

## *Xysticus brevidentatus* new to Bosnia and Herzegovina (Araneae: Thomisidae), with remarks on the habitat and distribution

Tobias Bauer, Martin Lemke & Paolo Pantini



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**Abstract.** The crab spider *Xysticus brevidentatus* Wunderlich, 1995 is one of the most rarely recorded thomisids in Europe. A new record of this species from Bosnia and Herzegovina, the northernmost of its currently known distribution, is presented together with first photographic illustrations of both adult sexes and the diagnostic genital characteristics. The paper also gives information on the habitat for the first time and discusses the known records of the species on the Balkan Peninsula and in southern Italy. The latter record needs further verification due to the recently revealed presence of the highly similar *Xysticus macedonicus* Šilhavý, 1944 in the same region.

**Keywords:** Balkan Peninsula, crab spider, faunistics, rare species

**Zusammenfassung.** *Xysticus brevidentatus* neu für Bosnien und Herzegowina (Araneae: Thomisidae), mit Anmerkungen zu Lebensraum und Verbreitung. Die Krabbenspinne *Xysticus brevidentatus* Wunderlich, 1995 ist eine der am seltensten nachgewiesenen Thomisiden Europas. Wir präsentieren einen neuen Nachweis der Art für Bosnien-Herzegowina zusammen mit der ersten fotografischen Dokumentation von adulten Tieren beider Geschlechter und den Genitalmerkmalen. Ebenso werden erstmals Angaben zum Habitat der Art gemacht sowie die bisher bekannte Verbreitung der Art auf dem Balkan und in Süditalien diskutiert. Der Nachweis aus letzterem Gebiet sollte verifiziert werden, da dort kürzlich auch die Präsenz der sehr ähnlichen *Xysticus macedonicus* Šilhavý, 1944 belegt wurde.

With over 80 currently valid taxa, *Xysticus* C. L. Koch, 1835 is the largest genus of crab spiders (Thomisidae) in Europe (Breitling 2019, Nentwig et al. 2020, World Spider Catalog 2020). The distribution and natural history of many of these species is still insufficiently known, especially in the Balkan Peninsula. Jantscher (2003) published several new localities for *Xysticus brevidentatus* Wunderlich, 1995, a species formerly only known from Dubrovnik, Croatia (the type locality; Wunderlich 1995). According to Jantscher (2003), *X. brevidentatus* belongs to the *X. cristatus* group and is closely related to *Xysticus macedonicus* Šilhavý, 1944. The latter is known to inhabit mountainous regions in, e.g., the European Alps as well as Italy, Bulgaria and Macedonia (Arachnologische Gesellschaft 2020, Breitling 2018, IJland & van Helsdingen 2019, Jantscher 2001, Muster 2000). *Xysticus brevidentatus* has been recorded in Croatia, northern Albania, southern Italy and Montenegro (Deltshev et al. 2011, Jantscher 2003, Kúrka et al. 2020), but not in Bosnia and Herzegovina. While *X. brevidentatus* is well illustrated in the literature (Wunderlich 1995, Jantscher 2003), there is, as pointed out by Jantscher (2003: 365), nothing known about the habitat of the species. Neither museum labels examined by the latter author, nor recent publications or the original description of the species contain any of this information whatsoever. Therefore, we report on specimens of *X. brevidentatus* collected in 2011 in the uplands of Bosnia and Herzegovina and present pictures of the habitat as well as of the habitus and the copulatory organs.

### Material and methods

Specimens were collected with a sweep net during a field trip in Bosnia and Herzegovina by ML and are deposited in the collection of the State Museum of Natural History Karlsruhe (SMNK). Additional comparative material of *Xysticus mace-*

*donicus* deposited in the Museo Civico di Scienze Naturali “E. Caffi” of Bergamo (MSNB) was examined. The habitus pictures were taken with a DSLR Nikon D810 mounted on LMScope Mik with the software Helicon Focus. The images of the copulatory organs were made with the software “Automontage” (Syncroscopy, Cambridge, UK) and taken with a Leica DFC 495 digital camera, connected to a Leica Z6 APO (Leica Microsystems, Wetzlar, Germany). The map was created with SimpleMappr (Shorthouse 2010) and edited in Photoshop CS2. Coordinates are given in decimal degrees (WGS 84).

Abbreviations used: TL = total length, PL = prosoma length, PW = prosoma width, ALE = diameter of anterior lateral eyes, AME = diameter of anterior median eye, PME = diameter of posterior median eye, PLE = diameter of posterior lateral eye, AME/AME = distance between AME, ALE/ALE = distance between ALE, PME/PME = distance between PME, ALE/AME = distance between ALE/AME. All measurements are in mm.

### Results

*Xysticus brevidentatus* Wunderlich, 1995 (Figs 1–2)

**Material examined.** BOSNIA AND HERZEGOVINA: 1 ♂, 1 ♀ (SMNK-ARA 17231), near Galečić, 43.8031°N, 17.1725°E, approx. 1000 m a.s.l., sweep netting bushes in mountainous grassland interspersed with large rocks (Fig. 3), 15. May 2011, M. Lemke leg., M. Lemke det., T. Blick vid.

**Additional material examined.** *Xysticus macedonicus* Šilhavý, 1944 (MSNB). ITALY: 1 ♂, 1 ♀, Calabria, Reggio Calabria, Roccaforte del Greco, Aspromonte, Diga del Menta, 38.122°N, 15.895°E, approx. 1500 m a.s.l., Sep. 2009, pitfall traps, M. Coco leg., P. Pantini det.; 2 ♂♂ (MSNB), Calabria, Reggio Calabria, San Luca, Aspromonte, Serra Juncari, 38.1559°N, 15.9367°E, approx. 1700 m a.s.l., Jun.–Oct. 2014, pitfall traps, E. Castiglione & F. Manti leg., P. Pantini det.

**Diagnosis.** For a full description and diagnosis, see Jantscher (2003).

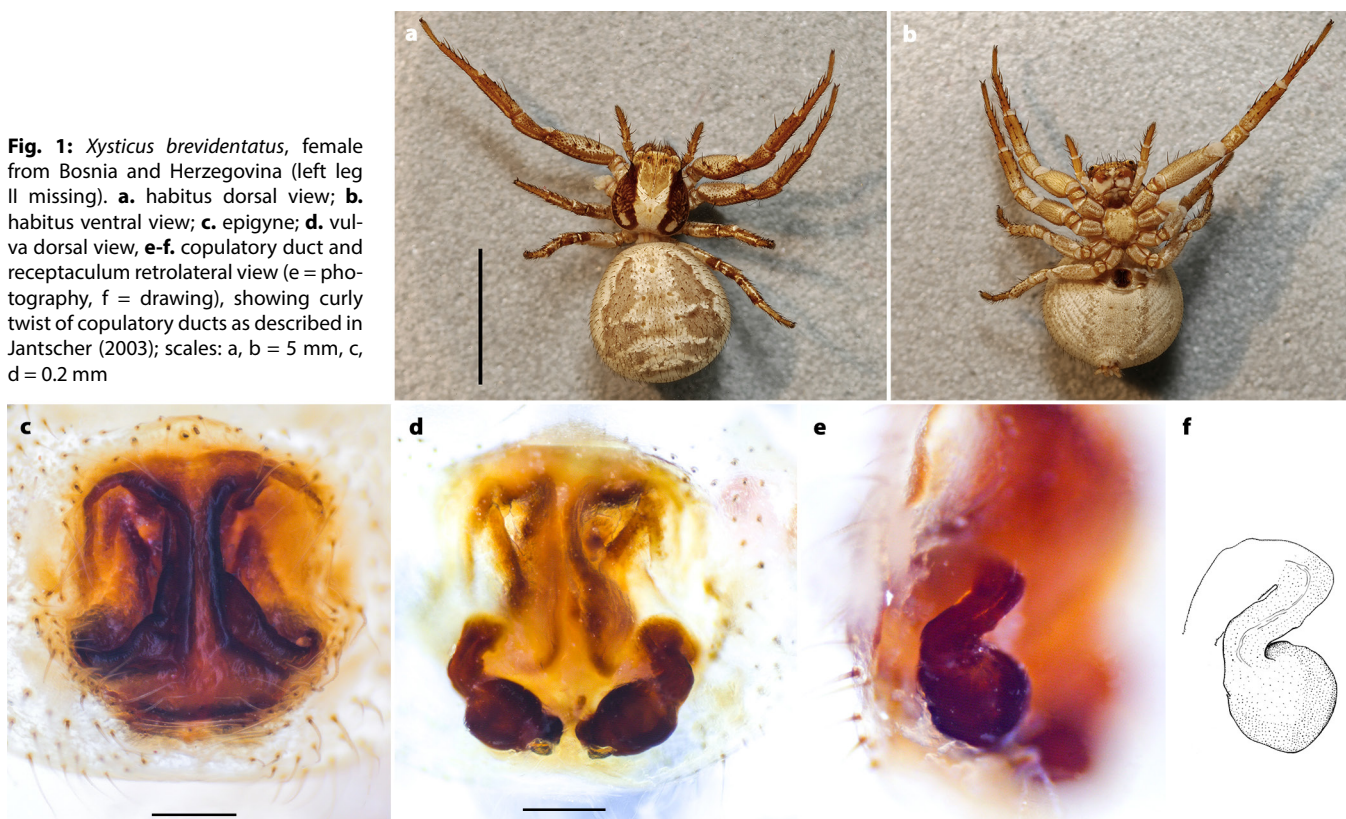
**Measurements.** Male: PL 2.8, PW 2.7, TL 5.6, AME 0.1, ALE 0.18, PME 0.1, PLE 0.13, AME/AME 0.42, ALE/

Tobias BAUER, Staatliches Museum für Naturkunde Karlsruhe, Erbprinzenstr. 13, 76133 Karlsruhe, Germany; E-mail: tobias.bauer@smnk.de  
Martin LEMKE, Wakenitzmauer 23, 23552 Lübeck; E-mail: ml@sh-spinnen.de  
Paolo PANTINI, Museo Civico di Scienze Naturali “Enrico Caffi”, Piazza Cittadella 10, 24129, Bergamo, Italy; E-mail: ppantini@comune.bg.it

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**Fig. 1:** *Xysticus brevidentatus*, female from Bosnia and Herzegovina (left leg II missing). **a.** habitus dorsal view; **b.** habitus ventral view; **c.** epigyne; **d.** vulva dorsal view, **e-f.** copulatory duct and receptaculum retrolateral view (e = photography, f = drawing), showing curly twist of copulatory ducts as described in Jantscher (2003); scales: a, b = 5 mm, c, d = 0.2 mm



ALE 1.09, AME/ALE 0.22, PME/PME 0.48. Female: PL 2.9, PW 2.8, TL 7.9, AME 0.09, ALE 0.18, PME 0.1, PLE 0.11, AME/AME 0.57, ALE/ALE 1.26, AME/ALE 0.27, PME/PME 0.55.

**Distribution.** The species has been mentioned in the literature from southern Italy, Montenegro, Albania and southern Croatia (Fig. 4; Deltshv et al. 2011, Jantscher 2003, Kürka et al. 2020, Wunderlich 1995). Our record from Bosnia and Herzegovina is thus the northernmost of its known distribution.

**Habitat.** Specimens from Bosnia and Herzegovina were collected by sweep netting small bushes on grassland at an altitude of approximately 1000 m (Fig. 3A-B). The ground was interspersed with large rocks and some smaller scrubs. The landscape consisted mostly of grassland and scrubland; there were no large forested or urbanized areas nearby. Only two specimens were caught, both from bushes. The area where the species was found belongs to the Adriatic carbonate platform, with thick limestone and dolomite deposits resulting in ba-

se-rich soils (Vlahović et al. 2005). The mountain climate in Bosnia and Herzegovina is complex due to the rugged relief, with an uneven spatial distribution of precipitation, long frost periods in winter and a significant amount of precipitation (as snow) in the winter months (Federalni hidrometeorološki zavod BiH 2020). The lowest amounts of rain fall in July and August, which are also the months with the highest mean temperatures (Federalni hidrometeorološki zavod BiH 2020).

**Further remarks.** Both specimens of *X. brevidentatus* are, in total, larger than all specimens previously examined by Jantscher (2003), but the PL of the female is in the range given by her. The male palp and the vulva of the examined material of *X. macedonicus* from Calabria (Aspromonte) correspond well to the drawings of the species in Jantscher (2001).

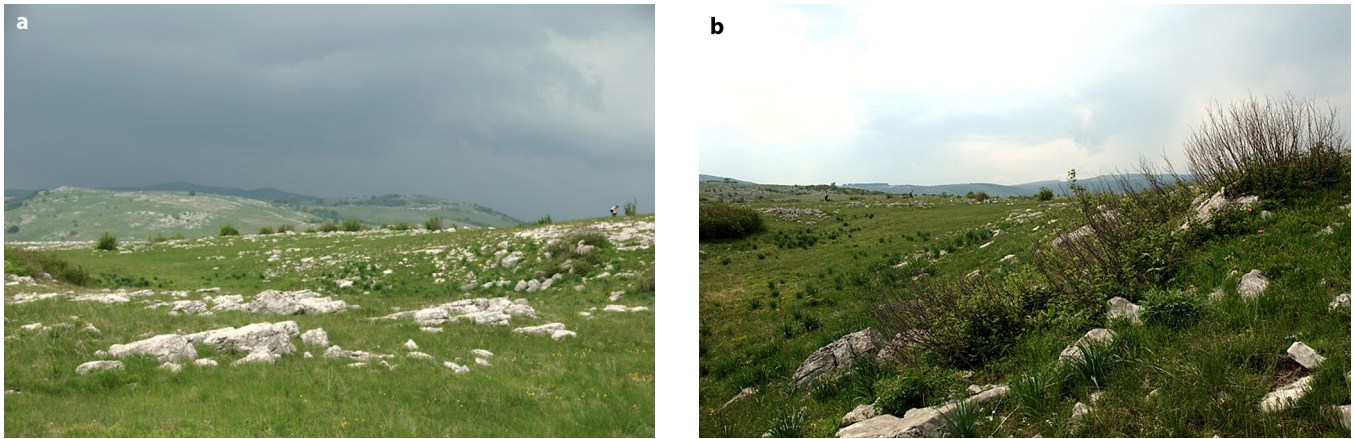
## Discussion

Based on the distribution reported in the literature, an occurrence of *X. brevidentatus* in Bosnia and Herzegovina was



**Fig. 2:** *Xysticus brevidentatus*, male from Bosnia and Herzegovina. **a.** habitus dorsal view; **b.** habitus ventral view; **c.** pedipalp ventral view; **d.** pedipalp retrolateral view; scales: a, b = 5 mm, c, d = 0.5 mm





**Fig. 3:** Locality of *Xysticus brevidentatus* in Bosnia and Herzegovina. **a.** grassland near Galečić; **b.** male and female were collected by sweep netting on low bushes.

to be expected. One of the records in Deltšev et al. (2011) was found at an altitude over 2000 m, which represents the highest known location of the species. The single record in Southern Italy (Aspromonte, Jantscher 2003), collected in 1906 by the well-known Austrian entomologist Gustav Pagannetti-Hummeler (OEBL 2020), represents the only specimen known from outside the Balkan Peninsula, and the species has not been collected in Italy again since then. We only found *X. macedonicus* in the Aspromonte massif, and Jantscher already mentioned that the single male specimen of (supposedly) *X. brevidentatus* from the Aspromonte massif differs in having an unusual short embolus and tutaculum. *Xysticus macedonicus*, a very similar and much more widespread species, was recently found in several mountainous regions in Italy outside the European Alps (IJland & van Helsdingen 2019, and our material). Although we were not able to examine the single record of *X. brevidentatus* from Italy, our material, the findings of IJland & van Helsdingen (2019) and the original remarks of Jantscher raise doubts about the correct determination of the specimen. Jantscher examined several specimens

of *X. macedonicus* and illustrated both species in detail (Jantscher 2001, 2003). It seems unlikely that she confused both species; however, at the time, *X. macedonicus* was not known from Italy.

Astrin et al. (2016) have shown that at least two species within the *X. cristatus* group (*X. cristatus* (Clerck, 1757) and *X. audax* (Schrank, 1803)) are not separable on the basis of COI (barcode) sequences, which might be attributed to occasional hybridisation resulting in mitochondrial introgression between these very closely related species. Additional published barcode data in the BOLD database (<http://doi.org/10.5883/BOLD:AAP2437>) show that the same COI haplotypes are also shared by *X. gallicus* Simon, 1875, *X. slovacus* Svatoň, Pekár & Pridavka, 2000 and *X. macedonicus* (e.g., *X. macedonicus* SPSLO281-12 from Switzerland identified by M. Kuntner, unpublished; *X. gallicus* GBMIN117776-17 from Greece and *X. slovacus* GBMIN117780-17 from Slovakia, reported in Gawryszewski et al. 2017: Suppl. Tab. 1). This indicates a considerable amount of genetic permeability of the species barriers in the *X. cristatus* species group.



**Fig. 4:** Records of *Xysticus brevidentatus* on the Balkan Peninsula and in Italy. Red/grey triangle = new record from Bosnia and Herzegovina, black dots = records from Balkan Peninsula in the literature, white star = dubious record in Italy (Jantscher 2003). White square = record from “northern Albania” without exact location in Jantscher (2003), the symbol is set arbitrary.

While *X. brevidentatus* is known from Croatia, Montenegro and Bosnia and Herzegovina, *X. macedonicus* has not been recorded there (Nentwig et al. 2020). On the other hand, the latter is known from the Alps in Austria and Germany (Jantscher 2001, Muster 2000), and from the more southern Balkans (e.g., Breitling 2018, Komnenov 2017, van Helsdingen et al. 2018). In Albania, *X. brevidentatus* is only known from mountainous regions in the north of the country (Kürka et al. 2020, Deltshv et al. 2011), while *X. macedonicus* was recorded from the Korab Mountains in the northeast (Kürka et al. 2020). Since both species can easily be confused with each other or further (more common) members of the *X. cristatus*-group, there is a need for re-examination of historical material to clarify the distribution of the species. For the time being, it appears that the two species occur parapatrically, as would be expected for a pair of recently separated sibling species. A potential contact zone in the mountain regions in northern Albania should be the target of future collection activities. The apparent disjunction in the distribution of *X. macedonicus* could be the result of insufficient sampling in the eastern part of its range, but for now it remains an intriguing puzzle, which represents a promising challenge for more detailed research on the taxonomy of these possibly geographically isolated sibling species. In conclusion, more (published) records accompanied by habitat data and gene sequences, including both nuclear and mitochondrial markers (Domènech et al. 2020), are urgently needed to obtain a better understanding of the taxonomy, ecology and natural history of *X. brevidentatus* and its relatives. Our work also stresses the importance of faunistic work accompanied by illustrations of the copulatory organs for the understanding of the distribution of species belonging to such notoriously difficult species groups.

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