Description of the male of Centromerus fuerteventurensis (Araneae: Linyphiidae)

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Description of the male of *Centromerus fuerteventurensis* (Araneae: Linyphiidae)

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Abstract. We describe the hitherto unknown male of *Centromerus fuerteventurensis* Wunderlich, 1992 and present new illustrations of the epigyne and vulva. We also provide an update on the known distribution of this species on the Canary Islands.

Keywords: Canary Islands, El Hierro, Fuerteventura, Gran Canaria, Taxonomy

Zusammenfassung. Beschreibung des Männchens von *Centromerus fuerteventurensis* (Araneae: Linyphiidae). In dieser Arbeit wird das bisher unbekannte Männchen von *Centromerus fuerteventurensis* Wunderlich, 1992 beschrieben, sowie neue Abbildungen der Epigyne und Vulva vorgelegt. Ebenso werden neue Daten zur bekannten Verbreitung der Art auf den Kanarischen Inseln präsentiert.

Centromerus Dahl, 1886 is a large genus of the linyphiid subfamily Micronetinae, accounting for 93 valid species (World Spider Catalog 2024). Only one species, *Centromerus fuerteventurensis* Wunderlich, 1992, has been recorded from the Canary Islands, and so far only from the island of Fuerteventura. The description was based on a single female collected on the peninsula of Jandía in 1990 (Wunderlich 1992). Later, during sampling conducted in the mesovoid shallow substratum (MSS) between 2006 and 2010, further specimens were collected from Gran Canaria and El Hierro. However, this material remained unidentified until now. The material includes specimens of the unknown male, which is described below along with a supplementary description of the female.

Materials and methods

Specimens were collected using MSS traps (López & Oromí 2010) filled with propylene glycol (Fig. 1). Traps were revised every three months. Collected specimens were then stored in absolute ethanol for further genetic analyses. The collection dates of the material examined were recorded as the date traps were emptied. The specimens examined in this study are stored in the collections of Departamento de Zoología de la Universidad de La Laguna (DZUL), Tenerife, Canary Islands, Spain, and in the collection of the first author of this article (JL). Colour of the specimens is described only for alcohol preserved specimens which, prior to alcohol preservation, appear to have been bleached by the trapping fluid. All measurements are in millimetres. Photos and measurements of selected features were obtained using a Leica M165 C stereomicroscope or a Leica DME microscope fitted with a Leica MC 190 HD digital camera, and connected to a computer with Leica Application Suite software v. 4.12.0 and Zerene Stacker software v. 1.04. Line drawings were made digitally on top of photos using the vector graphics editor Inkscape v. 1.2.2. Background shading was added to some drawings using Corel PaintShop Pro X9 v. 19.2.0.7 x64 to convert colour images to black and white shading by selecting grayscale and then negative image, and using the blend mode dodge and adjusting Gaussian blur. For abbreviations used in the description see Lissner (2018).

Fig. 1: Details of MSS traps. **a.** Filling stones into the hollow around a PVP pipe sealed by a silicone cap installed in the MSS; **b.** Detail of the collecting tray filled with propylene glycol, with a bait container placed in the centre. A nylon cord is tied to the bait container to descend and lift the tray through the PVC pipe; **c.** Landscape/vegetation at Brezal del Palmital. Photos: H. López

Results

Family Linyphiidae Blackwall, 1859
Subfamily Micronetinae Hull, 1920
Genus *Centromerus* Dahl, 1886

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Fig. 2: *Centromerus fuerteventurensis* Wunderlich, 1992 (DZUL-34438, except a: DZUL-34436). **a.** Habitus of alcohol preserved male with partly expanded bulbs; **b.** Chelicera in posteriolateral view; **c.** Eye configuration and stridulation files on the prolateral surfaces of the palpal femora; **d.** Paracymbium of left male palp in dorso-retrolateral view. Scale bars: a: 0.5 mm, b: 0.1 mm, c: 0.1 mm, d: 0.05 mm. Photos: J. Lissner

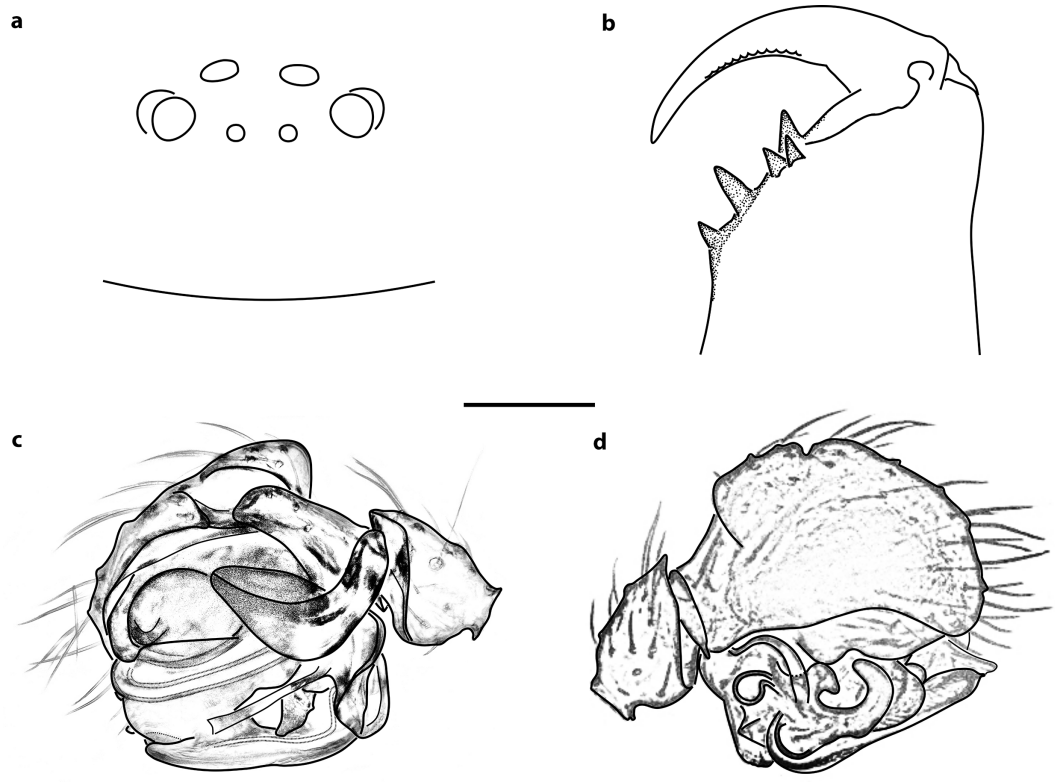

Fig. 3: *Centromerus fuerteventurensis* Wunderlich, 1992 (DZUL-34438). **a.** Eye configuration/clypeus, frontal view; **b.** Right chelicera in anterior view; **c.** Left male palp in retrolateral view; **d.** Left male palp in prolateral view. Scale bar a, b, c: 0.1 mm, b: 0.05 mm. Photos and drawings: J. Lissner

***Centromerus fuerteventurensis* Wunderlich, 1992**
(Figs 2-5, Tabs 1-2)
C. fuerteventurensis Wunderlich, 1992: 373, fig 391.
Holotype ♀: SPAIN, Canary Islands, Fuerteventura, peninsula of Jandía, Bco. deI Ciervo, Morro del Cavadero north of Morro Jable, grassy, stony W slope, 700 m, *Asteriscus* etc., Marcos Báez & Henrik Enghoff leg., 4. Jan. 1990, Depository: Natural History Museum of Denmark, Copenhagen, catalogue number ZMUC00010299.
New material examined. SPAIN, Canary Islands, El Hierro, Mercader (27.7129, -18.0222), MSS, 1070 m, 18. May 2006, 1 ♀♀, H. López leg., Coll. DZUL-34506; Canary Islands, Gran Canaria, Brezal del Palmital (28.1093, -15.6004), MSS, 570 m, 17. Aug. 2007, 1 ♂, 1 ♀♀, H. López leg., Coll. JL12604;

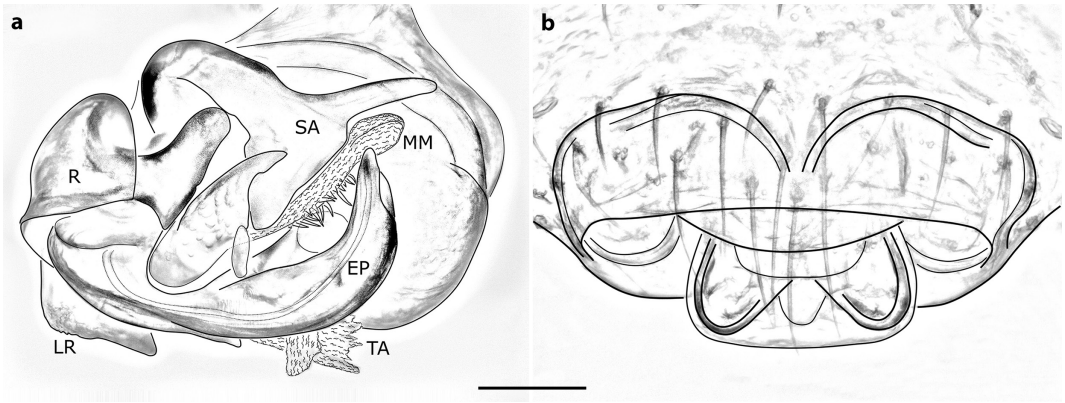

Fig. 4: *Centromerus fuerteventurensis* Wunderlich, 1992. **a.** Left male palp in ventral view (embolic division)(DZUL-34438); **b.** epigyne in ventral view (DZUL-34506). R = radix; LR = lamellar part of radix; TA = terminal apophysis; EP = embolus proper; MM = median membrane; SA = suprategular apophysis. Scale bar 0.05 mm. Drawings: J. Lissner

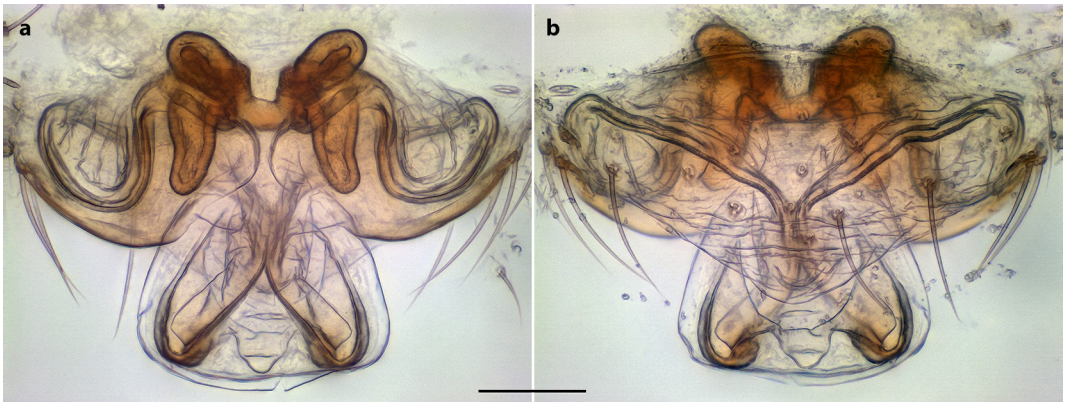

Fig. 5: *Centromerus fuerteventurensis* Wunderlich, 1992 (JL12604). **a.** vulva in dorsal view; **b.** epigyne/vulva in ventral view. Anterior arches in b) are straightened by coverslip squeezing subject and thus not with natural curvatures, compare with undistorted arches in Fig. 4b where a cavity slide was used. Scale bar 0.05 mm. Photos: J. Lissner

Tab. 1: *Centromerus fuerteventurensis* Wunderlich, 1992, male. Length (in mm) of leg segments

Appendage	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Leg I	0.52	0.17	0.48	0.44	0.30	1.91
Leg II	0.43	0.14	0.37	0.35	0.27	1.56
Leg III	0.41	0.15	0.32	0.35	0.26	1.49
Leg IV	0.54	0.16	0.51	0.45	0.31	1.97

Tab. 2: *Centromerus fuerteventurensis* Wunderlich, 1992, female. Length (in mm) of leg segments

Appendage	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Leg I	0.51	0.20	0.45	0.39	0.31	1.86
Leg II	0.49	0.19	0.39	0.35	0.27	1.69
Leg III	0.45	0.17	0.32	0.33	0.25	1.52
Leg IV	0.57	0.17	0.50	0.44	0.28	1.96

same locality, 3. Jan. 2009, 1 ♂, H. López leg., Coll. DZUL-34437; same locality, 3. Jan. 2010, 1 ♂, H. López leg., Coll. DZUL-34438.

Remarks. The female holotype was examined. It was collected by hand and is in excellent condition, much in contrast to the females of this study, which are damaged by prolonged exposure to trapping fluid. All our specimens are bleached, missing distal leg segments or entire legs, with the prosoma separated from the opisthosoma in most specimens. Only the sclerotized epigynes are unaffected by trapping fluid. Thus, the females of this study could not be measured due to poor condition of material. As a consequence, biometric measurements of the female are based on the holotype. The epigyne of the holotype was compared side by side under the stereomicroscope to the epigynes of the females examined in this study, and the specimens were found to be conspecific.

Diagnosis. The male of the recently described *C. caecus* Lecigne, 2023 is unknown (Lecigne et al. 2023) but based on the morphology of the female epigyne/vulva, it is the most closely related species to *C. fuerteventurensis*. The morphology of the epigyne and vulva of two species are very similar (compare Fig. 5 with fig. 3 in Lecigne et al. 2023). The vulvae exhibit only minor differences: in *C. caecus* the anterior part of receptacles is less elongate and the central part of the scapus is more distinctly sclerotized compared to *C. fuerteventurensis*. *Centromerus caecus* also differs by being eyeless. Based on the morphology of the male palp of described males, *C. fuerteventurensis* belongs to a group of *Centromerus* species similar to *C. europaeus* (Simon, 1911). The broadly rounded lamellar part of the radix (retrolateral view) and straight embolus (prolateral view) separate it from the most closely related congeners: *C. europaeus*, *C. bulgarianus* (Drensky, 1931), *C. subcaecus* Kulczyński, 1914, *C. dacicus* Dumitrescu & Georgescu, 1980 and *C. serbicus* Deltshev, 2002. In these species the lamellar part of radix is either pointy, angulated or bent near the tip, with the exception of *C. europaeus*, which differ by being eyeless.

Description of male (Coll. JL12604). Measurements. Total length 1.20; prosoma length 0.53; prosoma width 0.44; opisthosoma length 0.68. Habitus of alcohol preserved specimen as in Fig. 2a. Chelicerae, labium, sternum, gnathocoxae, and legs yellowish-brown. (Fig. 2a). Eyes reduced, in particular AME (Figs 2c, 3a). Eyes measurements: AME = 0.013, ALE = 0.033, PME = 0.025, PLE = 0.037. PER procurved, AER slightly recurved in dorsal view. Clypeus high, ~8 times diameter of AME. Chelicerae with fairly weak stridulatory

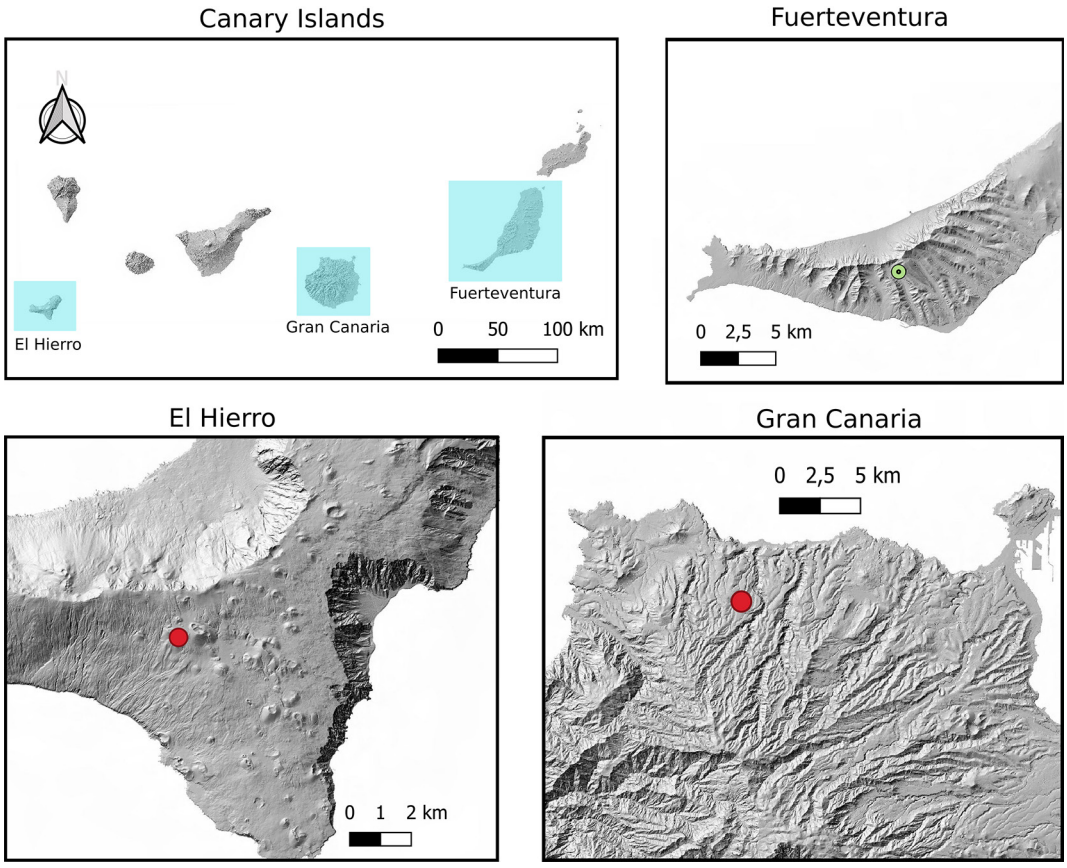

Fig. 6: Distribution of *Centromerus fuerteventurensis* Wunderlich, 1992 in the Canary Islands. Green dot (with black centre) is the sampling site of holotype on Fuerteventura, while red dots are the sampling sites of the MSS specimens of this study.

ridges on the lateral margin (Fig. 2b), opposed by stridulatory ridges on the prolateral surfaces of the palpal femora (Fig. 2c). Chelicerae with two closely set teeth at the anterior margin, posterior margin with three teeth, two teeth closest to fang socket largest (Fig. 3c). Fang with low, rounded teeth (Fig. 3b). Carapace uniformly yellowish-brown, translucent, head region darker. Sternum shield-shaped, projecting in between coxae IV, with curved setae along margin and smaller straight hairs in central area. Palpal patellae with apical dorsal spine. Leg formula 4123. Leg lengths as reported in Tab. 1. Femora spineless, with ventral row of strong hairs. Tibiae with two dorsal spines, spines smaller on tibia I. Metatarsi and tarsi spineless. Position of trichobothrium on metatarsus I (Tm I) = 0.37. Opisthosoma uniformly greyish-brown, oval, covered with yellow-brown, long setae. Colulus distinct, ~ ¼ length of anterior spinneret, with four hairs, one distal and three in transverse row near base.

Male palp (Figs 3c, 3d, 4a). Cymbium with conical protuberance pointing backward (Fig. 3c) and small indent along dorsal surface when seen in prolateral view (Fig. 3d). Teeth of paracymbium hidden by lateral margin in retrolateral view, only visible when paracymbium seen from slightly above (Fig. 2d). Teeth Nº = 27, irregular in size, some low and rounded while others triangular and pointy. Embolic division as in Fig. 4a. Median membrane with strong spikes on median part. Lamellar part of radix rounded in retrolateral view (Fig. 3c), with almost straight edge when viewed from below (Fig. 4a). Apical part of embolus curved 90° compared to basal part. Terminal apophysis complex with various projections.

Supplementary description of the female. Total length 1.34; prosoma length 0.63; prosoma width 0.46; opisthosoma length 0.72. Leg lengths as in Tab. 2. Epigyne as in Fig. 4b, vulva as in Fig. 5a). Scapus triangle-shaped with rounded corners, widest distally (Fig. 5a). Copulatory openings funnel-shaped, distinctly sclerotized, situated on ventral surface of scape near posterior margin. Copulatory ducts long, curving from copulatory opening towards centre of vulva, diverging to lateral edges, then curving back with U-turn, finally reaching receptacles near anterior edge of epigyne (Figs 5a, b). Receptacles elongated, anterior parts with right angle to each other, posterior parts rather narrow and nearly parallel (Fig. 5a). For the original description of female see Wunderlich (1992).

Remarks. The epigyne shows good agreement with the figure of the epigyne in the original description by Wunderlich (1992). The proportions of the structures are similar, only the levels of detail differ. As our drawing was made from a detached epigyne, subsequently cleared and examined using transmitted light microscopy, it allowed more structures to be visible (see photograph of epigyne in Fig. 5b).

Distribution. Only known from the Canary Islands (Fuerteventura, Gran Canaria and El Hierro).

Discussion

Centromerus fuerteventurensis is the only member of the genus known from the Canary Islands and it is considered endemic to the archipelago (Wunderlich 1992). Previous to this study it was only known from Fuerteventura. The new records extend its distribution to the Gran Canaria and El Hierro islands (Fig. 6). Our records, all from MSS samples, support the assumption of Wunderlich (1992) that this species is associated with microcavernicolous habitats. However, the species is not an obligate subterranean species as it has been found under stones and on different islands. An obligate subterranean species would live at least a few tens of centimetres

below surface in the MSS and cannot disperse long distances via air, water, or wind to colonise other islands. Thus, it seems that *C. fuerteventurensis* is just a troglophile. Accordingly, the species does not exhibit distinctive troglomorphic traits like leg elongation, depigmentation, or eye degeneration. In *C. fuerteventurensis* legs are at most slightly elongated (ratio of leg IV length to carapace length = 3.7). The eye sizes and the dark pigmentation surrounding the eyes seem reduced compared to most epigean *Centromerus* species, but these features are not particularly pronounced.

Acknowledgements
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