

The increasing interest and funding available for research of aquatic and semiaquatic habitats are essential prerequisites to expect new records and to fill the gaps in our knowledge on Bulgarian aquatic bug fauna. Such information is important for the conservation of their diversity and habitats, and for monitoring of potential threats from expected invasive alien species, e.g., *Trichocorixa verticalis verticalis* (Fieber, 1851) (Guareschi 2013), the only water bug in Europe considered alien (Rabitsch 2008b). The presence of this bug in the coastal wetlands of Bulgaria could be expected in the next years, as these areas are included in the future potential distribution of *the species* (Guareschi et al. 2013).

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