

***Carinostoma elegans* new to the Slovakian harvestmen fauna (Opiliones, Dyspnoi, Nemastomatidae)**

Anna Šestáková & Ivan Mihál

doi: 10.5431/aramit4804

Abstract. A new genus and species of small harvestman was found for the first time in Slovakia – *Carinostoma elegans* (Sørensen, 1894). One male and two females were collected in the Mlyňany arboretum of the Slovak Academy of Science (western Slovakia). Descriptions and photographs of both sexes of *C. elegans* are provided. Additional comments, and a map of distribution of all species of this genus, are provided.

Keywords: arboretum, faunistics, harvestmen, new record, western Slovakia

Zusammenfassung. *Carinostoma elegans* neu für die Weberknechtfauna der Slowakei (Opiliones, Dyspnoi, Nemastomatidae). Eine neue Weberknechtgattung und –art wurde erstmals in der Slowakische Republik nachgewiesen – *Carinostoma elegans* (Sørensen, 1894). Ein Männchen und zwei Weibchen wurden im Mlyňany Arboretum der Slowakischen Akademie der Wissenschaften nachgewiesen. Beide Geschlechter sowie die Verbreitung der Art werden beschrieben und abgebildet.

Altogether five species in three genera from the family Nemastomatidae are known to occur in Slovakia. During a brief zoological investigation into the arachnid fauna in the arboretum Mlyňany of the Slovak Academy of Science three specimens of a harvestman so far not known as a member of the Slovakian opilionid fauna were found. The specimens were identified as *Carinostoma elegans* Sørensen, 1894. The genus *Carinostoma* Kratochvíl, 1958 comprises three closely related European species (Schönhofer 2013). They are small, black colored, short-legged with silver spots and dorsal ornamentation forming rows of bridgethorns. Males have a bifid and spined penial glans and chelicera with a single excretion porus (Schönhofer & Martens 2012). The authorship of *Carinostoma elegans* is officially assigned to William Emil Sørensen, but the species was published thanks to Adolf Lendl. Sørensen was very busy that time, so Lendl asked him for permission to publish his descriptions (Lendl 1894). The presence of this species was expected in Slovakia due to its occurrence close to the border with Hungary and Ukraine (e.g. Kratochvíl 1935, Šilhavý 1956, Martens 1978, Stašiov 2004, Mihál et al. 2009). With this new record of *Carinostoma elegans* the number of the harvestmen species known from Slovakia reaches 35

and the number of genera increases to 25 (Bezděčka & Bezděčková 2011, Mihál & Astaloš 2011). As the species is new to the Slovakian harvestmen fauna, we provide a description of its morphology and compare its distribution to other species of the genus.

Methods

Specimens were extracted from samples using Berlese funnels and by individual collection. Microphotographs were made using EOS Utility software and a digital camera (Canon EOS 1100D) connected to a Zeiss Stemi 2000-C. Microslides of the ovipositor and penis were photographed using a Leica ICC50 camera connected to a Leica DM1000 using LAS EZ 1.8.0 software. Digital images were combined and edited using Photoshop CS6. Description of the species is based on mature specimens obtained in Slovakia. Material is deposited in 70% ethanol and as permanent microscope slides in Swann's medium in the collection of the Western Slovakia Museum in Trnava.

Results and Discussion

Nemastomatidae Simon 1872

***Carinostoma* Kratochvíl, 1958**

***Carinostoma elegans* (Sørensen, 1894)**

Taxonomy references

Nemastoma elegans Sørensen 1894: in Lendl 1894: 29-30, pl. 1, fig. 3 (♀); Roewer 1914: 164-165, fig. 32; Roewer 1919: 155-156; Roewer 1923: 671, fig. 836; Šilhavý 1939: 110, fig. 10 (♀); Cîrdei 1958: 1-2, fig. 1.

Anna ŠESTÁKOVÁ, The Western Slovakia museum, Múzejné námestie 3, Trnava, SK-91809, Slovakia, e-mail: asezakova@gmail.com
Ivan MIHÁL, Institute of Forest Ecology, Slovak Academy of Sciences, Štúrova 2, Zvolen, SK-96053, Slovakia, e-mail: mihal@savzv.sk

submitted: 4.10.2014, accepted 11.12.2014, online 23.12.2014

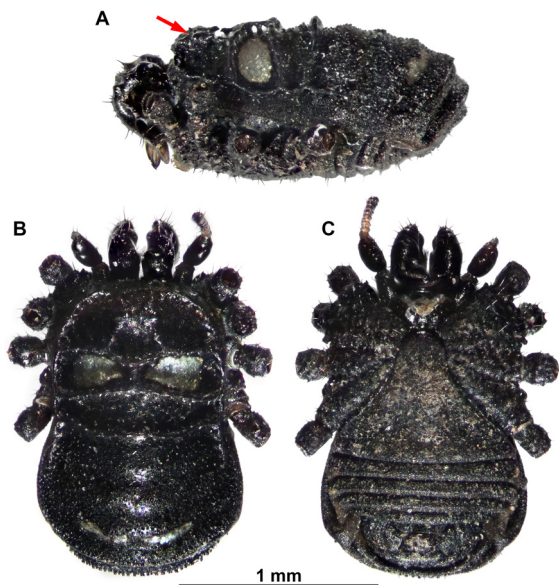


Fig. 1: Male habitus of *Carinostoma elegans*. A: lateral view, B: dorsal view, C: ventral view. Arrow points to eyes.

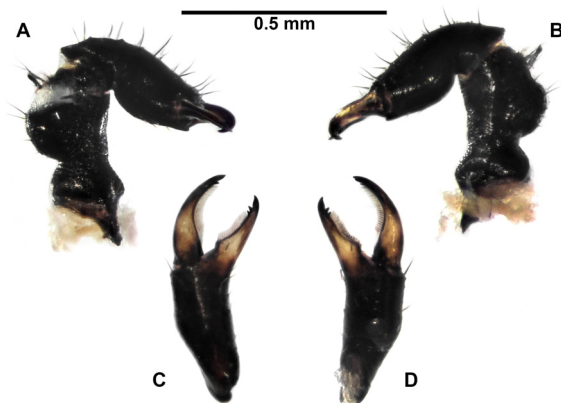


Fig. 2: Male left chelicera of *Carinostoma elegans*. A: prolateral view, B: retrolateral view, C: dorsal view, D: ventral view.

Nemastoma e. var. batorligetiense Szalay, 1951: in Szalay 1951: 307-309, figs 1-3 (♂♀).

Mitostoma e. (Sørensen 1894): in Šilhavý 1939: 110, fig. 10; Kratochvíl 1958: 572.

Carinostoma e. (Sørensen 1894): in Dumitrescu 1972: 73-74; Starega 1976: 54-56, fig. 42 (♂♀); Martens 1978: 137, figs 201-207 (♂); Karaman 1995: 36, fig. 8a; Băbălean 2001: 24, 26, figs a, b; Băbălean 2011: 47, figs 13-14.

Carinostoma e. batorligetiense (Szalay, 1951): in Loksa 1991: 685, fig. 2 (♂).

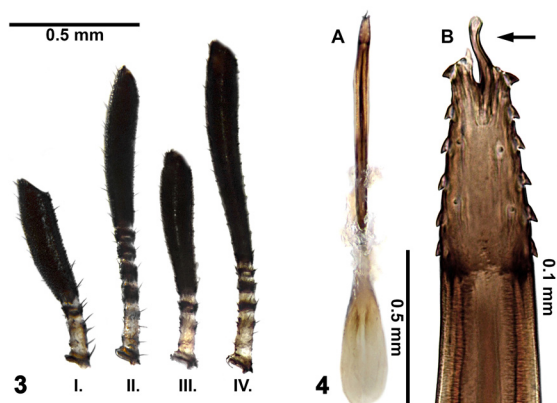


Fig. 3: Male femora with pseudoarticulation of *Carinostoma elegans*.

Fig. 4: Male penis of *Carinostoma elegans*. A: dorsal view, B: detail of penial glans, ventral view. Arrow points to stylus.

Misidentification and errors

Šilhavý (1966): fig. 19 (♂). Misidentification, the figure refers to *C. carinatum* (Roewer 1914). Schönhofer & Martens (2012): figs 5-6. Mixed up figures; figure 6 refers to *C. carinatum* and figure 5 to *C. elegans*.

Material examined

1 ♂, 1 ♀, extracted from bracket fungi and moss sample; 1 ♀, under old log: SLOVAKIA, the Mlyňany arboretum of Slovak Academy of Science, N48.32265° E18.36348°, 170 m a.s.l., 10 October 2013, leg. A. Šestáková, J. Christophoryová & K. Krajčovičová.

Diagnosis

Within *Carinostoma* only *C. elegans* has two transverse dorsal ridges with the upper one connected to the round post-ocular ridge; *C. carinatum* (Roewer, 1914) differs by an additional transverse ridge and *C. ornatum* (Hadži, 1940) lacks connection to the post-ocular ridge and dorsal spots; however, Karaman (1995) observed specimens, living in sympatry with *C. carinatum*, with dorsal spots as in *C. elegans*. Unlike *C. carinatum* and *C. ornatum*, males of *C. elegans* have a longer slender stylus of the penial glans (not thick and curved), and the excretion porus of the cheliceral apophysis is positioned within the cheliceral groove (not outside) (e.g. Hadži 1940, fig. 6g, Martens 1978, fig. 195, Rasputnig et al. 2014, fig. 2).

Characteristics of the Slovakian *Carinostoma elegans* sample

Body ovoid and black, ornamented with crests of bridgethorns; anteriorly with two large silver spots,

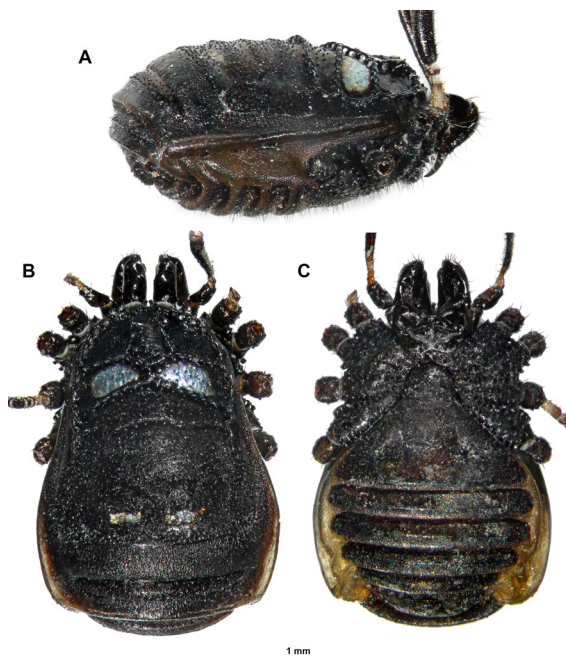


Fig. 5: Female habitus of *Carinostoma elegans*. A: lateral view, B: dorsal view, C: ventral view.



Fig. 6: Female left chelicera of *Carinostoma elegans*. A: prolateral view, B: retrolateral view, C: dorsal view, D: ventral view.

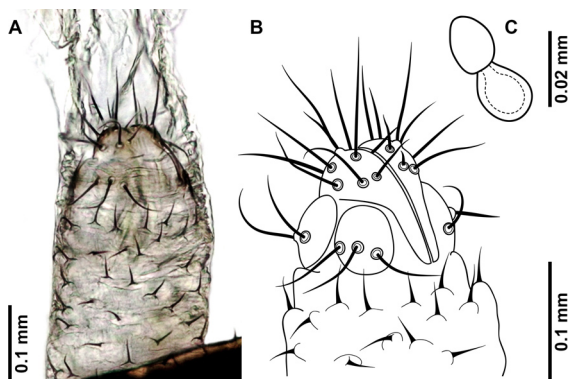


Fig. 7: Female ovipositor of *Carinostoma elegans*. A–B: ventral view, C: right receptaculum seminis.

posteriorly with two golden spots (Figs 1, 5). Legs relatively short; femora with typical pseudoarticulations as follows I=1-2, II=4, III=1-2, IV=3-4 (Fig. 3).

Male. Total length of body 1.5 mm. Basal segment of chelicerae has a small depression with excretion porus (Fig. 2). Penis as in Fig. 4; glans terminally bifid, slender stylus slightly curved, laterally on the margin covered with six pairs of short spines.

Female. Total length of body 1.8–2.0 mm. Chelicerae lack excretion porus on the basal segment (Fig. 6). Ovipositor with two terminal lobes and four subterminal ones; each of the subterminal ones with three spines (Fig. 7). A pair of subtle, two-segmented seminal receptacles (globular terminal segment and short tubular basal one) (Fig. 7C).

Comments

The number of posterior spots varies from one ellipsoid to two small ovals (var. *bartoligetiense*) (Băbălean 2011). Description of the variety *bartoligetiense* was based on eastern Hungarian specimens from locality of Bátorliget (Szalay 1951). Later it was categorized as a subspecies by Loksa (1991). Nowadays it is treated as a variety based on the recent taxonomic revision by Schönhofer (2013). Slovakian species represent var. *bartoligetiense*. Although one of Slovakian females has only one posterior spot, this is an abnormal absence of the left one. In addition no posterior spots were observed in one female from Romania by Cîrdei (1958).

Biological and ecological notes

The genus *Carinostoma* comprises edaphic thermophilous forest species found in the litter, under tree remnants, stones or in deep humus soil (Avram & Dumitrescu 1969, Băbălean & Ilie 2003, Mitov & Stoyanov 2004, Mitov 2008). Although, caves are not a typical habitat for this genus; several females of *C. elegans* were recorded near their entrances (Avram & Dumitrescu 1969, Ilie 2002). All species occur in forests, preferring higher altitudes in the southern populations (Schönhofer 2014).

Carinostoma adults seem to be most active around October (e.g. Oltean & Dumitrescu 1973, Novak & Gruber 2000, Rasputing et al. 2014), which corresponds to our discovery in Slovakia. Adults of *Carinostoma elegans* reach two peaks of maximum activity. The first peak is in autumn (from September to October) and the second in spring (from April to May) (Weiss 1988, Loksa 1991). In *C. ornatum* fe-

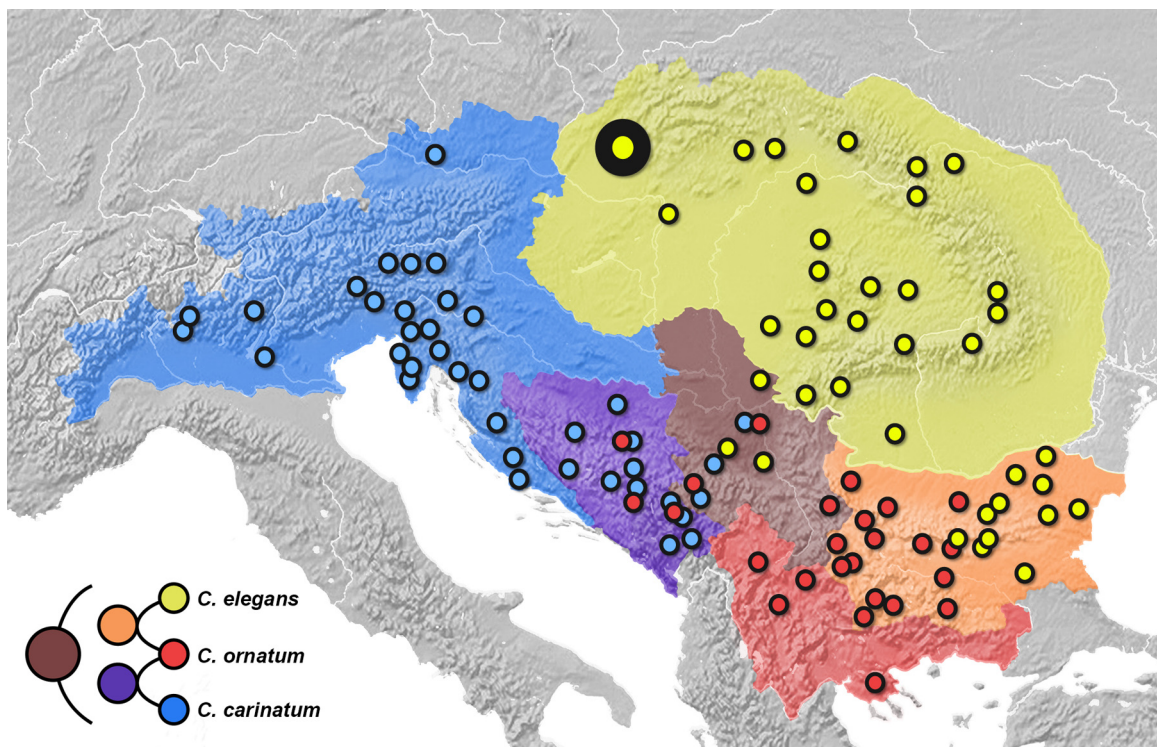


Fig. 8: Schematic map of distribution of the genus *Carinostoma*; disputable records omitted (for detailed information see Appendix). Yellow: *C. elegans*, Red: *C. ornatum*, Blue: *C. carinatum*. The Slovakian record marked with the largest character.

males with eggs were found in spring and autumn (from September to October and from April to June) (Mitov 2004, Mitov & Stoyanov 2004), which is probably similar in *C. elegans*.

Distribution

Carinostoma elegans is a south-east European species. It is the most eastern species of the genus, and its distribution is enclosed by the Carpathian Mountains. An isolated population was found in the east of Bulgaria (Fig. 8, yellow color). In comparison to the other species the most western one, *C. carinatum*, occurs from the Eastern Alps, following the Dinaric Alps to Serbia (Fig. 8, blue), and *C. ornatum* occupies the south-east along the Balkan Mountains and the Rhodopes (Fig. 8, red). According to Starega (1976) *C. elegans* seems to be vicariant with *C. ornatum*, so their distribution may be limited somewhere in the central Balkans, between the “Šipka” through “Iskyr”. However, Mitov (2004) predicted *C. elegans* in the Eastern Rhodopes. All three species of the genus *Carinostoma* occur in Serbia; moreover *C. elegans* co-

occurs with *C. ornatum* in Bulgaria and *C. carinatum* with *C. ornatum* in Bosnia and Herzegovina and Montenegro (Fig. 8, Tab. 1). According to the presented map there are some blank places, e.g. Albania, Moldavia, which is probably due to limited research activity.

The recent mention of *C. elegans* in Slovakia (Raspotnig et al. 2014), was clarified as the expected occurrence according to Martens (1978) (Raspotnig 2014, pers. comm.). However, *C. elegans* has been expected in Slovakia even earlier (e.g. Kratochvíl 1935, Mihál et al. 2009), but remained either very rare or hard to find. Our records from the arboretum could be caused by human activity. In the years 2011 and 2012 a few plants were imported from Hungary (Tanakajd) (Barta 2013, pers. comm.). Although all plants were placed into a garden nursery, two specimens of *C. elegans* were found in the oldest part of the arboretum near the castle. Other very recent records of *C. elegans* in the Aggteleki National Park from Hungary were situated very close to the Slovakian border (Komposch 2004), so it is probably pres-

Tab. 1. Distribution of the genus *Carinostoma* in Europe

	<i>C. carinatum</i> (Roewer, 1914)	<i>C. elegans</i> (Sørensen, 1894)	<i>C. ornatum</i> (Hadži, 1940)	References
Albania	probably			Pavičević et al. (2012), Mitov (2000)
Austria	+			Komposch (2011)
Bosnia and Herzegovina	+		+	Novak (2005a)
Bulgaria		+	+	Mitov (2004, 2008)
Croatia	+			Novak (2004)
Greece			+	Staręga (1976)
Hungary		+		Lengyel & Murányi (2006)
Italia	+			Stoch (2003)
Kosovo			+	Hadži (1940)
Macedonia	probably		+	Pavičević et al. (2012), Raspotnig et al. (2014)
Montenegro	+			Pavičević et al. (2012)
Romania		+		Băbălean (2005)
Serbia	+	+	+	Pavičević et al. (2012), Raspotnig et al. (2014)
Slovakia		+		present paper, Stašiov (2004)
Slovenia	+			Novak et al. (2006)
Ukraine		+		Bartoš (1939)

ent in the neighboring NP Slovenský kras (=Slovak Karst National Park) as well.

Disputable and dubious records

Although Roewer (1919) mentioned distribution of *C. carinatum* in Romania, this could not be confirmed by recent faunistic studies (e.g. Babălean 2001, 2002, 2011, Babălean & Ilie 2003, Mitov 2008). On the contrary, *C. ornatum* should be expected in Dalmatia (Novak 2004), as was presented by Hadži (1973), but this record has not been confirmed up to the present.

Acknowledgements

We would like to thanks to Janka Christophoryová and Katka Krajčovičová for their help in the field and the most for access to photo equipment at Comenius University in Bratislava and valuable comments on the manuscript. We are indebted to personnel of the Mlyňany arboretum SAV, especially to Marek Barta who allowed us to collect material. We are grateful to Dano Gruľa who facilitated this research and to two anonymous reviewers who improved the manuscript. This work was partially supported also by the Scientific Grant Agency VEGA (project No. 2/0035/13).

References

- Aurenhammer S & Komposch C 2013 Dynamic processes as a key factor for biodiversity? A zoological case study in the largest rockslip area of the Eastern Alps (Dobratsch, Austria; Arachnida: Araneae, Opiliones, Scorpiones; Insecta: Coleoptera). In: Bauch K (ed.): Conference Volume of the 5th Symposium for Research in Protected Areas, 10–12 June 2013, Mittersill. pp. 29–38
- Avram Ş 1978 Opilionides de la Vallée de Sighiștel (Roumanie). – Description de *Egaenus carpaticus* n.sp. (Phalangidae, Opiliones). Travaux de l'Institut de spéologie Emile Racovitza 17: 61–65
- Avram Ş & Dumitrescu D 1969 Contribuții la cunoașterea răspindirii geografice și a ecologiei opilionidelor cavernicole, endogee și epigee, din România. – Lucrările Institutului de Speologie (Emil Racoviță) 8: 99–145
- Băbălean AF 2001 Preliminary note on opilionids fauna (Arachnida: Opiliones) from Gorj. – Annales of the University of Craiova 5 (41): 23–29
- Băbălean AF 2002 Contribuții la cunoașterea faunei de Opilioniade (Arachnida: Opiliones) din Munții Metaliferi. – Oltenia, Studii și Comunicări-Științele Naturii 18: 127–130
- Băbălean AF 2005 General overview on the opilionid fauna (Arachnida, Opiliones) in Romania. – Analele Științifice ale Universității “Al.I. Cuza” Iași, s. Biologie animală 51: 47–54

Tab. 2. References used in the distribution map of the genus *Carinostoma*

Species	State	Reference
<i>C. carinatum</i> (Roewer, 1914)	Austria	Aurenhammer & Komposch 2013, Kofler 1968, Kritscher 1956, Martens 1978, Raspotnig et al. 2014, Roewer 1919
	Bosnia-Herzegovina	Martens 1978, Novak 2005a, Raspotnig et al. 2014, Roewer 1914, 1917, 1919, 1923, Šilhavý 1939
	Croatia	Martens 1978, Roewer 1919, 1923
	Italy	Martens 1978, Roewer 1919, 1951, Schönhofner & Martens 2010
	Montenegro	Karaman 1995, Martens 1978, Roewer 1919
	Serbia	Hadži 1973, Pavičević et al. 2012, Raspotnig et al. 2014, Roewer 1923
	Slovenia	Martens 1978, Novak 2005b, Novak et al. 2002, 2006, Raspotnig et al. 2014, Roewer 1919
<i>C. elegans</i> (Sørensen, 1894)	Bulgaria	Martens 1978, Mitov 1995, Starega 1976,
	Hungary	Komposch 2004, Lengyel, Muranyi 2006, Loksa 1991, Martens 1978, Szalay 1952
	Romania	Avram 1978, Avram & Dumitrescu 1969, Băbălean 2001, 2002, 2011, Băbălean & Ilie 2003, Băncilă & Plăiașu 2009, Cîrdei 1958, Dumitrescu 1972, Kolosvary 1963, Mitov 2008, Oltean & Dumitrescu 1973, Schönhofner & Martens 2010, Weiss 1975, 1980, 1984, 1988
	Ukraine	Bartoš 1939, Cîrdei 1960, Kolosváry 1929, Roewer 1919
<i>C. ornatum</i> (Hadži, 1940)	Bosnia-Herzegovina	Novak 2005a, Raspotnig et al. 2014
	Bulgaria	Martens 1978, Mitov 2004, Starega 1976
	Greece	Martens 1978
	Kosovo	Hadži 1940
	Macedonia	Raspotnig et al. 2014
	Montenegro	Karaman 1995
	Serbia	Karaman 1995, Martens 1978, Raspotnig et al. 2014

Băbălean AF 2011 Opilioniidele din S-V României determinant al speciilor. Sitech, Craiova. 150 pp.

Băbălean AF & Ilie V 2003 Some data concerning the harvestmen fauna (Arachnida, Opiliones) from the Caraș Severin County (Banat, Romania). – Archives of biological sciences, Belgrade 55 (3-4): 101-106

Băncilă RI & Plăiașu R 2009 Sampling efficiency of pitfall traps and Winkler extractor for inventory of the harvestmen (Arachnida: Opiliones). – Travaux de l'Institut de spéologie Emile Racovitza 48: 59-67

Bartoš E 1939 Die Weberknechte (Opiliones) des östlichen Carpathicums. – Folia Zoologica et Hydrobiologica 9 (2): 308-310

Bezděčka P 2009 Kosec *Paranemastoma quadripunctatum* potvrdený pre Slovensko. – Folia faunistica Slovaca 14 (9): 59-62

Bezděčka P & Bezděčková K 2011 *Leiobunum limbatum* – nový sekáč (Opiliones) pro Slovensko. – Folia faunistica Slovaca 16 (1): 32-33

Cîrdei F 1958 Contribuții la studiul faunei nemastomatidelor (Opiliones) din Moldova. – Studii și cercetări științifice, Academia Republicii Populare Romîne, Filiala Iași, (Biologie și științe agricole), Iași 9: 69-71

Cîrdei F 1960 [K izutseniyu senokostsev (Opiliones) iz severo-zapadnoy tsasti RNR i verkhnego retsnogo basseyna Pruta II. Sistematika]. – Analele Științifice ale Universității "Al. I. Cuza" din Iași 6: 77-95 (in Russian)

Dumitrescu D 1972 Contributions à la connaissance de la faune d'Opiliones (Arachnida) de Roumanie. – Travaux du Muséum d'Histoire naturelle (Grigore Antipa) 12: 69-83

Franc V & Mlejnek R 1999 First record of *Holoscotolemon jaqueti* (Opiliones, Erebmastidae) from Slovakia. – Biologia 54 (2): 134

Hadži J 1940 [Zwei interessante neue Opilionenarten der Gattung *Nemastoma*]. Glasnik, Bulletin de la Société Scientifique de Skoplie, Section des Sciences Naturelles 22: 1-17 (in Romanian with German summary)

- Hadži J 1973 Opilionea. Catalogus Faunae Jugoslaviae, III/4. Slovenska akademija znanosti in umetnosti, Ljubljana. 24 pp.
- Ilie V 2002 A check-list of the harvestmen (Opilionea) from the Romanian caves. – Archives of biological sciences, Belgrade 54 (1-2): 49-56
- Karaman I 1995 Fauna opilionea (Arachnida, Opiliones) durmitorskog područja. Diploma thesis, Univerzitet u Novom Sadu Prirodno-Matematički fakultet, Novi Sad. 74 pp.
- Kofler A 1963 Zur Begleitfauna von *Quedius* (*Microsaurus*) *ventralis* (Arag.) (Col., Staphylinidae). – Berichte des Naturwissenschaftlich-medizinischen Vereins in Innsbruck 56: 355-360
- Kolovszky G 1929 Die Weberknechte Ungarns (Opilionea). Studium Verlag, Budapest. 112 pp.
- Kolovszky G 1963 Opilionea din Transilvania (Weberknechte aus Siebenbürgen). – Comunicările Academiei republicii Populare Române 6 (13): 551-558
- Komposch C 2004 The harvestman fauna of Hungary (Arachnida, Opiliones). In: Samu F & Szinetár Cs (eds.) Proceedings of the 20th European Colloquium of Arachnology, Szombathely 22–26 July 2002, Hungary. pp. 227-242
- Komposch C 2011 Opiliones (Arachnida). In: Schuster R (ed.) Checklisten der Fauna Österreichs, No. 5, Österreichischen Akademie der Wissenschaften, Vienna. pp. 10-27
- Kratochvíl J 1935 Přehled zeměpisného rozšíření našich sekáčů. – Věda přírodní, 16: 5-12
- Kratochvíl J 1958 Jeskynní sekáči Bulharska (Palpatores – Nemastomatidae). – Acta Academiae Scientiarum Czechoslovenicae Basis Brunensis, Brno 30 (12): 523-576
- Kritscher E 1956 Teil IX c: Opiliones, Weberknechte. In: Strouhal H (ed.) Catalogus Faunae Austriae. Springer Verlag, Wien. pp. 1-8
- Lendl A 1894 A Magyar nemzeti muzeum kaszaspökgűjteménye. – Természetről Füzetek, Budapest 17(1-2): 15-33
- Lengyel GD & Murányi D 2006 Data to the Hungarian harvestman (Opiliones) fauna. – Folia Historico Naturalia Musei Matraensis 30: 117-128
- Loksa I 1991 The harvestmen (opiliones) fauna of the Bátorliget Natural Reserves (NE Hungary). In: Mahunka S (ed.) The Bátorliget Nature Reserves – after forty years, 1990. Hungarian Natural History Museum, Budapest. pp. 685-689
- Martens J 1978 Weberknechte, Opiliones-Spinnentiere, Arachnida. – Die Tierwelt Deutschlands 64: 1-464
- Mašan P 1998 First record of *Siro carpathicus* (Opiliones, Cyphophthalmi, Sironidae) from Slovakia. – Biologia, Bratislava 53: 350
- Mihál I, Mašan P & Astaloš B 2009 Kosce – Opiliones. In: Mašan P & Mihál I (ed.) Pavúkovec Cerovej vrchoviny. ŠOP SR Banská Bystrica, Správa CHKO Cerová vrchovina Rimavská Sobota, ÚZ SAV Bratislava, ÚEL SAV Zvolen (TU Zvolen). pp. 137-151
- Mitov PG 1995 New faunistic and chorologic data about Opiliones (Arachnida) from Bulgaria. – Annuaire de l'Université de Sofia "St. Kliment Ohridski", Faculté de Biologie 1 (86-87): 63-65
- Mitov PG 2000 Contribution to the knowledge of the harvestmen (Arachnida: Opiliones) of Albania. – Ekológia (Bratislava) 19 (Supplement 3): 159-169
- Mitov PG 2004 Harvestmen (Opiliones, Arachnida) of Eastern Rhodopes Mts. (S Bulgaria). In: Beron P & Popov A (ed.) Biodiversity of Bulgaria, 2. Biodiversity of Eastern Rhodopes (Bulgaria and Greece), Sofia. pp. 167-179
- Mitov PG 2008 Opiliones (Arachnida) from the Southern Dobrudzha (NE Bulgaria) and its adjacent regions. – Revista Ibérica de Aracnología 15 (2007): 123-136
- Mitov PG & Stoyanov I 2004 The Harvestmen Fauna (Opiliones, Arachnida) of the City of Sofia (Bulgaria) and its Adjacent Regions. In: Penev L, Niemelä J, Kotze DJ & Chipev N (eds.) Ecology of the City of Sofia. Species and Communities in an Urban Environment, Sofia-Moscow (Pensoft publishers). pp. 319-354
- Novak T 2004 An overview of harvestmen (Arachnida: Opiliones) in Croatia. – Natura Croatica 13 (3): 231-296
- Novak T 2005a An overview of harvestmen (Arachnida: Opiliones) in Bosnia and Herzegovina. – Natura Croatica 14 (4): 301-350
- Novak T 2005b The harvestmen fauna (Arachnida: Opiliones) from the sub Mediterranean region of Slovenia – II. – Annales, Series historia naturalis, Koper 15 (1): 103-114
- Novak T, Delakorda SL & Novak LS 2006 A review of harvestmen (Arachnida: Opiliones) in Slovenia. – Zootaxa 1325: 267-276
- Novak T & Gruber J 2000 Remarks on published data on harvestmen (Arachnida: Opiliones) from Slovenia. – Annales, Series historia naturalis 10 (21): 281-308
- Novak T, Slana L, Červek N, Mlakar M, Žmaher N & Gruber J 2002 Harvestmen (Opiliones) in human settlements of Slovenia. – Acta entomologica slovenica 10 (2): 131-154
- Oltean C & Dumitrescu D 1973 Contributions à la connaissance des Arachnides de la région de Vrancea. – Travaux du Muséum d'Histoire naturelle (Grigore Antipa) 13: 71-82
- Pavičević D, Popović M, Komnenov M & Njunjić I 2012 Diversity of arthropod fauna in caves and pits of Kamena Gora (Serbia) and its surroundings. – Fauna Balkana 1: 151-176
- Rasputnig G, Schaidler M, Stabentheiner E, Leis HJ & Karaman I 2014 On the enigmatic scent glands of dyspnoan harvestmen (Arachnida, Opiliones): first evidence for the production of volatile secretion. – Chemoecology 24: 43-55 – doi: [10.1007/s00049-014-0146-5](https://doi.org/10.1007/s00049-014-0146-5)
- Roewer CF 1914 Die Familien der Ischyropsalidae und Nemastomatidae der Opiliones = Palpatores. – Archiv für Naturgeschichte A80(3): 99-169
- Roewer CF 1919 Über Nemastomatiden und ihre Verbreitung. – Archiv für Naturgeschichte, Berlin A83(2): 140-160

- Roewer CF 1923 Die Weberknechte der Erde. Systematische Bearbeitung der bisher bekannten Opiliones. Fischer Verlag, Jena. 1116 pp.
- Roewer CF 1951 Über Nemastomatiden. Weitere Weberknechte XVI. – Senckenbergiana 32: 95–153
- Schönhofer AL 2013 A taxonomic catalogue of the Dyspnoi Hansen and Sørensen, 1904 (Arachnida: Opiliones). – Zootaxa 3679: 1–68 – doi: [10.11646/zootaxa.3679.1.1](https://doi.org/10.11646/zootaxa.3679.1.1)
- Schönhofer AL 2014 *Carinostoma* Kratochvíl, 1958. – Internet: <http://axelschoenhofer.weebly.com/carinostoma.html> (20.2. 2014)
- Schönhofer AL & Martens J 2010 Hidden Mediterranean diversity: Assessing species taxa by molecular phylogeny within the opilionid family Trogulidae (Arachnida, Opiliones). – Molecular Phylogenetics and Evolution 54 (2010): 59–75 – doi: [10.1016/j.ympev.2009.10.013](https://doi.org/10.1016/j.ympev.2009.10.013)
- Schönhofer AL & Martens J 2012 The enigmatic Alpine opilionid *Saccarella schilleri* gen. n., sp. n. (Arachnida: Nemastomatidae) – isolated systematic placement inferred from comparative genital morphology. – Organism Diversity & Evolution 12 (4): 409–419 – doi: [10.1007/s13127-012-0073-7](https://doi.org/10.1007/s13127-012-0073-7)
- Šilhavý V 1939 Sekáči skupiny *Nemastoma chrysomelas*. – Entomologické listy 2 (2): 105–115
- Šilhavý V 1956 Sekáči – Kosce. Fauna ČSR, No. 7, Nakladatelství Československé Akademie Věd, Praha. 271 pp.
- Šilhavý V 1966 Über die Genitalmorphologie der Nemastomatidae (Arach., Opiliones). – Senckenbergiana biologica 47: 67–72
- Starega W 1976 Die Weberknechte (Opiliones, excl. Sironidae) Bulgariens. – Annales Zoologici, Warszawa 33 (18): 287–433
- Stašiov S 2004 Kosce (Opiliones) Slovenska. Vedecké štúdie TU vo Zvolene, Zvolen. 118 pp.
- Stoch F 2003 Checklist of the species of the Italian fauna, Version 2.0. – Internet: <http://www.faunaitalia.it/checklist/introduction.html> (25.2.2014)
- Szalay L 1951 Opiliones aus der Umgebung von Sopron. – Acta Biologica Academiae Scientiarum Hungaricae 2: 299–310
- Weiss I 1975 Untersuchungen über die Arthropodenfauna xerothermer Standorte im südsiebenbürgischen Hügelland. II. Weberknechte (Opiliones, Arachnida). – Studii și comunicări. Științele Naturii. Muzeul Brukenthal 19: 263–271
- Weiss I 1980 Ökofaunistische Untersuchung der Spinnen und Weberknechte am Konglomerat von Podu Olt, Südsiebenbürgen. – Studii și comunicări. Științele Naturii. Muzeul Brukenthal 24: 369–412
- Weiss I 1984 Ökofaunistische Untersuchung der Spinnen und Weberknechte eines Hangprofils bei Seica Mare in Südsiebenbürgen. – Studii și comunicări. Științele Naturii. Muzeul Brukenthal 26: 243–277
- Weiss I 1988 Ökologie der Spinnen und Weberknechte in südosteuropäischen Waldsteppen. In: Haupt J (ed.) XI. Europäisches Arachnologisches Colloquium, Technische Universität Berlin. pp. 119–131