

## Revisiting the taxonomy of the rare and tiny comb-footed spider *Carniella brignolii* (Araneae, Theridiidae)

Barbara Thaler-Knoflach, Ambros Hänggi, Karl-Hinrich Kielhorn & Bodo von Broen

doi: 10.5431/aramit4702

**Abstract.** *Carniella brignolii* Thaler & Steinberger, 1988 was first described based on a male from Austria and still belongs to the rare, scarcely studied species. Based on material from Germany and Switzerland the hitherto unknown female now can be assigned and presented. In this context a new synonymy is also proposed: The cave-dwelling, troglomorphic *C. mihaili* (Georgescu, 1989) from Romania, originally established as new genus *Marianana*, is synonymised with *C. brignolii*.

**Keywords:** *Carniella mihaili*, cave-dweller, description, female, *Marianana*, new synonymy

**Zusammenfassung. Ergänzungen zur Taxonomie der seltenen Zwergkugelspinne *Carniella brignolii* (Araneae, Theridiidae).** *Carniella brignolii* Thaler & Steinberger, 1988 wurde nach einem Männchen aus Österreich erstmals beschrieben und gehört noch immer zu den seltenen und wenig untersuchten Arten. Mit rezentem Material aus Deutschland und der Schweiz kann nun das bisher unbekannte Weibchen zugeordnet und dargestellt werden. In diesem Zusammenhang wird außerdem eine neue Synonymie vorgeschlagen: Die höhlenbewohnende, troglomorphe *C. mihaili* (Georgescu, 1989) aus Rumänien, ursprünglich Typusart der neuen, inzwischen eingezogenen Gattung *Marianana*, wird mit *C. brignolii* synonymisiert.

The genus *Carniella* was first established by Thaler & Steinberger (1988) based upon a single European species, *C. brignolii*, from Carinthia, the eponymous region in Austria. Apparently, the generic nomenclature is rooted in the ancient name “*Carnia*” for Carinthia. Several species from Southeast Asia and one from Africa have been added in the last decades (Miller 1970, Wunderlich 1995, Knoflach 1996, Ono et al. 2007; see also Platnick 2014). Nae (2012) transferred a cave-dwelling, troglomorphic species described by Georgescu (1989) from Romania, *Theonoe mihaili*, into *Carniella*, and thus added a second European species to the genus.

The most prominent character of *Carniella* is the clypeal modification of the male (Thaler & Steinberger 1988, Knoflach 1996), which easily allows classification at generic level. Moreover, the male genital organ shows particular characteristics, such as a basal position of the cymbial hook and the absence of tibial trichobothria (Knoflach 1996, Agnarsson 2004).

Females are less conspicuous. All representatives are small-sized, with a body length of approximately 1 mm. According to their dwarfish appearance and their hidden subterranean life, records are rare and the state of knowledge scanty.

Here we present new taxonomic amendments for the type species *C. brignolii* from Europe, including the description of the female based on material from Germany and Switzerland and a new synonymy, which reveals that the female was already known under another species name. A male with an uninflated genital organ previously recorded by Hänggi & Stäubli (2012) allows synonymisation with *C. mihaili*.

### Material and methods

Specimens were first examined and arranged using a Leica Wild M8 stereoscopic microscope. Male and female genitalia were dissected and studied as temporary mounts by submerging them in glycerine on half-covered, hollow slides under a Wild M20 compound microscope equipped with a drawing tube and micrometer eyepiece. Owing to the scarcity of the material legs were not removed and instead measurements had to be taken from leg drawings from the entire specimens placed on glycerine slides. As a consequence, some of the limbs could not be oriented exactly horizontal to the optical axis of the microscope, as if they were separated from the body.

Barbara THALER-KNOFLACH, Institute of Ecology, University of Innsbruck, Technikerstraße 25, A-6020 Innsbruck, Austria.  
E-Mail: barbara.knoflach@uibk.ac.at  
Ambros HÄNGGI, Naturhistorisches Museum Basel, Abteilung Biowissenschaften, Augustinerstrasse 2, CH-4001 Basel.  
E-Mail: ambros.haenggi@bs.ch  
Karl-Hinrich KIELHORN, Albertstr. 10, D-10827 Berlin,  
E-Mail: kh.kielhorn@gmx.de  
Bodo von BROEN, Fürstenwalder Straße 17, D-10243 Berlin

submitted: 15. 1. 2014, accepted: 4. 3. 2014, online 27. 3. 2014

Abbreviations: bH basal haematodocha, E – embolus, MA – median apophysis, P – “paracymbium” or cymbial hook, S – subtegulum, T – tegulum, V – protrusion of basal haematodocha (nomenclature of male palp mainly sensu Agnarsson 2004 and Agnarsson et al. 2007).

Depository and museum abbreviations: NMB Naturhistorisches Museum Basel, ZMB –Museum für Naturkunde Berlin

## Results and discussion

### *Carniella brignolii* Thaler & Steinberger, 1988

*C. brignolii* Thaler & Steinberger, 1988: Male, n. sp., p. 998, figs. 1-4, 9-15. Type locality Warmbad Villach, Carinthia, Austria.

*C. b.*; Le Peru, 2011: Male, p. 376, 436, figs. 663-664 (described and redrawn from Thaler & Steinberger, 1988).

*C. b.*; Hänggi & Stäubli, 2012: Male, p. 59, fig. 2, Zürich, Switzerland.

*Marianana mihaili* Georgescu, 1989: Female, n. gen., n. sp., p. 89, figs. 17-26. Type locality Movile Cave, Dobrogea, Mangalia, 43.82568 N/ 28.56068 E, 1-2 m a.s.l., SE-Romania. **nov. syn.**

*Theonoe mihaili*; Le Peru, 2011: Female, p. 411, 468, fig. 794 (described and redrawn from Georgescu, 1989).

*Carniella mihaili*; Nae, 2012: Male, p. 68, figs. 1-12, Movile Cave, Romania.

### Material examined

1 ♂ (NMB; ARAN-20603), SWITZERLAND, Zürich, freight terminal, in pitfall-trap between track gravel, 2.6.-16.6.2009, N47.3834/E8.5167 (+ 10 m), 400 m a.s.l., leg. Anna Stäubli (Hänggi & Stäubli 2012). 1 ♀ (NMB, ARAN-25740), SWITZERLAND, Valais (Wallis), Miège, edge of organic parcel of vineyard, 27.5.1997, N46.31459/E7.55782 (+ 50 m), 720-740 m a.s.l., pitfall-trap, leg. M. Genini (site “MB” in Genini 2000). 1 ♀ (ZMB; B602), GERMANY, Brandenburg, Neuenhagen (Bad Freienwalde), gravel pit, in pitfall-trap on coarse sand, 2.5.-2.6.1997, N52.83982/E14.02679, 2 m a.s.l., leg. M. Sommer, coll. Bodo von Broen.

*Carniella brignolii*, the type species of the genus *Carniella* Thaler & Steinberger, 1988, was so far known only from the male, at least nominally. The corresponding female was described almost at the same time by Georgescu (1989) as new genus *Marianana* and new species *M. mihaili*; see synonymy list.

### Diagnosis

Males of *Carniella brignolii* are easily recognised by their modified clypeus (Fig. 4) and the conformation of their palpal sclerites (Figs. 5-8; further figures see Thaler & Steinberger, 1988): Embolus complex with distal spiral, tip of cymbium with noticeable recess and basal haematodocha with a specific, conspicuous apophysis, which largely protrudes beyond the male palp when expanded (V, Thaler & Steinberger 1988, Nae 2012 sub *C. mihaili*). As in other members of the genus, the “paracymbium” or cymbial hook is situated on the base of the cymbial retromargin, a conductor is missing and the palpal tibia lacks any trichobothria. Females show a rounded epigynal cavity with a clear septum.

### Description of female

Colouration, measurements, somatic features (Figs. 1-3): Carapace, sternum and legs uniformly light brown, abdomen greyish. Carapace 0.44/0.50 mm long, 0.35/0.38 mm wide, sternum 0.29/0.31 mm long and 0.26/0.27 mm wide. Sternum tapering posteriorly. Chelicerae with three denticles on anterior margin of fang groove.

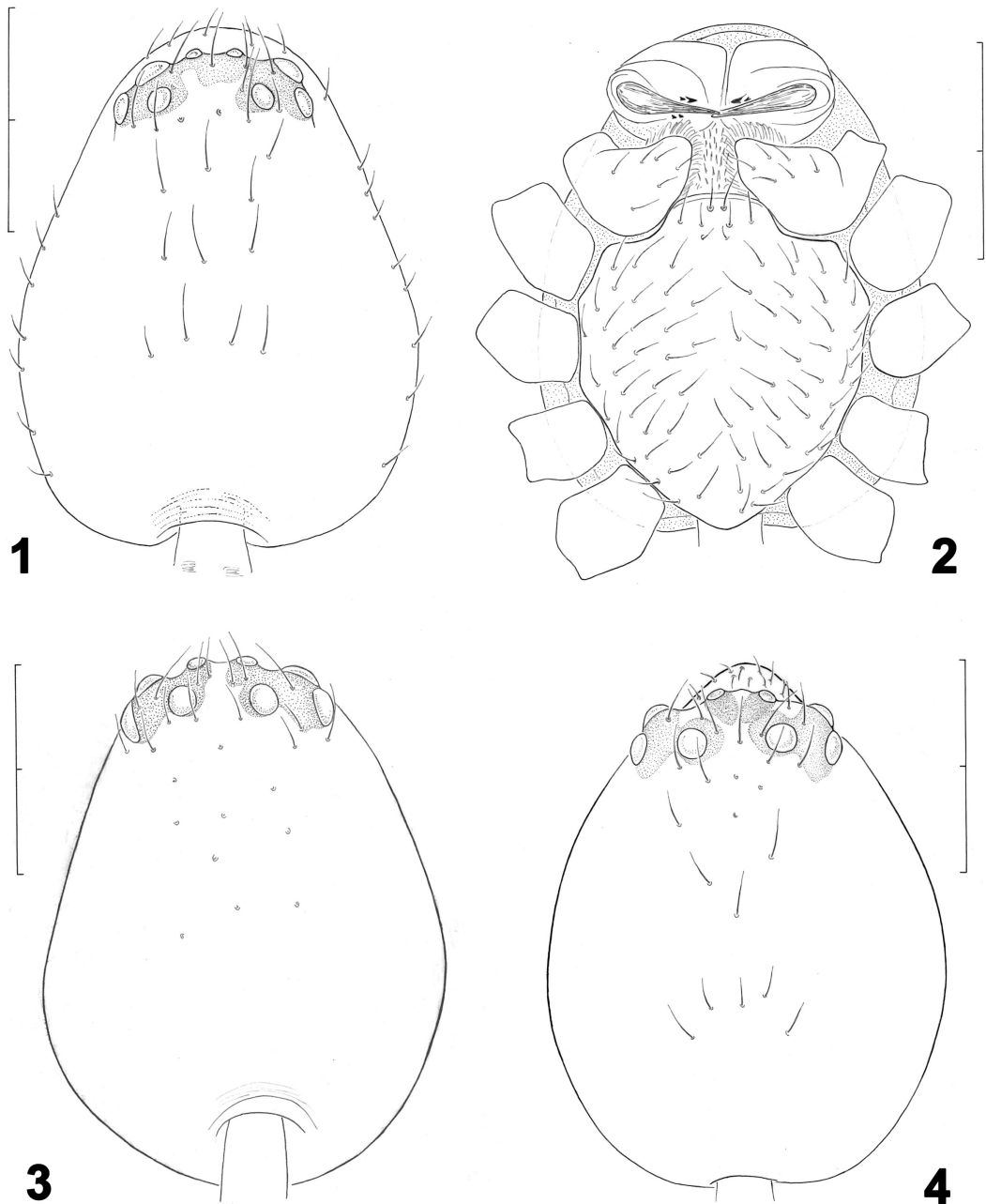
Leg measurements: Female from Brandenburg (mm): Femur/tibia/metatarsus/tarsus: Palp 0.20/0.08/-/0.16. Leg I 0.29/0.16/0.14/0.21. Leg II 0.28/0.16/0.12/0.19. Leg III 0.23/0.13/0.11/0.20. Leg IV 0.31/0.20/0.13/0.23.

Legs: 4123. Trichobothrial pattern (numbers of prodorsal/retrodorsal trichobothria of tibiae): I-II 1/2, III 2/1, IV 2/2. Metatarsi I-II with 1 trichobothrium, its position on I 0.35, on II 0.45. Metatarsi III and IV without trichobothrium. Tarsi and distal metatarsi ventrally with serrate bristles. Tarsal organ I-IV (I 0.32, II 0.35, III 0.31, IV 0.32). Tarsi I-IV 1.5, 1.6, 1.8 and 1.8 times longer than metatarsi.

Epigynum/vulva (Figs. 9, 11, 13): Epigynal cavity is a rounded, 0.1 mm wide, well outlined field, which is clearly divided along the midline by a longitudinal ridge. Copulatory orifices not clearly traceable. Copulatory ducts rather short, presumably starting at midline, running forwards at short distance and then backwards, entering at the anterior region of the receptacula seminis. Recurring part of ducts sclerotised. Receptacula seminis globular, at side margins of epigynal cavity.

### Synonymy

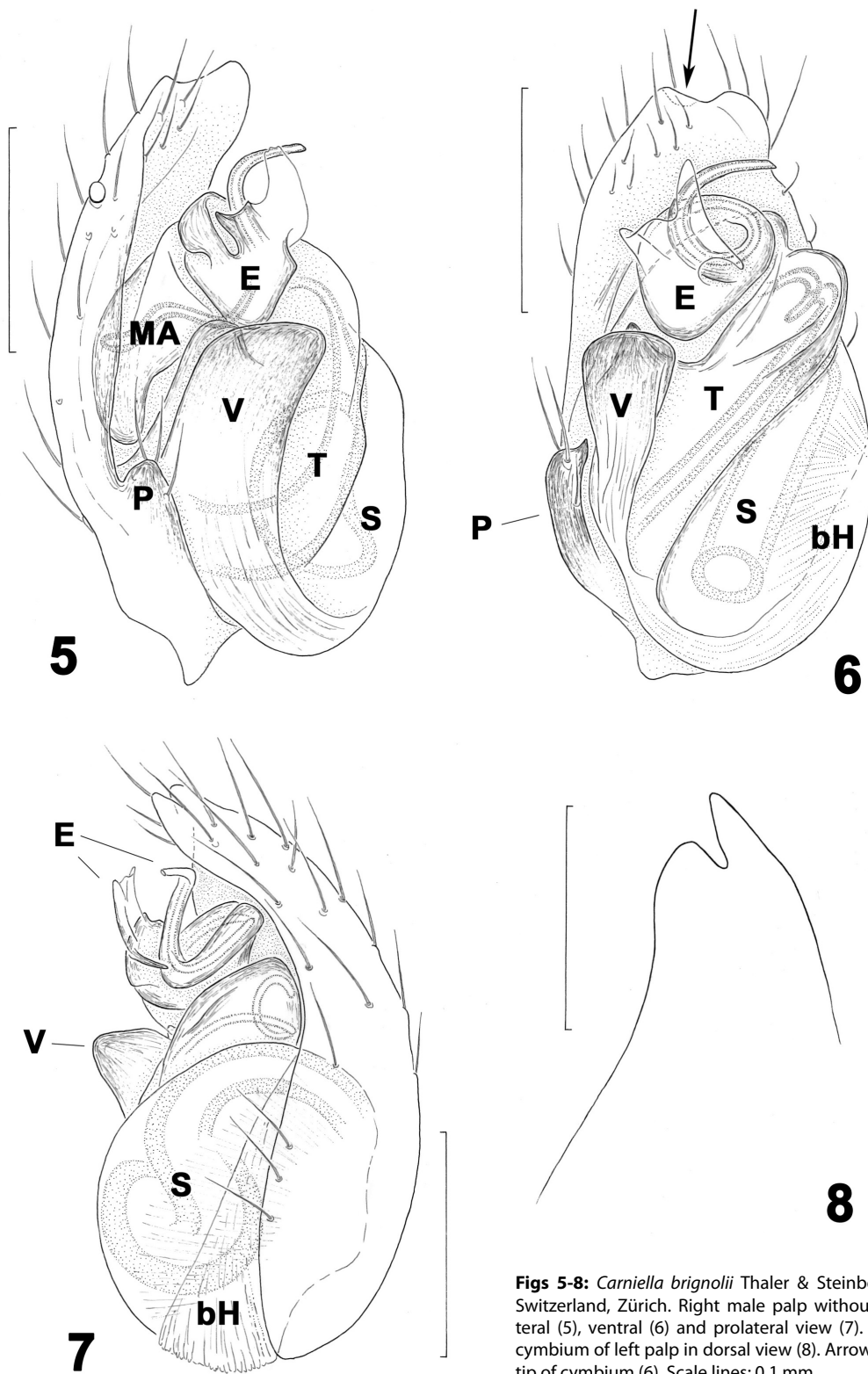
We consider *Carniella mihaili* as a new synonym of *C. brignolii*. Originally, *C. mihaili* was described by



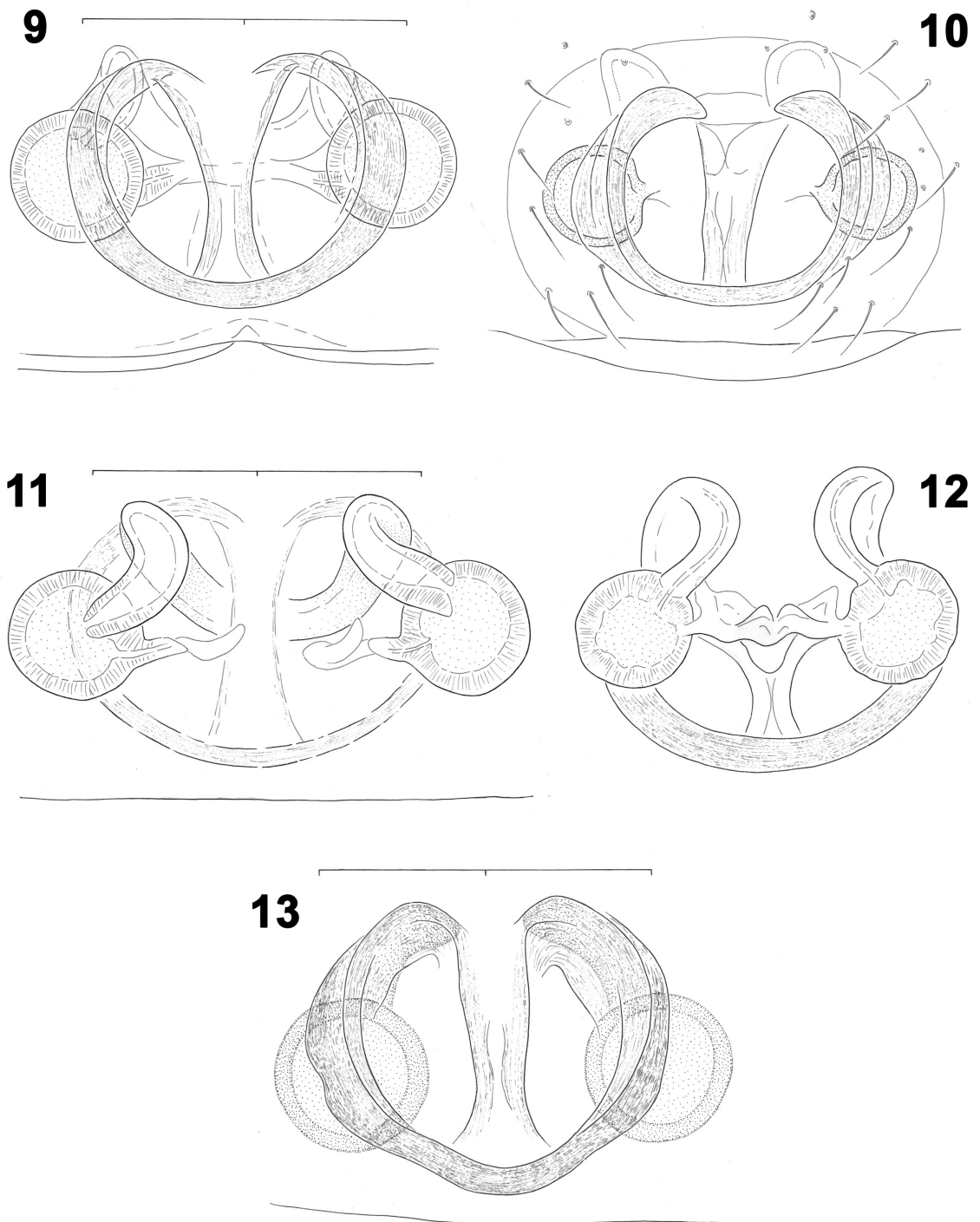
**Figs 1-4:** *Carniella brignolii* Thaler & Steinberger, 1988. Female from Switzerland, Valais (1-2) and from Germany, Brandenburg (3). Male from Switzerland, Zürich (4). Carapace, dorsal view (1, 3-4) and prosoma, ventral view (2). Scale lines: 0.2 mm.

Georgescu (1989) based on a single female representing the type species of the new genus *Marianana*. This monotypic genus later was synonymised by Wunderlich (2008) with *Theonoe* (see also Platnick

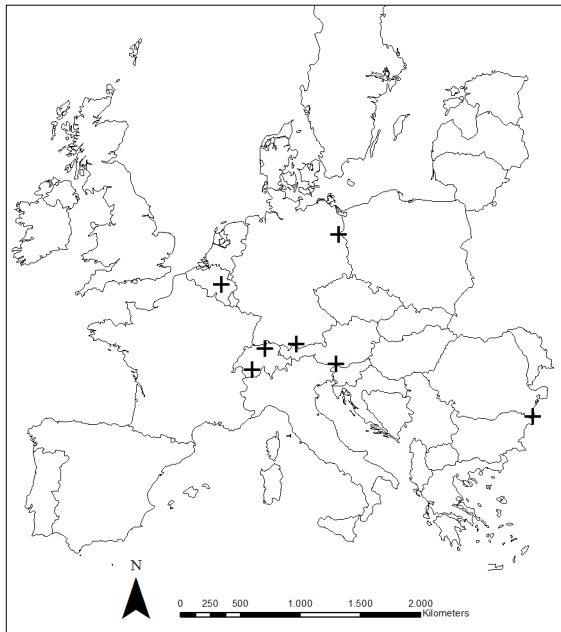
2014). With the additional knowledge based on males, Nae (2012) transferred *T. mihaili* into *Carniella* and thus the genus *Marianana* has to be listed as a junior synonym of *Carniella*.



**Figs 5-8:** *Carniella brignolii* Thaler & Steinberger, 1988, from Switzerland, Zürich. Right male palp without tibia, in retrolateral (5), ventral (6) and prolateral view (7). Outlines of distal cymbium of left palp in dorsal view (8). Arrow points to broken tip of cymbium (6). Scale lines: 0.1 mm.



**Figs 9-13:** *Carniella brignolii* Thaler & Steinberger, 1988. Female from Switzerland, Valais (9, 11), Germany, Brandenburg (13) and Romania (10, 12; taken from Georgescu 1989; sub *C. mihailii*). Epigynum/vulva, ventral (9, 10, 13) and dorsal view (11, 12). In Fig. 13 the epigynum was drawn from the entire female without being dissected. Scale lines: 0.1 mm.



**Fig. 14:** Distribution of *Carniella brignolii*. Austria: Warmbad Villach (Thaler & Steinberger 1988). Belgium: Corphalie site along River Meuse (Baert & Van Keer 1991). Germany: Bavaria, Halblech, Ostallgäu (Dröschmeister 1995); Brandenburg (see above). Switzerland: Zürich (Hänggi & Stäubli 2012); Valais, Miège (see above). Romania: Movile Cave (Nae 2012).

The excellent and highly accurate descriptions of Georgescu (1989) of the female and Nae (2012) of the male allow synonymisation of *C. mihaili* based on the literature. Nae (2012) already indicated noticeable similarities with *C. brignolii* regarding the male palp, but at that time only males with fully inflated palps were known and illustrated (figures see Thaler & Steinberger 1988). In the cave-dwelling males from Romania the palpal membranes were not expanded and thus the obvious protrusion of the basal haematodocha, 'typical' for *C. brignolii*, was hidden (abbreviated as "V" in Thaler & Steinberger 1988). A male with one uninflated genital organ (Figs. 5-7), previously recorded by Hänggi & Stäubli (2012), now strengthens the synonymy.

The following characters argue for the synonymy suggested herein. In the male palp, the basal haematodocha ends as a marked, sclerotised apophysis, which largely protrudes beyond the bulbus in the expanded palp ("V" in Thaler & Steinberger 1988 and Nae 2012). The cymbium shows distally a typical recess (Fig. 8; tip of cymbium unfortunately broken in the palp presented here, see Fig. 6). The embolus

is complex with a distal embolus spiral and several small, sclerotised projections as well as a larger hyaline one (abbreviated as TA in Thaler & Steinberger 1988 and EB in Nae 2012). The females agree in the rounded shape of the epigynal cavity with a clear septum, in the course of the copulatory ducts and the position of the receptacula (see Georgescu 1989; and Figs. 9, 13 vs. 10 and 11 vs. 12). Clypeal modification, shape of the sternum and carapace, size parameters and cheliceral dentation are likewise in accordance.

There still remains the problem of eye reduction. In the Romanian specimens from Movile Cave the median eyes are completely reduced. Reduction or loss of eyes is regarded as being among the morphological adaptations to subterranean and cave life (Růžicka 1999, 2009, Růžicka et al. 2013). A wide range of variation in eye size is known also for other soil living spiders, e.g. in the genus *Porrrhomma* (see Růžicka 2009, Růžicka et al. 2013). Therefore, it is suggested that this character is not appropriate for species discrimination in the particular case of *Carniella brignolii* and *C. mihaili*, as no other noticeable differences exist.

### Distribution

The distribution of *C. brignolii* has just recently been updated by Hänggi & Stäubli (2012). Few, scattered records come from Austria (Thaler & Steinberger 1988), Belgium (Baert & van Keer 1991), Germany (Dröschmeister 1995) and Switzerland (Hänggi & Stäubli 2012), see Fig. 14. For further details and habitat preferences see Hänggi & Stäubli (2012). With the new synonymy the range of distribution can be expanded to SE-Europe (specifically Romania) where a population with adaptations to cave life exists.

### Acknowledgments

We are deeply indebted to Jason Dunlop (Berlin) for the linguistic revision of the manuscript and to Lukas Rinnhofer (Innsbruck) for mapping Fig. 14.

### References

- Agnarsson I 2004 Morphological phylogeny of cobweb spiders and their relatives (Araneae, Araneoidea, Theridiidae). – Zoological Journal of the Linnean Society 141: 447-626 – doi: [10.1111/j.1096-3642.2004.00120.x](https://doi.org/10.1111/j.1096-3642.2004.00120.x)
- Agnarsson I, Coddington JA & Knoflach B 2007 Morphology and evolution of cobweb spider male genitalia (Araneae, Theridiidae). – Journal of Arachnology 35: 334-395 – doi: [10.1636/SH-06-36.1](https://doi.org/10.1636/SH-06-36.1)
- Baert L & Van Keer J 1991 A remarkable spider capture: *Carniella brignolii* Thaler & Steinberger, and the redis-

- covery of *Pseudomaro aenigmaticus* Denis in Belgium. – Newsletter of the British arachnological Society 62: 5
- Dröschmeister R 1995 Erstnachweis von *Carniella brignolii* (Araneae: Theridiidae) für Deutschland. – Arachnologische Mitteilungen 10: 15-16 – doi: [10.5431/aramit1004](https://doi.org/10.5431/aramit1004)
- Genini M 2000 Faune épigée de la vigne et des milieux environnants. – Revue suisse de Viticulture, Arboriculture, Horticulture 32(5): I-XII
- Georgescu M 1989 Sur trois taxa nouveaux d'aranéides troglobies de Dobrogea (Roumanie). – Miscellanea Speologica Romanica 1: 85-102
- Hänggi A & Stäubli A 2013 Nachträge zum «Katalog der schweizerischen Spinnen» 4. Neunachweise von 2002 bis 2011. – Arachnologische Mitteilungen 44: 59-76 – doi: [10.5431/aramit4410](https://doi.org/10.5431/aramit4410)
- Knoflach B 1996 Three new species of *Carniella* from Thailand (Araneae, Theridiidae). – Revue suisse de Zoologie 103: 567-579
- 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: 1-522
- Miller F 1970 Spinnenarten der Unterfamilie Micryphantidae und der Familie Theridiidae aus Angola. – Publicações culturais Companhia de Diamantes de Angola 82: 75-166
- 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
- Ono H, Chang YH & Tso IM 2007 Three new spiders of the families Theridiidae and Anapidae (Araneae) from southern Taiwan. – Memoirs of the National Science Museum Tokyo 44: 71-82
- Platnick NI 2014 The world spider catalogue, Version 14.5, American Museum of Natural History. – Internet: <http://research.amnh.org/entomology/spiders/catalog> (Theridiidae updated 17. Dec. 2013)
- Růžicka V 1999 The first steps in subterranean evolution of spiders (Araneae) in Central Europe. – Journal of Natural History 33: 255-265 – doi: [10.1080/002229399300407](https://doi.org/10.1080/002229399300407)
- Růžicka V 2009 The European species of the *microphthalmum*-group in the genus *Porrhomma* (Araneae: Linyphiidae). – Contributions to Natural History 12: 1081-1094
- Růžicka V, Šmilauer P & R Mlejnek 2013 Colonization of subterranean habitats by spiders in Central Europe. – International Journal of Speleology 42: 133-140 – doi: [10.5038/1827-806X.42.2.5](https://doi.org/10.5038/1827-806X.42.2.5)
- Thaler K & Steinberger K-H 1988 Zwei neue Zwerg-Kugelspinnen aus Österreich (Arachnida: Aranei, Theridiidae). – Revue suisse de Zoologie 95: 997-1004
- Wunderlich J 1995 Südostasiatische Arten der Gattung *Carniella* Thaler & Steinberger 1988, mit zwei Neubesreibungen (Arachnida: Araneae: Theridiidae). – Beiträge zur Araneologie 4: 553-558
- Wunderlich J 2008 On extant and fossil (Eocene) European comb-footed spiders (Araneae: Theridiidae), with notes on their subfamilies, and with descriptions of new taxa. – Beiträge zur Araneologie 5: 140-469