ECO-FAUNISTIC STUDY ON THE INVERTEBRATE FAUNA (*ARANEAE*, *COLLEMBOLA* AND *COLEOPTERA*) FROM THE VÂRGHIŞ GORGE NATURAL RESERVE (EASTERN CARPATHIANS, ROMANIA), WITH SPECIAL NOTE ON THE MICRO-REFUGIAL ROLE OF THE SUBTERRANEAN HABITATS

EUGEN NITZU, AUGUSTIN NAE, IONUŢ POPA

We dedicate this work to Istvan Denes, the passionate custodian of the Vârghş Gorge Natural Reserve, passed away in the year 2005

Résumé. Les auteurs présentent les résultats des recherches effectuées sur la faune de araneae, collembolesés et coléoptères édaphiques et souterrains de la région karstique de Vârghiş (Carpates Orientales, Roumanie). Ces résultats sont concrétisés dans l'identification de 37 espèces des araneae, 27 de collemboles et 82 de coléoptères (récoltés du sol, milieu ripique, souterrain superficiel et cavernes) parmi lesquels, 3 sont pour la première fois signalés en Roumanie. À la liste de la faune on ajoute des données concernant la chorologie et les biotopes dans lesquels ont été signalées les espèces.

1. INTRODUCTION

The caves from the Vârghiş Gorge have been known and studied since the 18th century, but the first monographic study of this karstic complex was carried out by T. ORGHIDAN and M. DUMITRESCU (1963). The invertebrate fauna inventoried by them includes 104 species collected from caves, among which, only 2 Collembola, 7 Coleoptera and 15 Araneae (Fig. 1), the authors giving, as themselves mentioned, a first incomplete list of species. M. GRUIA (2003), based on the material collected by us, cited 18 species of Collembola from the caves of this area, and FUHN & BURLACU (1971) cited other two edaphicolous species of Lycosidae (Araneae).

Taking into consideration that the Vârghiş Gorge is an important natural reserve (2970 Ha) in the Perşani Mountains, and the invertebrate fauna of this protected area is insuficiently known, in the years 2002 and 2004 we proceeded to a complex study

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of the soil and subterranean fauna. Our purpose was, first to all, to have a better evaluation of the soil and subterranean fauna in this area. This integrate study on the invertebrate fauna in different types of habitats (soil, riparian, mesovoid shallow substratum, caves) is the first step to a better understanding of the ecological inter-relation between habitats and the micro-refugial role of the karst in the preservation of soil and subterranean fauna.

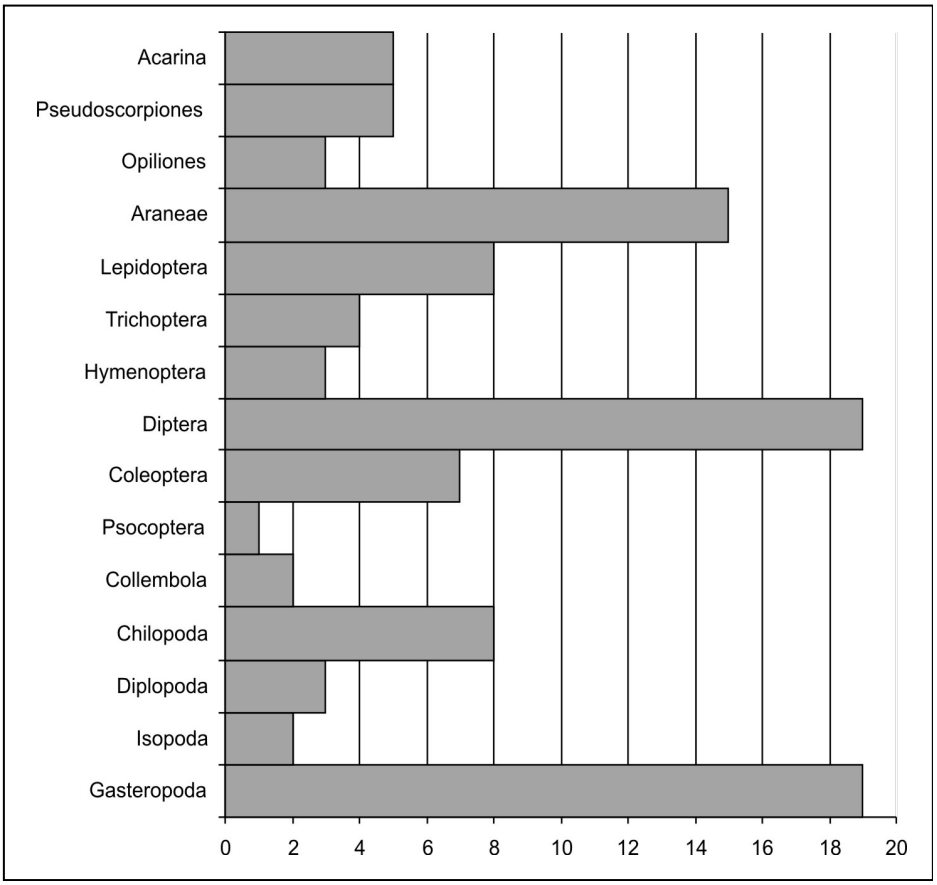

Fig. 1. – Graphical representation of invertebrate fauna recorded in caves from the Vârghiş Gorge by Orghidan & Dumitrescu (1963).

2. MATERIAL AND METHODS

In the years 2002 and 2004 we carried on three field investigations in the vernal (May 2002), estival (July 2004) and autumnal (Sepember 2004) seasons in the Vârghis Gorge Natural Reserve (the Eastern Carpathians) (Fig. 2).

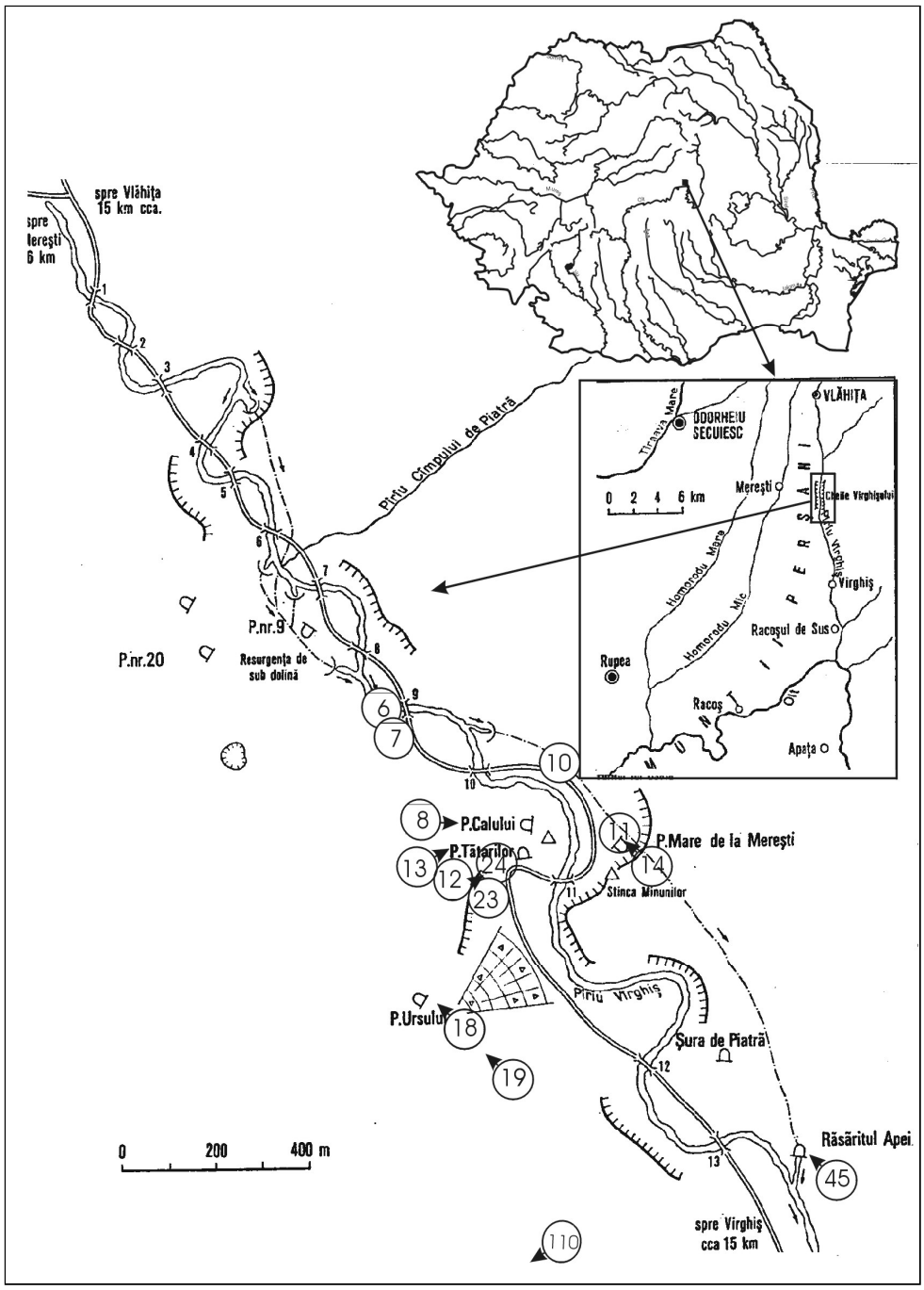

Fig. 2. – Schematic representation of the Vârghiş Gorge (the numbers in circles represent the catalogue number of the investigated caves) (after Bleahu et coll. 1976, modified).

For sampling the invertebrate fauna we used direct catching metods (tweezers, exhaustor), Barber traps, Winkler and Tülgren extraction methods. The light trapping method was used only in July.

For the mesovoid shallow substratum (M.S.S.) (also named subterranean superficial environment) the catching recipients with attractant were placed in holes between 15 and 30 cm in depth, and then covered with stones (Fig. 3).

The Barber traps were periodicaly verified at three day intervals.

The temperature and relative humidity values were recorded for each investigated habitat (riparian, soil, MSS and Caves).

Fig. 3. – Placement (30 cm depth) of the collecting tubes (Tr.) in the mesovoid shallow substratum (M.S.S.) covered by a thick layer of vegetable debris.

3. DISCUSSIONS

In the years 2002 and 2004 we sampled invertebrate fauna from the litter, vegetable debris under fallen blocks of limestone, riparian debris, mesovoid shallow substratum and 17 caves (Fig. 4A-E). For the caves, the particular recorded values of relative humidity (RH) and temperature (T) are given in Table 1. The variation of (RH) and (T) values in each sampling period for the rest of the investigated habitats is represented in Fig. 5. It could be observed that in the vernal and aestival seasons, significant variations in temperature between morning (T-1) and middle day (T-2) were recorded for soil and riparian debris, while under the fallen blocks of limestone and inside the MSS, both diurnal and seasonal variations were very low. In September the diurnal variations of temperature were low for all the investigated habitats.

Table 1

Values of the temperature and relative humidity recorded in caves

Cave	t^0C	RH %	Date
1200/12	7.6	65.1	18.V.2002
1200/13	18.2	60	14.V.2002
1200/11	6.8	84.5	18.VII.2004 at 16.5 m in depth
1200/19	4 9.3	81.2 73.3	18.VII.2004 16.V.2002
1200/10	7.8	84	19.VII.2004 h 11^{55}
1200/45	10.14 12.56	82.3 95.3	27:IX.2004 Tensional fracture
"P. Biospeologilor"	6.1 (6.5 m depth)	86.6 (6.5 m depth)	16.V.2002
1200/18 (P. Ursilor)	8.7	77.3	16.V.2002

An interesting micro-climatic aspect was revealed by the MSS which, in all periods, maintains very low temperatures (in May, while at the soil level the value of the temperature rises to 20°C, at only 30 cm depth, under a thick layer of vegetable debris (Fig. 3), the temperature rose up from 0.4 (T-1) to 1°C (T-2). This particular microclimate from the MSS is highly preferred by some cryophilous, umbraticolous species.

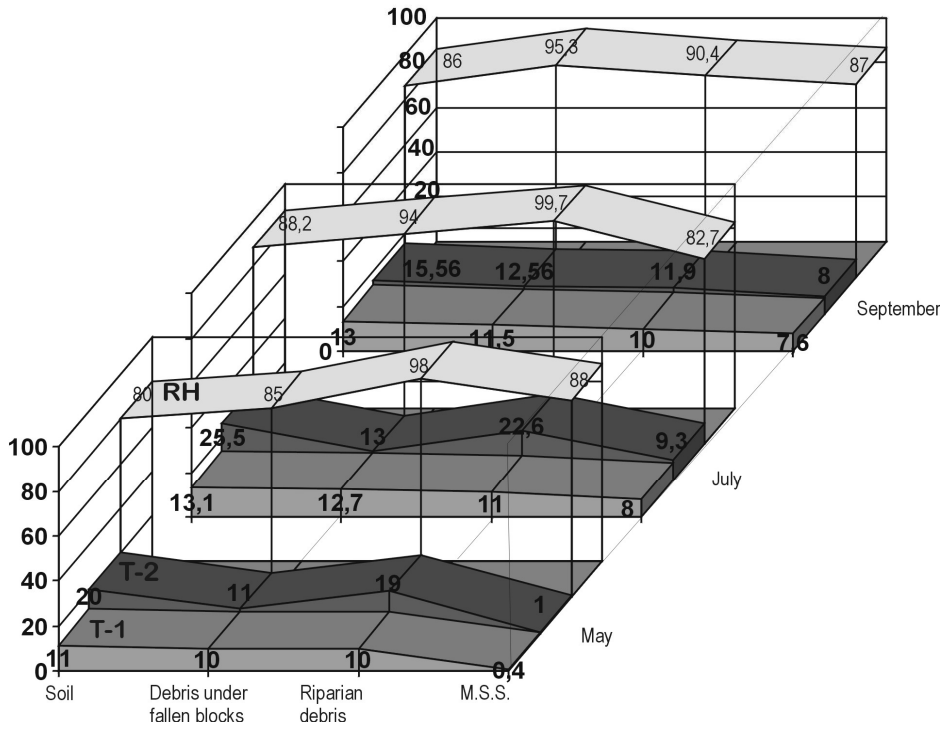

Fig. 5. – Diagram of the temperature and relative humidity variations in soil, debris under limestone blocks, riparian habitat and M.S.S. T-1 recorded values of temperature (Celsius degrees) in the morning; T-2 recorded values of temperature in middday, RH – relative humidity (%).

For these investigated habitats we identified 37 species of Araneae (11 families), 27 species of Collembola (belonging to 3 orders and 8 families), and 83 species of Coleoptera (11 families). The occurrences of species in each habitat, with references as to their geographic distribution, are given in Tables 2, 3 and 4.

T. ORGHIDAN and M. DUMITRESCU (1963) have cited *Centromerus drescoi* Denis 1952 for the cave fauna of the Vârghiş Gorge. M. DUMITRESCU and M. GEORGESCU (1980) refer to *C. jacksoni* Denis 1952 as synonym of *C. drescoi.* According to Platnick (2006) the valid name is *C. cavernarum* (syn. *C. jacksoni, C. drescoi*).

3.1. FAUNAL ANALYSIS

3.1.1. Habitat preferences

All recorded species are known as **edaphobiont** species. The number of species per habitat is presented in Fig 6. Among these, 7 species of Araneae (*Centromerus cavernarum, Diplocephalus cristatus, Micrargus herbigradus, Nesticus cellulanus Meta menardi, Metellina merianae, Cicurina cicur*), 9 species of Collembola (*Onychiuroides subgranulosus, Protaphorura armata, P. fimata, P. quadriocellata, Pogonognathellus flavescens, Plutomurus carpaticus, Heteromurus nitidus paucidentata, Lepidocyrtus serbicus, Arrhopalites pygmaeus*), 1 Coleoptera (*Quedius* mesomelinus) are **troglophile**, and other three coleoptera (*Abax parallelus, A. parallelepipedus, Catops tristis*) are **subtroglophile**. As could be observed in Fig. 6, for Araneae and Coleoptera, the greatest number of species occurred in the edaphic (soil) followed by riparian habitat, only few species being observed in MSS. On the contrary, for Collembola, the greatest number of species occurred in MSS.

3.1.2. Trophic categories

All species of Collembola are detritivorous and the species of Araneae are predacious. As concerns the species of Coleoptera, 57 of them are zoophagous (most of them Carabidae and Staphylinidae), 6 species are mixophagous, 2 fungivorous, 10 detritivorous, 1 sapro-xylophagous and 2 phytophagous (Table 4). Their repartition on the investigated habitats is given in Fig. 7. Beside 12 zoophagous species, in the subterranean environment all detritivorous and necrophagous species of Leiodidae (Catopinae) were found and also the large coprophagous *Geotrupes stercorosus* frequently observed in caves (used as shelters) in different karstic areas.

The dominant species in the caves is *Meta menardi* (Tetragatidae, Araneae) and its pray *Armadilidium versicolor quinqueseriatum* (Isopoda). Among the Coleoptera, all the species of detritivorous Catopinae were found preponderantly in the subterranean environments.

3.1.3. Zoogeographic structure

Most of the identified species have Palaearctic or European distributions (Tables 2, 3, 4). The number of endemic species occurred in the area is relatively small (1 Collembola and 5 Coleoptera Carpathian endemites). *Duvalius trannsylvanicus* Csiki, 1902, an endemic troglophile species for the Eastern Carpathians, cited by CSIKI (1946), JEANNEL (1928) for Vârghiş and ORGHIDAN & DUMITRESCU (1963) for Cave 1200/23 was not found again.

The springtail *Arrhopalites principalis* is a very rare species known up to now only for two caves from the Banat mountains (Peştera cu apă din Cheile Gârliştei and Peştera de după cârşă).

4. CONCLUSIONS

As a result of our study on the soil and subterranean fauna from the Vârghiş Gorge, 145 species were identified (37 Araneae, 27 Collembola and 83 Coleoptera). Among these, 2 species of Araneae (*Helophora insignis* and *Tmeticus affinis*) and 1 species of Coleoptera (*Catops subfuscus*), are for the first time recorded in the Romanian fauna, and the springtail *Arrhopalites principalis* is for the first time recorded in the Eastern Carpathians. In the mesovoid shallow substratum (M.S.S.) (also named subterranean superficial environment), unstudied up to now in the area, we identified 34 soil species (5 Araneae, 15 Collebola and 14 Coleoptera). Comparing the occurrence of the species in the investigated habitats, the springtails (detritivorous) are the best represented in M.S.S. and little in the riparian habitat. On the contrary, the predacious species of Coleoptera and Araneae are poorly represented in M.S.S. but very well in soil and riparian habitat. The very low temperature preserved in the M.S.S. during the vernal and estival seasons, create good microclimatic conditions for some cryophilic soil species as *Choleva nivalis*. For the analyzed systematic groups (Cls. Collembola, Ord. Araneae and Ord. Coleoptera) our study enlarged the number of species recorded from the caves to 56 (13 Araneae, 26 Collembola and 27 Coleoptera), emphasizing the micro-refugial role of subterranean environments in preserving numerous soil species preponderantly belonging to the zoophagous and decomposers trophic categories.

ACKNOWLEDGEMENTS. The researches were carried out with the financial support of a CEEX Natforman Grant.

Table 2

The occurrence of Araneae in the investigated habitats, with reference to their geographical distribution (Det. Nae A.)

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Distribution
Fam. Segestriidae						
Segestria senoculata (Linnaeus, 1758)					1200/13	Palearctic
Fam. Nesticidae						
Nesticus cellulanus (Clerk, 1757)					1200/45; 1200/19	Holarctic
Fam. Teridiidae						
Steatoda phalerata (Panzer, 1801)					1200/24	Palearctic
Fam. Linyphiidae						
Centromerita bicolor (Blackwall, 1833)		+				Palearctic
Centromerus arcanus (O.P.-Cambridge, 1873)		+	+			Palearctic
Centromerus cavernarum (L. Koch, 1872)	+	+				European
Centromerus sellarius (Simon, 1884)		+				European
Centromerus silvicola (Kulczynski, 1887)		+				East European
Diplocephalus cristatus (Blackwall, 1833)	+					Holarctic, New Zeeland, Falkland Is.
Diplocephalus latifrons (O.P.-Cambridge, 1863)	+		+			European
Gonatium rubellum (Blackwall, 1841)		+				Palearctic
Helophora insignis (Blackwall,1841)	+					Holarctic
Leptyphantes crucifer (Menge, 1867)	+				1200/24; 1200/12	Palearctic
Leptyphantes minutus (Blackwall,					1200/118	Holarctic

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Distribution
1833)						
Macrargus rufus (Wider, 1834)	+	+				Palearctic
Meioneta rurestris (C.L. Koch, 1836)	+					Palearctic
Micrargus herbigradus (Blackwall, 1854)			+			Palearctic
Microneta viaria (Blackwall, 1841)		+				Holarctic
Oedotorax apicatus (Blackwall, 1850)	+					Palearctic
Tenuiphantes alacris (Blackwall, 1853)			+		1200/24	Palearctic
Tenuiphantes tenebricola (Wider, 1834)		+			1200/24	Palearctic
Tmeticus affinis (Blackwall, 1855)	+	+				Palearctic
Fam. Tetragnatidae						
Meta menardi (Latreille, 1804)					1200/8, 10,12, 14,118,19, 110;	Palearctic
Metellina merianae (Scopoli, 1763)					1200/45	European
Metellina segmentata (Clerck, 1757)	+	+		+		Palearctic, introduced in Canada
Fam. Lycosidae						
Alopecosa pulverulenta (Clerck, 1757)					1200/12	Palearctic
Pardosa riparia (C.L. Koch, 1833)	+					Palearctic
Pirata knorri (Scopoli, 1763)	+					Palearctic
Fam. Agelenidae						
Histopona torpida (C.L. Koch, 1834)	+	+				European

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Distribution
Tegenaria silvestris L. Koch, 1872					1200/13; 1200/118	European
Fam. Hahniidae						
Cryphoeca silvicola (C.L. Koch,1834)		+				Palearctic
Fam. Dictynidae						
Cicurina cicur (Fabricius, 1793)		+				W-Palearctic
Mastigusa macrophthalma (Kulczynski 1897)		+				Central –East European
Fram. Amaurobiidae						
Amaurobius fenestralis (Stroem, 1768)					1200/13	W-Palearctic
Callobius claustrarius (Hahn, 1833)	+					Palearctic
Coelotes inermis (L. Koch, 1855)		+				European
Fam. Salticidae						
Heliophanus flavipes (Hahn,k 1832)					1200/13	Palearctic

Table 3

The occurrence of Collembola in the investigated habitats, with reference to the geographical distribution (Det. Popa, I.)

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Distribution
Ord. Poduromorpha **Fam. Neanuridae**						
Pseudachorutes dubius (Krausbaueri, 1838)	+	+			1200/45	Europe
Deutonura (Lathriopyga) conjuncta (Stach, 1929)		+				Europe
Morulina verrucosa (Borner, 1903)		+		+		Europe
Fam. Hypogastruridae						
Hypogastrura burkilli (Bagnall, 1940)				+	1200/10	Europe
Fam. Onychiuridae						
Onychiuroides subgranulosus (Gama, 1964)		+	+	+	1200/45 1200/23	Europe, Mediterranean zone
Protaphorura armata (Tullb., 1869)		+	+		1200/8	Cosmopolitan
Protaphorura fimata (Gisin, 1952)					1200/14	Europe
Protaphorura quadriocellata (Gisin, 1947)			+		1200/24	Europe
Orthonychiurus rectopapillatus (Stach, 1933)			+			Central – East Europe, Central – West Asia
Tetrodontophora bielanensis (Waga, 1842)		+	+	+		Central – East Europe
Ord. Entomobryomorpha						

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Distribution
Fam. Tomoceridae						
Tomocerus vulgaris (Tullb., 1871)	+					Cosmopolitan
Pogonognathellus flavescens (Tullb., 1871)	+	+	+	+	1200/10,12 19, 45	Cosmopolitan
Plutomurus carpaticus Rusek and Weiner, 1978					1200/14 1200/10	Central – East Europe
Fam. *Isotomidae*						
Folsomia quadrioculata (Tullb., 1871)				+	1200/45	Cosmopolitan
Desoria olivacea (Tullb., 1871)	+					Europe, Mediterranean zone
Isotomurus palustris (Muller, 1776)	+					Cosmopolitan
Fam. Entomobryidae						
Orchesella carpatica Ionesco, 1915				+	1200/45	Carphatians
Orchesella pontica Ionesco, 1915	+	+	+	+	1200/45	East Europe
Orchesella multifasciata (Tullb., 1871)		+				Europe
Heteromurus nitidus paucidentata Stach, 1930					1200/45	Cosmopolitan
Entomobrya multifasciata (Tullb., 1871)					1200/13	Cosmopolitan
Lepidocyrtus serbicus Denis, 1952		+		+	1200/45 1200/10	East Europe, Mediterranean zone
Lepidocyrtus paradoxus (Uzel, 1890)					1200/13	Europe
Pseudosinella sandelsorum Gruia,			+			Romania

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Distribution
1977						Carphatians
Ord. Symphypleona						
Fam. Arrhopalitidae						
Arrhopalites pygmaeus (Wankel, 1960)				+	1200/45 1200/8	Cosmopolitan
Arrhopalites principalis Stach, 1945				+		Europe, North America
Caprainea (Sminthurus) marginata Schott, 1893		+				Europe

Table 4

The occurrence of Coleoptera in the investigated habitats, with reference to the trophic groups and geographical distribution: c–coprophagous, d–detritivorous, ph–phytophagous, mx–mixophagous, n–necrophagous, s-x–saproxylophagous, z–zoophagous. Carp–Carpathians, Eu–Europe, Sib.–Siberia, Pal–Palaearctis, Med–Mediterranean, Ca–Caucasian reg., Tur–Turanian reg., Hol–Holarctic reg. (Det. Nitzu, E.)

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Trophic group	Distribution
Fam. Carabidae							
Carabus obsoletus carpathicus Palliardi, 1825		+				z	Carp. RO
Carabus granulatus granulatus Linnaeus, 1758		+			1200/12	z	Eu.
Carabus glabratus Paykull, 1790		+				z	Eu-Sib.
Carabus convexus Fabricius, 1755	+					z	W.-pal.
Carabus marginalis Fabricius, 1794		+				z	Eu-sib.
Carabus variolosus Fabricius, 1787	+					z	C-E.Eu.
Carabus auronitens escheri Palliardi, 1825		+				z	C-E.Eu.
Notiophilus biguttatus (Fabricius, 1779)		+			1200/12	z	W-pal.
Nebria rufescens (Stroem, 1768)	+	+				z	Pal.
Clivina fossor (Linnaeus, 1758)	+					z	Pal.
Dyschirius agnatus Motschulsky, 1844)	+					z	Pal.
Dyschirius digitatus (Dejean, 1825)	+					z	Eu.
Broscus cephalotes Linnaeus, 1758	+					z	W-pal.
Trechus obtusus Erichson, 1837	+					z	Eu-Med.
Bembidion (Metallina) lampros (Herbst, 1784)	+	+				z	Pal.
Bembidion (Synechostictus) millerianum	+					z	Eu.

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Trophic group	Distribution
Heyden, 1833							
Bembidion (Synechostictus) stomoides Dejean, 1831	+					z	Eu.
Bembidion (Pseudolimnaeum) doderoi Ganglbauer, 1892	+					z	Eu.
Bembidion (Bembidionetolitzkya) geniculatum Heer, 1837	+	+				z	Eu.
Bembidion (Bembidionetolitzkya) tibiale (Duftschmid, 1812)	+					z	Eu-Ca.
Bembidion (bembidionetolitzkya) varicolor (Fabricius , 1801)	+					z	Eu-Ca.
Bembidion (Peryphus) tetracolum Say, 1823	+					z	W-pal.
Bembidion (Trepanes) articulatum (Panzer, 1796)	+				1200/24	z	Pal.
Bembidion (Trepanes) octomaculatum (Goeze, 1777)	+					z	Pal.
Bembidion (s.str.) quadrimaculatum (Linnaeus, 1761)	+					z	Hol.
Asaphidion falvipes (Linnaeus, 1761)	+					z	Pal.
Tachyura diabrachys (Kolenati, 1845)	+					z	W-Pal.
Paratachys bistriatus (Duftschmid, 1812)			+			z	W-Pal.
Poecilus cupreus (Linnaeus, 1758)	+					z	Pal.
Pterostichus (Ferodinius) melas (Creutzer, 1799)		+				z	Eu-Ca.

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Trophic group	Distribution
Pterostichus (Pseudomaseus) nigrita (Paykull, 1790)	+	+				z	Pal.
Pterostichus (Phonias) strenuus (Panzer, 1796)	+					z	Eu-Sib.
Molops piceus orthogonius Chaudoir, 1868		+		+		z	RO
Abax parallelus (Duftschmid, 1812)		+			1200/7; 1200/12	z	Eu.
Abax parallelepipedus Piller et Mittelpacher, 1783		+			1200/7; 1200/13	z	Eu.
Limnodromus assimilis (Paykull, 1790)		+				z	Pal.
Paranchus albipes (Fabricius, 1796)	+					z	Eu+Med.
Acupalpus flavicollis (Sturm, 1825)		+	+			z	W.Sib.-Eu.
Acupalpus meridianus (Linnaeus, 1767)	+					z	W.Sib.-Eu.
Harpalus sulphuripes Germar, 1824		+				mx	Eu.
Chlaenius (Chlaeniellus) nitidulus Schrank, 1781		+			1200/7	z	Eu-Med.
Philorizus notatus (Stephens, 1827)		+		+		z	Eu-W.As
Fam. Staphylinidae							
Stenus (Parastenus) geniculatus Gravenhorst, 1806		+				z	Eu-Ca.
Habrocerus capillaricornis (Gravenhorst, 1806)		+				mx	Tur-Eu-Med
Paederidus ruficollis Fabricius, 1777	+					z	Eu
Lathrobium brunnipes (Fabricius, 1793)	+					z	Tur-Eu.

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Trophic group	Distribution
Medon brunneus (Erichson, 1839)		+		+		z	Eu-Ca.
Tasgius winkleri (Bernhauer, 1906)		+			1200/12	z	Eu
Quedius (Raphirus) humeralis (Stephens, 1832)		+				z	Eu-Ca
Quedius (Microsaurus) mesomelinus Marsham, 1802					1200/10 1200/14	z	Eu.
Othius punctulatus (Goeze, 1777)			+			z	W-Pal
Othius melanocephalus (Gravenhorst, 1806)		+				z	Eu-Ca
Mycetophorus bimaculatus Lacordaire, 1835		+			1200/13	f	Eu-Ca
Proteinus crenulatus Pandellé, 1867			+ (-50 cm)			f	Eu-Ca
Anthophagus (Phaganthus) caraboides (Linnaeus, 1758)			+ (-50 cm)			z	Eu
Geostiba circellaris (Gravenhorst, 1806)		+	+		1200/24	z	Eu-Ca.
Atheta (s.str.) incognita (Sharp, 1869)		+	+		1200/24	z	Eu+Med.
Dinaraea arcana (Erichson, 1839)		+			1200/10	mx	Eu-Sib.
Haploglossa gentiles (Märkel, 1845)		+			1200/14	mx	Eu.
Dexiogya forticornis A. Strand, 1939		+		+		z	Eu.
Leptusa (Pachygluta) ruficollis (Erichson, 1839)		+	+			mx	Eu-Ca
Anotylus sculpturatus Gravenhorst, 1806		+			1200/14	d	Pal.
(Pselaphinae) Bryaxis glabricollis Reichenbach, 1816		+			1200/12	z	Eu.

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Trophic group	Distribution
Bryaxis ruthenus (Saulcy, 1877)					1200/10	z	Carp.
Bryaxis reitteri (Saulcy, 1875)		+				z	E.Eu.
Fam. Silphidae							
Silpha carinata Herbst, 1783		+			1200/8	n	Eu
Fam. Leiodidae (Cholevinae)							
Choleva nivalis (Kraatz, 1856)			+			d	C-.E. Eu.
Apocatops nigrita Erichson, 1837					1200/24	n (d)	Eu-Ca
Catops picipes (Fabricius, 1787)		+			1200/10	n (d)	Eu-med
Catops longulus Kellner, 1846			+	MCV	1200/45 1200/110	n (d)	Eu
Catops tristis (Panzer, 1794)		+			1200/8 1200/23 1200/45	n (d)	Eu-Ca
Catops fuscus (Panzer, 1794)					1200/13	n (d)	Eu-Ca
*Catops subfuscus Kellner, 1846					1200/10 1200/110	n (d)	C. Eu.
Fam. Scydmaenidae							
NEuaphes parallelus (Chaudoir, 1845)		+				z	C.Eu.
Fam. Anthicidae							
Notoxus monoceros (Linnaeus, 1758)		+				mx	W.-Pal.
Fam. Cryptophagidae							
Cryptophagus deubeli Ganglbauer, 1897			+	+	1200/12 1200/19	d (f)	Carp.
Cryptophagus scanicus Linnaeus, 1758)		+			1200/10	d (f)	Eu.
Fam. Throscidae							

Species	Riparian debris	Soil and vegetable debris under fallen limestone blocks	Covered MSS	Nude MSS	Caves	Trophic group	Distribution
Aulonothroscus brevicollis (Bonvouloir, 1859)		+				s-x	Eu-Ca
Fam. Geotrupidae							
Geotrupes stercorosus Scriba, 1791		+			1200/14 1200/10	c	Eu-Sib.
Fam. Scarabaeidae (Aphodiinae)							
Aphodius (Nialus) niger Panzer, 1797		+				c	W. Pal.
Fam. Chrysomelidae							
Hermaeophaga mercurialis Fabricius, 1792		+			1200/12 1200/14	ph	Eu-Med.
Timarcha rugulosa rugulosa Herrich-Schäffer, 1838		+				ph	Carp. RO

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"Emil Racoviţă" Speleological Institute
Calea 13 Septembrie nr. 13, Sect. 5
050711 Bucureşti
eunitu@yahoo.com