



THE PRESENCE OF THE DINARIC GENUS *MESOSTALITA* DEELEMEN-REINHOLD, 1971 (ARACHNIDA: ARANEAE: DYSDERIDAE) IN THE JULIAN PREALPS (NE ITALY)

PRISOTNOST PAJKA DINARSKE VRSTE RODU *MESOSTALITA* (DEELEMEN-REINHOLD, 1971) (ARACHNIDA: ARANEAE: DYSDERIDAE) V BENEŠKIH PREDALPAH (SV ITALIJA)

Giacomo CANCIANI^{*1,2}, Luca TUROLO³, Luca TRINGALI¹,
Martina COLAUTTI² & Andrea COLLA⁴

Abstract

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Giacomo Canciani, Luca Turolo, Luca Tringali, Martina Colautti & Andrea Colla: The presence of the Dinaric genus *Mesostalita* Deeleman-Reinhold, 1971 (Arachnida: Araneae: Dysderidae) in the Julian Prealps (NE Italy)

Mesostalita is a genus of woodlouse hunter spiders (Arachnida: Araneae: Dysderidae), currently including three species: *M. nocturna*, *M. kratochvili*, and *M. comottii*. These are cave-dwelling species, endemic to the Dinarides. The genus distribution range is examined, focusing on published localities. In particular, the presence of *Mesostalita* in the Julian Prealps (NE Italy) is investigated by researching previous reports from the area. A new record, Foran di Landri cave, is reported, representing the fourth known occurrence of the genus in the area. A brief description and some photographs of the female specimen found in the cave are provided. Following this finding, the genus distribution range must be extended northwards to include the Julian Prealps, on the other side of the Isonzo-Soča river (representing a biogeographical barrier for many cave-dwellers), opposite to the Dinarides. This makes *Mesostalita* one of the few troglitic north-western Dinaric genera living on both sides of the river. Further sampling in caves in the area (to find at least a male individual) and molecular analyses are necessary to clarify the proper, specific status of specimens living in the Julian Prealps and their phylogenetic relationships within the genus.

Keywords: *Mesostalita*, Dysderidae, cave-dwelling spiders, Julian Prealps, Foran di Landri, new record

Izvleček

UDK 595.44(24)(234.323.4)

Giacomo Canciani, Luca Turolo, Luca Tringali, Martina Colautti & Andrea Colla: Prisotnost pajka dinarske vrste rodu *Mesostalita* (Deeleman-Reinhold, 1971) (Arachnida: Araneae: Dysderidae) v Beneških Predalpah (SV Italija)

Mesostalita je rod lovskih pajkov (Arachnida: Araneae: Dysderidae), trenutno so opisane tri vrste: *M. nocturna*, *M. kratochvili* in *M. comottii*. To so jamske vrste, endemične za Dinarsko gorovje. Proučeno je bilo območje razširjenosti pajkov tega rodu s poudarkom na objavljenih najdiščih. Natančneje, prisotnost pajkov rodu *Mesostalita* v Beneških Predalpah (SV Italija) je bila raziskana s proučevanjem prejšnjih poročil z navedenega območja. Poročamo o novem najdišču v jami Foran di Landri, ki pomeni četrto znano najdišče pajkov tega rodu na navedenem območju. Navedeni so kratek opis in nekaj fotografij samice, najdene v jami. Po tej ugotovitvi je treba območje razširjenosti pajkov tega rodu razširiti proti severu in vanj vključiti Beneške Predalpe na drugi strani Soče (to za mnoga jamska bitja pomeni biogeografsko oviro), nasproti Dinarskega gorovja. Tako so pajki rodu *Mesostalita* eni redkih troglobiontov med pajki severozahodnih dinarskih rodov, ki živijo na obeh straneh reke. Potrebni so še nadaljnje vzorčenje v jamah na navedenem območju (da bi našli vsaj še samca) in molekularne analize za razjasnitev pravilnega, specifičnega statusa osebkov, ki živijo v Beneških Predalpah, in njihovih filogenetskih odnosov znotraj rodu.

Ključne besede: *Mesostalita*, Dysderidae, jamski pajki, Beneških Predalpah, Foran di Landri, novo najdišče.

¹ Jamarski Klub Kraški Krti/G.S. Talpe del Carso. Località San Michele del Carso/Vrh, I-34070 Savogna d'Isonzo/Sovodnje ob Soči, Gorizia, Italy

² Associazione Speleologica Forum Julii Speleo. Via Carraria 99, I-33043 Cividale del Friuli, Udine, Italy

³ Gruppo Entomologico Triestino "Giuseppe Muller". Via Tominz 4, I-34139 Trieste, Italy

⁴ Museo Civico di Storia Naturale di Trieste. Via Tominz 4, I-34139 Trieste, Italy

* Corresponding author, giacomo.canciani90@gmail.com

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1. INTRODUCTION

Mesostalita Deeleman-Reinhold, 1971 is a genus of woodlouse hunter spiders (Arachnida: Araneae: Dysderidae). It can be distinguished from other similar genera by the shape of chelicerae and prosoma and the legs spinulation (Deeleman-Reinhold, 1971). According to some authors, such as Gasparo (1996, 1999) and Le Peru (2011), these features should not be considered relevant for taxonomy. *Mesostalita* should hence be included in the genus *Stalita* (together with *Stalita* s.s., *Parastalita*, and *Stalitella*). However, phylogenetic analyses confirm *Mesostalita* as a monophyletic genus (Pavlek & Mammola, 2020). It is currently considered a full genus by Mammola et al. (2018) and in portals Araneae.it (Pantini & Isaia, 2019), Spiders of Europe (Nentwig et al., 2024), and World Spider Catalogue (2024). Three species are currently considered to belong to the genus (World Spider Catalogue, 2024): *M. nocturna* (Roewer, 1931), *M. kratohvili* Deeleman-Reinhold, 1971, and *M. comottii* (Gasparo, 1999). Three additional species, new to science, each known from a single site in Žumberak mountains, southern Velebit mountains, and Kornati islands (Croatia), respectively, are yet to be described (Pavlek, 2021). These spiders are cave-dwellers and are considered to be troglotic species (Mammola et al., 2022). They live mainly in the network system of cracks and faults typical of subterranean environments (Deeleman-Reinhold & Deeleman, 1980). In caves they have low population densities (e.g., less than one *M. nocturna* individual per month has been observed during a survey in an Italian cave (Canciani, 2017)). They are wandering spiders and do not produce silk or webs (Gasparo & Thaler, 2000). All three species of the genus are endemic to the Dinarides (Mammola et al., 2022). *M. nocturna* lives in the Italian Karst (NE Italy) (Pantini & Isaia, 2019), SW Slovenia (Kostanjšek & Kuntner, 2015), and NW Croatia (Polak et al., 2012), *M. kratohvili* in NW Bosnia (Komnenov, 2010), and *M. comottii* in the Biokovo mountain (SW Croatia) (Gasparo, 1999). All currently published localities of the species are shown in Table 2. Another cave-dwelling Dysderidae species (i.e., *Stalita teanaria*) is present in the Italian Karst as well as *M. nocturna*. Nevertheless, the distribution range of both species has the Isonzo-Soča river as

the northern boundary (Gasparo & Thaler, 2000; Pantini & Isaia, 2019).

The Julian Prealps are a mountain range in the eastern part of the Alps. They are located between Italy (Friuli Venezia Giulia region) and Slovenia (Goriška statistical region). According to SOIUSA (International Standardised Mountain Subdivision of the Alps) (Marazzi, 2005), they are a subsection of the Julian Alps and Prealps section in the Southern Limestone Alps. Their borders are: the Resia valley to the north, the Isonzo-Soča river to the east and the south, and the Friuli plain to the west (Carulli, 2013). The Isonzo-Soča river (and its plain) separates the Julian Prealps from the Classical Karst, which is the north-western part of the Dinarides (Jurkovšek *et al.*, 2016). The Julian Prealps can be divided into two parts. The northern one is mainly mountainous and includes two main ranges: Plauris-Musi and Chiampòn-Gran Monte. It is characterised by an alternation of dolostones and limestones, which are also present in the other mountains in the area, such as Matajur and Bernadia. The southern part is hillier and includes lower reliefs. It is defined by interbedded shales and sandstones (flysch) with calcirudites and calcarenites, sometimes in thick carbonate beds (Carulli, 2006, 2013). The Julian Prealps are an important area from a speleological point of view, including more than 1,200 caves in their Italian part alone (Regione Autonoma Friuli Venezia Giulia, 2024). These caves have been the subject of many faunistic and biospeleological studies (e.g., Governatori & Chiappa, 1997; Stoch, 1997, 2008; Colla & Stoch, 2002). The area hosts an important subterranean fauna, consisting of dozens cave-dwelling species, both terrestrial and aquatic.

In this paper, we report a new record of *Mesostalita* from Foran di Landri, a cave located in the Julian Prealps. We also provide a comprehensive review of all published localities of the genus, focusing on the Julian Prealps. By doing so, we aim to shed light on the distribution range of this Dinaric spider genus, and in particular of a potential new taxon occurring in the Julian Prealps. This work would contribute to understanding its biogeographical significance.

2. MATERIALS AND METHODS

In the years 2018-2019, the A.S. Forum Julii Speleo cave group (Cividale del Friuli, Udine) carried out a speleological exploration in Foran di Landri cave (cadastral

nr. 11/46FR: Regione Autonoma Friuli Venezia Giulia, 2024), located in the southern Julian Prealps. The exploration led to the discovery of new, unexplored parts

of the cave (A.S. Forum Julii Speleo, 2019). A faunistic survey was performed at the same time. Preliminary results of this survey are published in Canciani (2019). On August 10, 2019, a single specimen of a cave-dwelling spider, clearly dead yet well-preserved, was found in the cave, among boulders at the bottom of the chamber right beyond the first two syphons, about 40-50 metres far from the entrance. The specimen was hand collected by two authors (G.C. and M.C.) and preserved in 95% ethanol. Then, it was moved to the entomology laboratory of Civic Museum of Natural History in Trieste for

microscope observation and morphological analysis. The specimen was identified as a female *Mesostalita*. Pictures of the specimen *habitus* were taken using a Leica Flexacam C1 camera, mounted on a Leica MZ16 stereomicroscope, with Leica Planapo 1.0x objective. Postproduction included the use of Helicon Focus 7 and Adobe Photoshop software (Figures 1-2). Additionally, a comprehensive bibliographic research was conducted to identify all known localities of *Mesostalita* species and to define their distribution range.

3. RESULTS

3.1. THE FORAN DI LANDRI SPECIMEN

The specimen collected in Foran di Landri (Figures 1-2) is a female with a total length of 3.1 mm. It exhibits typical features of troglobitic species, being completely anophthalmic and depigmented. This individual is similar to the specimen reported by Gasparo (1996) from Grotta di Canebola, in the same area, and belongs to the same taxon, according to the same author (F. Gasparo, *pers. comm.*, 2019). The prosoma is yellow-orange and polygo-

nal, measuring 1.51 mm in length and 1.02 mm in width. The opisthosoma is white, more rounded, and densely covered with hairs, measuring 1.60 mm in length and 1.04 mm in width. The chelicerae are 0.64 mm long with fangs measuring 0.40 mm. The legs are yellow-orange, elongated, and show evident spination. The lengths of leg segments are indicated in Table 1. The specimen is currently preserved in 95% ethanol in the first author's personal collection.



Figure 1: Dorsal view of the habitus of the Foran di Landri specimen.



Figure 2: Ventral view of the habitus of the Foran di Landri specimen.

Table 1. Leg segment lengths (in mm) of *Mesostalita* specimen found in Foran di Landri cave (abbreviations: Cx=coxa, Tr=trochanter, Fe=femur, Pt=patella, Tb=tibia, Mt=metatarsus, Ta=tarsus).

	Cx	Tr	Fe	Pt	Tb	Mt	Ta	total
I	0.62	0.17	1.46	0.77	1.52	1.61	0.51	6.67
II	0.57	0.21	1.89	0.82	1.73	1.65	0.53	7.40
III	0.42	0.18	1.38	0.58	1.09	1.44	0.46	5.55
IV	0.45	0.16	1.89	0.63	1.58	1.89	0.54	7.14

3.2. RECORDS OF MESOSTALITA

Mesostalita is a Dinaric genus. Almost the entirety of the genus records refer to areas located on the left side of the Isonzo-Soča river (Figure 3), considered to be the northern border of the Dinarides (Zupan Hajna, 2019). *M. nocturna* has the most widespread range among species of the genus, being documented from a total of eighteen caves. Of these, five are located in SW Slovenia (including Žegnana jama, its *locus typicus*) (Roewer, 1931; Di Caporiacco, 1937; Stepišnik & Ramšak, 2006; Polak & Pipan, 2021), twelve in the Italian Karst (NE Italy) (Gasparo & Thaler, 2000; Gasparo, 2002; Stoch, 2009; Canciani, 2023), and one in the northern Croatian Istria (Polak *et al.*, 2012). *M. kratochvili* is known from two caves in NW Bosnia, including Hrustovača pećina, its *locus typicus* (Deeleman-Reinhold, 1971). *M. comottii* is currently reported only from Tučepška Vilenjača, its *locus typicus*, in Biokovo (SW Croatia) (Gasparo, 1999). However, individuals of the latter spe-

cies have been collected in a few other (unpublished) caves in the area (Ozimec & Pavlek, 2011). Table 2 contains the list of all currently published localities of genus species to date.

On the right side of the Isonzo-Soča river, the genus has so far been reported only from three caves in the Julian Prealps (Gasparo, 1996; Bognolo, 2002). Only one individual has been documented for each cave. Foran di Landri is the fourth known locality for the genus in the Julian Prealps, with only one individual collected from each site (Figure 4). All collected specimens from the area are females. These individuals belong to a potential new taxon, mentioned by Gasparo (1996) as *Stalita* sp. *prope nocturna* due to its similarity to the Karst species. Here is the list of currently known localities and specimens of the genus *Mesostalita* in the Julian Prealps to date (cadastral numbers of caves are drawn from Friuli Venezia Giulia cave cadastre: Regione Autonoma Friuli Venezia Giulia, 2024):

- Grotta di Canebola (nr. 2370/1080FR) (Faedis, Udine): 1 ♀, F. Gasparo leg., 10.VI.1979 (Gasparo, 1996);
- Voragine a S di Prepotischis (nr. 2240/1025FR) (Prepotto, Udine) (Bognolo, 2002): 1 ♀, M. Bognolo leg., 12.XII.1999 (M. Bognolo, *pers. comm.*, 2019);
- Pozzo 1° di Miscecco (nr. 2780/1342FR) (Prepotto, Udine) (Bognolo, 2002): 1 ♀, M. Bognolo leg., 12.XII.1999 (M. Bognolo, *pers. comm.*, 2019);
- Foran di Landri (nr. 11/46FR) (Prestento di Torreano, Udine): 1 ♀, G. Canciani & M. Colautti leg., 10.VIII.2019 (new record).

Table 2: List of published localities of *Mesostalita* species and new record from Foran di Landri. Locus typicus of each species is indicated with “*”. Abbreviation: cad. nr. = cadastral number, IT = Italy, SL = Slovenia, HR = Croatia, BiH = Bosnia & Herzegovina. Cadastral numbers of the caves are drawn from Slovenia cave cadastre (Jamarska Zveza Slovenije, 2024), Friuli Venezia Giulia cave cadastre (Regione Autonoma Friuli Venezia Giulia, 2024), Croatia cave cadastre (Ministarstvo zaštite okoliša i zelene tranzicije, 2024), and Bosnia & Herzegovina cave cadastre (Mulaomerović et al., 2006).

Species	Cave	Cad. nr.	State/region	Bibliography
<i>Mesostalita nocturna</i> (Roewer, 1931)	Žegnana jama*	S.960/986VG	SL, Inner Carniola	Roewer, 1931
	Predjamski system	S.734/107VG		Di Caporiacco, 1937
	Postojnska Jama	S.747/108VG		
	Tikina jama	S.8837		Stepišnik & Ramšak, 2006
	Križna jama	S.65		Polak & Pipan, 2021
	Grotta Natale	551/2743VG	IT, Venezia Giulia	Gasparo & Thaler, 2000
	Grotta della Fornace	731/3913VG		
	Grotta Arnaldo Germoni	1525/4429VG		
	Abisso di Colle San Primo	126/160VG		Gasparo & Thaler, 2000; Gasparo, 2002
	Grotta Nemec	75/89VG		Gasparo, 2002
	Grotta Cosmini	424/561VG		
	Grotta Gualtiero Savi	5080/5730VG		Stoch, 2009
	Grotta di Borianò	125/135VG		
	Abisso Bonetti	393/765VG		
	Grotta Antonio Federico Lindner	829/3988VG		
	Grotta Francesco Stradi	1745/4558VG		Canciani, 2023
	Grotta Regina del Carso	2328/4760VG		
	Radota Jama	S.649/298VG	HR, northern Istria	Polak et al., 2012
<i>Mesostalita kratochvili</i> Deeleman-Reinhold, 1971	Hrustovača pećina*	BiH 1815	BiH, Bosanska Krajina	Deeleman-Reinhold, 1971
	Donja pećina kod Jasenovih potoka	BiH 5525		
<i>Mesostalita comottii</i> (Gasparo, 1999)	Tučepska Vilenjača*	HR 03896	HR, Biokovo	Gasparo, 1999
<i>Mesostalita</i> sp.	Grotta di Canebola	2370/1080FR	IT, Julian Prealps	Gasparo, 1996
	Voragine a S di Prepotischis	2240/1025FR		Bognolo, 2002
	Pozzo 1° di Miscecco	2780/1342FR		
	Foran di Landri	11/46FR		this study

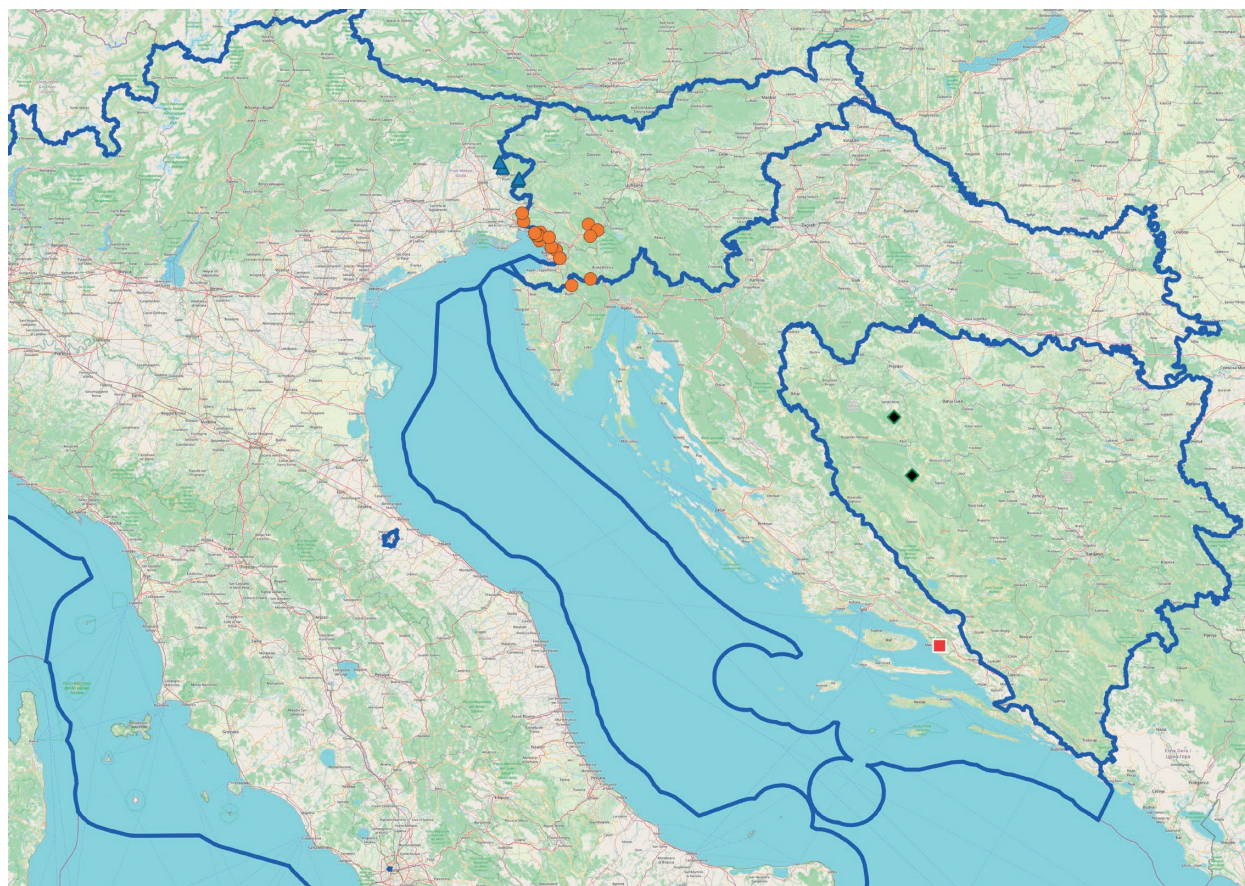


Figure 3: Position of published localities of *Mesostalita* species (*M. nocturna*: orange circles; *M. kratochvili*: black rhombuses; *M. comottii*: red square; *Mesostalita* sp. from the Julian Prealps: blue triangles). National borders are shown in blue. The map background is based on OpenStreetMap contributors (2024).

3.3. SPELEOLOGICAL AND FAUNAL NOTES ABOUT THE FOUR CAVES IN THE JULIAN PREALPS

The four caves in the Julian Prealps are located in the southern part of the area. Voragine a S di Prepotischi and Pozzo 1° di Miscecco open in the Judrio/Idrija river valley, near the Italy-Slovenia border (Figure 4). They are vertical caves, about 50 metres deep. In the former, an entrance pit leads to a large cavern measuring 36, 23, and 42 metres in length, width, and height, respectively (Figure 5). The latter is made up of two consecutive narrow pits (Figure 6) (Regione Autonoma Friuli Venezia Giulia, 2024). Grotta di Canebola and Foran di Landri are located about 15 km north-west of the previous ones and are about 4 km apart (Figure 4). They are horizontal, wider caves, measuring 1,400 and 314 metres in length, respectively (A.S. Forum Julii Speleo, 2019; Regione Autonoma Friuli Venezia Giulia, 2024). Grotta di Canebola consists mainly of a system of large sub-horizontal galleries developing within a layer of limestone breccia. The cave contains a single larger chamber, where the *Mesostalita* specimen was found (Figure

7) (Gasparo, 1996). Foran di Landri opens into a large cavern, measuring about 16 metres in diameter, partly occupied by a pond, beyond which two permanently flooded syphons are present. The cave continues with a series of chambers, galleries and syphons. A secondary branch made up of a few subsequent chimneys opens up next to the cave entrance (Figure 8) (A.S. Forum Julii Speleo, 2019). Three of these caves contain watercourses inside. Foran di Landri and Grotta di Canebola are active caves, having inner syphons and ponds, and are springs of streams flowing outside from their entrances. The stream, syphons and ponds are permanent in Foran di Landri, whereas they are temporary in Grotta di Canebola. In Voragine a S di Prepotischi a small stream flows through the bottom part of the cave, reaching considerable energy in case of heavy rains. Pozzo 1° di Miscecco is a fossil cave (Regione Autonoma Friuli Venezia Giulia, 2024).

Faunistic surveys have been carried out in all four caves. Cave-dwelling species, as well as *Mesostalita*, are reported from all of them. Bognolo (2002) reported the ground beetles *Anophthalmus gridellii* and *Laemostenus*

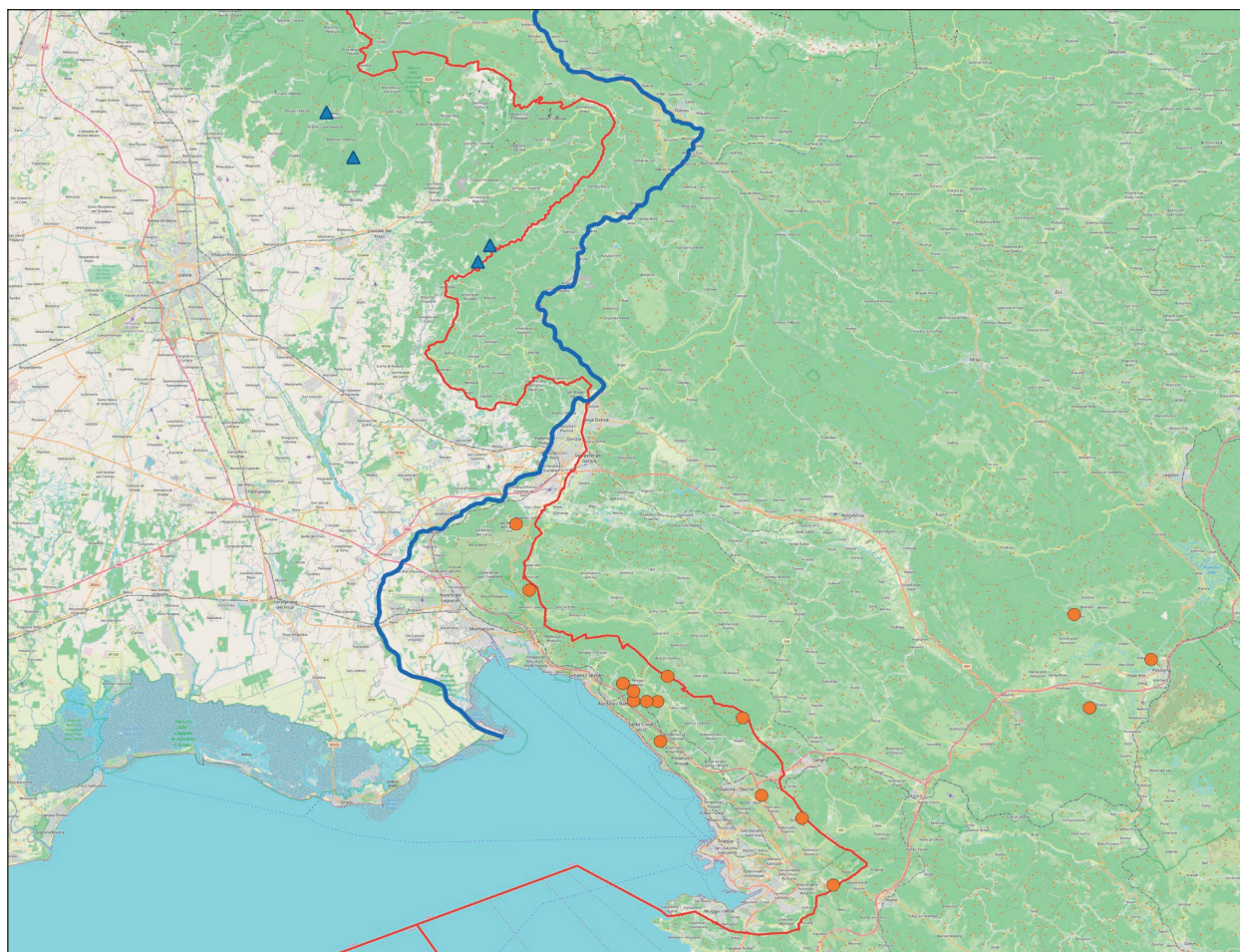


Figure 4: Position of localities of *Mesostalita nocturna* in the northern part of its distribution range (orange circles) and *Mesostalita* sp. in the Julian Prealps (blue triangles). The Isonzo-Soča river (blue line) flows between these two groups of localities, separating the Classical Karst (south) from the Julian Prealps (north). National borders are shown in red. The map background is based on OpenStreetMap contributors (2024).

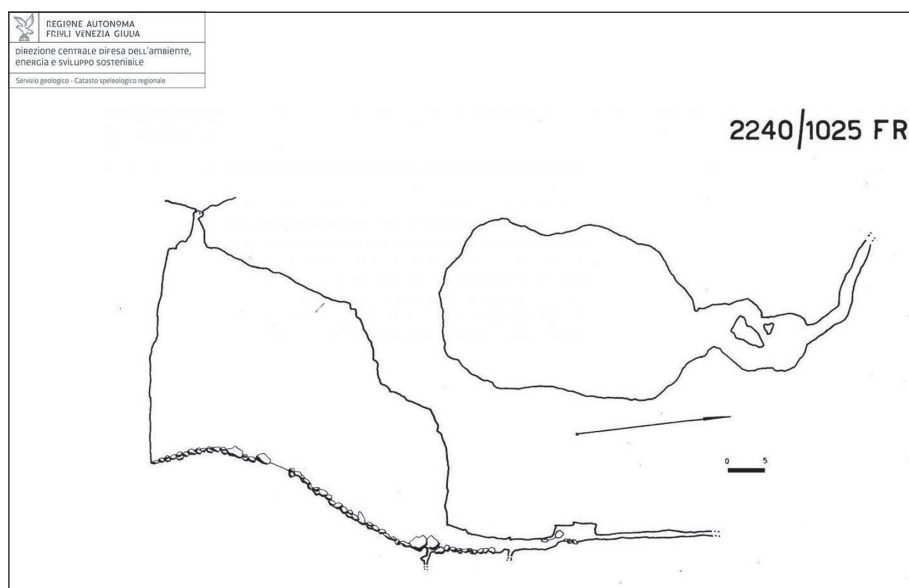


Figure 5: Survey of Voragine a S di Prepotischis (Regione Autonoma Friuli Venezia Giulia, 2024).

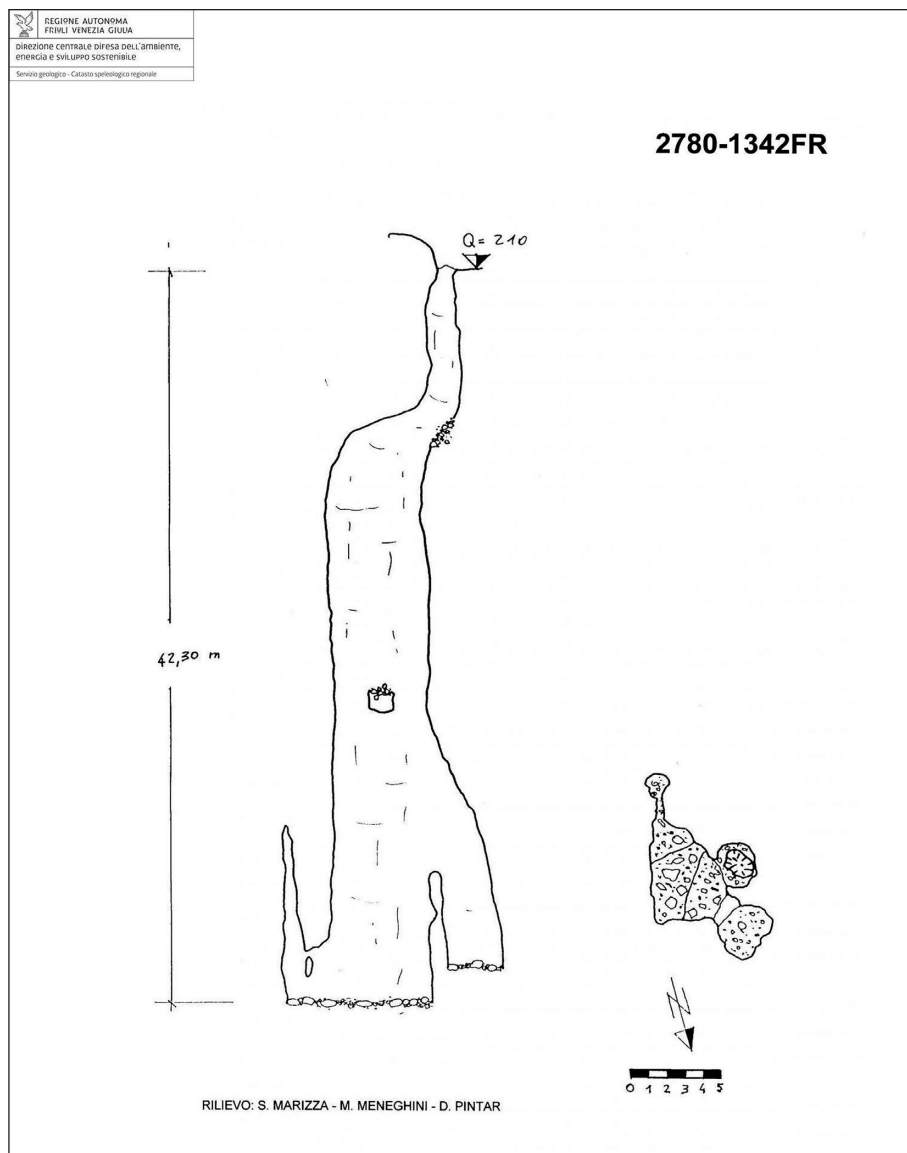


Figure 6: Survey of Pozzo 1° di Miscecco (Regione Autonoma Friuli Venezia Giulia, 2024).

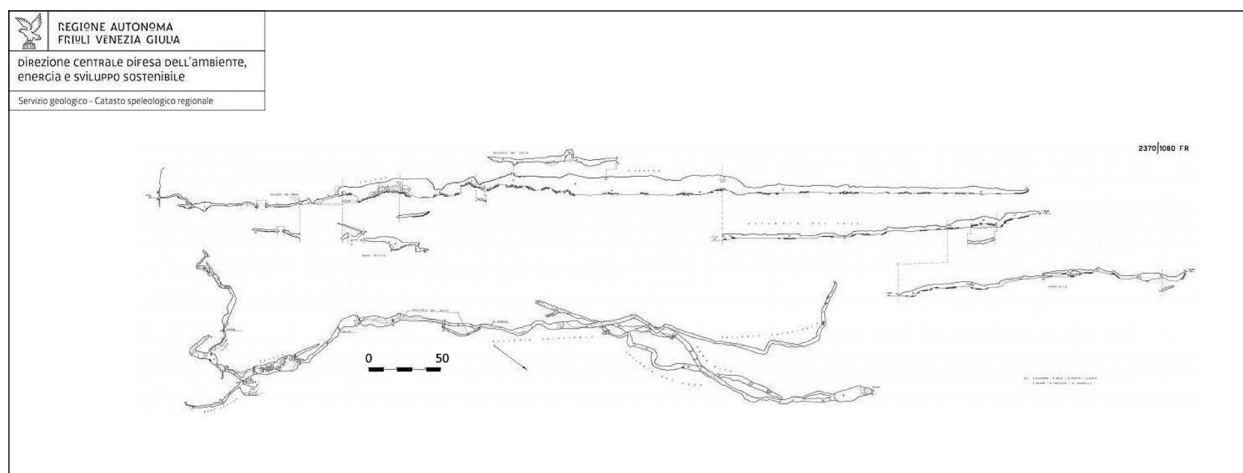


Figure 7: Survey of Grotta di Canebola (Regione Autonoma Friuli Venezia Giulia, 2024).

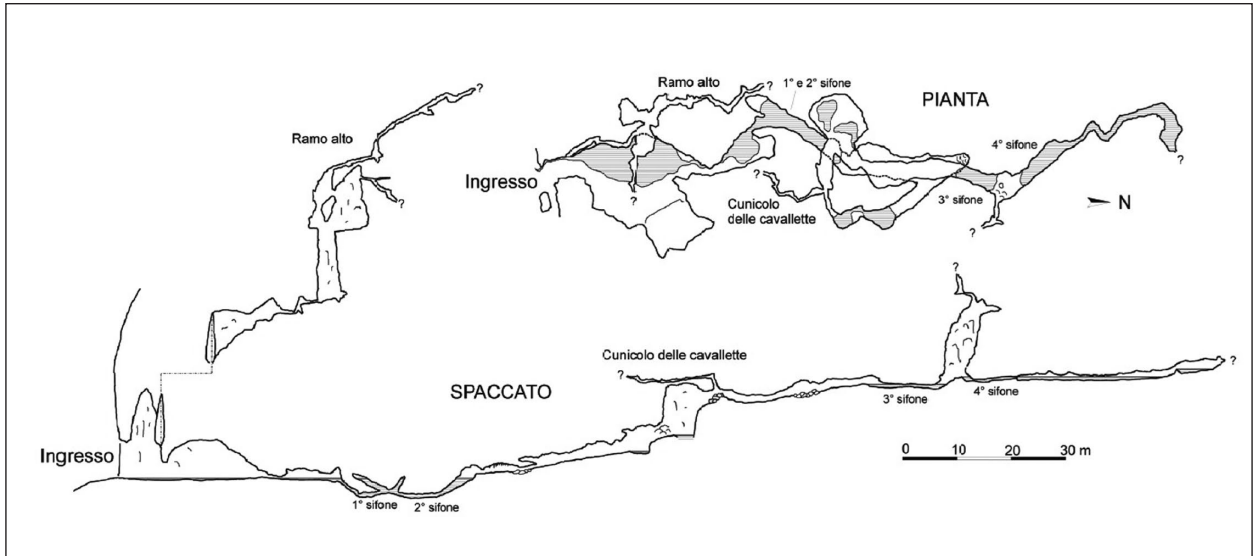


Figure 8: Survey of Foran di Landri, including the recently discovered parts of the cave (Colausti, 2019).

schreibersi from Voragine a S di Prepotischis and Pozzo 1° di Miscecco, as well as other non-cave-dwelling species. In Voragine a S di Prepotischis the pseudoscorpion *Chthonius spelaeophilus* is also present (Gardini, 2010). The pill millipede *Trachysphaera fabbrii* (Strasser, 1981), the harvestmen *Ischyropsalis muellneri* (Gruber, 1984), and the amphipod *Niphargus julius* (Stoch, 2008) are reported from Grotta di Canebola. Foran di Landri is most

likely one of the best-known caves in the area from a faunistic point of view. Several articles about its fauna have been recently published, including a preliminary list of species living in the cave (Canciani, 2019) and some faunal reports (Vagalinski et al., 2022; Canciani & Cechini, 2023; Canciani et al., 2023). Almost 40 species, half of which are closely related to subterranean environments, are present in the cave (unpublished data).

4. DISCUSSION AND CONCLUSIONS

The finding of a new *Mesostalita* specimen in the Julian Prealps may give a renewed impulse to research on the genus in this area, as well as on cave-dwelling fauna of the region. First of all, the distribution range of the genus *Mesostalita* must be extended northwards to include the Julian Prealps (on the other side of the Isonzo-Soča river, opposite to the Dinarides), as already suggested by Gasparo (1996, 1999), but not confirmed in subsequent publications. It should be noted that the Isonzo-Soča river represents a biogeographical barrier for many north-western Dinaric cave-dwellers. These have the Isonzo-Soča river as the north-western boundary of their distribution range (Latella & Stoch, 2001). The presence in the Julian Prealps thus makes *Mesostalita* one of the few troglobitic north-western Dinaric genera living on both sides of the river, such as the cholevine beetles *Aphaobius* (Bognolo & Vailati, 2010) and *Pretneria* (Bognolo, 2016). Nevertheless, only four individuals of the genus have been sampled and reported from the Julian Prealps since

the first finding in Grotta di Canebola in 1979 (Gasparo, 1996). Sampling these spiders is quite difficult, even in caves where they have already been reported. This is due first of all to their low population densities in caves. Moreover, they are wandering hunters, living mainly in the network system of cracks and faults, inaccessible to humans, which are typical of subterranean environments (Deeleman-Reinhold & Deeleman, 1980). The accidental finding of a dead *Mesostalita* specimen in Foran di Landri should be seen in this perspective as exceptional. However, a more systematic sampling in caves in the Julian Prealps, also involving the use of propylene-glycol pitfall traps (Höfer et al., 2015; Weigand et al., 2021), is needed to seek and collect new specimens in other localities, in order to better understand the genus distribution in the area.

Mesostalita individuals from the Julian Prealps belong to a potential new taxon, mentioned by Gasparo (1996) as *Stalita* sp. prope *nocturna* (to currently indicate it as *Me-*

sostalita sp. prope *nocturna*) due to its similarity to *M. nocturna*. Gasparo (1996) provides a morphological description of this taxon (based on the Grotta di Canebola specimen), including differences in female genitalia compared to *M. nocturna*, but he does not formally establish a new taxon. The presence of more female individuals from the Julian Prealps currently available should allow to conduct a more comprehensive analysis to better understand the genitalia variability between these specimens and *M. nocturna*. However, due to the lack of knowledge about female genitalia variability in the genus (Gasparo, 1996), finding at least a male individual is essential to clarify their proper specific status. Genetic and molecular analyses may be another option. DNA sequences of *M. nocturna* (as well as of *M. kratochvili*) are available on GenBank (<https://www.ncbi.nlm.nih.gov/genbank/>) (Pavlek & Mammola, 2020). DNA from the Foran di Landri specimen (dead yet well-preserved when

collected, and now preserved in 95% ethanol) or from more individuals sampled alive in the area can be used to assess genetic differences with *M. nocturna*. These analyses may help clarify the phylogenetic position of the Julian Prealps specimens within the genus *Mesostalita*.

Lastly, finding *Mesostalita* in Foran di Landri also contributes to improving the knowledge about cave-dwelling fauna from the Julian Prealps. Despite several studies (e.g., Governatori & Chiappa, 1997; Stoch, 1997, 2008; Colla & Stoch, 2002), new discoveries in the area are still possible, as recently shown by the finding of the second ever known locality of the cave-dwelling julid millipede *Stygiulus fimbriatus* (Vagalinski et al., 2022; Canciani et al., 2023). The Julian Prealps represent a very interesting area from this perspective. Therefore, further biospeleological and faunistic studies in the area are currently underway.

AUTHOR CONTRIBUTIONS

G.C.: field research in Foran di Landri, bibliographic research, article conception and writing. L.Tu.: morphological analysis, article revision. L.Tr.: map figures preparation. M.C.: field research in Foran di Landri. A.C.:

general support, photos of the *habitus* of the Foran di Landri specimen, article revision. All authors have read and agreed to the published version of the manuscript.

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REFERENCES

- A.S. Forum Julii Speleo, 2019. Foran di Landri. Il Landri svelato: ricerche e approfondimenti su una grotta tra storia e folklore. La Tipografia, Monfalcone, 127 pp.
- Bognolo, M., 2002. I coleotteri cavernicoli della valle dello Judrio. In: C.R.C. Seppenhof (eds.), La valle dello Judrio. Progetto di ricerca speleologica Judrio 2000. Tipografia Budin, Gorizia, pp. 135-142.
- Bognolo, M., 2016. Revision of the genus *Pretneria* Müller, 1931 (Coleoptera, Cholevidae, Leptodirinae). Atti del Museo Civico di Storia Naturale di Trieste, 58: 85-123.
- Bognolo, M., Vailati, D., 2010. Revision of the genus *Aphaobius* Abelle de Perrin, 1878 (Coleoptera, Cholevidae, Leptodirinae). Scopolia, 68: 1-75.

- Canciani, G., 2017. Variazione stagionale nella composizione della fauna ad artropodi in due cavità del Carso Goriziano [Master's Degree thesis]. University of Padua, 75 pp.
- Canciani, G., 2019. La fauna cavernicola del Foran di Landri. In: A.S. Forum Julii Speleo (eds.), Foran di Landri. Il Landri svelato: ricerche e approfondimenti su una grotta tra storia e folklore. La Tipografia, Monfalcone, pp. 65-79.
- Canciani, G., 2023. Un nuovo e aggiornato catalogo faunistico della Grotta Regina del Carso (2328/4760VG) (Carso Isontino, NE Italy). Atti del Museo Civico di Storia Naturale di Trieste, 64: 69-80.
- Canciani, G., Cechini, R., 2023. Due nuove stazioni per *Diphyus quadripunctorius* (O.F. Müller, 1776) (Hymenoptera, Ichneumonidae) nelle Prealpi Giulie e nella Tuscia viterbese. Atti del Museo Civico di Storia Naturale di Trieste, 64: 81-86.
- Canciani, G., Colautti, M., Del Ben, S., 2023. Foran di Landri: la seconda stazione per il millepiedi cavernicolo *Stygiulus fimbriatus*. Atti del Convegno Speleo2022 (Claut 2022), pp. 155-162.
- Carulli, G.B., 2006. Carta geologica del Friuli Venezia Giulia. Scala 1:150000. Note illustrative. S.EL.CA., Firenze, 44 pp.
- Carulli, G.B., 2013. La storia geologica delle Giulie. Alpi Giulie, 107(2): 1-134.
- Colautti, M., 2019. Foran di Landri: un viaggio per immagini. In: A.S. Forum Julii Speleo (eds.), Foran di Landri. Il Landri svelato: ricerche e approfondimenti su una grotta tra storia e folklore. La Tipografia, Monfalcone, pp. 23-34.
- Colla, A., Stoch, F., 2002. Prime ricerche biospeologiche nelle grotte dei Monti Musi (Parco Naturale delle Prealpi Giulie). Atti del Museo Civico di Storia Naturale di Trieste, 49: 93-112.
- Deeleman, P.R., Deeleman-Reinhold, C.L., 1980. Remarks on troglobitism in spiders. Proceedings of 8. Internationaler Arachnolog-Kongreß (Wien 1980), pp. 433-438.
- Deeleman-Reinhold, C.L., 1971. Beitrag zur Kenntnis höhlenbewohnender Dysderidae (Araneida) aus Jugoslawien. Slovenska Akademija Znanosti in Umetnosti, Razred za Prirodoslovne Vede, Classis IV, Historia Naturalis, 14: 95-120.
- Di Caporiacco, L., 1937. Aracnidi cavernicoli e lucifugi di Postumia. Le Grotte d'Italia, 2(2): 36-41.
- Gardini, G., 2010. Gli *Chthonius* (*Globochthonius*) d'Italia e di Slovenia (Pseudoscorpiones Chthoniidae). Gortania, 31: 53-64.
- Gasparo, F., 1996. Sulla presenza del genere *Stalita* Schiödte (Araneae, Dysderidae) in Friuli (Italia nordorientale). Atti e Memorie della Commissione Grotte "E. Boegan", 33: 47-53.
- Gasparo, F., 1999. *Stalita comottii* n. sp., un nuovo ragno cavernicolo della Dalmazia centrale (Araneae, Dysderidae). Atti e Memorie della Commissione Grotte "E. Boegan", 36: 17-25.
- Gasparo, F., 2002. Miscellanea Biospeologica. Parte II: Venezia Giulia. Atti e Memorie della Commissione Grotte "E. Boegan", 38: 27-70.
- Gasparo, F., Thaler, K., 2000. I ragni cavernicoli della Venezia Giulia (Italia nord-orientale) (Arachnida, Araneae). Atti e Memorie della Commissione Grotte "E. Boegan", 37: 17-55.
- Governatori, G., Chiappa, B., 1997. Artropodi terrestri di sistemi sotterranei delle Valli del Natisone (Prealpi Giulie). In: Muscio, G. (eds.), Il fenomeno carsico delle Valli del Natisone. Memorie dell'Istituto Italiano di Speleologia, s. II, 9, pp. 65-88.
- Gruber, J., 1984. Weberknechte aus Norditalienischen Höhlen (Arachnida: Opiliones: Nemastomatidae, Ischyropsalididae, Phalangidae). Atti e Memorie della Commissione Grotte "E. Boegan", 23: 61-63.
- Höfer, H., Astrin, J., Holstein, J., Spelda, J., Meyer, F., Zarte, N., 2015. Propylene glycol – a useful capture preservative for spiders for DNA barcoding. Arachnologische Mitteilungen, 50: 30-36. <https://doi.org/10.5431/aramit5005>
- Jamarska Zveza Slovenije, 2024. Kataster Jam Jamske zveze Slovenije. <https://kataster.jamarska-zveza.si/> [Accessed 17 July 2024]
- Jurkovšek, B., Biolchi, S., Furlani, S., Kolar-Jurkovšek, T., Zini, L., Jež, J., Tunis, G., Bavec, M., Cucchi, F., 2016. Geology of the Classical Karst Region (SW Slovenia–NE Italy). Journal of Maps, 12(S1): 352-362. <https://doi.org/10.1080/17445647.2016.1215941>
- Latella, L., Stoch, F., 2001. Biospeleology. In: Stoch, F. (eds.), Caves and karstic phenomena. Italian Habitats, Ministero dell'Ambiente e della Tutela del Territorio e Museo Friulano di Storia Naturale, 1, pp. 53-86.
- Komnenov, M., 2010. Checklist of spiders (Araneae) of Bosnia and Herzegovina. Uzizaž i Biospeld, 5: 51-69.
- Kostanjšek, R., Kuntner, M., 2015. Araneae Sloveniae: a national spider species checklist. ZooKeys, 474: 1-91. <https://doi.org/10.3897/zookeys.474.8474>
- Le Peru, B., 2011. The spiders of Europe, a synthesis of data. Volume 1: Atypidae to Theridiidae. Mémoires de la Société Linnéenne de Lyon, 2, 522 pp.
- Mammola, S., Cardoso, P., Ribera, C., Pavlek, M., Isaia, M., 2018. A synthesis on cave-dwelling spiders in Europe. Journal of Zoological Systematics and

- Evolutionary Research, 56: 301-316. <https://doi.org/10.1111/jzs.12201>
- Mammola, S., Pavlek, M., Huber, B.A., Ballarin, F., Tolve, M., Čupić, I., Hesselberg, T., Lunghi, E., Mouron, S., Graco-Roza, C., Cardoso, P., 2022. A trait database and updated checklist for European subterranean spiders. *Scientific Data*, 9: 236. <https://doi.org/10.1038/s41597-022-01316-3>
- Marazzi, S., 2005. Atlante orografico delle Alpi. SOIUSA. Suddivisione orografica internazionale unificata del Sistema Alpino. Priula & Verlucchi, 416 pp.
- Ministarstvo zaštite okoliša i zelene tranzicije, 2024. Bioportal – Katastar speleoloških objekata RH. Available from: <https://bioportal.hr/gis/> [Accessed 17 July 2024]
- Mulaomerović, J., Zahirović, D., Handžić, E., 2006. Katastar speleoloških objekata Bosne i Hercegovine. Speleološko društvo “SpeleoDodo”, Sarajevo, 274 pp.
- Nentwig, W., Blick, T., Bosmans, R., Gloor, D., Hänggi, A., Kropf, C., 2024. Spiders of Europe. Version 7.2024. <https://araneae.nmbe.ch/> [Accessed 17 July 2024] <https://doi.org/10.24436/1>
- OpenStreetMap contributors, 2024. Planet dump retrieved from <https://planet.osm.org>. <https://www.openstreetmap.org>. [Accessed 3 August 2024]
- Ozimec, R., Pavlek, M., 2011. Cave spiders of Biokovo Mt. In: Protrka, K., Škrabić, H., Srzić, S., Book of abstracts of Scientific and professional meeting “Biokovo at the turn of the millennium: the development of Nature Park in the 21st century” (Makarska 2011), pp. 26-27.
- Pantini, P., Isaia, M., 2019. Araneae.it: the online Catalog of Italian spiders with addenda on other Arachnid Orders occurring in Italy (Arachnida: Araneae, Opiliones, Palpigradi, Pseudoscorpionida, Scorpiones, Solifugae). *Fragmenta Entomologica*, 51(2): 127-152. <https://www.araneae.it/> [Accessed 17 July 2024] <https://doi.org/10.4081/fe.2019.374>
- Pavlek, M., 2021. Od prvog špiljskog pauka do danas. 170 godina istraživanja porodice Dysderidae u Dinari-dima. *Subterranea Croatica*, 19(1): 65-73.
- Pavlek, M., Mammola, S., 2020. Niche-based processes explaining the distributions of closely related subterranean spiders. *Journal of Biogeography*, 48: 118-133. <https://doi.org/10.1111/jbi.13987>
- Polak, S., Bedek, J., Ozimec, R., Zakšek, V., 2012. Subterranean fauna of twelve Istrian caves. *Annales, Series Historia Naturalis*, 22(1): 7-24.
- Polak, S., Pipan, T., 2021. The subterranean fauna of Križna jama, Slovenia. *Diversity*, 13: 210. <https://doi.org/10.3390/d13050210>
- Regione Autonoma Friuli Venezia Giulia, 2024. Catasto Speleologico Regionale Regione Autonoma Friuli Venezia Giulia. <https://catastogrotte.regione.fvg.it/> [Accessed 17 July 2024]
- Roewer, C.F., 1931. Arachnoideen aus südostalpinen Höhlen, gesammelt von Herrn Karl Strasser in den Jahren 1929 und 1930. *Mitteilungen über Höhlen- und Karstforschung*, 1931: 1-17.
- Stepišnik, U., Ramšak, L., 2006. Tikina jama. *Naše jame*, 46: 26-33.
- Stoch, F., 1997. La fauna delle acque carsiche sotterranee delle Valli del Natisone. In: Muscio, G. (eds.), *Il fenomeno carsico delle Valli del Natisone. Memorie dell'Istituto Italiano di Speleologia*, s. II, 9, pp. 89-100.
- Stoch, F., 2008. La fauna cavernicola delle Prealpi Giulie Settentrionali. In: Muscio, G. (eds.), *Il fenomeno carsico delle Prealpi Giulie Settentrionali. Memorie dell'Istituto Italiano di Speleologia*, s. II, 20, pp. 97-121.
- Stoch, F., 2009. Servizio di integrazione al catasto grotte nel Sito Natura 2000 SIC IT3340006 “Carso Tries-tino e Goriziano” e ZPS IT3341002 “Aree Carsiche della Venezia Giulia”. *Relazione Finale*. Udine, 232 pp.
- Strasser, C., 1981. Le *Trachysphaera* cavernicole del Friuli (Diplopoda Glomerida). *Gortania*, 2: 167-172.
- Vagalinski, B., Borissov, S., Bobeva, A., Canciani, G., Antić, D.Ž., 2022. The mostly cavernicolous millipede genus *Stygiulus* Verhoeff, 1929, stat. nov.: taxonomy, distribution and phylogenetic relationships (Diplopoda, Julida, Julidae). *European Journal of Taxonomy*, 798(1): 30-69. <https://doi.org/10.5852/ejt.2022.798.1669>
- Weigand, A.M., Desquitz, N., Weigand, H., Szucsich, N., 2021. Application of propylene glycol in DNA-based studies of invertebrates. *Metabarcoding and Metagenomics*, 5: e57278. <https://doi.org/10.3897/mbmg.5.57278>
- World Spider Catalogue, 2024. World Spider Catalog, Version 25.5. Natural History Museum Bern. <https://wsc.nmbe.ch/> [Accessed 20 July 2024] <https://doi.org/10.24436/2>
- Zupan Hajna, N., 2019. Dinaric karst – geography and geology. In: White, W.B., Culver, D.C., Pipan, T. (eds.), *Encyclopedia of Caves*. 3rd edition. Academic Press, pp. 353-362. <https://doi.org/10.1016/B978-0-12-814124-3.00039-X>