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Ephemeroptera, Plecoptera and Trichoptera (Insecta) from Water Bodies in the Region of Plovdiv City

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Abstract. This work summarises both literature and unpublished historical and new data on the mayflies, stoneflies and caddisflies fauna from the Maritsa River Valley in the region of Plovdiv City. The data originates from a period with broad time limits (1930-2017). In total, 40 taxa at species level were recorded. They belong to 16 families and represent, correspondingly, 23.28, 3.67 and 3.49 % of the species of Ephemeroptera, Plecoptera and Trichoptera currently known from Bulgaria. Among the established taxa, only one (*Palingenia longicauda*) is Extinct in Bulgaria (EX); one is Regionally Extinct (RE), one is Critically Endangered (CR), one - Potentially threatened and eight - rare or very rare on the territory of Bulgaria. Endemic species within the study area have not been reported.

Key words: mayflies, stoneflies, caddisflies, species richness, conservation status, Maritsa River, Plovdiv, Bulgaria.

Introduction

First sporadic data on semi-aquatic insects within the region of Plovdiv are given by RUSSEV (1957; 1960), who reported the findings of single mayfly species. Later RUSSEV (1966; 1967), summarising the results of hydrobiological studies on the Maritsa River, carried out during the period 1955-1963, reported the first data on Plecoptera and Trichoptera from the region of Plovdiv City. Based on purposeful seasonal studies in 1976 and 1977, UZUNOV *et al.* (1981) reported 15 mayfly and one caddisfly taxa at two locations in the Maritsa River within the district of Plovdiv City. In his contributions to the Fauna of Bulgaria series KUMANSKI (1985; 1988; 2007). presents data on the distribution of adult specimen of the order Trichoptera from Bulgaria. Among the localities of many of the species he mentions the Maritsa River. However, the specific data on the stonefly and caddisfly fauna from the area of the Plovdiv City are scarce.

The aim of this work is to present data on the faunistic diversity of the mayflies, stoneflies and caddisflies in the region of Plovdiv City, Bulgaria, with information on their distribution, habitat preferences and conservation status at a regional level.

Material and Methods

The study comprises the already published data on the findings of Ephemeroptera, Plecoptera and Trichoptera (EPT) representatives in the water bodies within Plovdiv City and its surroundings. Additionally, unpublished data were included as follows: faunistic records by B. Russev from 1955, data from "NATURA 2000" studies of "Maritsa River" Protected zone BG0000578 in 2011 (July, 30th), as well as materials from newly sampled localities in 2017 (May, 18th), the latter two collected by Y. Vidinova. These localities are new for some of the species and are marked with * in the text (Table 1).

Table 1. Location data of the newly observed sites.

River	Locality	Geographic coordinates		Altitude	UTM Grid
Parvenetska	upstream the mouth	N 42.131869°	E 24.683758°	169 m	LG06 (87)
Pyasachnik	upstream the mouth	N 42.164443°	E 24.773945°	158 m	LG16 (39)
Maritsa	near the Fair town	N 42.154369°	E 24.750878°	163 m	LG16 (29)
Maritsa	downstream Plovdiv, under the railway bridge and ring road	N 42.152852°	E 24.807722°	155 m	LG16 (89)

The unpublished materials were collected using the multihabitat method (CHESHMEDJIEV *et al*., 2011), fixed with alcohol and later sorted by systematic groups. Baetidae (Ephemeroptera) were determined according to MÜLLER-LIEBENAU (1969) and the rest of the mayflies - using the keys of BAUERNFEIND & HUMPESCH (2001). The systematic order followed BAUERNFEIND & SOLDAN (2012).

The current review of four stoneflies species was based on the available literature (two species) and new data (one species). One of the records originated from an unpublished protocol by Prof. B. Russev. The used systematic order was after MURANYI (2008).

We present here literature and original data on the occurrence of, respectively, five taxa and five species of Trichoptera. The newly collected caddisfly larvae were identified using the key of WARINGER & GRAF (2011).

Results and Discussion

Check-list

Order Ephemeroptera

Superfamily Baetoidea

Family Siphlonuridae Ulmer, 1920

Genus *Siphlonurus* Eaton, 1868

Subgenus *Siphlonurus* Eaton, 1868

Siphlonurus (*S.*) *aestivalis* (Eaton, 1903)

Localities: LG16 - swamp in Plovdiv (leg. prof. A. Valkanov), 04.04.1948 - mass flight (RUSSEV, 1960).

Distribution: macrophytic vegetation or layers of rotten leaves in lentic sections of rivers, in ponds and the shore zone of lakes, usually below 600 m a.s.l. (BAUERNFEIND & SOLDAN, 2012). In Bulgaria the species has been found at several locations, some of them at higher altitude (to about 1000 m a.s.l.); in riparian vegetation in river spills and swamps (RUSSEV & VIDINOVA, 1994). Found in Europe, excluding the British Isles, Iceland and the Iberian Peninsula (PUTHZ, 1978).

Family Baetidae Leach, 1815

Genus *Baetis* Leach, 1815

Subgenus *Baetis* Leach, 1815

Baetis (*B.*) *buceratus* Eaton, 1870

Localities: LG06 (87) - Parvenetska River*, 18.05.2017 - 4 la; LG06 (99) - Maritsa River, upstream Plovdiv, 1976-1977 (UZUNOV *et al*., 1981); LG16 (29) - Maritsa River, Plovdiv, near the Fair Town*, 18.05.2017 - 34 la; LG16 (39) - Pyasachnik River*, 18.05.2017 - 78 la; LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: large lowland rivers, sometimes dominant in β-mesosaprobic conditions of organic pollution (BAUERNFEIND & SOLDAN, 2012). Frequent in Bulgaria, very often with rich populations; widely distributed in the West Palaearctic (BAUERNFEIND & SOLDAN, 2012).

Baetis (*B.*) *nexus* Navás, 1918

Localities: LG16 (39) - Pyasachnik River*, 18.05.2017 - 2 la.

Distribution: lowland waters of different size, mostly in rivers, backwaters and artificial water channels with rather low current velocity, evidently preferring places with submerged aquatic vegetation (BAUERNFEIND & SOLDAN, 2012). Not so common in Bulgaria; probably widely distributed in the West Palaearctic without clear area limits (BAUERNFEIND & SOLDAN, 2012).

Baetis (*B.*) *fuscatus* (Linnaeus, 1761)

Localities: LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: from the rhithral to the potamal of streams and rivers with stony bottom, preferably inhabiting lotic sections with submerged aquatic plants (BAUERNFEIND & SOLDAN, 2012). No actual data on the species distribution in Bulgarian freshwaters. Found in the Palaearctic, widely distributed in almost all of Europe, including some Mediterranean Islands (BAUERNFEIND & SOLDAN, 2012).

Baetis (*B.*) *scambus* Eaton, 1870

Localities: LG16 (29) - Maritsa River, Plovdiv, near the Fair Town*, 18.05.2017 - 20 la.

Distribution: exclusively in lotic habitats, only as an exception in artificial water courses. Substratum preferences similar to *B. fuscatus* (BAUERNFEIND & SOLDAN, 2012). No actual data on the species distribution in Bulgarian freshwaters. West Palaearctic species (HAYBACH, 1998; JACOB, 2003), reported from almost all European countries (BELFIORE & THOMAS, 2017).

Baetis (*B.*) *macani* Kimmins, 1957

Localities: LG06 (99) - Maritsa River, upstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: typical lowland species, which larvae occur in all types of aquatic habitats, frequently in still water, usually on aquatic vegetation (BAUERNFEIND & SOLDAN, 2012). No actual data on the species distribution in Bulgarian freshwaters. Holarctic species; recorded in Northern Europe, including Fennoscandia (BAUERNFEIND & SOLDAN, 2012).

Baetis (*B.*) *tracheatus* Keffermüller & Machel, 1967

Localities: LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: slow-flowing lowland rivers, predominantly among submerged vascular vegetation. Typical lowland species, relatively pollution resistant, inhabits rivers and eutrophied still waters (BAUERNFEIND & SOLDAN, 2012). No actual data on the species distribution in Bulgarian freshwaters. Typical for the Western Palaearctic lowlands (BAUERNFEIND & SOLDAN, 2012).

Baetis (*B.*) *vernus* Curtis, 1834

Localities: LG06 (99) - Maritsa River, upstream Plovdiv; LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: eudominant in many localities, due to its very broad ecological range. Larvae usually prefer the rhithral of smaller streams but high densities may be observed in larger lowland rivers (BAUERNFEIND & SOLDAN, 2012). Widespread in Bulgaria. Peported from almost the whole of Europe, including the British Isles but not recorded from the Mediterranean Islands (BAUERNFEIND & SOLDAN, 2012).

Subgenus *Labiobaetis* Novikova & Kluge, 1987

Baetis (*L.*) *atrebatinus* Eaton, 1870

Localities: LG06 (99) - Maritsa River, upstream Plovdiv; LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: exclusively in large rivers, preferably inhabits submerged macrophytes and less frequently stony habitats (BAUERNFEIND & SOLDAN, 2012). No actual data on the species distribution in Bulgarian freshwaters. In continental Europe and the East Palaearctic (BAUERNFEIND & SOLDAN, 2012); predominantly in Western Europe, including the British Isles and Ireland (BELFIORE & THOMAS, 2017).

Baetis (*L.*) *tricolor* Tshernova, 1928

Localities: LG06 (99) - Maritsa River, upstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981); LG16 - Maritsa River, Plovdiv, 07.1942 - 4 la (leg. A. Valkanov); 07.10.1955 - several la (RUSSEV, 1966); LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: potamal of large lowland rivers, preferring low current velocity and rich submerged vegetation and roots (BAUERNFEIND & SOLDAN, 2012). No actual data on the species distribution in Bulgarian freshwaters. Found in the central and eastern parts of Europe (BELFIORE & THOMAS, 2017).

Subgenus *Rhodobaetis* Jacob, 2003

Baetis (*Rh.*) *rhodani* (Pictet, 1843)

Localities: LG06 (87) - Parvenetska River*, 18.05.2017 - 13 la; LG06 (99) - Maritsa River,

upstream Plovdiv, 1976-1977 (UZUNOV *et al*., 1981); LG16 - Maritsa River, Plovdiv, 23.04.1955 - mass (RUSSEV, 1966); LG16 (29) - Maritsa River, near the Fair Town, 18.05.2017 - 3 la; LG16 (39) - Pyasachnik River*, 18.05.2017 - 2 la; LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al*., 1981).

Distribution: lotic erosional habitats from the crenal to the potamal of rivers, also pools and oligotrophic lakes, including artificial watercourses (BAUERNFEIND & SOLDAN, 2012). *Baetis rhodani* represents the most eurythermic and eurytopic species within the genus (SARTORI & LANDOLT, 1999). One of the most common and ubiquitous species in Bulgaria. Recorded from all over Europe (BAUERNFEIND & SOLDAN, 2012).

Subgenus *Nigrobaetis* Novikova & Kluge, 1987

Baetis (*N.*) *muticus* (Linnaeus, 1758)

Localities: LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al*., 1981).

Distribution: similar to *B. rhodani* but distinctly less abundant and very rarely dominant. Larvae prefer the rhithral of smaller streams but have been found in the crenal and potamal (BAUERNFEIND & SOLDAN, 2012). Frequent species, however no actual data on its distribution in Bulgarian freshwaters. Reported from all over Europe except the central part of European Russia (BELFIORE & THOMAS, 2017).

Genus *Cloeon* Leach, 1815

Subgenus *Cloeon* Leach, 1815

Cloeon (*Cl.*) *dipterum* (Linnaeus, 1761)

Localities: LG06 (99) - Maritsa River, upstream Plovdiv, 1976-1977 (UZUNOV *et al*., 1981); LG16 - Maritsa River, Plovdiv, 07.10.1955 - 2 la (RUSSEV, 1966).

Distribution: almost all types of aquatic habitats, eudominant in still water but also found in running waters, especially in large slow-flowing rivers and backwaters (BAUERNFEIND & SOLDAN, 2012). Very common in Bulgarian standing waters, especially with the presence of macrophytes. Records from all over Europe excluding Italy and the surrounding islands (BELFIORE & THOMAS, 2017).

Subgenus *Similicloeon* Kluge & Novikova, 1992

Cloeon (*S.*) *simile* Eaton, 1870

Localities: LG06(99) - Maritsa River, upstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: larvae inhabit predominantly still waters with aquatic vegetation, preferring relatively cold oligotrophic lakes and fishponds at higher altitudes (BAUERNFEIND & SOLDAN, 2012). No actual data on the species distribution in Bulgarian freshwaters, rarely found species. Transpalaearctic; in Europe - records from almost the whole territory, except for European Russia and the Western Balkans (BELFIORE & THOMAS, 2017).

Genus *Procloeon* Bengtsson, 1915

Subgenus *Procloeon* Bengtsson, 1915

Procloeon (*Pr.*) *bifidum* (Bengtsson, 1912)

Localities: LG17 - channel near Plovdiv, State Fisheries Farm (SFF) - 14 la (leg. M. Dimitrov) (RUSSEV, 1960).

Distribution: fairly numerous in the metarhithral to potamal of middle-sized streams and (preferably) larger rivers. Rare in artificial water bodies. Larvae inhabit submerged vegetation as well as gravel, stone and coarse sediments (BAUERNFEIND & SOLDAN, 2012). Relatively rare in Bulgaria despite the lack of data on the actual distribution in the country. Transpalaearctic; in Europe widely distributed (BAUERNFEIND & SOLDAN, 2012).

Subgenus *Pseudocentroptilum* Bogoescu, 1947

Procloeon (*Ps.*) *pennulatum* (Eaton, 1870)

Localities: LG06 (99) - Maritsa River, upstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981, reported as *Centroptilum pennulatum*); LG16 - Maritsa River, Plovdiv, 07.10.1955 - 6 la (RUSSEV, 1966); LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: in the rhithral of smaller brooks, preferring stony habitats in pools or places with very slow current and partly coarse sand. Frequently found also in the potamal of larger rivers (BAUERNFEIND & SOLDAN, 2012). No actual data on the species distribution in Bulgarian freshwaters. Holarctic species; in the

Palaearctic recorded from the Iberian Peninsula and the British Isles through Europe to West Siberia (BAUERNFEIND & SOLDAN, 2012).

Superfamily Heptagenioidea
Family Isonychiidae Burks, 1953
Genus *Isonychia* Eaton, 1871
Subgenus *Isonychia* Eaton, 1871
Isonychia (*I.*) *ignota* (Walker, 1853)

Localities: LG16 - Maritsa River, Plovdiv, 08.1942 - 2 la, the aquatic vegetation along the river banks (RUSSEV, 1957); LG16 (89) - Maritsa River, downstream Plovdiv, 15.06.1947 (RUSSEV, 1966).

Distribution: larger rivers in the plains, preferably in places with submerged plants and strong current (BAUERNFEIND & SOLDAN, 2012). In Bulgaria the species was reported from several large rivers in sections with lower water velocity and/or rich in macrophytes (RUSSEV & VIDINOVA, 1994). Transpalearctic species, almost in the whole of Continental Europe (BAUERNFEIND & SOLDAN, 2012).

Family Heptageniidae Needham, 1901
Genus *Ecdyonurus* Eaton, 1868
Subgenus *Ecdyonurus* Eaton, 1868
Ecdyonurus (*E.*) *insignis* (Eaton, 1870)

Localities: LG06 (87)- Parvenetska River*, 18.05.2017 - 20 la.

Distribution: hyporhithral to metapotamal of rivers with stony bottom, occasionally also in the shore zone of oligotrophic lakes. Highest densities in lowlands up to 300-400 m a.s.l. (BAUERNFEIND & SOLDAN, 2012). Moderately spread in Bulgaria, predominantly in lowland sections of larger and deeper rivers (PRESOLSKA, 2014). Found in Europe, including the British Isles; not in Scandinavia (BAUERNFEIND & SOLDAN, 2012).

Genus *Electrogena* Zurwerra & Tomka, 1985
Electrogena lateralis (Curtis, 1834)

Localities: LG16 - Maritsa River, Plovdiv, 14.07.1955 - 3 la (RUSSEV, 1966, reported as *Heptagenia lateralis*).

Distribution: larvae prefer rivulets and smaller rivers with stony bottom. In Central Europe usually more common above 400 m a.s.l. (BAUERNFEIND & SOLDAN, 2012). In Bulgaria the species is known from many localities, mainly in the hyporhithral of rivers (VIDINOVA & RUSSEV, 1997). West Palaearctic species, reported from most of the European countries (BELFIORE & THOMAS, 2017).

Genus *Heptagenia* Walsh, 1863
Subgenus *Heptagenia* Walsh, 1863
Heptagenia (*H.*) *flava* Rostock, 1878

Localities: LG06 (99) - Maritsa River, upstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981); LG16 - Maritsa River, Plovdiv, 15.06.1947 - 1 la; 23.04.1955 - several la on the vegetation along the river bank (RUSSEV, 1966); LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: eurybiontic species with comparatively high ecological plasticity; widely spread in potamal of lowland rivers, usually on submerged logs, including larger Bulgarian rivers (VIDINOVA & RUSSEV, 1997). Palearctic species, in Continental Europe, not in Fennoscandia, the British Isles and the Iberian Peninsula (BAUERNFEIND & SOLDAN, 2012).

Subgenus *Kageronia* Matsumura, 1931
Heptagenia (*K.*) *fuscogrisea* (Retzius, 1783)

Localities: LG16 - Maritsa River, Plovdiv, 15.06.1947 - 1 la (RUSSEV, 1966).

Distribution: mostly in lowland lakes and ponds, occasionally also in slow-flowing rivers up to approximately 600 m a.s.l., exclusively on macrophytic vegetation, preferably sedges (BAUERNFEIND & SOLDAN, 2012). Very rare in Bulgaria, known from few localities (VIDINOVA & RUSSEV, 1997; PRESOLSKA, 2014). Palearctic species, reported from Northern, Eastern and Central Europe (BELFIORE & THOMAS, 2017).

Family Palingeniidae Albarda,1888
Genus *Palingenia* Burmeister, 1839
Palingenia longicauda (Olivier, 1791)

Localities: LG17 - channel near Plovdiv (SFF), Maritsa River, Plovdiv, 13.06.1956, 03.06.1958 - mass flight (leg. V. Naidenov) (RUSSEV, 1966).

Distribution: metapotamal of large lowland rivers with well-oxygenated and fast-flowing water. Larvae require a specially defined type of substratum (argyllal) with a high amount of clay and fine silt, they are highly sensitive against changes of abiotic factors and disappear rapidly from rivers with regulated banks or sections with organic pollution (BAUERNFEIND &

SOLDAN, 2012). In Bulgaria *P. longicauda* has been found until the 70s of the last century at several locations in the Danube River (RUSSEV, 1987). In Europe - historic records from many of the larger rivers in Central and South-Eastern Europe; at present probably only in the Danube and Tisza Rivers refuge in Hungary, Slovakia and Ukraine (by BAUERNFEIND & SOLDAN, 2012).

Superfamily Ephemerelloidea
Family Ephemerellidae Klapálek, 1909
Genus *Ephemerella* Walsh, 1863
Ephemerella ignita (Poda, 1761)

Localities: LG06 (87) - Parvenetska River*, 18.05.2017 - 17 la; LG06 (99) - Maritsa River, upstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981); LG16 (29) - Maritsa River*, Plovdiv, near the Fair Town, 18.05.2017 - 1 la; LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: predominantly in rhithral of medium-sized to large rivers, especially in the meta- and hyporhithral. With wide ecological range, larvae inhabit almost all types of running waters (BAUERNFEIND & SOLDAN, 2012). *Ephemerella ignita* is the most common mayfly species in Bulgaria (PRESOLSKA, 2014). Transpalearctic, in Europe there are records from all over the continent (BELFIORE & THOMAS, 2017).

Ephemerella notata Eaton, 1887

Localities: LG06 - 23.04.1955 - 8 la, nymphs (RUSSEV, 1966).

Distribution: rare species; larvae seem to prefer potamal (epipotamal) conditions but the meta- and hyporhithral of rivers are inhabited, too. Larvae usually prefer gravel bottom and places with relatively high current velocity.

Registered mainly in the large rivers in South Bulgaria, less rare in the tributaries of the Danube River. Since 1990, *E. notata* is found only in the Veleka River (SE Bulgaria; see PRESOLSKA, 2014). Reported from the western, central and eastern parts of Continental Europe, including the British Isles (BELFIORE & THOMAS, 2017).

Superfamily Caenoidea
Family Caenidae Newman, 1853
Genus *Caenis* Stephens, 1836
Caenis macrura Stephens, 1836

Localities: LG06 - 14.07.1955 - 7 la (RUSSEV, 1966); LG06 (87) - Parvenetska River*, 18.05.2017 - 17 la; LG06 (99) - Maritsa River, upstream Plovdiv; LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981).

Distribution: rheophilic species, inhabits the hyporhithral and epipotamal of rivers, especially with gravel and stony bottom, as well as the shore zone of lakes (BAUERNFEIND & SOLDAN, 2012). The most common mayfly in Bulgaria (PRESOLSKA, 2014). Palaearctic; widely distributed all over Europe (BELFIORE & THOMAS, 2017).

Caenis pseudorivulorum Keffermüller, 1960

Localities: LG16 (29) - Maritsa River, Plovdiv, near the Fair Town*, 18.05.2017 - 3 la; LG16 (89) - Maritsa River, downstream Plovdiv, near the railway bridge*, 30.07.2011 - 38 la.

Distribution: larvae inhabit the potamal of large lowland rivers below 300 m a.s.l.; sometimes syntopic with C. *macrura* (BAUERNFEIND & SOLDAN, 2012). In Bulgaria recorded from larger rivers in the Aegean Basin, less common in the tributaries (Ogosta and Iskar River) of the Danube River (PRESOLSKA, 2014). Palaearctic species; widely distributed all over Europe (BELFIORE & THOMAS, 2017).

Caenis rivulorum Eaton, 1884

Localities: LG16 - Maritsa River, Plovdiv, 23.04.1955 - several la (RUSSEV, 1966).

Distribution: larvae typically inhabit the rhithral and epipotamal of brooks and rivers, as well as stillwater and lakes between 200-500 m a.s.l.; lentic sections with stony bottom and a layer of detritus are usually preferred (BAUERNFEIND & SOLDAN, 2012). Rare in Bulgaria; all records until 1990 (PRESOLSKA, 2014). Palaearctic species; widely distributed all over Europe, not recorded from Italy, the Mediterranean Islands and Greece (BAUERNFEIND & SOLDAN, 2012).

Order Plecoptera

Suborder Arctoperlaria
Family Perlodidae Klapálek, 1909
Genus *Isoperla* Banks, 1906
Isoperla grammatica (Poda, 1761)

Localities: LG16 (29) - Maritsa River, Plovdiv City, 23.04.1955 (unpublished data by Prof. B. Russev).

Distribution: widespread species with high ecological plasticity. Inhabits predominantly the rocky bottom (mesolithal) with sands (psamal) and fine to medium-sized gravel (akal), within the ranges of 50-2000 m a.s.l.. The most common stonefly in Bulgaria; European species (MURANYI, 2008).

Isoperla obscura (Zetterstedt, 1840)

Localities: LG16 (29) - Maritsa River, Plovdiv City, 23.04.1955 (RUSSEV, 1966).

Distribution: mostly in lowland rivers; known in the past from the Maritsa River near the towns of Pazardzhik, Plovdiv, Dimitrovgrad and Svilengrad. Prefers coarse gravel substratum (mesolithal), macrophytes and fine particulate organic matter. Very rare and Regionally Extinct (RE) in Bulgaria. It has been found until the 70s of the last century; in Europe also rarely distributed. Palearctic species (MURANYI, 2008).

Family Leuctridae Klapalek, 1905

Genus *Leuctra* Stephens, 1835

Leuctra sp.

Localities: LG16 (89) - Maritsa River, downstream Plovdiv, under the railway bridge and ring road*, 30.07.2011 - 1 la.

Family Perlidae Latreille, 1802

Genus *Perla* Geoffroy, 1762

Perla marginata (Panzer, 1799)

Localities: LG16 (29) - Maritsa River, Plovdiv City, 1966, 1967 (RUSSEV, 1967).

Distribution: one of the most common rheophil stonefly species in Bulgaria; mainly inhabits xylal and micro-, meso- and macrolithal substrata. It can be found in the whole rhithral and potamal sections of Bulgarian rivers and streams (up to 2500 m a.s.l.) with xeno-oligosaprobic conditions. European species (MURANYI, 2008).

Order Trichoptera

Suborder Integripalpia

Family Brachycentridae

Genus *Brachycentrus* Curtis, 1834

Brachycentrus maculatus (Fourcroy, 1785)

Localities: LG16 (29) - inundated grass along the Maritsa River, Plovdiv, 23.04.1955 - 1 la (RUSSEV, 1966, recorded as *Oligoplectrum maculatum*). This locality has been destroyed (KUMANSKI, 1988).

Distribution: lowland rhithro- and potamobiont, as an exception in low mountains up to 1000 m a.s.l.; very rare for Bulgaria but when recorded - in great abundance (KUMANSKI, 1988). In all of Europe excluding the British Isles and the Scandinavian Peninsula (KUMANSKI, 1988).

Family Limnephilidae

Genus *Limnephilus* Leach, 1815

Limnephilus stigma Curtis, 1834

Localities: swampy water bodies near Plovdiv City (KUMANSKI, 1988).

Distribution: eurybiont, found mostly in standing or slow-flowing water bodies from 0 up to 1600 m a.s.l.; very rare for Bulgaria (KUMANSKI, 1988). Holarctic species (KUMANSKI, 1988).

Limnephilus lunatus Curtis, 1834

Localities: Plovdiv City, 24.05.1930 - 2♀ (KUMANSKI, 1968).

Distribution: eurybiont; very common for Bulgaria (KUMANSKI, 1981); mostly in slow-flowing water bodies in mountains and plains, various standing waters (including brackish) from 0 up to 2000 m a.s.l., found throughout the country and one of the most common species of the genus and the order in Bulgaria (KUMANSKI, 1988). West Palearctic species (KUMANSKI, 1988).

Family Leptoceridae

Genus *Oecetis* McLachlan, 1877

Oecetis ochracea (Curtis, 1825)

Localities: from Plovdiv without specific location (KUMANSKI, 1971).

Distribution: common for Bulgaria (KUMANSKI, 1981); the most common and abundant species of the family in the country with broad ecological spectrum, inhabiting various standing and slow-flowing water bodies (coastal or lowland inner water bodies, including swamps, lakes, reservoirs, oxbow lakes, richly vegetated sections) at 0-600 m a.s.l. (KUMANSKI, 1988). Holarctic species (KUMANSKI, 1988).

Family Goeridae

Genus *Goera* Leach, 1815

Goera pilosa (Fabricius, 1775)

Localities: LG06 (87) - Parvenetska River*, 18.05.2017 - 1 la.

Distribution: with very wide ecological spectrum, its larvae prefer calm sections of the rhithral, potamal in bigger rivers and limnal; in

Bulgaria very common especially in slower mountain streams at lower altitudes, in the potamal of almost all bigger rivers up to β-mesosaprobic conditions, at 0-1000 m a.s.l. (KUMANSKI, 1988). West Palearctic species (KUMANSKI, 1988).

Suborder Annulipalpia
Family Psychomyiidae
Genus *Psychomyia* Latreille in Cuvier, 1829
Psychomyia pusilla (Fabricius, 1781)

Localities: LG06 (87) - Parvenetska River*, 18.05.2017 - 1 la.

Distribution: typical of stony sections of the potamal of all Bulgarian rivers except for the Danube River, common also in the (hypo)rhithral of lowland rivers, sometimes in the crenal; typical in the plains and sometimes reaching 1000-1100 m a.s.l., with broad ecological spectrum, inhabiting also more polluted waters, very common in Europe (KUMANSKI, 1985). West Palearctic species (KUMANSKI, 1985).

Family Hydropsychidae
Genus *Hydropsyche* Pictet, 1834
Hydropsyche modesta Navàs, 1925

Localities: LG16 (29) - Maritsa River, Plovdiv, near the Fair town*, 18.05.2017 - 2 la; LG16 (89) - Maritsa River, downstream Plovdiv, under the railway bridge and ring road*, 30.07.2011 - 16 la (5 were earlier instars).

Distribution: one of the most common caddisflies with preferences for bigger rivers with slower flow but also found in smaller lowland streams. With broad ecological spectrum and typically found in lowlands up to 500-600 (rarely 700) m a.s.l.; known from the Maritsa River near the towns of Harmanli and Svilengrad (KUMANSKI, 1985). No specific mentioning of Maritsa River near Plovdiv was found among its localities in the available literature. Known from Southern Europe and Asia Minor (KUMANSKI, 1985).

Hydropsyche bulbifera McLachlan, 1878

Localities: LG06 (87) - Parvenetska River*, 18.05.2017 - 2 la; LG16 (29) - Maritsa River, Plovdiv, near the Fair town*, 18.05.2017 - 14 la; LG16 (39) - Pyasachnik River*, 18.05.2017 - 9 la; LG16 (89) - Maritsa River, downstream Plovdiv, under the railway bridge and ring road*, 30.07.2011 - 2 la. No specific mentioning of the Maritsa River near Plovdiv City was found among its localities in the available literature.

Distribution: one of the most common and evenly distributed caddisflies, with preferences for smaller rivers (potamal) but also found in bigger rivers and hyporhithral of premountain rivers; with broad ecological spectrum and could be found from the sea level up to 900 m a.s.l. (KUMANSKI, 1985). West Palearctic species (KUMANSKI, 1985).

Hydropsyche cf. *angustipennis* (Curtis, 1834)

Localities: LG16 (29) - Maritsa River, Plovdiv, near the Fair town*, 18.05.2017 - 11 la (9 of which earlier instars); LG16 (39) - Pyasachnik River*, 18.05.2017 - 4 la (earlier instars). No specific mentioning of the Maritsa River near Plovdiv was found among its localities in the available literature.

Distribution: broadly and evenly distributed, typical for smaller or lowland rivers, often with great abundance; rarely reaching up to 1100 m a.s.l. (KUMANSKI, 1985). European species (KUMANSKI, 1985).

Hydropsyche sp.

Localities: LG06 (99) - Maritsa River, upstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981); LG16 (89) - Maritsa River, downstream Plovdiv, 1976-1977 (UZUNOV *et al.*, 1981 - see RUSSEV 1967);

Early instars and/or pupae of *Hydropsyche* sp. indet. were recorded from LG06 (87) - Parvenetska River*, 18.05.2017; LG16 (29) - Maritsa River, Plovdiv, near the Fair town*, 18.05.2017; LG16 (89) - Maritsa River, downstream Plovdiv, under the railway bridge and ring road*, 30.07.2011.

Faunistic and zoogeographical notes

The listed here 27 mayflies belong to seven of the 15 Ephemeroptera families established in Bulgaria. They represent 23.27% of the currently known 116 species (PRESOLSKA, 2014). Three of them are newly reported for the area of Plovdiv City - *B. nexus*, *E. insignis* and *C. pseudorivulorum*. The recent field studies, which included two of the Maritsa River tributaries, enriched with new localities the knowledge on the distribution of some mayflies, namely the mouth sections of Parvenetska and Pyasachnik Rivers.

The zoogeographical analysis showed as most numerous the group of Palearctic species (10), followed by West Palearctic (8), Transpalearctic (6) and Holarctic (3). Additionally, three zoogeographical complexes are covered: Siberian (15), Pontic (7) and Mediterranean (5).

A total of four stonefly species from only one locality are known from the Maritsa River in the region of Plovdiv City, Bulgaria. They represent 3.67% of the total number (109) of the known taxa of the order Plecoptera in Bulgaria (TYUFEKCHIEVA *et al.,* 2019). From a zoogeographical point of view, the Bulgarian stonefly fauna is determined by Palaearctic and European species. Among them one Palearctic (*I. obscura*) and two European species (*I. grammatica, P. marginata*) were recorded from the Maritsa River in the region of Plovdiv City, Bulgaria.

Here we present a total of nine caddisflies (larvae and adults) from the region of Plovdiv City based on literature and original data. Overall, they represent 3.49% of the total number (258: KUMANSKI, 2007), while the newly (2011 and 2017) recorded species represent only 1.94% of the currently known taxa of the order Trichoptera in Bulgaria. In terms of zoogeography, two of the recorded species were European, five - West Palearctic and two - Holarctic.

Conservation status and threats

Among the above listed mayflies, only two species were assigned to one of the categories according to the IUCN criteria, namely *P. longicauda* as "Extinct" in Bulgaria (EX) and *H.* (*K.*) *fuscogrisea* as "Critically endangered" (CR) (VIDINOVA, 2011, 2011a). Further, the later species was stated as "rare" for Bulgaria (PRESOLSKA, 2014). Apart, *I. ignota* is listed in the category "Potentially threatened" by RUSSEV (1992). As the information on the distribution of Baetidae species in the Bulgarian rivers is not up-to date, it is difficult to give a reliable assessment of the conservation status of some of the species known from the area of Plovdiv City.

Only one rare stonefly (*I. obscura*) with high conservation value has been established within the study region. It can be considered as "Extinct" in the Bulgarian stretch of the Maritsa River and "Regionally Extinct" (RE) for the country according to TYUFEKCHIEVA *et al.* (2019). During the past 40 years there are no any data of the species occurrence in Bulgaria. It is classified as "Regionally Extinct" also in Italy (FOCHETTI *et al*., 1998) and very rare in all of Europe (ZWICK, 1992). The order Plecoptera is one of the most endangered groups of insects (FOCHETTI & TIERNO DE FIGUEROA, 2006). Due to the high ecological requirements of the stoneflies and the increasing pollution of rivers, all potamal species in Europe are either extinct or extremely vulnerable (RAVIZZA & NICOLAI, 1983; ZWICK, 1992; SANCHEZ-ORTEGA & TIERNO DE FIGUEROA, 1996; TYUFEKCHIEVA *et al.*, 2013).

At present, the order of Trichoptera is not included in the Red List of Threatened Invertebrates of Bulgaria (GOLEMANSKY *ed.*, 2011), while only four extinct species are included in the IUCN Red List of caddisflies (IUCN, 2014). These prevents us from providing information on the conservation status of the recorded species. Two of the previously found species (*Br. maculatus* and *L. stigma*) have been qualified as very rare by KUMANSKI (1988) and were not recorded from the samples from 2011 and 2017.

Endemic species of mayflies, stoneflies or caddisflies have not been reported within the study area.

Pollution with industrial and domestic waste waters, extraction of inert materials, destruction and dike building on the banks of larger rivers, as well as the hydrotechnical constructions are the main negative factors which influence not only the species of importance for the conservation, but the whole diversity of aquatic insects in rivers. The water courses in this urban area have been affected by organic pollution for a long time as it is mentioned in RUSSEV (1967) and RUSSEV *et al*. (1981). Therefore, applying the measures for conservation and protection of water bodies from pollution would increase the self-purification capacity of the Maritsa River in its middle course.

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Ephemeroptera, Plecoptera и Trichoptera (Insecta) от водоеми в района на гр. Пловдив

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Резюме: Настоящата работа обобщава както литературата, така и непубликувани и нови данни за фауната на Ephemeroptera, Plecoptera и Trichoptera (Insecta) от долината на река Марица в района на гр. Пловдив. Данните произхождат от периода 1930-2017. Регистрирани са общо 40 вида, принадлежащи към 16 семейства.