

Kryptonesticus georgescuae spec. nov. from Movile Cave, Romania (Araneae: Nesticidae)

Augustin Nae, Serban M. Sarbu & Ingmar Weiss



doi: 10.30963/aramit5503

Abstract. *Kryptonesticus georgescuae* spec. nov., a blind troglobitic spider species from the mesothermal sulfidic Movile Cave (Romania), is described and illustrated based on two female specimens. The male is unknown. The relationship between this new species and other European species of Nesticidae is discussed.

Keywords: blind, cave-spider, chemo-autotrophically based ecosystem, endemic, new species, troglobites

Zusammenfassung. *Kryptonesticus georgescuae* spec. nov. aus der Movile-Höhle, Rumänien (Araneae: Nesticidae). Eine blinde, troglobionte Spinnenart aus der mesothermalen Schwefelwasserstoff-Höhle Movile (Rumänien) wird anhand von zwei weiblichen Individuen beschrieben und abgebildet. Das Männchen ist unbekannt. Die Beziehung dieser neuen Art zu europäischen Nesticidae wird diskutiert.

Movile Cave is located near the town of Mangalia in southeastern Romania, at a distance of two kilometers from the Black Sea shore. It was discovered in 1986 when a 20 m deep artificial shaft intercepted a natural cave passage developed in Sarmatian limestones (12.5 MY). The lower sections of Movile Cave are flooded by thermomineral water (21 °C) rich in reduced chemical compounds such as H₂S, CH₄ and NH₄⁺. The redox interface created at the water surface between these reduced substances and the oxygen in the cave's atmosphere enables chemoautotrophic microorganisms to thrive here creating organic molecules in situ (Sarbu et al. 1996). These represent the food base for a rich and abundant community of aquatic and terrestrial troglobitic invertebrate species, the majority of which are endemic to this ecosystem (Sarbu 2000).

To date, 30 new species of aquatic and terrestrial arthropods have been described from Movile Cave (Sarbu 2000, Nitzu et al. 2016). Three endemic spiders have so far been described from this ecosystem: *Agraecina cristiani* (Georgescu, 1989), *Habnia caeca* (Georgescu & Sarbu, 1992) and *Lepthyphantes constantinescui* Georgescu, 1989. Movile Cave also hosts a very interesting population of *Carniella brignolii* Thaler & Steinberger, 1988, which has adaptations for the subterranean environment (Nae 2012), unlike the populations found outside caves in Central and Western Europe (Thaler-Knoflach et al. 2014).

The presence of a troglobitic Nesticidae living in Movile Cave was already reported in 1994 but, unfortunately, the new species could not be described then as two out of the three specimens were juveniles and the third was a female without an opisthosoma (Georgescu 1994). Since the cave was discovered in 1986, only two additional females have been found (Giurginca et al. 2009). So far our attempts to find males were unsuccessful. The genus *Kryptonesticus* is new for the Romanian fauna; the family Nesticidae is represented by 22 species, belonging to *Carpathonesticus* and *Nesticus*. Except *Nesticus cellulanus* (Clerck, 1757), all species are endemic (Nae 2013).

Material and methods

This study is based on two females from the Movile Cave, deposited in the following institutions:

SMF: Senckenberg Research Institute, Frankfurt am Main, Germany

ISER: Institute of Speleology „Emil Racovitza“, Bucarest, Romania.

The specimens were conserved in 70 % ethanol. The dissection was made in glycerol under a Zeiss Stemi 2000 stereomicroscope and mounted for observation in a mixture of gelatin Merk and anhydrous glycerol. An Olympus CH2 with a drawing attachment was used for microscopic examination and drawings. The photos were made on Zeiss Discovery V8 with Canon A 640 camera. Nomenclature follows the WSC (2017). Terminology for the copulatory organs follows López-Pancorbo et al. (2013) and Pavlek & Ribera (2017). Measurements are given in millimeters (mm).

Taxonomy

Family Nesticidae Simon, 1894

Genus *Kryptonesticus* Pavlek & Ribera, 2017 (type species: *K. deelemanae* Pavlek & Ribera, 2017)

***Kryptonesticus georgescuae* spec. nov.** (Figs 1-6)

Type data. Holotype: 1 female (SMF), Movile Cave, Mangalia, ROMANIA (geographical coordinates: 43.825N/28.560E), 24 July 1997, leg. Serban M. Sarbu. Paratype: 1 female (ISER, Nr. 5/2017), same locality as holotype, 14-17 March 2008, leg. Augustin Nae.

Etymology. The specific name is a patronym in honor of the Romanian arachnologist Maria Georgescu. She described only the prosoma (female) of this species as *Nesticus* sp. (Georgescu 1994).

Diagnosis. Completely eyeless, depigmented, troglobiont spider with long legs; can be recognized by genital characters: epigyne and vulva. The spermatheca form and the position of the medial vulval pockets of this new species resembles that of *K. henderickxi* (Bosselaers, 1998) and *K. beshkovi* (Deltshv, 1979), but can be distinguished by the position and orientation of insemination ducts (ID in Figs 1 & 4), anteriorly divergent through most of their course, roughly heart-shaped (approximately parallel with a longitudinal axis of symmetry in *K. henderickxi* and *K. beshkovi*) and by the shape of the median septum, which is narrower than that of *K. henderickxi*.

Augustin NAE, Institute of Speleology „Emil Racovitza“, Calea 13 Septembrie Nr. 13, 050711 Bucuresti, Romania; E-mail: augustin.iser@gmail.com; augustin.nae@iser.ro
Serban M. SARBU, California State University, Chico, Department of Biological Sciences, Chico CA 95929-515, Holt Hall 205, USA and Institute of Speleology „Emil Racovitza“, Calea 13 Septembrie Nr. 13, 050711 Bucuresti, Romania; E-mail: serban.sarbu@yahoo.com
Ingmar WEISS, Rehtränke 1, 94481 Grafenau, Germany; E-mail: mail@arachnologie.info

Description of female. Measurements: prosoma length 1.2, width 1.17; opisthosoma length 2.05; sternum length 0.75, width 0.65; total length 2.37. Leg measurements in Table 1. The opisthosoma is oval, the legs long, the first pair is notably longer than the other three. The ratio between the length of the prosoma and leg I is approximately 1:10. Prosoma, legs and opisthosoma pale white (holotype) and pale yellowish-orange respectively (paratype: Fig. 6). Eyes absent. Darker stains discernible on lateral prosoma in paratype female. Chelicerae: 0.6 mm long, same colour as prosoma, with 3 pro-marginal teeth, median longest (see Georgescu 1994). Frontal part of chelicerae with 4 rigid and serrated setae, brush shaped, flanked by 2 longer setae, delicately feathered. Retro-margin of chelicerae with 4 small teeth, decreasing in size from proximal to distal, and with several feathered setae.

Tab. 1: Leg measurements (mm)

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	0.62	0.22	0.35	–	0.72	1.92
I	3.85	0.55	3.82	3.30	0.92	12.45
II	2.57	0.55	2.32	2.12	0.92	8.50
III	1.92	0.45	1.30	1.35	0.75	5.77
IV	3.00	0.55	2.35	2.05	0.90	8.85

Trichobothrium on metatarsus I in position 0.64. Epigyne and vulva (Figs 1-5): Epigyne is wider than long, in lateral view not prominent and without depressions. The median septum has no prominences or hollows as in *K. beshkovi* and is narrower in the area where it meets the epigastric furrow than in *K. henderickxi*. The holotype has well-developed vulval pockets and well defined median parts. The spermathecae are lemon-shaped, their longitudinal axes being oblique to the body's longitudinal axis of symmetry. The insemination ducts converge posteriorly. The result is a characteristic heart-shaped overall impression of the epigyne with a small central median septum.

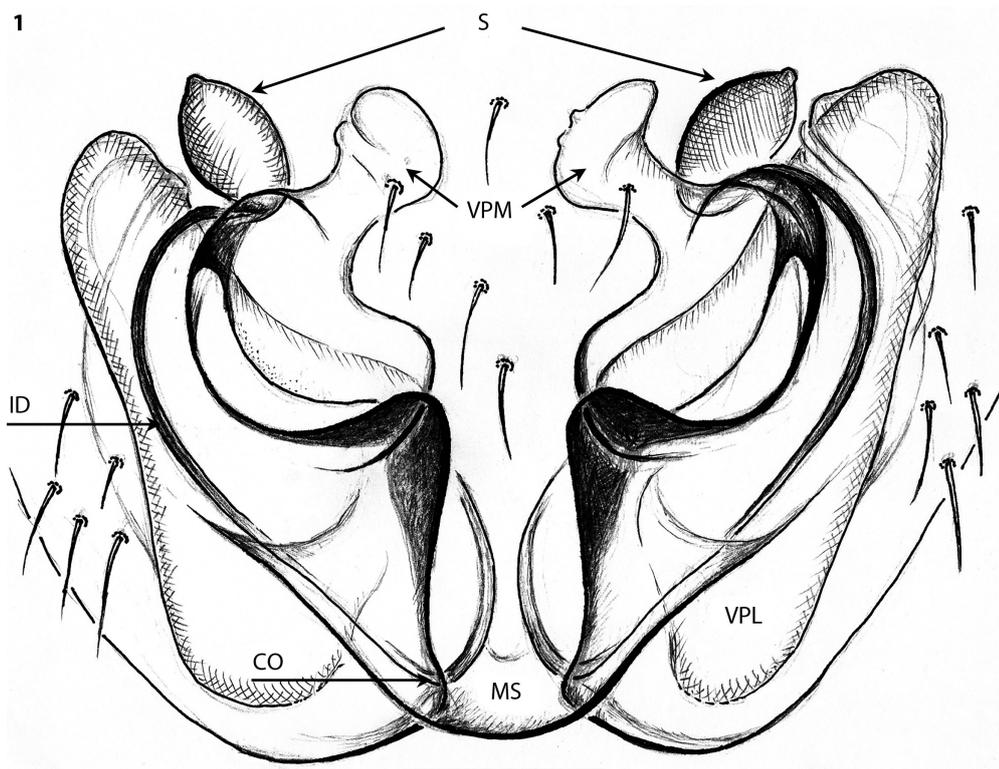
Male. Unknown.

Distribution. Only known from the type locality.

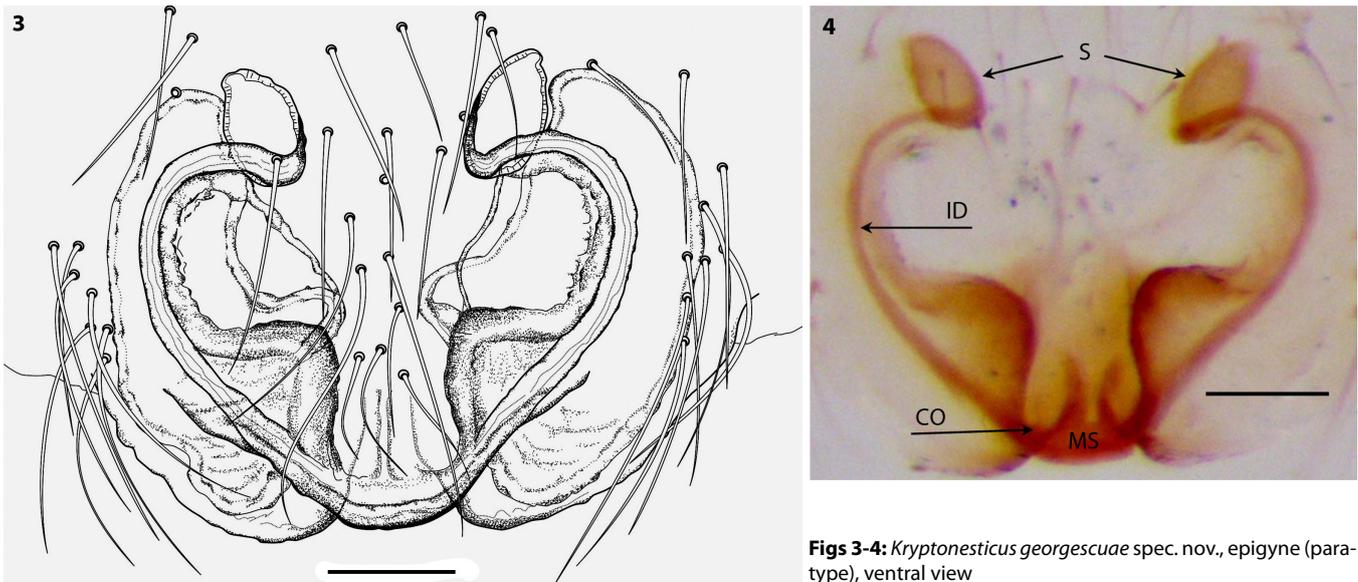
Habitat. The specimens were collected close to the sulfidic lake and in the second bell shaped zone at the end of the cave's main gallery.

Discussion

The recently defined genus *Kryptonesticus* currently includes eight species. With the exception of the widespread *K. eremita* (Simon, 1880), all other species are endemic in Croatia, Montenegro, Bosnia and Herzegovina, Bulgaria, Greece (Crete) and Turkey (Pavlek & Ribera 2017). The species described here from Movile Cave is the ninth belonging to this group. In terms of size, in being totally eyeless, in the length of the legs and in the absence of pigment, *K. georgescuae* resembles especially *K. henderickxi* (Bosselaers, 1998) and *K. beshkovi* (Deltshev, 1979), both from caves in Crete. However, all these features are not necessarily a hint of close relationship, but could be merely a consequence of extreme adaptation to subterranean life. In contrast, the structure of the epigyne may better show the true affinities or differences between species. But also in this respect, *K. georgescuae* seems to be closer related to these two troglobitic spiders from Crete. The females of *K. beroni* (Deltshev, 1977) from a cave in Bulgaria (only 370 km air-line distance from Movile Cave) appear rather closely related to the western Balkan species *K. deelemanae* Pavlek & Ribera, 2017 and *K. arenstorffi* (Kulczyński, 1914), and show no resemblance to *K. georgescuae*.



Figs 1-2: *Kryptonesticus georgescuae* spec. nov., epigyne (holotype), ventral view
 Abbreviations: CO = copulatory orifice, ID = insemination duct, MS = median septum, S = spermathecae, VPL = vulval pocket lateral, VPM = vulval pocket medial.
 Scale line = 0.1 mm



Figs 3-4: *Kryptonesticus georgescuae* spec. nov., epigyne (paratype), ventral view

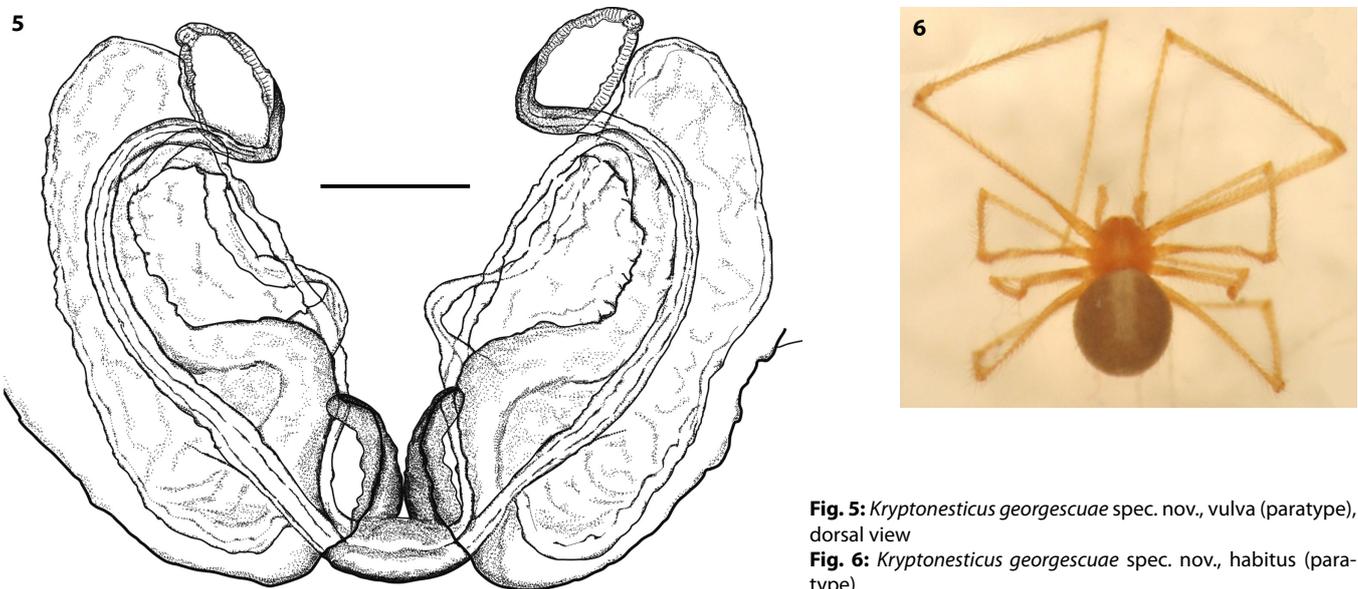


Fig. 5: *Kryptonesticus georgescuae* spec. nov., vulva (paratype), dorsal view

Fig. 6: *Kryptonesticus georgescuae* spec. nov., habitus (paratype)

Acknowledgements

The authors would like to thank the members of the GESS team for their efforts towards the protection of Movile Cave and for their help with field work, fauna survey and specimen collection. Movile Cave is a strictly protected site, part of the Natura 2000 sites (Code ROSCI0114 – Mlaștina Hergheliei – Obantul Mare and Peștera Movile). We thank also Theo Blick, Peter Jäger, Carles Ribera and Yuri Marusik for helpful comments on the manuscript.

References

- Georgescu M 1994 Sur la présence d'une espèce troglobionte de *Nesticus* (Araneae, Nesticidae) dans la grotte „Pestera de la Movile“ (Dobrogea, Roumanie). – Travaux de l'Institut de Spéologie „Émile Racovitza“ 33: 85-87
- Giurginca A, Nae A & Vanoaica L 2009 Species of Oniscidea and Araneae from the Movile cave drillings. – Travaux de l'Institut de Spéologie „Émile Racovitza“ 48: 31-43
- López-Pancorbo A, Kunt KB, Blagoev G, Deltshv C & Ribera C 2013 *Nesticus dimensis* new species, a new troglitic spider from Turkey (Araneae, Nesticidae), with comments on its phylogenetic relationships. – Zootaxa 3721: 183-192 – doi: [10.11646/zootaxa.3721.2.5](https://doi.org/10.11646/zootaxa.3721.2.5)
- Nae A 2012 *Carniella mihaili* (Georgescu, 1994) – new combination of genus and description of the male (Araneae, Theridiidae). – Travaux de l'Institut de Spéologie „Émile Racovitza“ 51: 67-72
- Nae A 2013 *Carpathonesticus orolesi* n. sp. from the Carpathians (Araneae, Nesticidae). – Travaux de l'Institut de Spéologie „Émile Racovitza“ 52: 27-32
- Nitzu E, Giurginca A, Nae A, Popa I, Baba Ș, Meleg IA, Vlaicu M 2016 The catalog of caves with endemic cavernicolous arthropod fauna of Romania. – Travaux de l'Institut de Spéologie „Émile Racovitza“ 55: 3 - 62
- Pavlek M & Ribera C 2017 *Kryptonesticus deelemanae* gen. et sp. nov. (Araneae, Nesticidae), with notes on the Mediterranean cave species. – European Journal of Taxonomy 262: 1-27 – doi: [10.5852/ejt.2017.262](https://doi.org/10.5852/ejt.2017.262)
- Sarbu SM 2000 Movile Cave, a chemoautotrophically based groundwater ecosystem. pp. 319-343. In: Wilkens H, Culver DC & Humphreys WF (Eds) Subterranean ecosystems – ecosystems of the world. Elsevier Science, Amsterdam. 791 pp.
- Sarbu SM, Kane TC & Kinkle BK 1996 A chemoautotrophically based cave ecosystem. – Science 272 (5270): 1953-1955 – doi: [10.1126/science.272.5270.1953](https://doi.org/10.1126/science.272.5270.1953)
- Thaler-Knoflach B, Hänggi A, Kielhorn K-H & Broen B von 2014 Revisiting the taxonomy of the rare and tiny comb-footed spider *Carniella brignolii* (Araneae, Theridiidae). – Arachnologische Mitteilungen 47: 7-13 – doi: [10.5431/aramit4701](https://doi.org/10.5431/aramit4701)
- WSC 2017 World spider catalog, version 18.0. Natural History Museum, Bern. – Internet: <http://wsc.nmbe.ch> – doi: [10.24436/2](https://doi.org/10.24436/2) (March 21, 2017)