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Aquatic beetles (Coleoptera) of the running waters in the Veľká Fatra Mountains (Slovakia)

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With 2 figures and 2 tables

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During 2004, the water beetle fauna of streams and rivers in the Veľká Fatra Mts. (Slovakia) was studied. More than 1600 specimens of adult beetles were collected from 14 sites covering the major part of the mountain area. 16 species were recorded, representing 4 families: Dytiscidae (2 species), Elmidae (8), Hydraenidae (5) and Scirtidae (1). Results are discussed in context of all previous data sets.

1 Introduction

The water beetle fauna of Slovakia including the protected area of the National Park Veľká Fatra is on the contrary to other groups of aquatic invertebrates (e.g. mayflies, stoneflies) explored and documented only superficially and non-complexly. It is the consequence of both, lack of more detailed faunistic surveys, and problematic sampling of water beetles as part of macrozoobenthos, using standard hydrobiological methods. These methods cover only a small part of species richness of beetles since adults are sparsely collected and larval stages are difficult to determinate. Moreover, the larvae of some families (e.g. Hydraenidae) are not aquatic. Consequently, also the abundance of aquatic beetles is strongly underestimated in most of limnological works.

Almost all existing data on aquatic Coleoptera of the area of our interest, the Veľká Fatra Mts., descend from two primary sources: Roubal´s faunistic records from the 1930´s (Roubal 1930, 1936, 1938) and more complex hydrobiological research of the Turiec river basin (Krno et al. 1996) and Revúca river basin (Krno 1978, 1992, Krno & Valachová 1999). Aquatic beetles are very briefly mentioned also by Mláka & Bitušík (1998) from the Bystrica stream (southern part of the Veľká Fatra Mts., Hron river basin). Detailed research focused on the water beetle fauna of this area was not performed until now and faunistic works do not exist.

The main goal of the study was to provide complex faunistic data on the beetle fauna of streams and rivers in the Veľká Fatra Mts., which improve

knowledge of the fauna in Slovakia and provide an important base for conservation activities in the respective area.

2 Material and methods

2.1 Characteristics of the study area and sampling sites (Fig. 1)

The surveyed area of the National Park Veľká Fatra stretches on the territory of the Veľká Fatra Mts. (Slovakia), belonging to the Western Carpathians province (subprovince Inner Western Carpathians). It has a complicated geological structure and is formed by three main geomorphological units: the Krížňanská Veľká Fatra (the highest part of the mountains), the Liptovská Veľká Fatra (both consist mainly of mesozoic limestones, dolomites, slates and sandstones), and the Smrekovická Veľká Fatra (granodiorits). The area is bordered by the Turiec river from the west and the Revúca river from the east (both are the left-side tributaries of the Váh river, bounding the mountains from the north). The whole area including all selected streams is drained by the upper Váh river except for the small southern part belonging to the Hron river basin; both rivers are tributaries of the Danube.

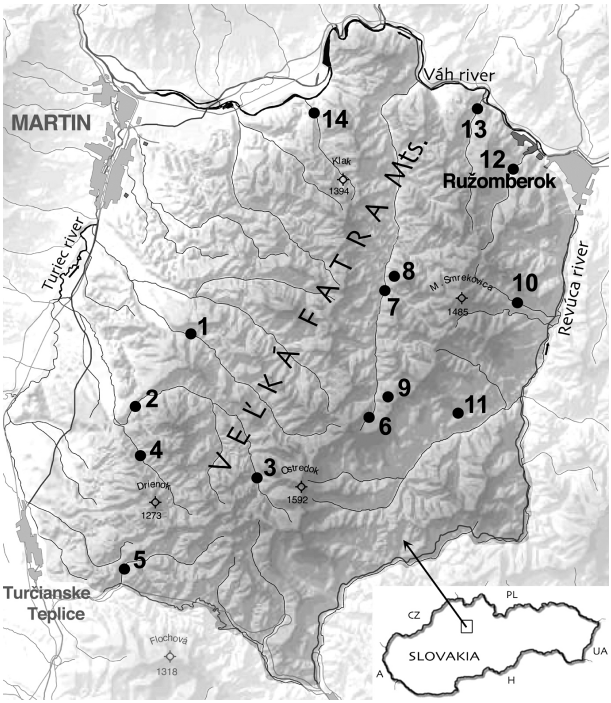

Fig. 1: Studied area in the Veľká Fatra Mts., Slovakia with streams and sampling sites marked. 1 = Necpalský potok, 2,3 = Gaderský potok, 4 = Blatnický potok, 5 = Teplica, 6,7 = Ľubochnianka, 8 = Čierňava, 9 = stream in Vyšný Rakytov valley, 10 = Matejkovský potok, 11 = Teplý potok, 12 = Čutkov, 13 = Bystrý potok, 14 = Ráztoky

The 14 sample sites are spread over the Veľká Fatra Mts. in the National Park. Four streams flow into the Turiec river: Necpalský potok (site 1), Gaderský potok (2, 3), Blatnický potok (4), and Teplica stream (5). The stream Čierňava (8) and the stream in the Vyšný Rakytov valley (9) flow into the Ľubochnianka river (6, 7). Matejkovský potok (10) and Teplý potok stream (11) are tributaries of the Revúca river. Čutkov (12), Bystrý potok (13), and Ráztoky (14) reach directly the Váh river.

The investigated stream stretches are typical (sub)montane running waters of rhithral type, characterized mainly by fast flowing water and by substrate consisting of different particle sized lithal (from boulders to gravel), combined with moss. Calmer stretches (mainly the sites 2, 7, 11, 13) have a more uniform substrate (mesolithal). Most anthropogenically influenced was site 5.

2.2 Sampling methods

The field work was undergone July and September 2004 on 14 sampling sites of 12 streams. Samples were taken once at each site (approximately 100 m stream section/1 hour, semiquantitative samples), from all present mineral and organic substrates (stones, mosses, roots) using a hand net.

Sampling was focused exclusively on aquatic beetles. The specimens collected were immediately fixed by ethyl acetate. In the laboratory, adults were genitalized if necessary, determined to the species level, and counted. Subsequently basic ecological metrics (as dominance) were calculated.

3 Results and discussion

3.1 Recent data

The faunistic survey of the water beetle fauna of the Veľká Fatra Mts. streams, undertaken mainly for the purposes of the National Park Authority, yielded more then 1600 specimens. The sampling sites were explored very carefully and it is assumed, that the major part of the species spectrum was covered, despite single sampling. As the survey was focused on species spectrum and diversity of the sites, the attention was paid mainly to the adult specimens (larvae are hard to determinate). For the same reason individual collecting was preferred to standard hydrobiological methods, which are usually unsuitable for sampling aquatic beetles (Zaťovičová & al. 2004).

In total, 16 species of water beetles were found: The highest species richness showed site 8 with 12 species, the lowest the sites 4 and 7 with 5 species. Four beetle families has been detected: Dytiscidae (2 species), Elmidae (8), Hydraenidae (5) and Scirtidae (1 taxon) (Tab. 1).

Tab. 1: Aquatic Coleoptera of the Veľká Fatra Mts. streams. Relative abundance (Dominance) in %, total abundance (Ind./1 hour sampling) and number of taxa/site

TAXON / SITE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14
DYTISCIDAE														
Oreodytes sanmarkii (Sahlberg, 1934)	-	-	-	-	-	-	-	-	-	0.7	-	-	0.4	-
Platambus maculatus (Linnaeus, 1758)	-	-	-	-	-	-	-	0.5	-	-	-	-	0.4	-
ELMIDAE														
Elmis aenea (Müller, 1806)	12.7	14.4	24.4	16.3	23.7	-	15.3	47.3	11.9	33.8	22.8	34.7	43.6	19.7
Elmis latreillei Bedel, 1878	-	-	4.9	-	-	7.6	-	-	7.1	2.8	1.0	6.7	-	-
Elmis maugetii Latreille, 1798	31.4	8.1	9.8	5.1	1	-	59.3	6.5	3.6	2.8	1.5	-	21.6	4.9
Elmis sp. - larvae	-	-	-	-	-	-	-	-	-	-	-	-	0.4	-
Esolus angustatus (Müller, 1821)	-	-	4.9	-	-	33.3	-	3.0	9.5	4.8	1.5	1.3	-	3.3
Esolus parallelepipedus (Müller, 1806)	-	1.8	-	-	-	4.5	-	1.0	-	-	-	-	-	-
Limnius perrisi (Dufour, 1843)	4.2	4.5	8.5	10.2	8.2	18.2	1.7	3.5	4.8	9.7	7.9	2.7	0.8	8.2
Limnius volckmari (Panzer, 1793)	3.4	2.7	-	-	-	-	-	-	-	-	-	2.7	-	6.6
Riolus subviolaceus (Müller, 1817)	11	33.3	8.5	57.1	52.6	12.1	13.5	9.4	17.9	-	45.5	33.3	0.4	16.4
HYDRAENIDAE														
Hydraena dentipes Germar, 1842	5.1	3.6	1.2	-	-	-	-	1.0	-	0.7	1.0	-	3.0	4.9
Hydraena gracilis Germar, 1824	16.1	18	12.2	9.2	9.3	6.1	3.4	13.4	19.0	19.3	10.0	14.7	18.9	14.8
Hydraena pygmaea Waterhouse, 1833	2.5	2.7	-	-	-	-	-	1.5	-	0.7	0.5	-	1.9	13.1
Hydraena saga D'Orchymont, 1930	1.7	-	11	-	2.1	7.6	-	4.4	11.9	6.2	-	-	0.7	3.3
Hydraena sp. - female	11.9	8.1	13.4	2.0	3.1	9.1	6.8	8.4	9.5	18.6	5.9	4.0	7.9	-
Limnebius truncatellus (Thunberg, 1794)	-	-	-	-	-	-	-	0.5	-	-	-	-	-	-
Limnebius sp. - female	-	-	1.2	-	-	1.5	-	-	-	-	-	-	-	-
SCIRTIDAE														
Elodes sp. - larvae	-	2.7	-	-	-	-	-	-	4.8	-	2.5	-	-	4.9
Total abundance	118	111	82	98	97	66	59	203	84	145	202	75	264	61
Number of taxa	10	11	11	6	7	9	6	13	10	11	11	8	12	11

Dytiscidae were represented by *Oreodytes sanmarkii* and *Platambus maculatus*, preferring marginal parts of running waters; they were found only at 3 sites in minimal numbers. Scirtidae were represented by few larvae of *Elodes* at four sites.

Running waters are preferably inhabited by Elmidae and Hydraenidae. In the Veľká Fatra Mts. 4 species of *Hydraena* and 8 species of Elmidae (4 genera) have been found, that are 20 % and 40 % respectively of the species recorded from Slovakia until now (Kodada et al. 2003). Also concerning abundance, these families were dominant and reached together 95-100 % of total beetle abundance (Elmidae 54-90 %) (Fig. 2). The 8 Elmidae species are common in Central European streams and small rivers from lowlands to mountain areas; no rare species were found. The alteration, substitution and differences in abundance of vicariant species within the genera (*Elmis latreillei* – *E. aenea* – *E. maugetii*; *Esolus angustatus* – *E. parallelepipedus*; *Limnius perrisi* – *L. volckmari*) are the consequence of different autecological demands, e.g. temperature, altitude, flow type (sensu Illies et Botosaneanu 1963).

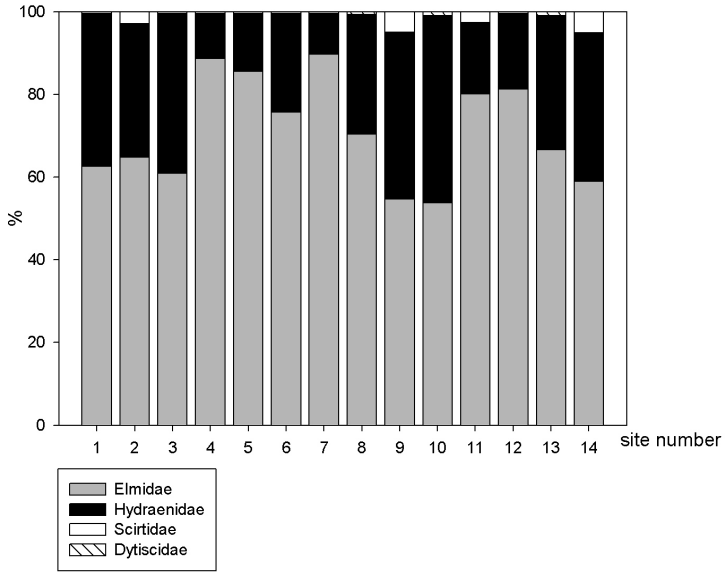

Fig. 2: Relative abundance (Dominance) of four water beetle families in Veľká Fatra Mts. streams. Site numbers as in Fig. 1

3.2 Previous data

On the base of several publications mentioned above 46 species of water beetles of both, running and standing waters, have been found in the Veľká Fatra Mts. up to 2004 (Tab. 2). 12 species occur only in the larger rivers Turiec and Revúca outside the area of the National Park (Roubal 1930, Krno et al. 1996, Krno & Valachová 1999). The majority of remaining 34 species (15 of them were found also during our research) come from a single hydrobiological research of the Turiec river and its tributaries, and were gained in a systematic three-year study (4 samplings/year), supplemented by individual collecting in 1989-90 (Krno & al. 1996).

Tab. 2: Aquatic Coleoptera in the Veľká Fatra Mts. Investigation 2004 and literature data. * = data from unspecified sites of the upper Váh river basin

Taxon	2004	Literature data	Locations
DRYOPIDAE			
*Dryops striatopunctatus (Heer, 1841)		Kodada et al. (2003)	
DYTISCIDAE			
Agabus bipustulatus (Linnaeus, 1767)		Krno et al. (1996)	Turiec
Agabus guttatus (Paykull, 1798)		Roubal (1930); Krno (1992); Mláka & Bitušík (1998); Krno & Valachová (1999); Krno et al. (1996)	various streams
*Agabus unguicularis Thomson, 1867		Kodada et al. (2003)	
Agabus sp. - larvae		Krno (1978)	without exact location
*Bidessus grossepunctatus Vorbinger, 1907		Kodada et al. (2003)	
Graphoderus cinereus (Linnaeus, 1758)		Roubal (1930)	Turiec
Hydroglyphus geminus (Fabricius, 1792)		Krno et al. (1996)	Turiec
Hydroporus discretus Fairmaire, 1859		Krno et al. (1996)	Turiec + Gaderský potok
*Hydroporus longicornis Sharp, 1871		Kodada et al. (2003)	
*Hydroporus marginatus (Duftschmid, 1805)		Kodada et al. (2003)	
*Hydroporus morio Aubé, 1838		Kodada et al. (2003)	
Hydroporus nigrita (Fabricius, 1792)		Krno et al. (1996)	Turiec + Gaderský potok
Hydroporus palustris (Linnaeus, 1761)		Krno & Valachová (1999); Krno et al. (1996)	various streams
*Hydroporus rufifrons (Müller, 1776)		Kodada et al. (2003)	
*Hygrotus confluens (Fabricius, 1787)		Kodada et al. (2003)	
Ilybius fuliginosus (Fabricius, 1792)		Krno et al. (1996)	Turiec + Gaderský potok
*Nebrioporus canaliculatus (Lacordaire, 1835)		Kodada et al. (2003)	
*Nebrioporus depressus (Fabricius, 1775)		Kodada et al. (2003)	
Oreodytes sanmarkii (Sahlberg, 1834)	x	Krno et al. (1996)	Turiec + Gaderský potok
Oreodytes septentrionalis (Gyllenhal, 1827)		Roubal (1930, 1938); Krno & Valachová (1999)	various streams
Platambus maculatus (Linnaeus, 1758)	x	Krno et al. (1996)	Turiec
Scarodytes halensis (Fabricius, 1787)		Krno et al. (1996)	Turiec
ELMIDAE			
Elmis aenea (Müller,1806)	x	Krno (1992); Mláka & Bitušík (1998); Krno & Valachová (1999); Krno et al. (1996)	various streams
Elmis latreillei Bedel, 1878	x	Roubal (1936); Krno (1992); Krno & Valachová (1999); Krno et al. (1996)	various streams
Elmis maugetii Latreille, 1798	x	Krno (1978); Krno et al. (1996)	various streams
Elmis sp. - larvae	x		
Esolus angustatus (Müller, 1821)	x	Krno & Valachová (1999); Krno et al. (1996)	various streams
Esolus parallelepipedus (Müller, 1806)	x	Krno et al. (1996)	Turiec + Gaderský potok
*Limnius opacus Müller, 1806		Kodada et al. (2003)	
Limnius perrisi (Dufour, 1843)	x	Krno & Valachová (1999); Krno et al. (1996)	various streams
Limnius volckmari (Panzer, 1793)	x	Mláka & Bitušík (1998); Krno & Valachová (1999); Krno et al. (1996)	Turiec, Revúca + Gaderský potok
Oulimnius tuberculatus (Müller, 1806)		Krno & Valachová (1999); Krno et al. (1996)	Turiec + Revúca
Riolus cupreus (Müller, 1806)		Krno (1992); Krno et al. (1996)	various streams
Riolus subviolaceus (Müller, 1817)	x	Roubal (1938); Krno (1992); Krno & Valachová (1999); Krno et al. (1996)	various streams
GYRINIDAE			
*Gyrinus substriatus Stephens, 1828		Kodada et al. (2003)	

Taxon	2004	Literature data	Locations
HALIPLIDAE			
Brychius elevatus (Panzer, 1794)		Krno et al. (1996)	Turiec + Gaderský potok
*Haliplus wehnckei Gerhardt, 1877		Kodada et al. (2003)	
HELOPHORIDAE			
Helophorus aquaticus (Linnaeus, 1758)		Krno et al. (1996)	Turiec
Helophorus arvenicus Mulsant, 1846		Krno et al. (1996)	Turiec
Helophorus brevipalpis Bedel, 1881		Krno et al. (1996)	Turiec + Gaderský potok
Helophorus montenegrinus Kuwert, 1885		Krno et al. (1996)	Turiec
HYDRAENIDAE			
*Hydraena belgica d´Orchymont, 1930		Kodada et al. (2003)	
Hydraena britteni Joy, 1907		Krno et al. (1996)	Gaderský potok stream
Hydraena dentipes Germar, 1842	x	Roubal (1930)	Harmanec env.
Hydraena excisa Kiesenwetter, 1849		Krno et al. (1996)	Turiec + Gaderský potok
Hydraena gracilis Germar, 1824	x	Roubal (1930); Krno et al. (1996)	Turiec, Revúca + Gaderský potok
Hydraena melas Dalla Torre, 1877		Krno et al. (1996)	Turiec + Gaderský potok
Hydraena minutissima Stephens, 1829		Krno et al. (1996)	Turiec
Hydraena pygmaea Waterhouse, 1833	x	Roubal (1930); Krno et al. (1996)	Turiec + Gaderský potok
Hydraena reyi Kuwert, 1888		Krno et al. (1996)	Turiec + Gaderský potok
Hydraena riparia Kugelann, 1794		Krno et al. (1996)	Turiec
Hydraena saga D'Orchymont, 1930	x	Krno et al. (1996)	Turiec + Gaderský potok
Hydraena sp.	x	Krno (1992); Krno & Valachová (1999)	various streams
*Limnebius stagnalis Guillebeau, 1890		Kodada et al. (2003)	
Limnebius truncatellus (Thunberg, 1794)	x	Krno et al. (1996)	Turiec + Gaderský potok
Limnebius sp.	x		
Ochthebius gibbosus Germar, 1824		Roubal (1930); Krno et al. (1996)	Turiec
Ochthebius melanescens Dalla Torre, 1877		Krno et al. (1996)	Turiec
Ochthebius metallescens Rosenhauer, 1847		Roubal (1930)	without exact location
HYDROPHILIDAE			
Anacaena globulus (Paykull, 1798)		Krno et al. (1996)	Turiec + Gaderský potok
Anacaena lutescens (Stephens, 1829)		Krno et al. (1996)	Turiec + Gaderský potok
Laccobius striatulus (Fabricius, 1801)		Krno et al. (1996)	Turiec
SCIRTIDAE			
Elodes sp.	x		
Scirtes hemisphericus (Linnaeus, 1758)		Krno (1992)	Bukovinka env.

Despite the relatively high number of beetle species recorded from this area, for almost half of them (*H. discretus*, *H. nigrita*, *I. fuliginosus*, *O. sanmarkii*, *E. parallelepipedus*, *B. elevatus*, *H. brevipalpis*, *H. britteni*, *H. excisa*, *H. melas*, *H. reyi*, *H. saga, L. truncatellus, A. globulus, A. lutescens* - Tab. 2) the only known site of occurrence in the National Park area is one stream: Gaderský potok (our sites 2 and 3). Some data include also few other sites (Roubal 1930, 1936, Krno 1992, Mláka & Bitušík 1998, Krno & Valachová 1999). The findings of Krno (1978) are without exact localization as well Kodada & al. (2003) who mentions 15 additional species from the upper Váh river basin, but they might not necessarily occur in the Veľká Fatra Mts. area (Tab. 2).

Our study provides a real picture of the beetle fauna inhabiting running waters of the Veľká Fatra Mts. Even no rare or endangered species was recorded, it may help to fill the gaps in faunistics and provide a base for conservation activities.

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