

HELMINTHOLOGICAL INVESTIGATIONS OF SMALL MAMMALS IN THE SĂLAJ COUNTY, ROMANIA

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ABSTRACT. Occurrence of 29 helminth species in 13 host species from the Sălaj County is recorded. Three trematodes (*Rubensitrema exasperatum*, *Brachylaima fulvum*, *Plagiorchis elegans*) as well as four cestodes (*Neoskrjabinolepis schaldybini*, *Staphylocystis furcate*, *Choanotaenia hepatica*, *Molluscotaenia crassiscolex*) are reported as new species to the Romanian fauna and 14 species proved to be new to the fauna of Transylvania. Prevalence and intensity of infection of small mammalian species by parasitic helminths remained beyond the expected level.

Keywords: Trematoda, Cestoda, Acanthocephala, Nematoda, parasites, small mammals

INTRODUCTION:

Several studies deal with the helminth fauna of rodents in Romania (*Chiriac & Barbu*, 1962, 1963; *Chiriac & Hamar*, 1966; *Popescu & Barbu*, 1971; *Popescu et al.*, 1974, *Mészáros & Murai* 1979; *Murai*, 1987; *Tkach & Swiderski*, 1997; *Callejón et al.*, 2010) Protoscolecids of *E. multilocularis* had also been found in wild rodents (*Arvicola terrestris*, *Microtus arvalis*, *Myodes glareolus*) in most of the regions of Transylvania (*Sikó Barabási*, 1993; *Sikó Barabási et al.*, 1995, 2010, 2011). Sălaj County, located in the northwest of Romania, has been, until recently, a helminthologically rather less investigated region of Transylvania. Within the framework of the research program "Invertebrate faunistic investigation of the Sălaj County" we have an opportunity to study the helminth fauna of small mammals in 2014 and 2015.

MATERIAL AND METHODS:

This study is based on the parasites of small mammals collected using wooden traps in different

parts of Sălaj County, Romania in 2014 and 2015. The list of localities is arranged according to *Gubányi* (2015) in the present volume and plotted on the map of Sălaj County (Fig. 1).

During the research period 287 small mammals were investigated from a parasitological point of view. The host individuals (altogether 131 infested specimens) belong to the following species: *Crocidura leucodon*, *C. suaveolens*, *Sorex araneus*, *S. minutus*, *Neomys anomalus*, *Apodemus agrarius*, *A. flavicollis*, *A. sylvaticus*, *A. uralensis*, *Microtus agrestis*, *M. arvalis*, *M. subterraneus*, *Myodes glareolus*. Trematodes and cestodes were fixed in Bouin's solution. Whole mount preparations were stained with iron-carmin after *Georgiev et al.* (1986) and/or haematoxiline for cestodes and trematodes. Rostellar hooks and eggs were prepared in Berlese solution. Nematodes were translutened in lactophenol solution. Prevalance and intensity of infections were calculated by Quantitative Parasitology (*Rozsa et al.*, 2000, *Reiczigel et al.*, 2013).

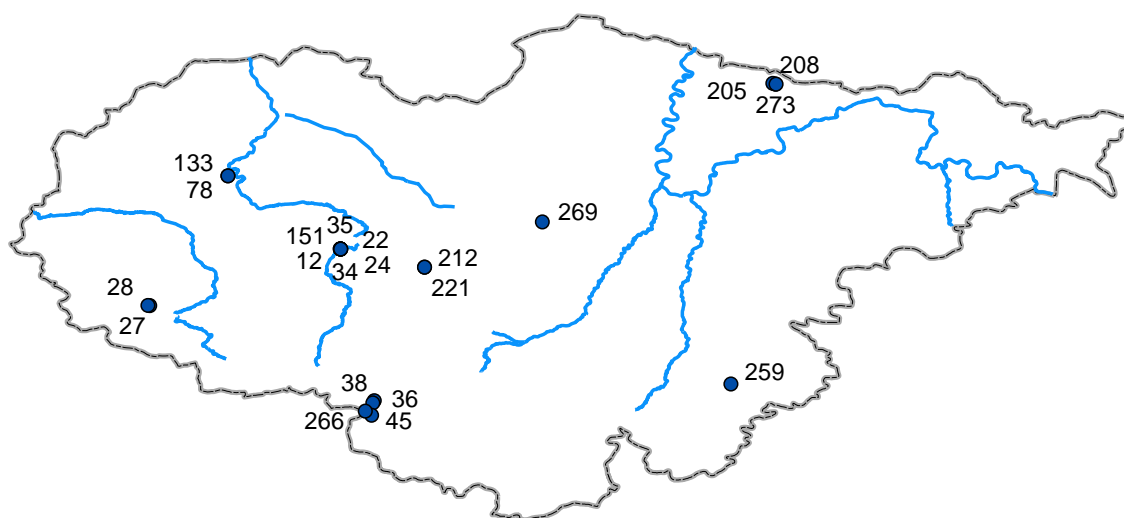


Fig. 1. Map of collecting sites of small mammals in Sălaj County. Numbers of localities is arranged according to *Gubányi* (2015): 12, 22, 24, 34, 35, 151 – Vârșoț (Varsolc); 27, 28 – Iaz (Krasznajáz); 36, 38, – Huta (Csákyújfalu); 78, 133 – Cehei (Somlyócsehi), Balta Cehei; 205, 208, 273 – Vălișoara (Dióspatak); 212, 221 – Aghireș (Egrespatak); 259 – Ugrutiu (Ugróc); 45, 266 – Poic, Satul Hurez; 269 - Zalău-Ortelec (Zilah-Vártelek).

RESULTS AND DISCUSSION:

Twenty-nine taxa have been found belong to 3 species of Digenea, 14 of Cestoda, 1 of Acanthocephala, and 11 of Nematoda. All of them are new to the area, 14 species new to the fauna of Transylvania and 7 new to Romania as well. The dominant endoparasite group in both rodents and

shrews were tapeworms, followed by nematodes. Prevalence, mean and median intensity of infection shows considerable differences among the infected hosts (Fig. 2). Prevalence of helminth species for small mammalian species was generally very low. Intensity of infection remained below the expected level, as well (cf. Tenora *et al.*, 1973, Murai 1974, Mészáros 1980).

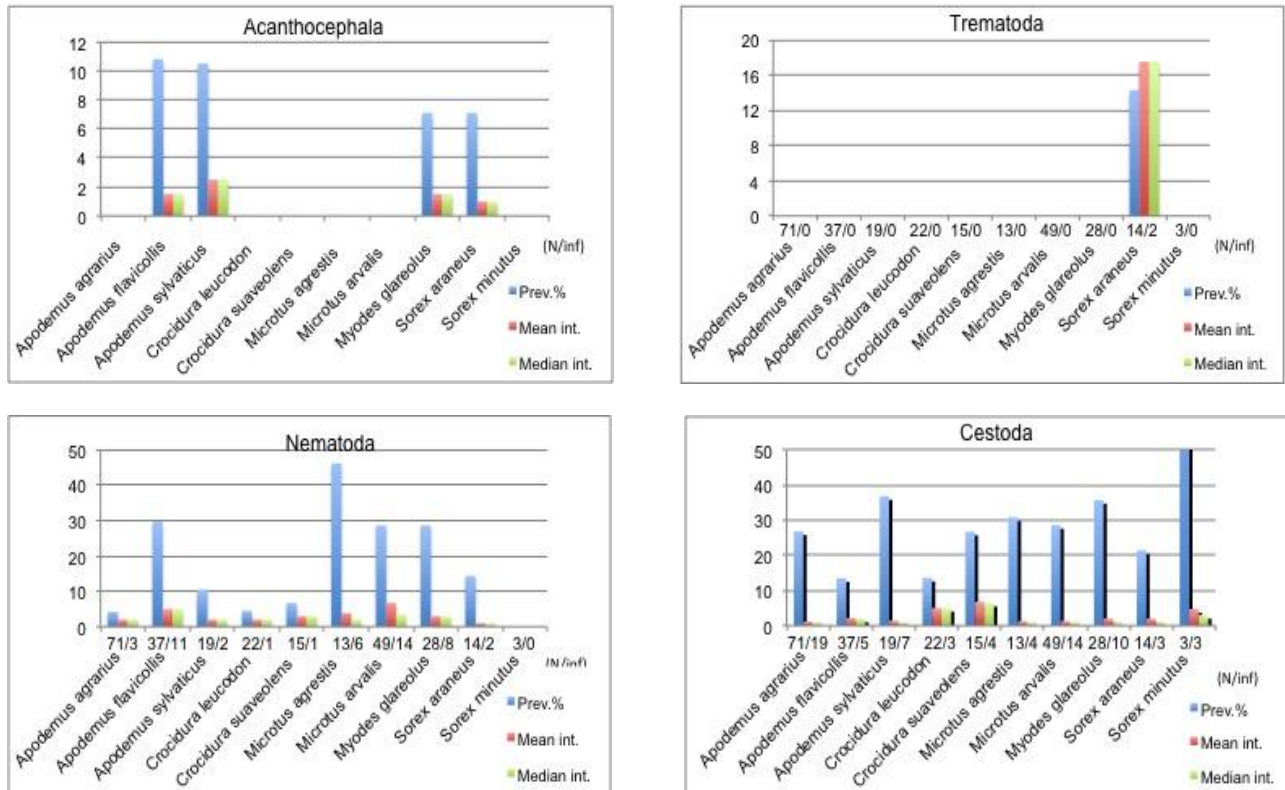


Fig. 2. Prevalence, mean intensity and median intensity of the parasite groups (Acanthocephala, Trematoda, Nematoda, Cestoda) by host species

The list of parasite-host relationship contains the name of helminth species, prevalence and intensity of infection followed by the host species, then the name of localities and geographical coordinates, number of host specimens, localization and total number of the parasites.

TREMATODA

PLAGIORCHIDA

OMPHALOMETRIDAE

Rubinstrema exasperatum (Rudolphi 1819) — prevalence (%): 0.3, mean intensity: 19, median intensity: 19.

Sorex araneus: Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 23.04.2014, gaster (19).

BRACHYLAEMIDA

BRACHYLAIMIDAE

Brachylaima fulvum Dujardin 1843 — prevalence (%): 0.3, mean intensity: 1, median intensity: 1

Sorex araneus: Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 23.04.2014, gaster (1).

PLAGIORCHIDA

PLAGIORCHIIDAE

Plagiorchis elegans Rudolphi 1802 — prevalence (%): 0.3, mean intensity: 15, median intensity: 15.

Sorex araneus: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11–14.08.2014, intestine (15).

CESTODA

CYCLOPHYLLIDEA

MESOCESTOIDAE

Mesocestodes sp. metacestodes in the intermediate host — prevalence (%): 0.3, mean intensity: 1, median intensity: 1.

Myodes glareolus: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), Mlaștina de la Iaz, N47.11065° E22.66125°, 19-19-21.05.2014, cav. abd. (9).

CATENOTAENIIDAE

Skrjabinotaenia lobata (Baer 1925) — prevalence (%): 1.4, mean intensity: 1.75, median intensity: 1.

Apodemus sylvaticus: Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 21.05.2014, intestine (1); Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), Mlaștina de la Iaz, N47.11065° E22.66125°, 19-19-21.05.2014, 3 ind., intestine (6).

HYMENOLEPIDIDAE

Hymenolepis diminuta (Rudolphi 1819) — prevalence (%): 6.6, mean intensity: 1.32, median intensity: 1.

Apodemus agrarius: Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), Mlaștina de la Iaz, N47.11065° E22.66125°, 19-21.05.2014, 3 ind., intestine (3); Depresiunea Silvaniei, Aghireș (Egrespatak), dry sward with loess wall and abandoned orchard, N47.15716° E22.99252°, 27-28.05:2015, intestine (1), 28-29.05:2015, 3 ind., intestine (4) ; Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, 3 ind., intestine (4), 27-30.04.2015, intestine (1) ; Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 23.04.2014, intestine (1), 21.05.2014, 2 ind., intestine (2), 28-30.04.2015, intestine (1); *Apodemus flavicollis*: Depresiunea Silvaniei, Aghireș (Egrespatak), dry sward with loess wall and abandoned orchard, N47.15716° E22.99252°, 27-28.05:2015, intestine (1) ; Culmea Prisnelului, Vălișoara (Dióspatak), stream valley, N47.375697° E23.412971°, 26-27.05.2015, intestine (1) ; Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 23.04.2014, intestine (1); *Myodes glareolus*: Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 28-30.04.2015, intestine (1).

Hymenolepis horrida (Linstow 1901) — prevalence (%): 1.4, mean intensity: 1.5, median intensity: 1.

Apodemus flavicollis: Depresiunea Silvaniei, Aghireș (Egrespatak), dry sward with loess wall and abandoned orchard, N47.15716° E22.99252°, 27-28.05:2015, intestine (1); *Myodes glareolus*: Munții Meseș, Huta (Csákyújfalu), beech forest, N46.99394° E22.92883°, 21-23.05.2014, 3 ind., intestine (5).

Hymenolepis sp. — prevalence (%): 1, mean intensity: 1, median intensity: 1.

Apodemus agrarius: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, intestine (1); *Apodemus sylvaticus*: Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 21.05.2014, 2 ind., intestine (2).

Hymenolepis uncinata Stieda 1862 — prevalence (%): 1.4, mean intensity: 7.5, median intensity: 8.

Crocidura leucodon: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 22.05.2014, intestine (10); *Crocidura suaveolens*: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, 3 ind., intestine (20).

Neoskrjabinolepis schaldybini Spassky 1947 — prevalence (%): 1, mean intensity: 6, median intensity: 7.

Crocidura suaveolens: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, intestine (7); *Sorex minutus*: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, intestine (11).

Rodentolepis asymmetrica (Janicki 1904) — prevalence (%): 1.7, mean intensity: 1, median intensity: 1.

Apodemus agrarius: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236° 11-14.08.2014, intestine (1); *Apodemus flavicollis*: Culmea Prisnelului, Vălișoara (Dióspatak), stream valley, N47.375697° E23.412971°, 26-27.05.2015, intestine (1); *Microtus arvalis*: Munții Meseș, Huta (Csákyújfalu), beech forest, N46.99394° E22.92883°, 21-23.05.2014, 3 ind., intestine (3).

Rodentolepis fraterna (Stiles, 1906) — prevalence (%): 0.3, mean intensity: 1, median intensity: 1.

Apodemus agrarius: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236° 11-14.08.2014, intestine (1).

Staphylocystis furcata (Stieda 1862) — prevalence (%): 0.3, mean intensity: 1, median intensity: 1.

Sorex minutus: Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 21.05.2014, intestine (1).

DILEPIDIDAE

Choanotaenia hepatica Baer 1932 — prevalence (%): 0.3, mean intensity: 1, median intensity: 1.

Sorex araneus: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 27-30.04.2015, intestine (1).

Molluscotaenia crassiscolex (Linstow 1890) — prevalence (%): 0.3, mean intensity: 7, median intensity: 7.

Sorex araneus: Munții Meseșului (Meszes-hegység), Poic, Satul Hurez, marshy meadow, N46.984257° E22.919834°: 08.09.2015, intestine (7).

ANOPLICEPHALIDAE

Paranoplocephala gracilis Tenora et Murai 1980 — prevalence (%): 0.3, mean intensity: 2, median intensity: 2.

Microtus agrestis: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, intestine (2).

Paranoplocephala macrocephala Douthitt 1915 — prevalence (%): 1.4, mean intensity: 1, median intensity: 1.

Myodes glareolus: Munții Meseș, Huta (Csákyújfalu), beech forest, N46.99394° E22.92883°,

21-23.05.2014, 2 ind., intestine (2); Munții Meseș, Huta (Csákyújfalu), wet meadow, N46.995438° E22.929872°, 21-23.05.2014, intestine (1); *Microtus agrestis*: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, intestine (1).

Paranoplocephala omphalodes (Hermann 1783) — prevalence (%): 4.5, mean intensity: 1.15, median intensity: 1.

Myodes glareolus: Munții Meseș, Huta (Csákyújfalu), beech forest, N46.99394° E22.92883°, 21-23.05.2014, intestine (1); *Microtus agrestis*: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, 2 ind., intestine (2); *Microtus arvalis*: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, crassum (2), 9 ind., intestine (10).

Paranoplocephala sp. — prevalence (%): 0.3, mean intensity: 2, median intensity: 2.

Microtus arvalis: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, intestine (2).

ARCHIACANTHOCEPHALA

MONILIFORMIDA

MONILIFORMIDAE

Moniliformis moniliformis (Bremser 1819) — prevalence (%): 3.1, mean intensity: 2.11, median intensity: 2.

Apodemus flavicollis: Munții Meseș, Huta (Csákyújfalu), beech forest, N46.99394° E22.92883°, 21-23.05.2014, intestine (2).

ADENOPHOREA

ENOPLIDA

TRICHURIDAE

Trichuris muris (Schrank 1788) — prevalence (%): 0.3, mean intensity: 1, median intensity: 1.

Microtus agrestis: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, intestine (1♀).

SECERNENTEA

ASCARIDIDA

SYPHACIIDAE

Syphacia nigeriana Baylis 1928 — prevalence (%): 1, mean intensity: 6.33, median intensity: 2.

Microtus agrestis: Dealurile Sălajului, Zalău-Ortelec (Zilah-Vártelek), oak forest on the top of the hill, semi-natural steppe, N47.21078° E23.132415°: 09.09.2015, cecum (16); *Microtus arvalis*: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, 2 ind., intestine (3♀).

Syphacia stroma (Linstow 1804) — prevalence (%): 1, mean intensity: 5.33, median intensity: 5.

Apodemus flavicollis: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11-14.08.2014, intestine (9♀); Munții

Meseș, Huta (Csákyújfalu), beech forest, N46.99394° E22.92883°, 21-23.05.2014, intestine (5♀); Dealurile Sălajului, Zalău-Ortelec (Zilah-Vártelek), oak forest on the top of the hill, semi-natural steppe, N47.21078° E23.132415°: 09.09.2015, intestine (2); *Apodemus sylvaticus*: Munții Meseș, Huta (Csákyújfalu), wet meadow, N46.995438° E22.929872°, 21-23.05.2014, intestine (8♀).

RICTULARIIDAE

Rictularia proni Seurat, 1915 — prevalence (%): 0.3, mean intensity: 1, median intensity: 1.

Apodemus agrarius: Dealurile Sălajului, Zalău-Ortelec (Zilah-Vártelek), oak forest on the top of the hill, semi-natural steppe, N47.21078° E23.132415°: 09.09.2015, intestine (1).

SPIRURIDA

SPIROCERCIDAE

Mastophorus muris (Gmelin, 1790) — prevalence (%): 0.7, mean intensity: 1.5, median intensity: 1.5.

Apodemus flavicollis: Dealurile Sălajului, Zalău-Ortelec (Zilah-Vártelek), oak forest on the top of the hill, semi-natural steppe, N47.21078° E23.132415°: 09.09.2015, 2 ind., gaster (3).

STRONGILIDA

HELIGMOSOMIDAE

Heligmosomoides glareoli Baylis 1928 — prevalence (%): 1, mean intensity: 2.67, median intensity: 2.

Myodes glareolus: Munții Meseș, Huta (Csákyújfalu), beech forest, N46.99394° E22.92883°, 21-23.05.2014, 3 ind., intestine (6♂, 2♀).

Heligmosomoides laevis (Dujardin 1845) — prevalence (%): 0.7, mean intensity: 14.5, median intensity: 14.5.

Microtus arvalis: Munții Meseș, Huta (Csákyújfalu), beech forest, N46.99394° E22.92883°, 21-23.05.2014, crassum (25); Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 21.05.2014, intestine (1♂, 3♀).

Heligmosomoides polygyrus (Dujardin 1845) — prevalence (%): 4.5, mean intensity: 3.69, median intensity: 3.

Apodemus agrarius: Munții Meseș, Huta (Csákyújfalu), wet meadow, N46.995438° E22.929872°, 21-23.05.2014, intestine (3♀); *Apodemus flavicollis*: Munții Meseș, Huta (Csákyújfalu), beech forest, N46.99394° E22.92883°, 21-23.05.2014, 7 ind., intestine (4♂, 3♀); Munții Meseș, Huta (Csákyújfalu), wet meadow, N46.995438° E22.929872°, 21-23.05.2014, 2 ind., intestine (1♂, 2♀); *Apodemus sylvaticus*: Depresiunea Silvaniei, Lacul de acumulare Vîrșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 21.05.2014, intestine (3♀); Munții Plopiș (Réz-hegység), Iaz (Krasznajáz), Mlaștina de la Iaz, N47.11065° E22.66125°, 19-21.05.2014, intestine (1).

Heligmosomum costellatum (Dujardin 1845) — prevalence (%): 5.6, mean intensity: 5.31, median intensity: 3.

Crocidura suaveolens: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11–14.08.2014, intestine (3♀); *Microtus agrestis*: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 11–14.08.2014, 2 ind., intestine (8♂, 5♀), crassum (5); *Microtus arvalis*: Lunca râului Crasna, Cehei (Somlyócsehi), Balta Cehei, reed beds, N47.268977° E22.754236°, 21–23.05.2014, intestine (3♀), 11–14.08.2014, crassum (4♂, 10♀), intestine (2♂, 3♀), intestine (20); Munții Meseș, Huta (Csákyújfalú), wet meadow, N46.995438° E22.929872°, 21–23.05.2014, crassum (13); Depresiunea Silvaniei, Lacul de acumulare Virșoț, Vârșoț (Varsolc), near reservoir, willows, reed bed, N47.17847° E22.88972°, 21.05.2014, intestine (1♀).

Heligmosomum mixtum Schulz 1954 — prevalence (%): 2.4, mean intensity: 3, median intensity: 3.

Myodes glareolus: Munții Meseș, Huta (Csákyújfalú), beech forest, N46.99394° E22.92883°, 21–23.05.2014, 4 ind., intestine (1♂, 12♀); Munții Meseș, Huta (Csákyújfalú), wet meadow, N46.995438° E22.929872°, 21–23.05.2014, intestine (1♂, 3♀), 2 ind. crassum (4♀).

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