

A check list of the mayfly fauna (Insecta; Ephemeroptera) of the Republic of North Macedonia with a short literature review

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Abstract

This paper summarizes published records contributing to our knowledge regarding the Ephemeroptera fauna from the territory of the Republic of North Macedonia. Based on this comprehensive review the recent mayflies' fauna of North Macedonia consists of 80 species that belongs to 20 subgenera, 28 genera and 15 families. As the presence of two of those species (*Palingenia longicauda* (Olivier, 1791) and *Neophemera maxima* (Joly, 1870)) is doubtful, we could assume that the more accurate number of species is 78. A further increase in the number of recorded species could be expected, as some taxa (*Ecdyonurus* and *Rhithrogena*, for example) are insufficiently studied at the moment

Key words: Ephemeroptera, review of literature, nomenclature, taxonomy.

Introduction

The earliest known reference of the ephemeropteran fauna from the territory of North Macedonia dates back from 100 years ago and is attributed to Ulmer (1920), who mentioned the first mayfly record, the adult form of *Neophemera maxima* (Joly, 1870). Šamal (1935) studying the mayfly larvae stated 12 more species, including description of one new species, so by the end of 1940's a total of 14 mayfly species were known (Ikonomov, 1951). The most significant breakthrough considering mayflies' taxonomy and diversity from the region came with Ikonomov (1951; 1953; 1954a,b,c; 1958; 1960; 1961a,b,c; 1962a,b,c,d; 1963a,b; 1964; 1970). During his extensive research Ikonomov noted a total of 55 species and 4 subspecies (Ikonomov 1960). From that number 9 species (*Baetis* (*Baetis*) *meridionalis* Ikonomov, 1954, *B.* (*B.*) *vardarensis* Ikonomov, 1962, *B.* (*B.*) *kozufensis* Ikonomov, 1962, *Centroptilum pirinense* Ikonomov 1962, *Electrogena mazedonica* (Ikonomov, 1954), *Choroterpes* (*Euthraulius*) *balcanica* (Ikonomov 1961), *Paraleptophlebia lacustris* Ikonomov, 1962, *Ephemerella maculocaudata* (Ikonomov, 1961), and *Caenis strugaensis* Ikonomov, 1961) were previously

unknown, thus being described for the first time by Ikonomov (Ikonomov 1954b,c; 1961a,b,c; 1962c,d; 1963a). The complete check list of species recorded by Ikonomov, with the valid (updated) taxonomy (based on Bauernfeind and Soldan 2012), is presented in **Table 1**.

By the end of 1970's the mayfly fauna is enriched by 5 species (*Ecdyonurus* (*Helvetoraeticus*) *zelleri* (Eaton, 1885), *E.* (*Ecdyonurus*) *aurantiacus* (Burmeister, 1839), *E.* (*E.*) *dispar* (Curtis, 1834), *Baetis* (*Baetis*) *lutheri* Müller-Liebenau, 1967, *Siphonurus* (*Siphonurus*) *armatus* (Eaton, 1870)) (Puthz 1980). More than 20 years later, 6 more species (*Paraleptophlebia ruffoi* Biancheri, 1956, *Baetis* (*B.*) *melanonyx* (Pictet, 1843), *Ecdyonurus* (*H.*) *picteti* (Meyer-Dür, 1864), *Rhithrogena savoienensis* Alba-Tercedor & Sowa, 1987, *Rh.* gr. *hybrida* Eaton, 1885, *Rh.* *braaschi* Jacob, 1974) were added to the mayfly fauna of North Macedonia (Tanasijević 1981; Vidinova 1998; Memeti et al. 1999). Most recently, Jacob (2003) note the first record of *Baetis* (*Labiobaetis*) *balcanicus* Müller-Liebenau & Soldan, 1981, Bauernfeind and Soldan (2012) enriched with another three species (*Metreletus balcanicus* (Ulmer, 1920), *Paraleptophlebia cincta* (Retzius, 1783), *P. wernerii* Ulmer, 1920) and Slavevska-Stamenković et al.

Table 1. List of Ephemeropteran species described and reported by Ikonomov (1959), and corrected valid names according Bauernfeind and Soldan (2012).

Old name	Valid name
<i>Ameletus inopinatus</i>	<i>Ameletus inopinatus</i> Eaton, 1887
<i>Siphonurus aestivalis</i>	<i>Siphonurus (Siphonurus) aestivalis</i> (Eaton, 1903)
<i>Pseudocloeon hyalopterum</i>	<i>Baetis (Acentrella) hyalopterum</i> (Bogoescu, 1951)
<i>Baetis carpatica</i>	<i>Baetis (Baetis) alpinus</i> (Pictet, 1843)
<i>Baetis venustulus</i>	<i>Baetis (B.) fuscatus</i> (Linnaeus, 1761)
<i>Baetis bioculatus</i>	<i>Baetis (B.) fuscatus</i> (Linnaeus, 1761)
<i>Baetis meridionalis</i>	<i>Baetis (B.) meridionalis</i> Ikonomov, 1954
<i>Baetis vardarensis</i> n. sp.	<i>Baetis (B.) vardarensis</i> Ikonomov, 1962
<i>Baetis kozufensis</i> n. sp.	<i>Baetis (B.) kozufensis</i> Ikonomov, 1962
<i>Baetis tenax</i>	<i>Baetis (B.) vernus</i> Curtis, 1834
<i>Baetis vernus</i>	<i>Baetis (B.) vernus</i> Curtis, 1834
<i>Baetis tricolor</i>	<i>Baetis (Labiobaetis) tricolor</i> Tshernova, 1928
<i>Pseudocentropitillum</i> sp. <i>strugaensis</i>	<i>Baetis (Nigrobaetis) digitatus</i> Bengtsson, 1912
<i>Baetis pumilus</i>	<i>Baetis (N.) muticus</i> (Linnaeus, 1758)
<i>Baetis niger</i>	<i>Baetis (N.) niger</i> (Linnaeus, 1761)
<i>Baetis rhodani</i>	<i>Baetis (Rhodobaetis) rhodani</i> (Pictet, 1843)
<i>Centroptilum luteolum</i>	<i>Centroptilum luteolum</i> (Müller, 1776)
<i>Centroptilym pirinense</i> n. sp.	<i>Centroptilum pirinense</i> Ikonomov 1962
<i>Cloeon dipterum</i>	<i>Cloeon (Cloeon) dipterum</i> (Linnaeus, 1761)
<i>Cloeon praetextum</i>	<i>Cloeon (Similicloeon) praetextum</i> Bengtsson, 1914
<i>Centroptiloides ambigua</i>	<i>Cloeon (S.) simile</i> Eaton, 1870
<i>Procleon lychnidensis</i>	<i>Procleon (Procleon) bifidum</i> (Bengtsson, 1912)
<i>Isonychia ignota</i>	<i>Isonychia (Isonychia) ignota</i> (Walker, 1853)
<i>Oligoneuriella poecile</i>	<i>Oligoneuriella pallida</i> (Hagen, 1855)
<i>Oligoneuriella rhenana</i>	<i>Oligoneuriella rhenana</i> (Imhoff, 1852)
<i>Ecdyonurus insignis</i>	<i>Ecdyonurus (Ecdyonurus) insignis</i> (Eaton, 1870)
* <i>Ecdyonurus flumminum</i>	<i>Ecdyonurus (E.) submontanus</i> Landa, 1969
<i>Ecdyonurus venosus</i>	<i>Ecdyonurus (E.) venosus</i> (Fabricius, 1775)
<i>Ecdyonurus epeorides</i>	<i>Ecdyonurus (Helvetoraeticus) epeorides</i> Demoulin, 1955
<i>Heptagenia trimaculata</i>	<i>Electrogena affinis</i> (Eaton, 1887)
<i>Heptagenia macedonican.</i> sp.	<i>Electrogena mazedonica</i> (Ikonomov, 1954)
<i>Heptagenia coerulans</i>	<i>Heptagenia (Dacnogenia) coerulans</i> Rostock, 1878
<i>Heptagenia flavipes</i>	<i>Heptagenia (Heptagenia) longicauda</i> (Stephens, 1836)
<i>Epeorus assimilis</i>	<i>Epeorus (Epeorus) assimilis</i> Eaton, 1885
<i>Iron yougoslavicus</i>	<i>Epeorus (Ironopsis) yougoslavicus</i> (Šamal, 1935)
<i>Rhithrogena aurantiaca</i>	<i>Rhithrogena diaphana</i> species group.

<i>Rhithrogena semicolorata</i>	<i>Rhithrogena semicolorata</i> (Curtis, 1834)
<i>Euthraulus balcanicus</i>	<i>Choroterpes (Euthraulus) balcanica</i> (Ikonomov, 1961)
<i>Habroleptoides robusta</i>	<i>Habroleptoides confusa</i> Sartori & Jacob, 1986
<i>Habroleptoides modesta</i>	<i>Habroleptoides confusa</i> Sartori & Jacob, 1986
<i>Habrophlebia konjarensis</i>	<i>Habrophlebia fusca</i> (Curtis, 1834)
<i>Habrophlebia lauta</i>	<i>Habrophlebia lauta</i> Eaton, 1884
<i>Paraleptophlebia lacustris</i> n. sp.	**<i>Paraleptophlebia lacustris</i> Ikonomov, 1962
<i>Paraleptophlebia submarginata</i>	<i>Paraleptophlebia submarginata</i> (Stephens, 1836)
<i>Ephemera lineata</i>	<i>Ephemera (Ephemera) lineata</i> Eaton, 1870
<i>Ephemera hellenica</i>	<i>Ephemera (E.) hellenica</i> Demoulin, 1955
<i>Palingenia longicauda</i>	<i>Palingenia longicauda</i> (Olivier, 1791)
<i>Polymitarcis virgo</i>	<i>Ephoron virgo</i> (Olivier, 1791)
<i>Potamanthus luteus</i>	<i>Potamanthus luteus</i> (Linnaeus, 1767)
<i>Ephemerella ignita</i>	<i>Ephemerella ignita</i> (Poda, 1761)
<i>Ephemerella maculocaudata</i>	<i>Ephemerella maculocaudata</i> (Ikonomov, 1961)
<i>Chitonophora</i> sp. <i>nympha unicolorata</i>	<i>Ephemerella mucronata</i> (Bengtsson, 1909)
<i>Ephemerella notata</i>	<i>Ephemerella notata</i> Eaton, 1887
<i>Ephemerella spinosa</i> n. sp.	<i>Serratella ikonomovi</i> (Puthz, 1971)
<i>Torleya major</i>	<i>Torleya major</i> (Klapalek, 1905)
<i>Caenis macrura</i>	<i>Caenis macrura</i> Stephens, 1835
<i>Orelanthus macedonicus</i>	<i>Caenis horaria</i> (Linnaeus, 1758)
<i>Caenis lycnidensis</i>	<i>Caenis strugaensis</i> Ikonomov, 1961
<i>Prosopistoma foliaceum</i>	<i>Prosopistoma pennigerum</i> (Müller, 1785)

Legend: *According to illustrations provided by Ikonomov (1959), the *Ecdyonurus flumminum* resembles most the *Ecdyonurus (E.) submontanus* description; **According to Bauernfeind and Soldan (2012) *Paraleptophlebia lacustris* is omitted from species list, amplifying on misidentification (listed as synonym of *Paraleptophlebia cincta* (Retzuis, 1783)). In Fauna Europaea taxa list this species exist as species so far known from 2 countries (Belfiore and Thomas, 2013, <https://fauna-eu.org>).

(2016) confirmed the presence of *Caenis pseudorivulorum* Keffermüller, 1960. The full relevant taxa records are listed in **Table 2**, where summarizes all available literature sources.

The newest relevant publications include the report of *M. balcanicus* (larva and imago) (Rimcheska and Vidinova 2018) and partial contribution with Ephemeroptera records concerning some streams from Ohrid Lake watershed is given in Trajanovski et al. (2019).

Presolska (2014) explained why the misidentification (Table 2) of the *Epeorus sylvicola* records from some Balkan countries occur, as pointing out on the proposed synonym, *E. sylvicolus* (Pictet) for two differ-

ent species (*E. assimilis* Eaton, 1885 and *E. sylvicolus* (Pictet, 1865)) proposed by Puthz (1973), and as later stated by Thomas et al. (2000) this proposed synonym mentioned by numerous European specialist is not valid. Furthermore, Presolska (2014) also revised the material from her institutional collection and confirmed that these materials belong to *E. assimilis* species. In addition to this finding also all collections of the recent larval materials from different sites from territory of North Macedonia refer to *E. assimilis* (Rimcheska, Vidinova, unpublished data). Thereafter, all the mentions (Puthz 1980; Memeti et al. 1999) of *E. sylvicola* for the territory of North Macedonia are not valid as well

Table 2. Check list of the established mayfly species from the fauna of North Macedonia with the relevant literature sources.

Recorded species	Author, publication, year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Family Ameletidae	McCafferty, 1991																													
Genus <i>Ameletus</i>	Eaton, 1885																													
<i>Ameletus inopinatus</i>	Eaton, 1887									X													X							
Genus <i>Metreletus</i>	Demoulin, 1951																													
<i>Metreletus balcanicus</i>	(Ulmer, 1920)																													
Genus <i>Siphonurus</i>	Eaton, 1868																													
Subgenus <i>Siphonurus</i>	Eaton, 1868																													
<i>Siphonurus (Siphonurus) aestivalis</i>	(Eaton, 1903)									X																				
<i>Siphonurus (S.) croaticus</i>	Ulmer, 1920										X																			
<i>Siphonurus (S.) armatus</i>	(Eaton, 1870)																													
Family Baetidae	Leach, 1815																													
Genus <i>Baetis</i>	Leach, 1815																													
Subgenus <i>Acentrella</i>	Bengtsson, 1912																													
<i>Acentrella (Baetis) hyalopterum</i>	(Bogoescu, 1951)																													
Subgenus <i>Baetis</i>	Leach, 1815																													
<i>Baetis alpinus</i>	species-group																													
<i>Baetis (Baetis) alpinus</i>	(Pictet, 1843)																													
<i>Baetis (B.) melanonyx</i>	(Pictet, 1843)																													
<i>Baetis fuscatus</i>	species-group																													
<i>Baetis (B.) fuscatus</i>	(Linnaeus, 1761)																													
<i>Baetis lutheri</i>	species-group																													
<i>Baetis (B.) lutheri</i>	Müller-Liebenau, 1967																													
<i>Baetis (B.) meridionalis</i>	Ikonomov, 1954																													
<i>Baetis (B.) vardarensis</i>	Ikonomov, 1962																													
<i>Baetis vernus</i>	species-group																													

<i>Baetis (B.) kozufensis</i> Ikonomov, 1962	X																						X	
<i>Baetis (B.) vernus</i> Curtis, 1834	X																							X
Subgenus <i>Labiobaetis</i> Novikova & Kluge, 1987																								
<i>Baetis (Labiobaetis) balcanicus</i> Müller-Liebenau & Soldan, 1981																								X
<i>Baetis (L.) tricolor</i> Tshernova, 1928																								X
Subgenus <i>Nigrobaetis</i> Novikova & Kluge, 1987																								
<i>Baetis (Nigrobaetis) digitatus</i> Bengtsson, 1912																								
<i>Baetis (N.) muticus</i> (Linnaeus, 1758)		X																						X
<i>Baetis (N.) niger</i> (Linnaeus, 1761)		X																						X
Subgenus <i>Rhodobaetis</i> Jacob, 2003																								
** <i>Baetis (Rhodobaetis) gemellus</i> Eaton, 1885		X																						X
<i>Baetis (Rh.) rhodani</i> (Pictet, 1843)		X																						X
Subfamily Cloeninae																								
Genus <i>Centroptilum</i> Eaton, 1869																								
<i>Centroptilum luteolum</i> (Müller, 1776)							X	X																X
<i>Centroptilum pirinense</i> Ikonomov 1962							X	X																X
Genus <i>Cloeon</i> Leach, 1815																								
Subgenus <i>Cloeon</i> Leach, 1815																								
<i>Cloeon (Cloeon) dipterum</i> (Linnaeus, 1761)							X	X																X
Subgenus <i>Similicloeon</i> Kluge & Novikova, 1992																								
<i>Cloeon (Similicloeon) praetextum</i> Bengtsson, 1914							X																	X
<i>Cloeon (S.) simile</i> Eaton, 1870							X	X																X
Genus <i>Procloeon</i> Bengtsson, 1915																								
Subgenus <i>Procloeon</i> Bengtsson, 1915																								
<i>Procloeon (Procloeon) bifidum</i> (Bengtsson, 1912)																								X
Subgenus <i>Pseudocentroptilum</i> Bogoescu, 1947																								
<i>Procloeon (Pseudocentroptilum) pennulatum</i> (Eaton, 1870)																								X
Superfamily Heptagenioidea																								
Family Isonychiidae Burks, 1953																								
Genus <i>Isonychia</i> Eaton, 1871																								
Subgenus <i>Isonychia</i> Eaton, 1871																								
<i>Isonychia (Isonychia) ignota</i> (Walker, 1853)																								X
Family Oligoneuriidae Ulmer, 1914																								
Genus <i>Oligoneuriella</i> Ulmer, 1924																								
<i>Oligoneuriella pallida</i> (Hagen, 1855)																								X
<i>Oligoneuriella rhenana</i> (Imhoff, 1852)																								X
Family Heptageniidae Needham, 1901																								
Subfamily Ecdyonurinae Ulmer, 1920 (1905)																								

<i>Ephemerella notata</i> Eaton, 1887 Genus <i>Serratella</i> Edmunds, 1959	X	X	X	X	X	X	X	X	X	X
<i>Serratella ikononovi</i> (Puthz, 1971) Genus <i>Torleya</i> Lestage, 1917	X	X	X	X	X	X	X	X	X	X
<i>Torleya major</i> (Klapalek, 1905) Superfamily Caenoidea										
Family Caenidae Newman, 1853										
Genus <i>Caenis</i> Stephens, 1836	X	X	X	X	X	X	X	X	X	X
<i>Caenis horaria</i> (Linnaeus, 1758)	X	X	X							
<i>Caenis macrura</i> Stephens, 1835	X	X	X							
<i>Caenis pseudorivulorum</i> Keffermüller, 1960	X	X	X							
<i>Caenis strugaensis</i> Ikononov, 1961 Family Neoephemeridae Traver, 1935										
Genus <i>Neoephemera</i> McDunnough, 1925										
<i>Neoephemera maxima</i> (Joly, 1870) Family Prosopistomatidae										
Genus <i>Prosopistoma</i> Latreille, 1833	X	X	X	X	X	X	X	X	X	X
<i>Prosopistoma pennigerum</i> (Müller, 1785)										

(Table 2). These doubts are mention and by Bauernfeind and Soldan (2012) where besides *Epeorus (Epeorus) sylvicola* and *Baetis (Rhodobaetis) gemellus* are subject of misidentification. Concerning reported misidentification of *Paraleptophlebia lacustris* (proposed as synonym of *P. cincta*) in Bauernfeind and Soldan (2012) in this review will be listed as a relevant species (Ikononov 1960) as long as the comparison between the available material from southern Balkan and central Europe will be proceeded for further analyzes. Besides this two misidentified species, in the book of Mayflies, Bauernfeind and Soldan (2012) amplify that the previously recorded mayfly species *Neoephemera maxima* and *Palingenia longicauda*, nowadays are listed as extinct species from North Macedonia. In that order can be concluded that the current recorded taxa are down to 78 existing species (Table 2).

The presence of *Rhithrogena gorganica* Klapalek, 1907 (Belfiore and Thomas, 2013, <https://fauna-eu.org>.) should be discussed further. Most likely this record has been taken from Šamal (1935) and it could be a subject of misidentification, because this species is endemic, and probably restricted to Carpathian Mountains (Bauernfeind and Soldan 2012). In addition to these misidentifications, Ikononov (1970) stated, he visited all sites listed in Šamal (1935, 1939), and 40 years later he confirmed the presence/or correct determination of only 9 species from previously reported 13 by Šamal (Table 2). The published records of *Rhithrogena goeldlini* Sartori & Sowa 1988 (gr. *diaphana*), *Rh. degrangei* Sowa 1969, *Rh. gratianopolitana* Sowa, Degrange & Sartori 1986 and *Rh. hercynia* Landa 1969 (gr. *hybrida*) (Vidinova 1998), due to doubtful presence of recorded *Rhithrogena* species in the region (Bauernfeind and Soldan 2012) will be re-evaluated and revised further (Vidinova pers. comm.).

In the near future an extensive research focusing on Ephemeroptera fauna is needed in order to provide a more relevant data, and to clarify noted controversies. A further increase in the number of recorded species could be expected, as some taxa (*Ecdyonurus* and *Rhithrogena*, for example) are insufficiently studied at the moment. Providing more accurate knowledge on the diversity and presence of mayflies in North Macedonia is significant because many of those species are valuable indicators for water quality, and should be included in all competent hydroecological studies of its habitats.

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References

- Bauernfeind E. & Soldan T. 2012. The Mayflies of Europe (Ephemeroptera). Apollo Books, Ollerup, 781 pp.
- Belfiore C. & Thomas A. 2013. Ephemeroptera. Accessed through: Fauna Europaea at http://www.faunaeur.org/full_results.php?id=193549
- Ikonomov P. 1951. Contribution à l'étude d'éphéméroptères de la Vallée d'Ochrida. Annuaire de la Faculté de Philosophie de l'Université de Skopje, Section des sciences naturelles, 4(3): 1-33.
- Ikonomov P. 1953. Ephemeroptera der Umgebung des Prespa-Sees. Annuaire de la Faculté de Philosophie de l'Université de Skopje, Section des sciences naturelles, 6(7):1-29.
- Ikonomov P. 1954a. Über das Weibchen von *Iron jugoslavicus* Samal. Fragmenta Balcanica, 1(1): 1-6.
- Ikonomov P. 1954b. [Über eine neue *Heptagenia* (Ephem.) aus Mazedonien]. Fragmenta Balcanica, 1(7): 57-68.
- Ikonomov P. 1954c. [Über eine neue Larve der Gattung *Baetis* (Ephem.) aus Mazedonien]. - Fragmenta Balcanica, 1(11): 95-105.
- Ikonomov P. 1958. Preliminary notes on the nymphs of Ephemeroptera found in Macedonian waters. Verh. Int. Ver. Limnol., 13: 858-859.
- Ikonomov P. 1959. Ephemeroptera of Macedonia. PhD dissertation, Skopje.
- Ikonomov P. 1960. Die Verbreitung der Ephemeroptera in Mazedonien. Acta Musei Macedonici Scientiarum Naturalium, 7(3): 41-74.
- Ikonomov P. 1961a. Eintagsfliegen (Ephemeroptera) Jugoslaviens, *Euthraulius balcanicus* n. sp. (Leptophlebiidae). Fragmenta Balcanica, 4(1): 1-10.
- Ikonomov P. 1961b. Ephemeroptera Jugoslaviens. *Caenis strugaensis* sp. n. (Caenidae). - Fragmenta Balcanica, 4(2): 11-19.
- Ikonomov P. 1961c. Eintagsfliegen (Ephemeroptera) Mazedoniens. Fam. Ephemerellidae. Acta Musei Macedonici Scientiarum Naturalium, 8(3): 53-74.
- Ikonomov P. 1962a. Eintagsfliegen (Ephemeroptera) Jugoslavicus. *Oligoneuriella poecile* sp. n. Fragmenta Balcanica, 4(10): 69-79.
- Ikonomov P. 1962b. Eintagsfliegen (Ephemeroptera) Jugoslavicus. *Oreianthus macedonicus* (Ulmer) = (*Rhoënanthus* Ulm.). Fragmenta Balcanica, 4(11): 81-91.
- Ikonomov P. 1962c. Baëtidae (Ephemeroptera) macedoniens. Faculté des Sciences Naturelles de Université de Skopje. Biologie, 13: 83-140.
- Ikonomov P. 1962d. Eintagsfliegen (Ephemeroptera) Jugoslavicus. *Paraleptophlebia lacustris* n. sp. Fragmenta Balcanica, 4(17): 129-138.
- Ikonomov P. 1963a. Eintagsfliegen (Ephemeroptera) Macedoninens. Genus *Heptagenia* (Ecdyonuridae). Annuaire de la Faculté des Sciences d'Université de Skopje (1962), 14(7): 155-165.
- Ikonomov P. 1963b. Ephemeroptera Jugoslaviens. *Habrophlebia* sp. *nympha konjarensis*. Annuaire de la Faculté des Sciences d'Université de Skopje (1962), 14(9): 175-181.
- Ikonomov P. 1964. Die Eintagsfliegen (Ephemeroptera) des Flusses Varder. Annuaire de la Faculté des Sciences d'Université de Skopje, 15(5): 191-198.
- Ikonomov P. 1970. Repartition des larves Éphéméroptères et Plécoptères dans les cours d'eau de Macédoine. Annuaire de la Faculté des Sciences d'Université de Skopje (1969), 22: 5-11.
- Jacob, U. 2003. Baetis Leach 1815, sensu stricto oder sensu lato. Ein Beitrag zum Gattungskonzept auf der Grundlage von Artengruppen mit Bestimmungsschlüsseln. Lauterbornia, 47: 59-129.
- Memeti A., Russev B. & Janeva I. 1998. Ephemeroptera and Plecoptera (Insecta) in the river Tetovska/Vardar and its tributaries in the Shar Mountains, Macedonia. Lauterbornia, 33: 45-48.
- Presolska Y. 2014. Composition, distribution and ecology of the order Ephemeroptera (Insecta) in Bulgaria. PhD thesis, IBER-BAS, Sofia, Bulgaria, 373pp. (In Bulgarian).
- Puthz V. 1973. Zwei neue Synonyme in der Gattung *Epeorus* Eaton (Insecta, Ephemeroptera, Heptageniidae). Rev. Suisse Zool., 80(2): 577-580.
- Puthz, V. 1980. Ergebnisse der Albanien-Expedition 1961 des Deutschen Entomologischen Institutes. 94. Beitrag (Ephemeroptera). Beiträge zur Entomologie = Contributions to Entomology, 30(2): 343-355.
- Rimcheska B., Vidinova Y. 2018. New records of

- Metreletus balcanicus* (Ulmer, 1920) (Ephemeroptera: Ameletidae) from Republic of Macedonia. Journal of Entomological Research Society, 20(3): 123-127.
- Šámal J. 1935. Les Ephémères et les Plécoptères des ruisseaux de la Yougoslavie méridionale. Verhandlungen der Internationalen Vereinigung für Theoretische und Angewandte Limnologie Bd. VII, 113–116.
- Šámal J. 1939. *Iron jugoslavicus* nov. spec. Glasnik, Bulletin de la Société Scientifique de Skoplje, Vol. XX: 89–95.
- Slavevska-Stamenković V., Rimcheska B., Vidinova Y., Tyufekchieva V., Paunović M., Ristovska M. & Prelić D. 2016. Contribution to the knowledge of Ephemeroptera, Plecoptera and Trichoptera from Republic of Macedonia. Acta zoologica bulgarica, 68 (2): 199-206.
- Tanasijevic M. 1981. New find of the species *Paraleptophlebia ruffoi* Biancheri, 1956 (Ephemeroptera, Leptophlebiidae). Nov nalaz vrste *Paraleptophlebia ruffoi* Biancheri, 1956 (Ephemeroptera, Leptophlebiidae). Godisnjaka Bioloskog Instituta Univerziteta u Sarajevu, 34: 165-166.
- Thomas A; Marie V; Brulin M. 2000. Corrections á la faune des Ephémères d'Europe occidentale: 2. *Epeorus assimilis* Eaton, 1885 est une espèce valide, distincte d'*E. sylvicolus* (Pictet, 1865) [Ephemeroptera, Heptageniidae]. Ephemera (1999), 1(2): 85-91.
- Trajanovski, S., Budzakoska Gjoreska, B., Kenderov, L., Trajanovska, S., Zdraveski, K., & Trichkova, T. (2019). Potential threats to benthic macroinvertebrate fauna in Lake Ohrid watershed: Water pollution and alien species. Acta Zoologica Bulgarica, Supplement 13: 91-98.
- Ulmer G. 1920. Neue Ephemeropteren. Archiv für Naturgeschichte, 85A(11): 1-80.
- Vidinova Y. 1998. New *Rhithrogena*-species (Ephemeroptera: Heptageniidae) for the fauna of Macedonia. Lauterbornia 33: 49-51.