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RECORDS OF CARABID AND STAPHYLINID BEETLES ALONG THE EDGES OF THE SOČA RIVER AND ITS TRIBUTARIES IN 2012 (COLEOPTERA: CARABIDAE, STAPHYLINIDAE)

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Abstract - A survey was undertaken along the Soča River and its tributaries (NW Slovenia) to get an initial understanding of the species of Carabidae and Staphylinidae present. An effort was made to target species associated with river edges, particularly those in the mossy splash zones at the edges of upland streams and those associated with exposed riverine sediments (ERS). A total of 54 species were collected of which 42 were recorded from the main river and 22 from the two tributaries. The main river samples had a greater species diversity, with many species being associated with exposed riverine sediment (sand and shingle), whereas the tributaries supported a series of waterfall, seepages and 'splashzone' species not found on the main river. Habitat requirements for certain species found in both Slovenia and the UK seem to be broadly similar.

KEY WORDS: Carabidae, Staphylinidae, Exposed Riverine Sediment, Riparian, Soča River, Slovenia.

Izvleček – PODATKI O HROŠČIH DRUŽIN CARABIDAE IN STAPHYLINIDAE NA BREGOVIH REKE SOČE IN NJENIH PRITOKOV V LETU 2012 (COLEOPTERA: CARABIDAE, STAPHYLINIDAE)

Da bi spoznali prisotnost vrst iz družin Carabidae in Staphylinidae, smo opravili raziskavo reke Soče in njenih pritokov (SZ Slovenija). Posvetili smo se vrstam, vezanim na rečne bregove, posebno tistim na mahovnatih območjih pršenja ob robovih gorskih potokov in tistim z razkritih rečnih sedimentov. Skupno je bilo zbranih 54 vrst, 42 od teh v glavni strugi in 22 v dveh pritokih. Vzorci iz glavne struge so imeli večjo vrstno raznolikost, z mnogimi vrstami vezanimi na razkrite rečne sedimente (pesek in

prod), medtem ko pritoki gostijo več vrst slapov, mezeče vode in prša, ki jih v glavni strugi ni najti. Kaže, da imajo nekatere vrste, ki živijo tako v Sloveniji kot v Veliki Britaniji, v grobem enake habitatne potrebe.

KLJUČNE BESEDE: Carabidae, Staphylinidae, razkriti rečni sedimenti, obrežen, reka Soča, Slovenija.

Introduction

Exposed riverine sediments (ERS) are typical of sections of unstable meandering wandering gravel, and braided rivers. They are neither truly terrestrial, nor truly aquatic (Bates *et al.,* 2009). ERS are present in the shoals, bars and spits present in river channels which are periodically exposed during periods of normal or lower than average flow. The sediments range in size from cobbles and boulders to silt and sand. The character, shape, size, location and sediment composition vary greatly, providing significant habitat diversity. This habitat is strongly associated with hydrological disturbance for both the formation of the sediment bars and for impeding vegetation colonisation (Bates *et al.,* 2007). They are important habitats for invertebrates but notably for beetles (Hammond, 1998; Eyre *et al.,* 2001; Fowles, 2003).

The purpose of the project was to prepare an initial species list of riparian species. To the author's knowledge, this has yet to be undertaken for these types of species in the Soča valley. This investigation sampled both the main channel of the Soča River and its tributaries. In the latter, ERS were still present but waterfalls and their constituent splash zones became the prevalent habitat. Although the main focus of the work was to generate an inventory of riparian species, a preliminary comparison of the fauna of the river and some tributaries was also considered important.

Methods

The Soča river flows through western Slovenia and northeastern Italy. Its source lies in the Trenta Valley in the Julian Alps in northwestern Slovenia. This alpine river has been deeply carved into limestone and has characteristic white shingle bars and bare rock along its length. There is a large braided channel downstream of Bovec. From either side of the valley, further tributaries feed into the main channel. These often consist of steep sided streams that cascade through woodland. Woody debris and boulders were plentiful at the time of the survey.

The survey protocol followed was designed to collect terrestrial ground-dwelling beetles from within the channel of the river. Samples were taken from nine different points (see Table 1 below). They were taken from two of the river's tributaries in the Trenta valley. Main river samples were taken from between the settlement of Trenta and as far downriver as the bridge at Kamno. One main river sample (sample 5) was abandoned as it had very little beetle activity and was seemingly dominated by ants.

Table 1: Sample points along the Soča and its tributaries listed in chronological order.

Sample Point	Date	Coordinates *	Water Course	Type of water course
1.	4th June 2012	GKY 403655 GKX 137115	Beladovec	Upland stream.
2	4th June 2012	GKY 403357 GKX 137337	Soča	Main channel.
3	5th June 2012	GKY 401388 GKX 136144	Soča	Main channel.
4	5th June 2012	GKY 385922 GKX 131593	Soča	Main channel
5 abandoned	6th June 2012	GKY 404167 GKX 138215	Soča	Main channel.
6	6th June 2012	GKY 406651 GKX 138833	Beli potok	Upland stream.
7	7th June 2012	GKY 403373 GKX 137307	Beladovec	Straightened stream
8	7th June 2012	GKY 395092 GKX 119391	Soča	Main channel.
9	8th June 2012	GKY 403698 GKX 137027	Beladovec	Upland stream.

*from Atlas Okolja - http://gis.arso.gov.si/atlasokolja/profile.aspx?id=Atlas_Okolja_AXL@Arso

Each sample consisted of the combined catches of a series of separate searches within a one hour period. Each search used a different method to maximise the potential for collecting riverine species (Drake *et al*., 2007) with the following search techniques being employed:

1. Cobbles, wood and other debris were over-turned, insects below being collected;
2. Sand and other soft sediments were trampled and patted, and surface-active insects collected directly up from the ground;
3. Bare ground is splashed next to water margins. Insects washed into the water were scooped up with a sieve. Areas that have been splashed were also checked for surface-active insects;
4. Litter was sieved over a tray with a 5 mm mesh;
5. Moss and other vegetation was pulled up and sieved with a 5 mm mesh. This was dropped into a slower moving part of the watercourses and held under the water. Any insects escaping to the surface are scooped off the top with a sieve;
6. Excavation of river shingle down to the water table with a trowel. The sides of the excavation were then collapsed down into the water and insects that were within the shingle float to the surface to be scooped up.

The exact amount of time that was spent in each different activity varied between sites and was dependent on factors such as particle size, amount of litter and size of shingle and sand bar available.

Insects were collected using a pooter or taken directly by hand, if large enough. Other equipment employed included a trowel, a plastic sieve with small (less than 1 mm) diameter, a 5 mm 'garden' sieve and white trays. Captured specimens were then transferred to a glass tube and anaesthetised with a few drops of ethyl acetate. These were stored in a freezer before being sorted. Carabidae and Staphylinidae were dissected where necessary and then carded for identification.

Identification proved somewhat problematic as the author had to rely on English, German and Scandinavian keys (Assing and Schulke, 2011; Lott, 2009; Lott and Anderson, 2011; Luff 2007; Trautner and Geigenmuller, 1987; Lohse 1974; Strand and Vik, 1964). The author also visited the Natural History Museum in London, UK and used comparative material to verify the vast majority of specimens. A couple of problematic species required the assistance of Roger Booth at the Natural History Museum to critically determine. Eight specimens remained unidentified. These, along with the rest of the collection reside with the author.

Permission to undertake the survey was granted by both the Agencija Republike Slovenije za okolje (35601-145/2011-6) and the Triglavski narodni park (35611-14/2011-2).

Results

A total of 54 species of Carabidae and Staphylinidae were recorded in all (Table 2). Of these, 42 species were recorded from the main river and 22 from the two tributaries. The number of species caught from each of the main river samples was 23, 16, 15 and 10 respectively. The number of species caught from each of the tributary samples was 11, 9, 8 and 4 respectively. The average species richness for both families from the four tributary samples was 8. The average species richness from the four main river samples was 16; twice as much as the species richness from the tributaries.

Ten species were collected from both the tributaries and the main river. Thirty-one species were found only on the main river and twelve species were caught only from the tributaries.

Discussion

There is considerable difference between the main river and its tributaries both in terms of richness and the species present. However, despite the main river samples having a greater species richness it must be pointed out that the tributary samples included twelve species not found in the main river samples. Clearly, both the tributaries and the main river support distinctive assemblages each of which are important elements of the catchment's biodiversity.

Lott (2003, 2009), Lott and Anderson (2011) and Luff (2007) provide short accounts of species' habitat requirements in the UK and Koch (1989) provides some general information about species requirements in Europe. Based on the results in this study the UK requirements of these species seem to be broadly similar in Slovenia:

Bembidion bualei, *B. decorum*, *B. punculatum*, *Perileptus aerolatus*, *Ischnopoda coarctata*, *I. umbratica*, *Deleaster dichrous* and *Thinodromus arcuatus* are all associated with river shingle in the UK, and seem to have a similar association in Slovenia. They were found along the main channel only.

Omophron limbatum and *Cicindela hybrida* are both associated with sand, being found only on the braided channel sample at Bovec. Whereas *O. limbatum* seems to have more of an affinity with sand along river edges, *C. hybrida* has more diverse tastes.

Species such as *Dianous coerulescens*, *Quedius riparius and Lesteva hanseni* are all described as moss specialists and were characteristically found along the Beladovec in the splashzones of waterfalls.

Species such as *Myllaena brevicornis*, *Bembidion deletum*, *Gabrius astutoides* tend to be found either next to streams or adjacent to seepages (trickles of water running over hard surfaces and sand). These species were found either along the edges of waterfalls at Beladovec or in litter along the Beli potok.

Lohse (1974) makes some references to the habitats for the Aleocharinae (Staphylinidae). *Atheta monacha* is described as being present within the entire alpine area in montane to sub-alpine zones near running water. It was found along the Beladovec and the Soča. *Aloconota ernestinae* is described as being found in Alpine areas and their forelands.

Schillhammer (2012) describes *Philonthus caerulescens* as in the south central Europe on sandy-gravelly to gravelly river shores and *P.rufimanus* as being found on river shores in the south of Europe. Both of these were present along broad shingle and sand bars on the main river, seemingly being active diurnal species.

All the species of Carabidae recorded are listed in the latest Slovenian checklist (Drovenik and Peks, 1999).

Incidental water beetles were captured and then identified by Professor Garth Foster. He suggested that two of these were worth mentioning: *Ochthebius* (*Enicocerus*) *granulatus* is listed as Slovenian (Hansen, 1998). This was recorded along the Beli potok stream. *Dryops striatipunctatus* was also recorded on the main river at the bridge at Kamno.

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Table 2: Carabidae and Staphylinidae (listed alphabetically) recorded from the Trenta Valley in 2012. There is no Sample 5 as this was abandoned due to the sampling station being dominated by ants.

	Water Course	**Soča**				**Beli potok**	**Beladovec**		
	Sample number	Sample 2	Sample 3	Sample 4	Sample 8	Sample 6	Sample 1	Sample 7	Sample 9
	Grid Reference	GKY403357 GKX137337	GKY401388 GKX136144	GKY385922 GKX131593	GKY395092 GKX119391	GKY406651 GKX138833	GKY403655 GKX137115	GKY403373 GKX137307	GKY403698 GKX137027
Species	**Authority**								
Carabidae									
Asaphidion caraboides	(Schrank, 1781)		•	•					
Bembidion ascendens	Daniel, 1902			•	•				
Bembidion azurescens	DellaTorre, 1877			•					
Bembidion bualei	Jacquelin du Val, 1852	•	•						
Bembidion decorum	(Panzer, 1799)				•				
Bembidion deletum	Audinet-Serville, 1821					•			
Bembidion elongatum	Peyron, 1858				•				
Bembidion geniculatum	Heer 1837/8								•
Bembidion punctulatum	Drapeiz, 1821			•	•				
Bembidion pygmaeum	(Fabricius, 1792)	•							
Bembidion stomoides	Dejean, 1831		•		•	•			
Bembidion tibiale	(Duftschmid, 1812)	•	•			•			•
Bembidion varicolor	Fabricius, 1803	•	•	•	•	•			
Cicindela hybrida	Linnaeus, 1758			•					
Nebria picicornis	Fabricius, 1792	•	•	•	•				
Omophron limbatum	(Fabricius, 1777)			•					
Peocilus versicolor	(Sturm, 1824)		•						
Perileptus aerolatus	(Creutzer, 1799)			•	•				
Pterostichus fasciatopunctatus	(Creutzer, 1799)								•
Tachys micros	(Fischer von Waldheim, 1828)			•	•				
Staphylinidae									
Aloconota cambrica	(Wollaston, 1855)	•			•	•			
Aloconota currax	(Kraatz, 1856)					•	•	•	

	Water Course	Soča				Beli potok	Beladovec		
	Sample number	Sample 2	Sample 3	Sample 4	Sample 8	Sample 6	Sample 1	Sample 7	Sample 9
	Grid Reference	GKY403357 GKX137337	GKY401388 GKX136144	GKY385922 GKX131593	GKY395092 GKX119391	GKY406651 GKX138833	GKY403655 GKX137115	GKY403373 GKX137307	GKY403698 GKX137027
Species	**Authority**								
Aloconota ernestinae	(Bernhauer, 1898)				•				
Aloconota sulcifrons	(Stephens, 1832)	•					•		
Atheta monacha	Bernhauer, 1899	•					•	•	
Bledius subterraneus	Erichson, 1839		•	•	•	•			
Brachygluta tristis	(Hampe 1863)	•							
Deleaster dichrous	(Gravenhorst, 1802)	•	•						
Dianous coerulescens	(Gyllenhal, 1810)						•		•
Gabrius astutoides	(Strand, A. 1946)					•	•		•
Geodromicus nigrita	(Muller, P.W.J. 1821)				•		•	•	•
Hydrosmecta [haunoldiana]?		•							
Ischnopoda balteata	(Erichson, 1837)				•				
Ischnopoda coarctata	(Erichson, 1837)				•				
Ischnopoda umbratica	(Erichson, 1837)				•				
Lathrobium sp.	Na				•				
Lesteva hanseni	Lohse, 1953						•		
Atheta fungi agg	Na	•							
Mylleana brevicornis	(Mathews, A.H. 1838)						•		
Ochthephilus praepositus	Mulsant & Rey 1878	•					•		
Paederidius rubrothoracicus	(Goeze, 1777)		•	•	•				
Paederidius ruficollis	(Fabricius, 1781)			•	•				
Philonthus caerulescens	(Lacordaire 1835)				•				
Philonthus rufimanus	Heer 1839			•					
Phylhygra elongatula	(Gravenhorst, 1802)								
Phylhygra hygrotopora	(Kraatz, 1856)	•						•	
Quedius riparius	Kellner, 1843						•		•
Stenus asphaltinus	Erichson, 1840					•			

	Water Course	Soča				Beli potok	Beladovec		
	Sample number	Sample 2	Sample 3	Sample 4	Sample 8	Sample 6	Sample 1	Sample 7	Sample 9
	Grid Reference	GKY403357 GKX137337	GKY401388 GKX136144	GKY385922 GKX131593	GKY395092 GKX119391	GKY406651 GKX138833	GKY403655 GKX137115	GKY403373 GKX137307	GKY403698 GKX137027
Species	**Authority**								
Stenus sp	Na				•				
Tachyporus sp.	Na	•							
Thinodromus arcuatus	(Stephens, 1834)				•				
unknown Aleocharinae 1	Na						•		
unknown Aleocharinae 2	Na	•							
unknown Aleocharinae 3	Na								•
Total number of Species		**16**	**10**	**15**	**23**	**9**	**11**	**4**	**8**