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Resurrection of *Synema globosum canariense* Dahl, 1907 (Araneae: Thomisidae) with comments on other synonyms within this genus

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Abstract. The thomisid spider *Synema globosum* (Fabricius, 1775) is widely distributed in the Palaearctic realm and is particularly common in southern parts of zones with a temperate climate. Seven subspecies have been described; the widely distributed nominotypical subspecies, *S. g. globosum* and six with much more restricted ranges. As of now, just two subspecies are still recognised as valid while the others have been synonymized with the nominate subspecies. This study now revalidates *S. g. canariense* Dahl, 1907 (**subsp. reval.**) based on findings from molecular and comparative morphological analysis. We also argue that the synonymization of the subspecies *S. g. daghestanicum* Utochkin, 1960 and the species *S. japonicum* Karsch, 1879 with *S. globosum* in Ono (1988) is formally correct, but needs further investigation with modern methods.

Keywords: Canary Islands, crab spider, napoleon spider, Spain, subspecies, taxonomy

Zusammenfassung. Revalidierung von *Synema globosum canariense* Dahl, 1907 (Araneae: Thomisidae) mit Kommentaren zu anderen Synonymisierungen innerhalb der Gattung. Die Krabbenspinne *Synema globosum* (Fabricius, 1775) ist weitverbreitet innerhalb der Paläarktis und ist besonders häufig in südlichen Zonen mit gemäßigtem Klima. Sieben Unterarten wurden beschrieben; die weitverbreitete nominotypische Unterart *S. g. globosum* und sechs weitere mit stärker eingeschränkten Verbreitungsgebieten. Heutzutage sind nur noch zwei dieser Unterarten anerkannt während die anderen mit der nominotypischen Unterart synonymisiert wurden. Diese Studie revalidiert nun *S. g. canariense* Dahl, 1907 (**subsp. reval.**) basierend auf einer genetischen sowie vergleichend-morphologischen Analyse. Des Weiteren wird argumentiert, dass die Synonymisierung der Unterarten *S. g. daghestanicum* Utochkin, 1960 und der Art *S. japonicum* Karsch, 1879 mit *S. globosum* durch Ono (1988) formal korrekt ist, aber weitere Untersuchungen mit modernen Methoden benötigt.

Synema globosum (Fabricius, 1775) is a crab spider that ambushes insects on leaves and on flowers of herbs and shrubs. Being a predator of florivores and other herbivores it may lower herbivore damage on some plant species, as shown for *Erophaca baetica* (L.), Boiss. (Canterbury 2019). Crab spiders using flowers as capture sites may also alter the structure of communities of flower-visiting insects, and thereby influence plant pollination (Marrero et al. 2015). Taxonomy is crucial for studying such ecological interactions because it clearly identifies the species involved. As in the case of many other genera, our view of *Synema* has evolved over time with species being added, synonymized, or transferred. Several subspecies have been erected, but nearly all were later synonymized with the nominotypical subspecies (WSC 2023). The genus currently holds 124 accepted species including *S. globosum*, which also is the type species (WSC 2023).

According to the current understanding *Synema globosum* is widely distributed in the Palaearctic realm, ranging from the Canary Islands to Eastern Asia (Nentwig et al. 2023, Ono 1988, WSC 2023, Wunderlich 1987). In Europe it is found in Southern Europe, Western Europe, and the southern half of Eastern Europe (Nentwig et al. 2023). It is particularly common in the Mediterranean region, which also includes Tunisia, Algeria, and Morocco (Nentwig et al. 2023). It is not known whether the species has become established in Northern Europe. In recent years it has been recorded several times in England, but there is as yet no evidence of established populations (Bee et al. 2020).

A well-known feature of *S. globosum* is the variation in colour among specimens, being much more pronounced in females than in males (Fig. 1). The opisthosoma (folium excepted) can be coloured in shades of either white, yellow, orange, or red. Some specimens are bicoloured, but with one colour dominating (Fig. 1: F4, F5, M1). The dorsum of the opisthosoma has a broad, foliaceous, black pattern (rarely brown), and the anterior part resembles the outline of a bicorne hat. Hence, the vernacular name of this species is 'Napoleon Spider'. The head is brown to dark brown, and the front 1st and 2nd pairs of legs are dark brown to blackish with paler annulations distally. The 3rd and 4th pairs of legs are both shorter and paler than the front legs. The species exhibits sexual dimorphism, males are smaller and darker and with less colour variation compared to females.

According to the Canary Islands Government (2022), *S. globosum* is the only *Synema* species listed from the islands, with records from Gran Canaria, Tenerife, La Gomera and La Palma. In 2011, *Synema* specimens were beaten from bushes in the pine forest belt on the southern slopes of Tenerife. Due to their general appearance it seemed unlikely that these specimens belonged to *S. globosum*, as their colour markings differed significantly from those of specimens from the European mainland. Later, more specimens from the islands of La Gomera and Gran Canaria were collected, again none of which looked like European *S. globosum*. In fact, the habitus of the Canarian specimens is a much better match with that of *S. imitatrix* (Pavesi, 1883) from the African continent when compared to images of the latter species in Dippenaar-Schoeman et al. (2020). With these observations in mind, it was hypothesized that the synonymization of *S. g. canariense* with *S. globosum* is invalid. A morphological comparison of the two subspecies was performed to test this hypothesis. Also, barcode sequences of Canarian specimens were compared to data available at BOLD and GenBank to provide additional context.

Abbreviations

COI = cytochrome c oxidase I (gene)
CJL = Collection Jørgen Lissner (eventually deposited at Natural History Museum of Denmark)

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Fig. 1: *Synema globosum globosum* (Fabricius, 1775), habitus of live specimens. F = Female, M = Male. **F1.** Nages et Solorgues, France; **F2.** Osani, Corsica, France; **F3.** Cala Mesquida, Majorca, Spain; **F4.** Campanet, Majorca, Spain; **F5.** Meuilley, Dijon, France; **F6.** Póvoa Dão, Portugal; **M1.** Saint-Rémy-de-Provence, France; **M2.** Vieira do Minho, Portugal. © Jørgen Lissner, except F1 © Jean-Philippe Taberlet. Note artefacts due to flash reflections from ring flash

Material and methods

Morphological comparison of habitus was made using colour photographs of live specimens (Figs 1-2). The sterna of preserved specimens were photographed using a Leica M165C stereomicroscope fitted with a Leica MC 190 HD digital camera. The stereomicroscope was connected to a computer with Leica Application Suite V. 4.12 and Zerene Stacker software V. 1.04. Specimens used for DNA barcoding are deposited in the invertebrate collection of the Instituto de Productos Naturales y Agrobiología (IPNA-CSIC). DNA was extracted from a selection of seven specimens following a Chelex protocol (Casquet et al. 2012). The 5' region (658 bp) of the mtDNA COI gene was amplified using LCO1490 and HCO2198 primers (Folmer et al. 1994). PCR reaction conditions were as follows: initial denaturation at 95°C for 2 min, followed by 40 cycles of 94°C for 30 s, 42°C for 35 s, and 72°C for 45 s, and a final extension of 72°C for 5 min. 2 µL of diluted (1/10) DNA extract was amplified with 23 µL of PCR mix (for a total volume of 25 µL), comprised of 14.4 µL of water, 2.5 µL of 10x NH4 buffer (Bioline), 1.5 µL of 50 mM MgCl2 (Bioline), 2 µL of 2.5 mM dNTPs (Bioline), 0.5 µL of BSA (20 mg/ml), 1 µL of each primer (10 µM), and 0.1 µL of Taq polymerase (BIOTAQ). PCR products were sequenced using the Sanger DNA sequencing service of Macrogen (www.macrogen.com). Sequences were then edited in Geneious 2021.1.1 (www.geneious.com) and compared to the "nucleotide" database of GenBank (www.ncbi.nlm.nih.gov/genbank/) using BLAST (Altschul et al. 1990). A dataset was assembled including our sequenced barcodes, all available barcode sequences within GenBank for *S. globosum* and a selection of close related species (outgroups). Uncorrected p-distances among sequences were obtained from Geneious 2021.1.1 (www.geneious.com). A maximum-likelihood tree was constructed with RAxML 8.2. on the CIPRES Science Gateway (Miller et al. 2010) using a GTR+G model of evolution. The best scoring ML tree was selected among 100 searches on the original alignment with different randomised parsimony starting trees. Support values were obtained with 1000 bootstrap replicates (Felsenstein 1985).

Material examined: *Synema globosum globosum* (Fabricius 1775). AUSTRIA: Bisamberg (48.3239°N, 16.3622°E) 300 m, 09.V.2005, 1♂, Jan Pedersen leg., CJL-7158; Petronell-Carnuntum (48.1180°N, 16.8567°E) 150 m, 08.V.2008, 1♂, Jan Pedersen leg., CJL-7226. FRANCE: Corsica, Porto (42.2656°N, 8.7059°E) 0-250 m, 11.VII.2013, 1♂1♀, Jørgen Lissner leg., CJL-9079; Corsica, Osani (42.3214°N, 8.6365°E) 120-180 m, rock steppe with bushes, 12.VII.2013, 1♀, Jørgen Lissner leg., CJL-9008; Saint Remy-de-Provence (43.7891°N, 4.8317°E) 60 m, park, 05.IV.2007, 1♂, Jørgen Lissner leg., CJL-4087; Arcenant (47.1478°N, 4.8278°E) 465 m, rock steppe with bushes, 21.VI.2004, 1♀, Jørgen Lissner leg., CJL-1693; Meuilley (47.1373°N, 4.8884°E) 290 m, tall pasture, 24.VI.2004, 2♂♂2♀♀, Jørgen Lissner leg., CJL-1926. GREECE: Laconia, Parnon Oros (37.2207°N, 22.6287°E) 1700 m, 08.VII.1982, 1♂, Bjarne Skule leg., CJL-2604; Olympia (37.6380°N, 21.6300°E) 70 m, 24.VI.1964, 1♀, Johan Thomas Skovgaard leg., CJL-2649. ITALY: Finale Ligure (44.1739°N, 8.3420°E) 320 m, 06.VII.2015, 1♀, Jan Dolansky leg., CJL-10742. SPAIN: Majorca, Puig Randa (39.5243°N, 2.9182°E) 380 m, oak forests, 08.IV.2016, 1♂, Jørgen Lissner leg., CJL-11459; Majorca, Betlem, Cala Camps (39.7493°N, 3.3015°E) 5 m, rock steppe with bushes, 30.IV.2019, 1♂, Jørgen Lissner leg., CJL-3245; Majorca, Santuari de Lluc (39.8231°N, 2.8834°E) 480 m, mixed forest, 21.IV.2013, 1♂, Jørgen Lissner leg., CJL-8824; Majorca, Cala Romàntica (39.5195°N, 3.3069°E) 16 m, vacant lot with bushes, 23.IV.2019, 1♂, Jørgen Lissner leg., CJL-2852; Majorca, Es Castell (39.7882°N, 2.9269°E) 170 m, mixed forest, 20.IV.2018, 1♂, Jørgen Lissner leg., CJL-12331; Majorca, Cap de ses Salines (39.2650°N, 3.0561°E) 44318 m, rock steppe with bushes, 27.IV.2018, 2♂♂, Jørgen Lissner leg., CJL-12413; Majorca, La Trapa (39.5999°N, 2.3609°E) 270 m, rock steppe with bushes, 24.IV.2014, 1♀, Jørgen Lissner leg., CJL-9694; Majorca, Dunes es Trénc (39.3491°N, 2.9865°E) 2 m, sand dune with bushes, 25.IV.2014, 1♀, Jørgen Lissner leg., CJL-9719; Majorca, Dunes es Trénc (39.3491°N, 2.9865°E) 2 m, sand dune with bushes, 27.IV.2018, 1♀, Jørgen Lissner leg., CJL-12423; Majorca, Cala Mesquida (39.7398°N, 3.4304°E) 22 m, pine forest, 30.IV.2019, 1♀, Jørgen Lissner leg., CJL-2987; Majorca, Cala Mesquida (39.7423°N, 3.4328°E) 25 m, sand dune with bushes, 05.IV.2016, 1♀, Jørgen Lissner leg., CJL-11370; Majorca, Es Castell (39.7882°N, 2.9269°E) 170 m, mixed forest, 27.IV.2019, 1♀, Jørgen Lissner leg., CJL-3357; Majorca, Torrent de Sant Miquel (39.7934°N, 2.9652°E) 48 m, stream bank with bushes, 03.V.2019, 1♂1♀, Jørgen Lissner leg., CJL-3077; Majorca, Pòrtol (39.6303°N, 2.7646°E) 215 m, mixed forest, 25.IV.2018, 1♂1♀, Jørgen Lissner leg., CJL-12389; Majorca, Cala Mesquida (39.7423°N, 3.4328°E) 25 m, sand dune with bushes, 04.V.2019, 3♀♀, Jørgen Lissner leg., CJL-2945. PORTUGAL: Póvoa Dão (40.5488°N, 7.9436°W) 225 m, 31.V.2006, 1♂1♀, Jorge Alexandre Mota de Almeida leg., CJL-3594; Rua da Fonte da Porca (41.6447°N, 8.2073°W) 330 m, shrubs, 02.IIX.2017, 1♂, Jørgen Lissner leg., CJL-3475. *Synema globosum canariense* Dahl, 1907. SPAIN: Tenerife, Monte del Agua (28.3303°N, 16.8385°W) 800 m, laurel forest, 18.IV.2011, juvenile, Jørgen Lissner leg., CJL-7635; La Gomera, Las Poyatas (28.1488°N, 17.1930°W) 295 m, xerophylic zone, 03.IV.2017, 1♂, Jørgen Lissner leg., CJL-11865; Gran Canaria, Caldera de Bandama (28.0332°N, 15.4557°W) 220 m, xerophylic zone, 06.IV.2017, juvenile, Daniel Suárez leg., CJL-12596; Gran Canaria, El Brezal (28.1072°N, 15.6016°W) 470 m, wax myrtle - tree heath, 07.IV.2017, juvenile, Daniel Suárez leg., CJL-12595; Tenerife, Las Mercedes (28.5224°N, 16.2941°W) 670 m, xerophylic zone, 07.IV.2017, 1♀, Jørgen Lissner leg., CJL-11922; Gran Canaria, Teror (28.0353°N, 15.5523°W) 800 m, garden, 09.XI.2018, 1♀, Jørgen Lissner leg., CJL-1389; Gran Canaria, Tenteniguada (27.9758°N, 15.5289°W) 800 m, rural landscape, 14.XI.2016, 1♀, Daniel Suárez leg., CJL-12594; Tenerife, Taucho (28.1535°N, 16.7198°W) 970-1060 m, pine forest, 13.IV.2011, 1♂1♀, Jørgen Lissner leg., CJL-7549; La Gomera, Los Telares (28.1508°N, 17.1978°W) 240 m, xerophylic zone, 22.IV.2015, 1♂1♀, Jørgen Lissner leg., CJL-10592.

Results

Barcoding

A fragment of the 5'-COI was successfully amplified and sequenced (GenBank accession numbers OM807203-OM807209) for seven specimens from the Canary Islands. By conducting a maximum-likelihood analysis including

Fig. 2: *Synema globosum canariense* Dahl, 1907, habitus of live specimens. GC = Gran Canaria, T = Tenerife; LG = La Gomera. © Jørgen Lissner. Note bright glare artefacts due to flash reflections, particularly on the glossy cephalothoraxes

those seven sequences as well as sequences obtained in Urfer et al. (2021) and sequences from BOLD and GenBank, four main clades were recovered (Fig. 4). All seven sequences from the Canarian specimens were identical, forming a monophyletic sister clade with individuals from mainland Spain, Portugal, and Italy ('green clade' in Urfer et al. 2021). Uncorrected p-distances between the Canarian clade and the 'green clade' range between 0.9-1.6% while distances to the remaining clades ranges between 2.2-3.2% ('purple clade' in Urfer et al. 2021) and 6.1-6.9% ('blue clade' in Urfer et al. 2021).

Morphological comparison

Synema globosum canariense Dahl, 1907 was erected due to colour differences between Canarian specimens and those of Western Europe (Dahl 1907). Dahl denoted the continental population with a trinomen, *Synema globosum globosum,* to point out the nominotypical subspecies. According to the key in Dahl (1907), *S. g. canariense* differs from *S. g. globosum* by having a different coloured prosoma: "Auf dem Cephalothorax ist der hintere Teil des Kopfes und auch der Seitenrand immer heller als die dazwischen liegenden Teile" [author translation: the back part of the head and also the side margins are always lighter than the parts in between]. Dahl (1907) described the colouration of the cephalothorax in *S. g. globosum* as: "Auf dem Cephalothorax ist höchstens der hintere Teil des Kopfes hell" [author translation: on the cephalothorax, at most the back of the head is pale]. Later, *Synema g. canariense* was synonymized with *S. globosum* by Wunderlich (1987:252). Wunderlich (1987) did not provide any arguments for this synonymization, but it was nevertheless accepted by the WSC (2023). In the present study we compared several morphological characters to assess the validity of the synonymization (Tab. 1). Most of the morphological differences listed were found to be distinct and not clinal with only a few characters slightly overlapping. The differences found apply to all individuals examined within each subspecies range. The results agree with Dahl (1907), but with some deviations. The colour differences of prosomas are reproduced in this study for only females and juvenile males. In these specimens, the dark marking of the cephalothorax forms a "U" in females and juvenile males of *S. g. canariense* (Fig. 2). However, in examined adult males only the back part of the head is light in *Synema g. canariense* (Fig. 2) while in *S. g. globosum* it is uniformly coloured, brown to blackish brown (Fig. 1), not in agreement with Dahl (1907), at least not in live specimens. The dark/light areas become much less contrasting in alcohol preserved specimens. In females of *S. g. globosum* there is a slightly paler area at the back of the head which forms a wide "v" pointing towards the rudimentary fovea and they lack the dark "U"-marking (Fig. 1). Colouration of the sterna is shown in Fig. 3. Differences are minor, nevertheless distinct among the two subspecies (Tab. 1). Opisthosomal markings were not mentioned by Dahl (1907), but they also show distinctive differences (Tab. 1.).

Discussion

Barcoding

Urfer et al. (2021) studied molecular and morphological variation in 72 adult specimens of *S. globosum* collected across the European continent and Turkey. The study did not include material from the distributional ranges of the subspecies, *S. g. canariense* and *S. g. nigriventre* or from ranges of the possible subspecies, *S. g. daghestanicum* and *S. g. japonicum*. Thus, only specimens from the range of the nominotypical subspecies were investigated. They found rather large (up to ≈ 6 %) genetic distance in the COI barcode, but without any biogeographical pattern. Somatic and genital characters in both sexes and morphometrics of the male palp exhibited high intraspecific variation that did not match with the genetic data. According to Urfer et al. (2021), one possible explanation is that *S. g. globosum* could be highly polymorphic both in terms of its mtDNA and morphology. Differences in both morphological features compared to mainland specimens as well as the monophyletic position of the Canarian specimens are sufficient arguments to resurrect the subspecies *S. g. canariense*. Different studies dealing with spider species delimitation had recovered a wide variety of divergence threshold. Robison et al. (2009) established a divergence set at 6.8%, based on the mean divergence of different spider families. This study includes two Thomisidae genera, *Misumenops* and *Xysticus* with values of divergence of 4.9% and 6.85%, respectively. A study addressing the phylogenetic relationship of the tribe Coriarachnini (Breitling 2019) recovered interspecific divergences ranging from 3.5% (genus *Mecaphesa*) to 9.6% (genus *Xysticus*). Integrative taxonomic studies from non-thomisid spiders had recovered a wide range of interspecific/intraspecific divergence such as 4–5%/0.6–2.7% (genus *Micaria*, Gnaphosidae; Muster & Michalik 2020), 3.8–13.0%/0.6–2.5% (genus *Dysdera*, Dysderidae; Řezáč et al. 2014), 5.2–10.2%/0.2–3.9% (genus *Aphonopelma*, Theraphosidae; Hamilton et al. 2014) or 10.6–17.2%/1.4–4.6% (genus *Loxosceles*, Sicariidae; Planas & Ribera 2014). A study comprising up to 371 morphospecies from 39 different families recovered a mean intraspecific divergence of 2.07%, while mean interspecific divergence was 9.73% (Domènech et al. 2021). Although there are morphological differences as well as a clear physical barrier between mainland and insular populations, the low divergence found between the Canarian clade and its sister clade (0.9–1.6%) prevents elevation of the subspecies *S. g. canariense* to species level. Genetic structuring in four main clades and the great

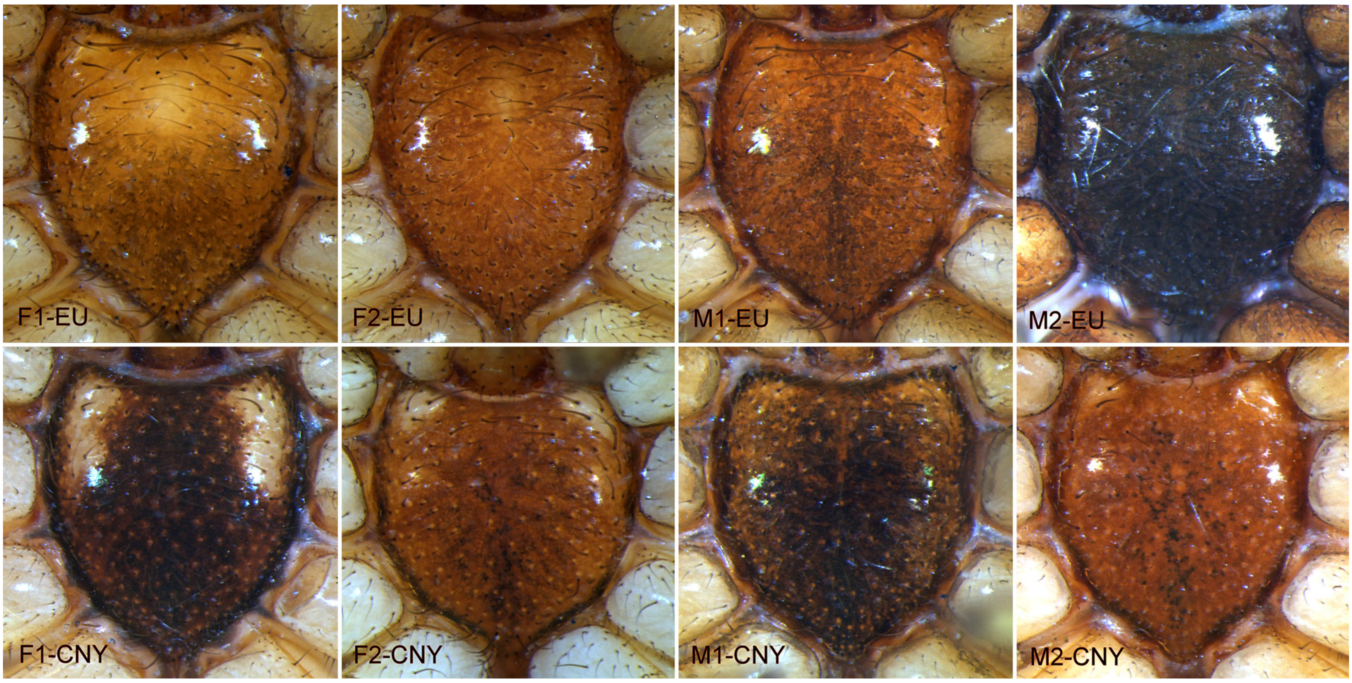

Fig. 3: *Synema globosum globosum* (Fabricius, 1775) (upper row) and *Synema globosum canariense* Dahl, 1907 (lower row), sterna of preserved specimens. F = Female, M = Male, EU = Europe, CNY = Canary Islands. Bright white spots are glare artefacts from LED illumination of subject. **F1- EU.** Porto, Corsica, France; **F2- EU.** Cala Mesquida, Majorca, Spain; **M1- EU.** Pòrtol, Majorca, Spain; **M2- EU.** Rua da Fonte da Porca, Portugal; **F1-CNY.** Teror, Gran Canaria; **F2-CNY.** Las Mercedes, Tenerife; **M1- CNY.** Los Telares, La Gomera; **M2- CNY.** Taucho, Tenerife

Tab. 1. Colour differences between *Synema g. globosum* (Fabricius, 1775) and *Synema g. canariense* (Dahl, 1907)

Character	***Synema g. globosum*** (Fabricius, 1775)	***Synema g. canariense*** (Dahl, 1907)
Male carapace	Uniformly coloured, brown to blackish brown (Fig. 1)	Brown to dark brown with pale or paler posterior part of head (Fig. 2), some specimens with dark brown "U"-mark and pale margin as in females
female (and juvenile) carapace	Yellow-brown to dark brown with back of head slightly paler (Fig. 1)	Pale with a large, dark brown "U"-mark and pale margin (Fig. 2)
Sternum	Uniformly coloured brown to blackish brown sometimes paler medially, never paler anterolaterally (Fig. 3)	Bicoloured (whitish marks anterolaterally, however only vaguely discernible in males, not paler medially (Fig. 3)
Colour polymorphy	A distinct feature of females, indistinct in males. Female opisthosoma white, greyish white, cream, greenish white to light green, greenish yellow, yellow brown, golden, bright yellow, orange, red or dark red, males white (Fig. 1)	At most rudimentary and then only males. Female opisthosoma generally pale, whitish, never bright yellow, orange or red, males white or dirty white (Fig. 2)
Opisthosoma (not including foliaceous mark)	Often bicoloured red/yellow (Fig. 1 F4), orange/yellow (Fig. 1 F5), white/orange (Fig. 1 M1)	Not bicoloured in all examined material (Fig. 2)
Foliaceous mark	Usually jet black (Fig. 1), sometimes brown with darker edges (Fig. 1F2)	Light brown with distinctly darker edges or spots, sometimes blackish, not jet black (Fig. 2)

divergences found among them suggest the potential for high cryptic diversity within *S. globosum*. An integrative taxonomic approach is suggested to shed light on the diversity of *S. globosum* and, potentially, to delimit new subspecies, probably fitting with each clade recovered by Urfer et al. (2021). Future genetic studies of *Synema* should also include material from other subspecies and preferentially also other *Synema* species, and analyses of the nuclear genome for mtDNA lineages in sympatry. Such nuclear genomic analyses would enable testing for potential reproductive isolation associated with mtDNA lineages, thus revealing if these divergences represent cryptic species, or an unusually high level of intraspecific mtDNA variation (e.g., Pérez-Delgado et al. 2022). Several *Synema* species have been poorly described, some of them not even being illustrated, pointing to the need for a revision of *Synema*.

Comparative morphological analysis

Mayr (1963) defined subspecies as an "aggregate of local populations of a species inhabiting a geographic subdivision of the range of the species and differing taxonomically from other populations of the species". This was elaborated by Monroe (1982), defining subspecies as referring to "one of two or more populations of a species living in different, isolated subdivisions of the species' range and varying from one another by morphological characteristics that are not minor or clinal and with these conditions applying to all individuals within the subspecies' range". Perhaps a more modern way of subdividing polytypic spider species into subspecies is the concept of superspecies with allospecies as subunits (Kraus 2002). The underlying concept in these definitions is the biospecies comprised of two or more subspecies with allopatric speciation as the primary mechanism of speciation. Based on results from the above mentioned molecular and comparative morphological analysis it follows that all conditions of Monroe (1982) are met for recognizing *S. g. canariense* as a subspecies. Thus we here revalidate *S. g. canariense* Dahl, 1907 (**subsp. reval.**), rejecting Wunderlich (1987: 252). The title page of this book on the spiders of the Canarian Islands and Madeira (Wunderlich 1987) shows a photo of a yellow female, a common colour morph of the nominotypical subspecies of the continent. However, this photo is also found in a book with colour images of European spiders (Sauer & Wunderlich 1982), indicating that the photo probably depicts a European specimen. Both subspecies are geographically isolated as the Canarian Islands are separated from Africa by the 100 km wide Lanzarote Passage, with an additional 50 km to Gran Canaria which is the easternmost island with known presence of *Synema*. Photos of Canarian *Synema* on iNaturalist (e.g. https://www.inaturalist.org/observations/115217436) indicate the presence of specimens with darker foliaceous mark than reported in this study, but apparently not completely jet black as in most European specimens.

Synema g. globosum from the European mainland may arrive in the Canary Islands accidentally by human induced introduction. There are several examples of this species being introduced to new areas outside its natural range, such as to England (Bee et al. 2020). Arrival of *Synema g. globosum* to the Canary Islands could break reproductive isolation and result in intergradation with *Synema g. canariense*. Hopefully, this can be avoided. The spider fauna of the Canary Islands is characterised by an evolutionary history involving chance events of arrival and establishment, often followed by speciation events that may have occurred without frequent intergradation. Subspecies or local geographic races represent conservation units of special interest, and in our opinion, they should have the same focus in conservation efforts as species since they have the potential to evolve into new species. The pale colour of Canarian *Synema* could be an adaptation to higher solar radiation of the more southerly situated Canarian Islands. Interestingly, the habitus of *Synema g. canariense* is nearly identical to some colour morphs of *S. imitatrix* (Pavesi, 1883) according to colour images in Dippenaar-Schoeman et al. (2020). However, the latter species also encompass specimens with bright green carapaces which are never seen in *S. g. canariense*.

Comments on other synonymies in *Synema*

As mentioned above, most subspecies of *S. globosum* are not currently accepted. Five out of the seven described subspecies of *S. globosum* have been synonymized with the nominotypical subspecies by Breitling et al. (2016), Ono (1988)

Fig. 4: Maximum-likelihood tree showing the phylogenetic placement of *Synema globosum canariense*. Bootstrap values are presented only for main clades. Countries are indicated after GenBank accession number. Sequences are coloured following Urfer et al. (2021) classification, i.e. blue for 'blue clade', purple for 'purple clade' and green for 'green clade'. Red: specimens sequenced in this study. Black: sequences not included in Urfer et al. (2021)

and Wunderlich (1987) according to the WSC (2023). This leaves *Synema globosum nigriventre* Kulczyński, 1901 from South Siberia as the only currently still accepted subspecies of *Synema globosum* (WSC 2023) beside from the nominotypical subspecies. The three synonymizations of Breitling et al. (2016) are justified as Franganillo erected separate subspecies within the polymorphic *S. globosum* based on some of the above-mentioned colour morphs: *Synema globosum clarum* Franganillo, 1913 = *Synema globosum* (Fabricius, 1775) (Breitling et al. 2016: 55), *Synema globosum flavum* Franganillo, 1913 = *Synema globosum* (Fabricius, 1775) (Breitling et al. 2016: 56) and *Synema globosum pulchellum* Franganillo, 1926 = *Synema globosum* (Fabricius, 1775) (Breitling et al., 2016: 56). According to the WSC (2023), Ono (1988) stated the following synonymizations in his revisional study of Japanese thomisids: *Synema globosum daghestanicum* Utochkin, 1960 = *Synema globosum* (Fabricius, 1775) (Ono, 1988: 147) and *Synema japonicum* Karsch, 1879 = *Synema globosum* (Fabricius, 1775) (Ono, 1988: 147). *Synema japonicum* Karsch, 1879 has been the subject of several taxonomic changes. Dahl (1907) regarded it a subspecies of *S. globosum*. Utochkin (1960) seems to have been unaware of its subspecies status as he still considered *S. japonicum* a valid species. However, Ono (1988) decided he would treat this species as *S. globosum* which was accepted as a synonymization by the WSC (2023). He argued that 1) differences in colouration and markings could not be used to identify subspecies, 2) there were only little or no variation in the genital parts, 3) he regarded the material available to him as "not sufficient for determining the subspecies division of the species". None of the arguments of Ono (1988) contradicts the definitions of a subspecies (e.g. Monroe 1982). Thus, his decision "I prefer to put all the described subspecies and varieties in the complex of *S. globosum* in the broadest sense" is not logically deducible from his reasoning. Hence, although formally correct, the synonymizations of the subspecies *S. g. daghestanicum* Utochkin, 1960 and the species *S. japonicum* Karsch, 1879 with *S. g. globosum* in Ono (1988) are questionable. These taxa are in urgent need of being investigated for phenotypic and genetical differences to recognize their proper taxonomic ranks.

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