Zoogeography and Faunistics
Research Article

ACTA ZOOLOGICA BULGARICA
Acta zool. bulg., 68 (3), 2016: 343-350

Survey of Aquatic Coleopterans of Bulgarka Natural Park (Central Stara Planina Mts., Bulgaria)

Teodora M. Teofilova[1], Pencho G. Pandakov[2]

[1] Institute of Biodiversity and Ecosystem Research (IBER), Bulgarian Academy of Sciences, 1 Tsar Osvoboditel Blvd., 1000 Sofia, Bulgaria; E-mail: oberon_zoo@abv.bg
[2]Department of Ecology and Environmental Protection, Faculty of Biology, Sofia University, 8 Dragan Tsankov Blvd.; 1000 Sofia, Bulgaria; E-mail: p.pandakov@gmail.com

Abstract: The aquatic beetle fauna of the Bulgarka Natural Park was studied based on examinations of the macrozoobenthos in the rivers from the catchment area of the Yantra River flowing through the park. Altogether 13,041 specimens were captured (7,053 imagos and 5,988 larvae). They belonged to 27 species and 18 higher taxa of nine families of the order Coleoptera. The most abundant were the representatives of the families Elmidae (55%), Hydraenidae (27%) and Scirtidae (15%). One species was new for the Bulgarian fauna, *Deronectes fairmairei* (Leprieur, 1876). Two species were registered for the first time in the Stara Planina Mts.: *Haliplus obliquus* (Fabricius, 1787) and *Boreonectes griseostriatus* (De Geer, 1774). Two endemic species were found: *Hydraena leonhardi* Breit, 1916 (Bulgarian endemic) and *Hydraena subintegra* Ganglbauer, 1901 (Balkan endemic). The fauna of aquatic beetles in Bulgarka Natural Park is still insufficiently studied, and future studies are needed for more comprehensive description of the diversity of aquatic coleopterans in the park.

Key words: aquatic Coleoptera, macrozoobenthos, Bulgarka Natural Park, Stara Planina Mts.

Introduction

Benthic animals are an important component of the aquatic ecosystems and studies on them can provide information about the status of the water bodies. Aquatic beetles (Coleoptera) are adapted to live in water during all stages of their life cycle. They are abundant in many types of freshwater habitats. Water beetles are considered a suitable group for the assessment of the environmental quality and for indicating the succession in aquatic environments (Eyre, Foster 1989, Hebauner 1988, Valladares *et al.* 2002).

The study of the aquatic beetles in Bulgaria has started at the end of the 19th century and has been undergoing considerable development towards the end of the 20th century. Recent studies on aquatic invertebrates in some Bulgarian mountain rivers have been performed by Kenderov & Apostolov (2008), Kenderov *et al.* (2012), Stoichev (1999, 2002) and others.

Studies on the species composition of aquatic coleopterans on the territory of Bulgarka Natural Park are lacking. The main objective of the present study is to examine the species composition of aquatic beetles in the park and to review the habitat preferences of the recorded beetles.

Material and Methods

Study area

Bulgarka Natural Park (Figure 1), declared in 2002 (MEW 2002), covers parts of the Stara Planina Mountains (the Balkan Mountains), i.e. the northern slopes of Shipka and Tryavna Mounts as well as adjacent parts of the neighbouring Forebalkan Mounts. The main watershed of Bulgaria, which separates the Black Sea river basin and the Mediterranean river basin, passes trough the territory of the park. The total length of the watershed within the boundaries of the Bulgarka Natural Park is approximately 55 km. Surface water currents in the park flow into the Yantra River to the north and into the Tundzha River to the south. Most of the territory of Bulgarka Natural Park (89%) is located in the catchment area of the Yantra River (MEW 2014). The main ele-

ments of the hydrographic network of the park are the Yantra River and its tributaries, more important of which are the Stanchevhanska, Plachkovska, Kozyata, Byalata, Sivyak, Samarinska, Panicharka, Levicharka, Belilska and Elovitsa Rivers. The average altitude is 940 m a.s.l. According to the climatic zoning of Bulgaria, the territory of the natural park belongs to the Continental-European area of the Temperate Climatic Zone; it is a part of the climatic region of Western and Central Stara Planina Mts.

Sampling and Laboratory Analyses

Field-work was carried out in the summer and autumn (August – November) of 2013. All stations were visited during low water conditions, which in 2013 were well expressed. Twenty-five qualitative macrozoobenthic samples were collected, using a hand net (580 μm mesh size). Each sample (EN-ISO 10870: 2012) constituted of 10 separate sets, and their distribution was consistent with the main types of the bottom substrate. Samples were taken from sections with length of 50 m, applying various techniques: "kicking" and "swilling" of stones, rinsing of macrophytes and other objects found in the water. The beetles were taken to the laboratory for further identification.

Specimens were identified following Bei-Bienko (1965), Bouchard (2004), Chertoprud & Chertoprud (2003), Clifford (1991), Epler (1996), Friday (1988), Guéorguiev (1987), Oscoz *et al.* (2011), Pehlivanov *et al.* (2010) and Trizzino *et al.* (2013). The classical four-level classification of Tischler (1949) for invertebrates as modified by Sharova (1981) was used for determination of the dominance structure: eudominants (with degree of dominance (n_i/N).100 > 10%), dominants (5 to 10%), subdominants (2 to 5%), recedents (1 to 2%), subrecedents (< 1%). Species occurrence was established according to the classification of Bodenheimer (1955) and Balogh (1958).

Twenty-five sampling stations were examined (Table 1, Figure 1). Further on in the text, the numbers of the sampling stations in Table 1 are used as code of the studies stations.

Results and Discussion

During the study, we collected a total of 13,101 specimens (7,089 imagos and 6,012 larvae). Of these, 60 (36 imagos and 24 larvae) were not fitted for identification due to their poor condition or because they were terrestrial beetles and were therefore excluded from the discussion.

The list of the recorded beetles (Table 2) follows the system of Löbl & Smetana (2003–2013) and partly de Jong (2013) and Williams & Feltmat (1992). We identified 27 species and 18 higher taxa of beetles. Representatives of nine families of Coleoptera (Gyrinidae, Haliplidae, Dytiscidae, Hydrophilidae, Helophoridae, Hydraenidae, Scirtidae, Elmidae and Dryopidae) were recorded. Single specimens of the families Carabidae, Staphylinidae, Chrysomelidae, Latridiidae and Curculionidae were found at some of the stations but since these beetles were mostly terrestrial and probably appeared accidentally in the samples, they were not included in the discussion. The most abundant were the representatives of the families Elmidae (55% of all), Hydraenidae (27%) and Scirtidae (15%); (Figure 2).

Elmidae (riffle beetles) inhabit mostly fast and slower sections of streams and wave-swept shores. Elmid beetles were found at all stations, but were most abundant in the less impacted parts of rivers: the spring zone of the Elovitsa River, Panicharka River before its confluence into the Hristo Smirnenski Dam, Sivyak River above the village of Ezeroto, Yantra River above Gabrovo, Byalata Reka River, Plachkovska River above the village of Radevtsi.

Hydraenidae (moss beetles) prefer stream margins, ponds near emergent vegetation and hygropetric habitats. They were also found at all stations, and were most abundant in the less impacted parts of rivers: Stanchevhanska River above the village of Gaydari, Panicharka and Levicharka Rivers before their confluence into the Hristo Smirnenski Dam, Zelenodravska River, the spring zones of the Elovitsa and Samarinska Rivers, Sivyak River above the village of Ezeroto.

Scirtidae (marsh beetles) inhabit lentic and slow lotic waters, especially near emergent vegetation, as well as tree holes and springs. They were most abundantin the Kozyata River above the water intake, the spring zone of the Elovitsa River, Byalata Reka River, Yovovska River before its confluence into the Samarinska River.

Dytiscidae (predaceous diving beetles) prefer ponds and lakes, and are found in the slower sections of the brooks and rivers, especially near vegetation. We found them from stations with a greater human impact: station *5* in the Belilska River, stations *7* and *9* in the Kozyata River, Plachkovska River after the village of Radevtsi, Kreslyuvska River after the villages of Gorni Damyanovtsi, Ruevtsi and Kreslyuvtsi, Yovovska River after the villages of Yovovtsi, Gorni Tsonevtsi and Nozheri.

Gyrinidae (whirligig beetles) are common in the slower sections of streams and rivers and in ponds and lakes, especially near vegetation. We found them in the Plachkovska River after the village of Radevtsi, Stanchevhanska River after Stanchev han Village, Yovovska River after the villages of Yovovtsi, Gorni Tsonevtsi and Nozheri, stations *5*, *7*, and *9*, but also in the less affected parts of the rivers (station *1* and *2*).

Table 1. Description and date of visiting of the sampling stations

№	Location	Coordinates	Altitude	Date
1	Panicharka River before its confluence into the Hristo Smirnenski Dam– located in less affected part of river	N 42°48'43.27" E 25°13'32.43"	546 m	12.10.2013
2	Levicharka River before its confluence into the Hristo Smirnenski Dam– located in less affected part of river	N 42°48'26.83" E 25°13'47.07"	559 m	12.10.2013
3	Zelenodravska River before its confluence into the Belilska River – located in less affected part of river	N 42°47'35.48" E 25°16'23.88"	634 m	12.10.2013
4	Belilska River before the confluence of the Zelenodravska River – located in less affected part of river	N 42°47'33.76" E 25°16'40.12"	631 m	01.11.2013
5	Belilska River after the water intake installation (before its confluence into the Kozyata River) – at the end of a 1.5 km drained section of the river	N 42°48'17.97" E 25°18'9.37"	520 m	11.10.2013
6	Kozyata River above water intake № 2 – located in less affected part of river	N 42°47'30.72" E 25°17'54.29"	615 m	11.10.2013
7	Kozyata River after water intake № 2 (above mini hydro power plant) – in the middle of a drained section of the river	N 42°48'3.43" E 25°18'4.08"	559 m	11.10.2013
8	Kozyata River after mini hydro power plant "Malusha" – after the confluence of the waters from the plant	N 42°48'15.68" E 25°18'10.29"	524 m	11.10.2013
9	Kozyata River after a fish farm – after the confluence of the waste waters from the fish breeding pools	N 42°48'31.26" E 25°18'15.90"	508 m	11.10.2013
10	Elovitsa River – spring zone – located in less affected part of river	N 42°45'51.08" E 25°20'10.92"	797 m	14.10.2013
11	Elovitsa River immediately after the explosive factory "Elovitsa" – before its confluence into the Sivyak River	N 42°47'10.47" E 25°21'46.83"	590 m	13.10.2013
12	Sivyak River above the village of Ezeroto – located in less affected part of river	N 42°45'40.35" E 25°21'52.80"	782 m	13.10.2013
13	Sivyak River above the architectural-ethnographic complex "Etara" – located at the exit from the Park territory; evaluates the impact of the waste waters from the villages of Potok and Charkovo	N 42°48'7.43" E 25°21'0.09"	536 m	22.08.2013
14	Yantra River above the Yabalka quarter (town of Gabrovo) – located in less affected part of river	N 42°46'5.45" E 25°24'38.30"	768 m	13.10.2013
15	Byalata Reka River – located in less affected part of river	N 42°46'46.16" E 25°23'3.15"	543 m	13.10.2013
16	Yantra River above the complex "Etara" – evaluates the state of the river at the exit of the Park territory	N 42°48'31.87" E 25°21'26.86"	515 m	13.10.2013
17	Samarinska River, spring zone – located in less affected part of river	N 42°46'42.56" E 25°27'19.30"	778 m	02.11.2013
18	Yovovska River before its confluence into the Samarinska River – after the villages of Yovovtsi, Gorni Tsonevtsi and Nozheri	N 42°48'45.94" E 25°27'57.71"	557 m	02.11.2013
19	Samarinska River at the exit from the Park territory – above the town of Plachkovtsi, after the Kasovtsi and Stoevtsi quarters	N 42°49'1.34" E 25°28'14.38"	541 m	02.11.2013
20	Plachkovska River above the village of Radevtsi – located in less affected part of river	N 42°47'50.46" E 25°29'55.69"	596 m	15.10.2013
21	Plachkovska River above the railway tunnel – at the exit from the Park territory, after Radevtsi	N 42°48'57.33" E 25°29'17.01"	537 m	21.08.2013
22	Neykovska River above the town of Plachkovtsi – before its confluence into the Plachkovska River, after the village of Neykovtsi	N 42°49'1.84" E 25°29'37.15"	543 m	21.08.2013
23	Stanchevhanska River above the village of Gaydari – located in less affected part of river	N 42°47'59.35" E 25°35'34.40"	565 m	02.11.2013
24	Stanchevhanska River after the village of Stanchev han	N 42°49'8.87" E 25°33'13.93"	461 m	02.11.2013
25	Kreslyuvska River before its confluence into the Stanchevhanska River – after the villages of Gorni Damyanovtsi, Ruevtsi and Kreslyuvtsi	N 42°49'8.98" E 25°33'12.60"	460 m	02.11.2013

Haliplidae (crawling water beetles) and Hydrophilidae (water scavenger beetles) prefer aquatic vegetation at the edges of slow streams or slower sections of rivers and ponds and lakes. Adult haliplids (*Haliplus obliquus*) were found only in the Kozyata River bellow a fish farm, and in the Belilska River bellow the water intake installation. Larval stages were found at some additional stations in the less affected water bodies: the spring zone of the Elovitsa River, Zelenodravska River, Byalata Reka River, Sivyak River above the village of Ezeroto, Plachkovska River above the village of Radevtsi

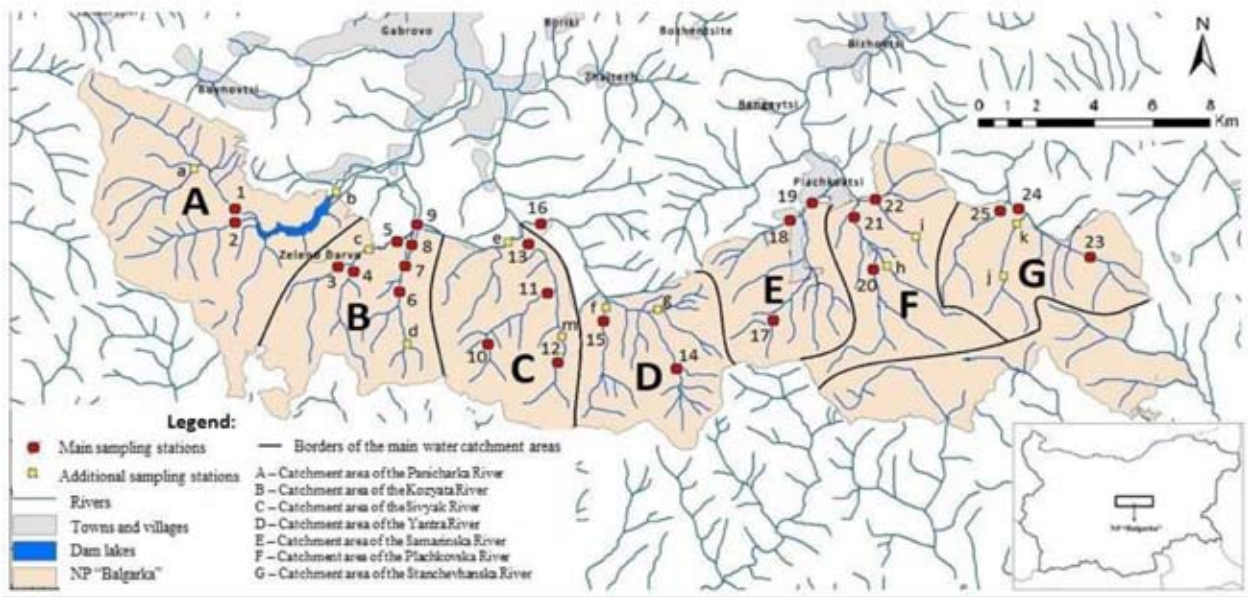

Fig. 1. Main catchment areas and sampling stations on the territory of the Balgarka Natural Park (at the additional stations only hydromorphological characteristic and physico-chemical parameters of the water were measured; macrozoobenthos was not collected)

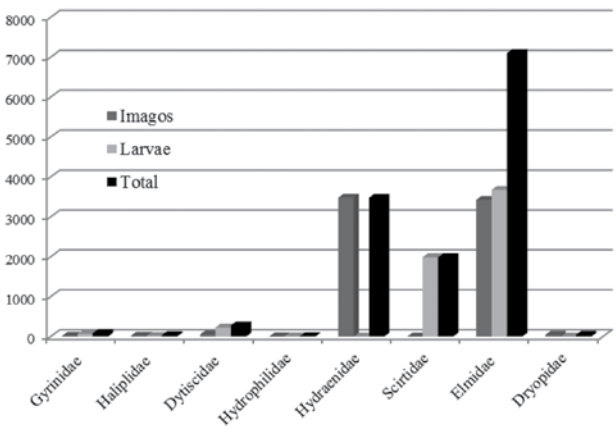

Fig. 2. Number of captured specimens in the different families of Coleoptera

(Table 3). Therefore, we may conclude that haliplids are more sensitive to the water quality during their larval stage. Hydrophilid larvae were most abundant in the Yovovska River after the villages of Yovovtsi, Gorni Tsonevtsi and Nozheri.

Dryopids (long-toed water beetles) usually inhabit swift streams and shallow regions of ponds and lakes especially in emergent vegetation. We found one representative of Dryopidae, *Pomatinus substriatus*, that was most abundant at the less affected stations (Panicharka River, Zelenodravska River, Stanchevhanska River above the village of Gaydari, Plachkovska River above the village of Radevtsi), but was also present at more affected stations: (Belilska River after the water intake installation, Stanchevhanska River after the village of Stanchev han and Kreslyuvska River after the villages of Gorni Damyanovtsi, Ruevtsi and Kreslyuvtsi).

The number of captured larvae and adults varied across the families (Table 3). The primary partition in the number of the imago of the families Elmidae and Hydraenidae formed nearly 98% of the total number of captured adult beetles (Figure 2). Family Elmidae represented over 61% of the number of collected larvae, followed by Scirtidae (33%) and Dytiscidae (4%). The largest number of caught adults belonged to *Hydraena gracilis* (32%), *Elmis latreillei* (18%) and *Esolus parallelepipedus* (14%). The most numerous were the larvae of the genera *Limnius* (28%), *Elmis* (15%) and *Esolus* (13%).

We recorded one new species for the Bulgarian fauna, *Deronectes fairmairei*. This species has a Western Mediterranean distribution and has been identified as "possible" for the Bulgarian fauna (Guéorguiev 1987; Fery & Brancucci 1997). Two species were registered for the first time in Stara Planina Mts.: *Haliplus obliquus* and *Boreonectes griseostriatus*. Two endemic species were found (Trizzino *et al.* 2013): *Hydraena leonhardi* (Bulgarian endemic) and *Hydraena subintegra* (Balkan endemic).

The analysis of the dominance structure of the adult beetles showed the presence of four eudominants with 76% of all captured specimens (*Hydraena gracilis*, 32%; *Elmis latreillei*, 19%; *Esolus parallelepipedus*, 14%; *Hydraena subintegra*, 11%), one dominant (*Limnius perrisi*; 8%), two subdominants (*Limnius volckmari*, 4%; Hydraena riparia, 3.5%) and two recedents (*Riolus cupreus*, 2%; *Esolus an-*

Table 2. Check-list of the Coleoptera complex from the benthal of the rivers in the Balgarka Natural Park. With (***) is marked the new record for the fauna of Bulgaria, with (**) are marked the new records for the region of Stara planina Mts.

№	Taxa	Imagos		Larvae		Station and frequency of occurrence [F,%]
		num-bers	% of all	num-bers	% of all	
	Suborder Adephaga					
	Family Gyrinidae					
1	Gyrinidae g. sp.			70	0.53	*1*, *2*, *5*, *7*, *9*, *21* [24]
	Subfamily Gyrininae					
	Tribe Gyrinini					
	Genus *Gyrinus* Geoffroy, 1762					
	Subgenus *Gyrinus* O. F. Müller, 1764					
2	*Gyrinus* (*Gyrinus*) *distinctus* Aubé, 1836	19	0.14			*5*, *18*, *21*, *23*, *24* [20]
	Family Haliplidae					
3	Haliplidae g. sp.			14	0.11	*3*, *9*, *10*, *12*, *14*, *15*, *20* [28]
	Genus *Haliplus* Latreille, 1802					
4	*Haliplus* spp.			2	0.02	*20* [4]
	Subgenus *Haliplidius* Guignot, 1928					
5	***Haliplus (Haliplidius) obliquus* (Fabricius, 1787)	23	0.09			*5*, *9* [8]
	Famly Dytiscidae					
6	Dytiscidae g. sp.			147	1.12	*1*, *5*, *6*, *8*, *9*, *10*, *16*, *19*, *23*, *25* [40]
	Subfamily Agabinae					
	Tribe Agabini					
	Genus *Agabus* Leach, 1817					
7	*Agabus* spp.	6	0.05	4	0.03	*7*, *18* [8]
	Genus *Platambus* C. G. Thomson, 1859					
8	*Platambus maculatus* (Linnaeus, 1758)	14	0.11	36	0.27	*1*, *2*, *9*, *15*, *16*, *18*, *19*, *20*, *21*, *23*, *24*, *25* [48]
	Subfamily Dytiscinae					
	Tribe Cybistrini					
	Genus *Cybister* Curtis, 1827					
9	*Cybister* spp.			41	0.31	*3*, *4*, *15*, *17* [16]
	Subfamily Hydroporinae					
	Tribe Hydroporini					
	Genus *Deronectes* Sharp, 1882					
10	****Deronectes fairmairei* (Leprieur, 1876)	32	0.24			*2*, *3*, *5*, *20*, *21* [20]
	Genus *Oreodytes* Seidlitz, 1887					
11	*Oreodytes* sp. 1	2	0.02			*7* [4]
12	*Oreodytes* sp. 2	1	0.01			*7* [4]
	Genus *Boreonectes* Angus, 2010					
13	***Boreonectes griseostriatus* (De Geer, 1774)	1	0.01			*5* [4]
	Suborder Polyphaga					
	Famly HYDROPHILIDAE					
14	Hydrophilidae g. sp.			7	0.05	*4*, *8*, *18* [12]
	Family HELOPHORIDAE					
	Genus *Helophorus* Fabricius, 1775					
15	*Helophorus* sp.	1	0.01			*17* [4]
	Subgenus *Rhopalohelophorus* Kuwert, 1886					
16	*Helophorus (Rhopalohelophorus) brevipalpis* Bedel, 1881	2	0.02			*25* [4]
	Family HYDRAENIDAE					
	Subfamily Hydraeninae					
	Tribe Hydraenini Mulsant, 1844					
	Genus *Hydraena* Kugelann, 1794					

Table 2. Continued

№	Taxa	Imagos		Larvae		Station and frequency of occurrence [F,%]
		numbers	% of all	numbers	% of all	
	Subgenus *Hydraena* Kugelann, 1794					
17	*Hydraena (Hydraena) assimilis* Rey, 1885	10	0.08			*5*, *8*, *15*, *20*, *25* [20]
18	*Hydraena (Hydraena) excisa* Kiesenwetter, 1849	5	0.04			*3*, *17*, *23* [12]
19	*Hydraena (Hydraena) gracilis balcanica* d'Orchymont, 1930	2235	17.1			all without *22* [96]
20	*Hydraena (Hydraena) leonhardi* Breit, 1916	2	0.02			*3*, *23* [8]
21	*Hydraena (Hydraena) minutissima* Stephens, 1829	48	0.37			*1*, *2*, *3*, *4*, *5*, *15*, *17*, *18*, *19*, *20*, *21*, *23*, *24*, *25* [56]
22	*Hydraena (Hydraena) nigrita* Germar, 1824	32	0.24			*3*, *4*, *5*, *7*, *10*, *12*, *14*, *17*, *18*, *23*, *24* [44]
23	*Hydraena (Hydraena) pygmaea* Waterhouse 1833	17	0.13			*9*, *10*, *12*, *20* [16]
24	*Hydraena (Hydraena) reyi* Kuwert, 1888	50	0.38			*3*, *4*, *18*, *19*, *20*, *21*, *23*, *24*, *25* [36]
25	*Hydraena (Hydraena) riparia* Kugelann, 1794	250	1.91			all without *4*, *7*, *11*, *14*, *18*, *22* and *23* [72]
26	*Hydraena (Hydraena) subintegra* Ganglbauer, 1901	779	5.95			all without *2*, *7*, *8*, *16*, *18*, *19*, *21*, *24* and *25* [64]
27	*Hydraena* sp. 1	7	0.05			*2*, *4*, *6* [12]
28	*Hydraena* sp. 2	3	0.03			*12*, *20*, *25* [12]
29	*Hydraena* sp. 3	1	0.01			*21* [4]
	Subfamily Ochthebiinae					
	Tribe Ochthebiini					
	Genus *Ochthebius* Leach, 1815					
	Subgenus *Ochthebius* Leach, 1815					
30	*Ochthebius (Ochthebius) metallescens* Rosenhauer, 1847	1	0.01			*20* [4]
	Subgenus *Enicocerus* Stephens, 1829					
31	*Ochthebius (Enicocerus) granulatus* Mulsant, 1844	24	0.18			*5*, *9*, *14*, *15*, *16*, *18*, *20*, *21* [32]
	Family SCIRTIDAE					
32	Scirtidae g. sp.			1990	15.2	all without *22* and *24* [92]
	Family Elmidae					
	Subfamily Elminae					
	Tribe Elmini					
	Genus *Elmis* Latreille, 1798					
33	*Elmis* spp.	60	0.46	913	6.97	all without *13* and *25* [92]
34	*Elmis latreillei* Bedel, 1878	1305	9.96			all without *7* [96]
35	*Elmis maugetii* Latreille, 1798	25	0.19			*9*, *10*, *20*, *25* [16]
	Genus *Esolus* Mulsant & Rey, 1872					
36	*Esolus* spp.	2	0.02	756	5.77	all without *4*, *7*, *14*, *22* [84]
37	*Esolus angustatus* (Müller, 1821)	87	0.65			*2*, *3*, *4*, *10*, *12*, *15*, *18*, *23*, *24*, *25* [40]
38	*Esolus parallelepipedus* (Müller, 1806)	1006	7.6			all without *7*, *11*, *13*, *22* [84]
	Genus *Limnius* Illiger, 1802					
39	*Limnius* spp.			1701	12.9	all without *22* [96]
40	*Limnius perrisi* (Dufour, 1843)	555	4.24			*3*, *5*, *6*, *9*, *10*, *11*, *12*, *14*, *17*, *21*, *25* [44]
41	*Limnius volckmari* (Panzer, 1793)	267	2.04			all without *9*, *16*, *21*, *22* [87]
	Genus *Oulimnius* des Gozis, 1886					
42	*Oulimnius tuberculatus* (Müller, 1806)			22	0.17	*9*, *17*, *22* [12]
	Genus *Riolus* Mulsant & Rey, 1872					
43	*Riolus* spp.			285	2.18	*3*, *4*, *6*, *8*, *9*, *10*, *11*, *12*, *13*, *14*, *15* [44]
44	*Riolus cupreus* (Müller, 1806)	134	1.01			all without *2*, *4*, *5*, *7*, *16*, *17*, *22*, *23*, *25* [64]
	Family DRYOPIDAE					
	Genus *Pomatinus* Sturm, 1853					
45	*Pomatinus substriatus* (Müller, 1806)	46	0.35			*1*, *2*, *3*, *4*, *5*, *6*, *8*, *15*, *20*, *23*, *24*, *25* [48]
	Total: 13,041	7,053		5,988		

gustatus, 1%). The highest was the number of the subrecedents and they represented over 50% of the number of all species. Recurring ecological model in biocoenotic studies is the presence of a few abundant species and the predominance of a variety of rare species (Preston 1962), which was confirmed by the results of this study, showing the greatest number of species from the category of the subrecedents. In relation to the distribution of the number of specimens over the categories of dominance, the biggest share of eudominants and dominants should be highlighted.

The main part of the recorded taxa from Bulgarka Natural Park were defined as random (with frequency of occurrence F < 25%). Of them as very rare (F< 5%) could be defined the single specimens from the genera *Haliplus*, *Helophorus* and *Oreodytes*, as well as *Ochthebius metallescens* and *Boreonectes griseostriatus* (new for the Stara Planina Mts.). Some beetles were common for all investigated rivers. Permanent species (F > 50%) in adult stage were *Hydraena gracilis*, *Hydraena riparia*, *Hydraena subintegra*, *Hydraena minutissima*, *Elmis latreillei*, *Esolus parallelepipedus*, *Limnius volckmari* and *Riolus cupreus*. In larval stage permanent were: *Elmis* spp., *Esolus* spp., *Limnius* spp. and Scirtidae g. sp. Similar species composition was found for three rivers in Lithuania (Bernotienė & Višinskienė 2007).

The highest number of taxa and specimens was found at station *10*, and the lowest – at station *22* (Table 4). We found high abundance at station *10* and a small number of specimens at stations *13* and *22* (Figure 3). These values probably reflect the impact of anthropogenic loads: station *10* is located in the spring zone of the Elovitsa River, where the anthropogenic impact is minimal, station *13* is impacted by the waste waters from the villages of Potok and Charkovo, and station *22* is located immediately after the village of Neykovtsi.

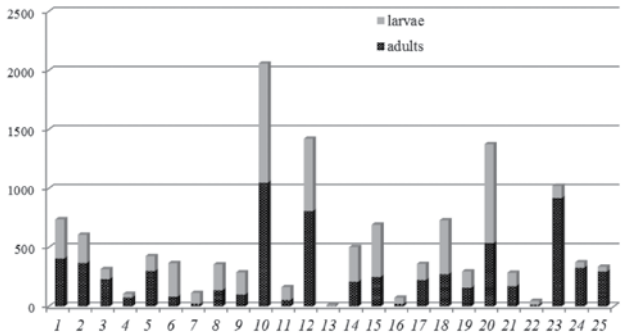

Fig. 3. Number of captured specimens (adults and larvae) from the studied sampling stations in Balgarka Natural Park

Table 3. Number of the captured specimens from the different families of aquatic beetles.

Family	Imago	Larvae	Total
Gyrinidae	19	70	89
Haliplidae	23	16	39
Dytiscidae	56	228	284
Hydrophilidae	3	7	10
Hydraenidae	3480	0	3480
Scirtidae	0	1990	1990
Elmidae	3426	3677	7103
Dryopidae	46	0	46
Total:	7053	5988	13041

Conclusions

The fauna of the aquatic beetles in Bulgarka Natural Park is insufficiently studied so far. As a result of the present study 27 species and 18 higher taxa were recorded. One species was new for the Bulgarian fauna and two species were registered for the first time from Stara Planina Mts. One Bulgarian and one Balkan endemic species were captured.

The diversity of this group in the area could be revealed only after future investigations and discovery of additional new species for the region.

The analysis of the dominance structure showed the presence of eudominant species, which is typical for anthropogenically-influenced and unsustainable ecosystems.

Once again species richness and abundance reflected the influence of the anthropogenic impacts over the animal communities, as most of the captured aquatic beetles seem to be attached to the less affected rivers or parts of rivers (Zelenodravska River, Panicharka River, Levicharka River, Elovitsa River and Samarinska River in their spring zones, Byalata Reka River, stations *4*, *6*, *12*, *14* and *20*).

Table 4. Number of the captured species and specimens from the different sampling stations. N – Number of species; S – Number of specimens (both adult and larvae)

Station	1	2	3	4	5	6	7	8	9	10	11	12	13
N	15	17	17	13	18	16	10	13	19	21	10	15	10
S	738	609	317	107	426	365	114	349	289	2058	163	1423	47
Station	14	15	16	17	18	19	20	21	22	23	24	25	
N	12	17	11	14	19	13	19	16	4	15	15	16	
S	502	694	75	358	730	291	1376	286	14	1021	374	335	

The main negative factors were the alteration of the hydrological regime and the pollution by wastewater from the settlements, and the drying up of the smaller rivers in the eastern part of the park due to the inefficient hydrotechical facilities. There were numerous completely drained or partially dehydrated river sections, affecting negatively the life in the rivers.

References

Balogh J. 1958. Lebensgemeinschaften der Landtiere. Berlin, 560 p.

Bei-Bienko G. Y. (Ed.) 1965. Identification guide of the insects of the European part of the USSR in five volumes. Volume 2. Coleoptera and Strepsiptera. Nauka, Moscow-Leningrad, 668 p. (In Russian).

Bernotienė R. & G. Višinskienė 2007. The diversity of benthic invertebrates in three rivers in Lithuania. – *Acta Biologica Universitatis Daugavpiliensis*, 7 (2): 87-96.

Bodenheimer F. 1955. Precis d'ecologie animale. Paris, 315 p.

Bouchard R. W. Jr. 2004. Guide to aquatic macroinvertebrates of the Upper Midwest. Water Resources Center, University of Minnesota, St. Paul, MN, 208 p.

Chertoprud M. V. & E. S. Chertoprud 2003. A short identification guide on the freshwater invertebrate fauna of the center of the European Russia. MAKS Press, Moscow, 196 p. (In Russian).

Cheshmedjiev S., R. Soufi, Y. Vidinova, V. Tyufekchieva, I. Yaneva, Y. Uzunov & E. Varadinova 2011. Multi-habitat sampling method for benthic macroinvertebrate communities in different river types in Bulgaria. – *Water Research and Management*, **1** (3): 55-58.

Clifford H. F. 1991. The Aquatic Invertebrates of Alberta. The University of Alberta Press, on-line edition: http://sunsite.ualberta.ca/Projects/Aquatic_Invertebrates/index.php

de Jong Y. S. D. M. (ed.) 2013. Fauna Europaea, version 2.6 Web Service available online at http://www.faunaeur.org

EN-ISO 10870: 2012. Water quality. Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters.

Epler J. H. 1996. Identification Manual for the Water Beetles of Florida (Coleoptera: Dryopidae, Dytiscidae, Elmidae, Gyrinidae, Haliplidae. Hydraenidae, Hydrophilidae, Noteridae, Psephenidae, Ptilodactylidae, Scirtidae). Final Report for DEP Contract Number WM621. Systematic Enthomologist, Crawfordville, FL, 259 p.

Eyre M. D. & G. N. Foster 1989. A comparison of aquatic Heteropera and Coleoptera communities as a basis for environmental and conservation assessment in static water sites. – *Journal of Applied Entomology*, **108**: 355-362.

Fery H. & M. Brancucci 1997. A taxonomic revision of *Deronectes* Sharp, 1882 (Insecta: Coleoptera: Dytiscidae) (part I). – *Annalen des Naturhistorischen Museums in Wien*, **99B**: 217-302.

Friday L. E. 1988. A key to the adults British water beetles. – *Field Studies*, **7**: 1-151.

Guéorguiev V. B. 1987. Fauna of Bulgaria. Volume 17. Coleoptera, Hydrocanthares. BAS, Sofia, 162 p. (in Bulgarian)

Hebauer F. 1988. Gesichtspunkte der ökologischen Zuordnung aquatischer insekten zu den sukzessionsstufen der Gewässer. – *Berichte der ANL*, **12**: 229-239.

Löbl I. & A. Smetana 2003–2013. Catalogue of Palearctic Coleoptera, Vol. 1 – 8. Apollo Books, Stenstrup.

Kenderov L. A. & A. M. Apostolov 2008. Composition and structure of hyporheal crustacean complex of Iskar River Valley in different environmental conditions. – *Natura Montenegrina*, **7** (2): 145-167.

Kenderov L. A., S. A. Stoichev & I. Y. Yaneva 2012. Comparative Studies of Water Invertebrate Fauna from Benthal and Hyporheic Habitats in Iskar River Catchment. I. Infauna: Free-Living Nematodes (Nematoda) and Chironomid Larvae (Diptera: Chironomidae). – *Acta zoologica bulgarica*, **64** (3): 273-281.

MEW (Ministry of Environment and Water of Bulgaria) 2002. Order № RD-775 of 09.08.2002 for declaration of the "Balgarka" Natural park in the lands of the villages Plachkovtsi, Radevtsi-Neykovtsi, Stanchev han and Prestoy – Municipality of the town of Tryavna; Toplesh, Smirnenski, Charkovo, Etara and Aprilovo – Municipality of the town of Gabrovo, publ. SG 86/10.09.2002. (In Bulgarian).

MEW (Ministry of Environment and Water of Bulgaria) 2014. Inventory of the status of the components of the environment within the territory of the Balgarka Natural park. Final report on the Project "Development of a plan for the management of Balgarka Natural park" (№ DIR-593210-1-5), 73 p. (In Bulgarian).

Oscoz J., D. Galicia & R. Miranda (eds.) 2011. Identification Guide of Freshwater Macroinvertebrates of Spain. Springer, XXI, 153 p.

Pehlivanov L., Y. Uzunov, S. Naumova, I. Yaneva, D. Parvanov, E. Varadinova, L. Kenderov, Y. Presolska, V. Tyufekchieva, A. Panova-Karadzhova, R. Soufi & A. Petrova 2010. A short identification guide on the invertebrate fauna (macrozoobenthos) of the Bulgarian rivers and lakes. MEW, Sofia, 134 p. (In Bulgarian).

Preston F. W. 1962. The canonical distribution of commonness and rarity. – *Ecology*, **43**: 185-215, 410-432.

Sharova I. 1981. Life forms of Carabids. Nauka, Moskow, 360 p. (In Russian).

Stoichev S. A. 1999. Contribution to the study of the free-living nematode fauna (Nematoda: Nemathelminthes) from surface and groundwaters in the catchment area of Iskar River and Struma River. – *Acta Zoologica Bulgarica*, **51**: 25-33.

Stoichev S. A. 2002. Hydrofaunistic investigation of the Urdini Ezera glacial lakes, Northwestern Rila Mountains, Western Bulgaria. – *Acta Zoologica Bulgarica*, **54** (1) 63-68.

Tischler W. 1949. Grundzüge der terrestrischen Tierökologie. Friedrich Vieweg und Sohn, Braunschweig, 219 p.

Trizzino M., L. Carnevali, S. De Felici & P. Audisio 2013. A revision of Hydraena species of the "Haenydra" lineage (Coleoptera, Hydraenidae). – *Zootaxa*, **3607** (1): 001-173.

Valladares L. F., J. Garrido & F. García-Criado 2002. The assemblages of aquatic Coleoptera from shallow lakes in northern Iberian Meseta: Influence of environmental variables. – *Journal of Applied Entomology*, **99**: 289-298.

Williams D. D. & B. W. Feltmat 1992. Aquatic Insects. CAB International. xiii, 358 p. ISBN: 0-85198-782-6.

Received: 06.11.2015
Accepted: 23.08.2016