First Checklist of Stoneflies (Insecta: Plecoptera) of Bulgaria, with Application of the IUCN Red List Criteria at the National Level

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Abstract: The first list of the species-group taxa of stoneflies (Plecoptera) of Bulgaria is presented based on literature and supplemented by unpublished data of the present authors. This survey includes 103 species and six subspecies, belonging to 23 genera and seven families. Three taxa, Brachyptera beali beali (Navás, 1923), Protonemura rauschi Theischinger, 1975 and Isoperla chius Zwick, 1978, are new for the country. At present, 31 of the stoneflies recorded in Bulgaria are endemic and c. 68% of them are Balkan endemics. The inclusion in Red Data Lists of threatened species of the Plecoptera is essential for the protection of rare and endemic species and for the preservation of their habitats. In order to achieve that, their conservation status has been assessed. One species is considered Extinct (EX), two – Regionally Extinct (RE) from the country, two – Possibly Extinct (PE), 22 – Critically Endangered (CR), nine – Endangered (EN) and 21 – Vulnerable (VU).

Key words: Plecoptera, taxon list, endemic species, conservation status, first country records, Bulgaria

Introduction

Studies on stoneflies in Bulgaria are being carried out for more than 170 years. The first literature data appeared in the middle of the 19th century (Pictet 1841), followed in the late 19th and early 20th centuries by papers by Klapálek (1895, 1913) and Schoenemund (1926). Later on, Navás (1929) described seven new species and Buresch (1936) reported 19 stoneflies from Bulgaria, some of which were reported under synonymous names later. The second wave of studies was initiated during the early 1960s and 1970s by Raušer (1962, 1963, 1965, 1966), Aubert (1964), Braasch (1969, 1970, 1972), Joost (1970), Sowa (1970) and Braasch & Joost (1971a, 1971b, 1971c, 1972, 1973, 1975, 1976, 1977). They carried out an enormous amount of faunistic and taxonomic research. The first more detailed paper on Bulgarian stoneflies was published by Raušer (1962) and contained 29 species. Subsequently, Braasch & Joost (1971a) expanded it to 73 species. As the final result of their research, Braasch and Joost described 16 new species of Plecoptera from Bulgaria and reported further 41 species that were new for the country.

al. 2013, Varadinova et al. 2013). Other contributions to the knowledge of Bulgarian Plecoptera were given in papers by Kumanski (2004) and Tyufekchieva et al. (2011), both studying the biodiversity of the Eastern and Western Rhodopes. In Bulgaria’s Biological Diversity book, the rich collection of Bulgarian stoneflies was identified by K. Kumanski and based on his results Gueorgiev et al. (1998) increased their species number to 96. They belonged to 22 genera and seven families, including a total of 24 endemic species. Hubenov et al. (2000a, b) presented new faunistic records for the Central Balkan and Rila National Parks, mentioning 99 and 101 Bulgarian stonefly species, respectively.

The third phase of research on stoneflies started in the last decade as a result of a next generation of publications. Murányi (2007) has reported Leuctra mortoni feheri Murányi, 2007 as a subspecies new for science, based on materials collected by the author from the Rila Mountains. Graf & Bálint (2010) also described one new species from Bulgaria, Leuctra hansmalickýi Graf, 2010. Later, Tyufekchieva et al. (2013) briefly discussed 107 stoneflies species, focusing mainly on the distribution and conservation significance of species of Taeniopterygidae. Finally, in a study of stoneflies from the Vrachanska Planina Mountains Tyufekchieva et al. (2016) have reported 108 species from the country. However, the data are fragmentary and do not present information on species diversity and conservation status of the Plecoptera for the whole territory of Bulgaria.

Materials and Methods
The list of the species-group taxa of stoneflies of Bulgaria is based on 522 benthic samples processed between 1995 and 2011 by the first author. These have been supplemented by unpublished and literature data, published between 1841 and 2016. Overall, this contribution includes more than 27,600 specimens from c. 1200 samples collected from 360 localities.

Nomenclature and systematic arrangements follow Murányi (2008) and DeWalt et al. (2018). The present checklist comprises the following data: valid taxon name, synonyms, all other names used for the species when recorded in Bulgaria and remarks. New country records are given for some rare species. They include the name of the water body, elevation (m a.s.l.), GPS coordinates or UTM code number (see below), date in the format day/ month/year, number and life cycle stage of the examined material and name(s) of collector(s). Remarks include data on endemism. The endemics are divided in Balkan (found in more than one Balkan country), Bulgarian (found in Bulgaria only), regional (found in more than one locality of a certain region) and local (known only from one locality) following Hubenov (2007).

We present an up-to-date assessment of the conservation status of stoneflies in Bulgaria, using the internationally accepted Red List guidelines developed by the International Union for Conservation of Nature (IUCN 2017). The procedure for assessing taxa at a regional level differs from that at a global level and is summarised in the Guidelines for Application of IUCN Red List Criteria at Regional and National Levels (IUCN 2012b).

The Bulgarian stoneflies have been assessed using criteria B, D1 and D2, owing to the nature of the available data. The species distribution and the geographic coordinates are provided through using the cartographic system based on UTM grid and the Bulgarian UTM Directory computer programme (Michev 1999). The size of each locality is usually equal to UTM grid cell 10 x 10 km.

The taxa of the Plecoptera have been classified in the following categories: Extinct (EX); Regionally Extinct (RE); Possibly Extinct (PE); Critically Endangered (CR); Endangered (EN); Vulnerable (VU); Nearly Threatened (NT); Least Concern (LC); Data Deficient (DD); Not Evaluated (NE). The IUCN Red List Categories abbreviations used in the text were based on the IUCN Red List Categories and Criteria (IUCN 2012a).

Abbreviations of collectors: BR=Boris Russev†, JK=Jenő Kontschán, DM=Dávid Murányi, TS=Teodora Stoyanova, TSz=Timea Szedergési, VT=Violeta Tyufekchieva, YV=Yanka Vidinova.

Results
List of the species-group taxa
This first stonefly checklist comprises 109 species-group taxa (103 species and six subspecies). Three species, Brachyptera beali beali (Navás, 1923), Protonemura rauschi Theischinger, 1975 and Isoperla chius Zwick, 1978, are new to the Bulgarian fauna.

The genus Leuctra has the largest number of species and subspecies – 23 (21.1%). Other genera are presented as follows: Protonemura – 15, Nemoura – 12, Isoperla – 11, Brachyptera – 8, Rhabdiopteryx – 5; Taeniopteryx, Chloroperla and Perla – 4; Capnia, Amphinemura, Perlodes and Siphonoperla – 3; Dinoceras – 2 and the remaining nine genera Oemopteryx, Zwicknia, Capnopsis, Nemurella, Arcynopteryx, Isogenus, Besidolus, Bulgaroperla and Marthamea – with one species.
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**Family Taeniopterygidae Klapálek, 1905**

The general distribution and ecology of the family Taeniopterygidae was compiled and discussed by Tyufekchieva et al. (2013).

**Genus Taeniopteryx Pictet, 1841**

- *Taeniopteryx auberti* Kis & Sowa, 1964
- *Taeniopteryx hubaulti* Aubert, 1946
- *Taeniopteryx nebulousa* (Linnaeus, 1758)
- *Taeniopteryx schoenemundi* (Mertens, 1923)

**Genus Brachyptera Newport, 1851**

Brachyptera beali beali (Newport, 1851)

New Bulgarian record: Luda River, above Rakitna Village, Pirin Mts., 706 m a.s.l., N41°50.58.51', 23.04.2009, 1 larva, leg. TS.

Remarks: Balkan endemic; first record for Bulgaria. In stone and gravel (mesolithal) habitats, as well as inundated higher vegetation in metarhithral of Luda River. Found in oligosaprobic conditions ($S_r = 74.00$). The species seems to be very rare in Bulgaria. Known from Pirin Mts. but with a limited distribution, reflecting the habitat preferences of this species in South-Eastern Europe. An overview of the taxonomy, synonymy, distribution and ecology of *B. beali beali* is presented by Karaouzas et al. (2016).

- *Brachyptera braueri* (Klapálek, 1900)
  = *Taeniopteryx braueri* in Buresch (1936)

Remarks: The distribution of many species in Bulgaria is still based on old data from more than 40 years ago. According to Tyufekchieva et al. (2013), *B. braueri* probably does not occur in Bulgaria. Its presence or absence in the fauna of Bulgaria needs further confirmation.

Brachyptera bulgarica Raušer, 1962

Brachyptera helenica Aubert, 1956

Remarks: Balkan endemic.

Brachyptera risi (Morton, 1896)

Brachyptera seticornis (Klapálek, 1902)

Brachyptera thracica Raušer, 1965

Remarks: Bulgarian endemic; local, known only from Rhodope Mts.

Brachyptera zwicki Braasch & Joost, 1971

**Genus Rhabdiopteryx Klapálek, 1902**

Rhabdiopteryx alpina Käthreiber, 1934

Remarks: Confirmed records of *R. alpina* are restricted to the Alps (Vinçon & Murányi 2009) and Bulgarian records likely refer to *R. harperi* Vinçon & Murányi, 2009.

- *Rhabdiopteryx hamulata* (Klapálek, 1902)
- *Rhabdiopteryx navicula* Theischinger, 1974
- *Rhabdiopteryx neglecta* (Albarda, 1889)
- *Rhabdiopteryx triangularis* Braasch & Joost, 1972

Remarks: Balkan endemic.

**Genus Oemopteryx Klapálek, 1902**

Oemopteryx loewii (Albarda, 1889)

**Family Capniidae Klapálek, 1905**

**Genus Zwicknia Murányi, 2014**

Zwicknia bifrons (Newman, 1838)

= *Capnia bifrons* in publications before Murányi et al. (2014)

Remarks: Specific identity of Bulgarian Zwicknia must be confirmed.

**Genus Capnia Pictet, 1841**

Capnia nigra (Pictet, 1833)

Remarks: Reported for the first time for Bulgaria from the Iskar River (1♀, 04.1917) by Braasch & Joost (1971a) and its presence in Bulgaria must be confirmed. *Capnia nigra* is a very widespread species, found also in Greece and Albania and from Morocco to Japan.

Capnia vidua vidua Klapálek, 1904

Remarks: Braasch & Joost (1975) reported *C. vidua* without subspecific identity. However, the presence of the nominotypical subspecies in Bulgaria needs to be confirmed.

Capnia vidua rilensis Raušer, 1962

**Genus Capnopsis Morton, 1896**

Capnopsis schilleri balcanica Zwick, 1984


Remarks: Balkan endemic.

**Family Leuctridae Klapálek, 1905**

**Genus Leuctra Stephens, 1835**

Leuctra albida Kempny, 1899

Leuctra balcanica Raušer, 1965

Remarks: Balkan endemic.

Leuctra bronislawi Sowa, 1970

Leuctra cingulata Kempny, 1899


Remarks: Mentioned by Klapálek (1913) from Rila Mts. but no additional records were published and the specimen does not exist in the collection of the National Museum Prague. Our data confirm the Bulgarian occurrence of this widespread European species.

Leuctra digitata Kempny, 1899

Leuctra fusca fusca (Linnaeus, 1758)

Leuctra hirsuta Graff & Bálint, 2010

Remarks: Bulgarian endemic; local, known only from Rila Mts.

Leuctra helenae Braasch, 1972

Remarks: Bulgarian endemic; local, known only from Central Balkan Mts.

Leuctra hippopus Kempny, 1899

Leuctra hirsuta Bogoescu & Tabacaru, 1960

= *Leuctra evae* in Raušer (1962)

Remarks: Balkan endemic.

Leuctra inermis Kempny, 1899

Leuctra joosti Braasch, 1970

Remarks: Bulgarian endemic.

Leuctra kumanskii Braasch & Joost, 1977

Remarks: Bulgarian endemic; local, known only from Pirin Mts.

Leuctra major Brinck, 1949
Leuctra marani Raušer, 1965
Remarks: Balkan endemic.

Leuctra mortoni mortoni Kempny, 1899
Remarks: Braasch (1972) reported L. mortoni from the Stara Planina, Rila and Pirin Mountains. Later, the subspecies L. mortoni feheri was described on the basis of specimens from northern Albania and the Rila Mountains (Murányi 2007). Thus, the populations in the Rila and Pirin Mts. likely belong to this southern subspecies, while the subspecific identity of the population from the Stara Planina Mts. needs to be confirmed.

Leuctra mortoni feheri Murányi, 2007
Remarks: Balkan endemic.

Leucta nigra (Olivier, 1811)

Leuctra prima Kempny, 1899

Leuctra pseudohippopos Raušer, 1965
Remarks: Balkan endemic.

Leuctra pseudosignifera Aubert, 1954
Remarks: Braasch & Joost (1971a, 1971c, 1975) reported it and the closely related L. prima from several Bulgarian localities. Early-spring emerging species of the prima group were revised a decade ago (Vinçon & Murányi 2007) but no Bulgarian specimens were studied. Therefore, the identity of the Bulgarian populations needs to be confirmed.

Leuctra rosinae Kempny, 1900

Leuctra quadrimaculata Kis, 1963

FAMILY NEMOURIDAE Newman, 1853

Genus Amphinemura Ris, 1902
Amphinemura borealis (Morton, 1894)
Remarks: With a single record from Bulgaria (Russev 1967). Very rare also in the Carpathians.

Amphinemura standfussi (Ris, 1902)

Amphinemura triangularis (Ris, 1902)

Genus Protonemura Kempny, 1898
Protonemura auberti Illies, 1954

Protonemura autumnalis Raušer, 1956

Protonemura beaumonti (Aubert, 1956)
Remarks: Recorded by Braasch & Joost (1971c, 1975) from the Strandzha and the Stara Planina Mts. These specimens most probably refer to P. rauschi, since P. beaumonti is an endemic species of the Peloponnese but was reported from several other parts of the Balkans prior to the description of P. rauschi (Karaouzas et al. 2016).

Protonemura brevistyla (Ris, 1902)

Protonemura hrahei Raušer, 1956

Protonemura illesi Kis, 1963
Remarks: Balkan endemic.

Protonemura intricata intricata (Ris, 1902)

Protonemura mattheyi (Aubert, 1956)
Remarks: Balkan endemic.

Protonemura meyeri (Pictet, 1841)

Protonemura montana Kimmins, 1941

Protonemura nitida (Pictet, 1835)

Protonemura praecox praecox (Morton, 1894)

Protonemura rauschi Theischinger, 1975

New Bulgarian record: Haskovo Province, Malko Gradistshe Village, brook in mixed forest south of the village, 435 m a.s.l., N41°44.235’ E25°58.801’, 29.05.2012, 2 male, 3 females, 1 male larva, leg. JK, DM, TSz.
Remarks: Balkan endemic. First record for Bulgaria, though those of P. beaumonti most probably also refer to this species. In small torrents and brooks, mainly in forested areas of low and medium-high elevations.

Protonemura strandschaensis Braasch & Joost, 1972
Remarks: Balkan endemic.

Protonemura tarda Braasch, 1972
Remarks: Bulgarian endemic.

Genus Nemoura Latreille, 1796

Nemoura avicularis Morton, 1894

Nemoura braaschi Joost, 1970
Remarks: Balkan endemic.

Nemoura bulgarica Raušer, 1962

= Nemoura kownackorum in Sowa (1970)
Remarks: Bulgarian endemic.

Nemoura cambrica Stephens, 1836

Nemoura cinerea cinerea (Retzius, 1783)

= Nemoura variegata in Buresch (1936)

Nemoura flexuosa Aubert, 1949

Nemoura longicauda Kis, 1964

Nemoura marginata Pictet, 1835

Nemoura pirinensis Raušer, 1962
Remarks: Bulgarian endemic.

Nemoura pygmaea Braasch & Joost, 1972
Remarks: Bulgarian endemic.

Nemoura subtilis Klapálek, 1895

Nemoura uncincta Despax, 1934

= Nemoura fulviceps in Russev (1961); Braasch & Joost (1971a, 1971b, 1975); Kumanski (1997); Hubenov et al. (2000b); Tyufekchieva et al. (2011)

Genus Nemurella Kempny, 1898

Nemurella picietii Klapálek, 1900

FAMILY PERLOLIDAE Klapálek, 1909

Genus Arcynopteryx Klapálek, 1904

Arcynopteryx dichroa (McLachlan, 1872)

= Arcynopteryx compacta in Buresch (1936);

Braasch & Joost (1971a; 1972); Kumanski (1997);

Hubenov et al. (2000a, 2000b); Vidinova et al. (2000)

New distribution data: outflow of Sulzata Lake, Rila Mts., 2535 m a.s.l., FM87, 07.10.2001, 2 larvae, leg. YV;
outflow of Okoto Lake, Rila Mts., 2440 m a.s.l., FM87, 07.10.2001, 12 larvae, leg. YV;
outflow of Bubreka Lake, Rila Mts., 2355 m a.s.l., FM87, 07.10.2001, 2 larvae, leg. YV;
outflow of Okoto Lake, Rila Mts., 2440 m a.s.l., FM87, 07.10.2001, 12 larvae, leg. YV;

Genus Isogenus Newman, 1833

Isogenus nubecula Newman, 1833

Genus Besdolus Newman, 1853

Besdolus rickeri (Pictet, 1841)

= Perla (Dictyopteryx) ventralis in Pictet (1841)

= Dictyogenus ventralis in Braasch, Joost (1976);

Gueorguiev et al. (1998)

YV; Belichka River, Belitsa Town, 850 m a.s.l., GM14, 31.10.1996, 1 larve, leg. YV, VT; Trigradska River, 1300 m a.s.l., KG80, 01.11.1995, 1 larva, leg. YV, VT.

Remarks: Described from the ‘mons Balkan’, probably from Bulgarian territory (Zwick & Weinzierl 1995).

Genus Perloides Banks, 1903

- Perloides dispar (Rambur, 1842)
- Perloides intricatus (Pictet, 1841)
  - = Perloides intricata in Braasch & Joost (1971c, 1975) and Russev & Janeva (1975)
- Perloides microcephalus (Pictet, 1833)
  - = Perloides microcephala in Braasch & Joost (1971a, 1971c, 1975)

Genus Bulgaroperla Raušer, 1966

Bulgaroperla mirabilis mirabilis Raušer, 1966
Remarks: Balkan endemic.

Genus Isoperla Banks, 1906

- Isoperla auriberg Raušer, 1965
  Remarks: Bulgarian endemic.
- Isoperla belal Illies, 1963
- Isoperla buresi Raušer, 1962
- Isoperla chius Zwick, 1978
  New Bulgarian record: Haskovo Province, Madzhari Village, stream in bushy vegetation, south of the village, 240 m a.s.l., N41°39.423' E25°41.927', 29.05.2012, 4 male, 5 females, 1 larva, leg. JK, DM, TSz.
  Remarks: First record for Bulgaria. In medium-sized to large streams at low to medium-high elevations. Hitherto reported from the Chios Island of Greece and from Western Turkey (Darilmaz et al. 2016).

- Isoperla grammatica (Poda, 1761)
  - = Chloroperla grammatica in Buresch (1936)
  - = Isoperla rufescens in Buresch (1936)
- Isoperla obscura (Zetterstedt, 1840)
- Isoperla oxylepis balcanica Raušer, 1962
  Remarks: Balkan endemic.
- Isoperla oxylepis oxylepis (Despax, 1936)
- Isoperla russevi Sowa, 1970
  Remarks: Balkan endemic.
- Isoperla submontana Raušer, 1965
  Remarks: Balkan endemic.
- Isoperla tripartita Illies, 1954
  = Isoperla tripartita graeca in Raušer (1963), Braasch & Joost (1971c) and Kumanski (1997)

Family Perlidae Latreille, 1802

Genus Marthamea Klapálek, 1907

Marthamea vitripennis (Burmeister, 1839)
Remarks: Previously recorded for the lithorheophilic coenosis of the Danube (Russev 1959), Maritsa (Russev 1967, Zwick 1984b) and Strouma Rivers (Zwick 1984b). The species has not been recorded in Bulgaria for more than 50 years.

Genus Perla Geoffroy, 1762

- Perla abdominalis Burmeister, 1839
  = Perla burmeisteriana in Braasch, Joost (1971a, 1971b); Russev (1971, 1977); Janeva (1987); Russev et al. (1991); Hubenov et al. (2000b); Vidinova et al. (2000, 2006); Tyufekchieva et al. (2011).
  = Perla illesi Braasch & Joost, 1973
  = Perla marginata (Panzer, 1799)
  Remarks: According to Karaouzas et al. (2016), the previous Balkan records of P. marginata probably refer to P. pallida Guérin-Ménéville, 1838 (Sivec, Stark 2002). Here we list the species as P. marginata. Detailed information on its distribution in Bulgaria is to be presented in a future contribution.

- Perla pallida Guérin-Ménéville, 1838
  = Perla bureschi in Schoenemund (1926); Buresh (1936)
  = Perla pallida dacica in Braasch & Joost (1971b); Kumanski (1997)
  = Perla pallida dacica in Braasch (1972); Vidinova et al. (2000)

Genus Dinocras Klapálek, 1907

Dinocras cephalotes (Curtis, 1827)
= Perla cephalotes in Buresh (1936)
= Dinocras megacephala (Klapalek, 1907)
= Dinocras klapaleki in Russev (1967)

We have assessed the conservation status of the presented species (Table 1). Currently, among the 109 Bulgarian stonefly taxa that have been recorded, one species is Extinct (EX); two species are Regionally Extinct (RE) from the country; two - Possibly Extinct (PE); 22 - Critically Endangered (CR); nine - Endangered (EN); 21 - Vulnerable (VU); 18 - Least Concern (LC); 14 species are Near Threatened (NT); 17 species are classified as Data Deficient (DD) and three species are Not Evaluated (NE).
Table 1. Threatened stonefly species according to the IUCN categories and criteria (IUCN 2012a). Taxa are given in taxonomic order within each conservation status category. For abbreviations, see Materials and Methods.

<table>
<thead>
<tr>
<th>Taxa Category</th>
<th>Taxa</th>
<th>Criterion</th>
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<tbody>
<tr>
<td>Oemopteryx loewii</td>
<td>Perla pallida</td>
<td>VU</td>
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<tr>
<td>Isoperla obscura</td>
<td>Dinocras cephalotes</td>
<td>VU</td>
</tr>
<tr>
<td>Marthamea vitripennis</td>
<td>Brachyptera risti</td>
<td>LC</td>
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<tr>
<td>Taeniopteryx nebulosa</td>
<td>Brachyptera seticornis</td>
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<tr>
<td>Isogenus nubecula</td>
<td>Leuctra fusca fusca</td>
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<td>Leuctra hippopus</td>
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<td>Brachyptera thracica</td>
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<td>Brachyptera zwicki</td>
<td>Leuctra nigra</td>
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<td>Rhabdiopteryx alpina</td>
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Discussion

Based on our results, we could speculate that the stonefly fauna of Bulgaria is among the richest on the Balkan Peninsula. The number of species of the Plecoptera for Greece and Turkey are 78 and 117, respectively (Karouzas et al. 2016, Darilmaz et al. 2016), whereas for the Republic of North Macedonia and Serbia – 100 (Muranyi et al. 2014) and 90 ( Petrović et al. 2014), respectively.

The order Plecoptera has a moderate level of endemism in Bulgaria. Currently, the checklist comprises 31 endemic stoneflies (28.44% of all Bulgarian stoneflies). Among the established endemic species and subspecies, the Balkan endemics are predominant. They include 19 species and two subspecies (67.7% of all the endemics). Ten endemics are found only in Bulgaria: four of them (B. thracica, L. hansmalickyi, L. helenae and L. kamanski) are local endemics (12.90% of all the endemics) and six (19.35% of all the endemics) – regional endemics (P. torda, N. bulgarica, N. pirinensis, N. pygmaea, I. auberti and Ch. brachyptera). Most of the endemic stoneflies in Bulgaria are representatives of the families Leuctridae and Nemouridae.

Moreover, stoneflies are among the most significant biological components in running waters (Zwick 2000) and, at the same time, one of the most endangered groups of insects ( Fochetti & Tierno de Figueroa 2006). Since the first manuscript that presented information on the conservation status of Bulgarian stoneflies (Tyufekchieva et al. 2013), available information on this topic in Bulgaria has increased with the inclusion of several species in the Faunistic Diversity of the Vrachanski Balkan Nature Park (Tyufekchieva et al. 2016).

As pointed out in IUCN (2012a), all taxa listed as Vulnerable, Endangered, Critically Endangered are defined as threatened. Therefore, at present almost 50% of the Bulgarian stoneflies are considered threatened (see Table 1). Overall, this is applicable for all European stoneflies: 63% of the taxa likely belong to one or more IUCN categories ( Red List categories).

In addition, for 21 of the species we have observed decrease in the area of their distribution over the last 20 years, probably due to destruction of their preferred habitats. Some new sampling has provided evidence that even in suitable habitats, the species are highly localised and restricted. Consequently, these species have been classified as Vulnerable. Nine taxa qualify as Endangered. There are particular threats to these species due to their small or fragmented populations and the specific habitats they inhabit. Twenty-two stoneflies are strongly restricted in one or a few isolated localities in Bulgaria and, therefore, they are assessed as Critically Endangered.

The last records of M. vitripennis and I. obscura date back to 1965 (Russev 1967). Russev (1966a) reported I. obscura for the first time for Bulgaria from the Maritsa River (Plodiviv and Dimitrovgrad Towns, 23-24.04.1955). Some of its known localities possibly have been incorrectly reported by Russev & Janeva (1975) because of confusion with other species. The only data available about the presence of O. loewii in Bulgaria date back to the middle of the last century. Therefore, we consider these species (O. loewii, I. obscura and M. vitripennis) as Extinct or Regionally Extinct in Bulgaria. Additionally, T. nebulosa and I. nebulosa have not been recorded for several decades. These species can be assessed as Possibly Extinct. It is quite likely that the species still exist, but no studies have been performed to verify their occurrence in the country.

Similar is the situation in other European countries. For instance, I. nebulosa and I. obscura are Regionally Extinct for the Italian Alps ( Fochetti et al. 1998) and the Czech Republic ( Boková & Soldán 2013). The Possibly Extinct (PE) T. nebulosa and the Vulnerable T. schoenemundi ( Tyufekchieva et al. 2013) are Regionally Extinct in Switzerland ( Lubini et al. 2012). According to Rauser (1992) and Zwick (1984a), C. schileri is likely to disappear from sites with lower elevation and will continue to exist only in mountainous rivers and streams, which has also been confirmed by our studies. This species has been assessed as Endangered (EN) for Bulgaria, similarly to Slovakia ( Krno 1994). Furthermore, M. vitripennis is Regionally Extinct for Spain, France, Greece, Poland and Slovakia. Oemopteryx loewii is very probably globally extinct; the last data are the Bulgarian ones. All available specimens are females and the records are older than 100 years.

On the other hand, it is known that some of the stoneflies that have been considered extinct from Western and Central Europe during the 20th century ( Zwick 1984b, 1992, 2004, Sivec 2002, Popujac 2008) are still being recorded from Hungary, Austria, Croatia and Slovakia ( Kovacs & Ambrus 2001, Derka et al. 2002, Popujac & Sivec 2011). All stoneflies with narrow ecological niches and distribution, as well as with specific requirements to their environments, might be extremely vulnerable and under the threat of disappearance ( Brown et al. 2009). Nevertheless, currently no European stoneflies have been included in any Red Data Lists of threatened species ( Fochetti & Tierno de Figueroa 2006). The present assessment of the conservation status of Bulgarian Plecoptera is the
first step towards the addition of stoneflies with high conservation importance in such lists. This could assist in the protection of the rare and endemic species, together with the preservation of their habitats.

References


