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Two new species of *Cybaeodes* Simon, 1878 (Araneae, Liocranidae) and description of the male of *C. magnus* Ribera & De Mas, 2015 from the MSS in the eastern Prebaetic Mountain Range (eastern Spain)

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Abstract. Many species in the spider genus *Cybaeodes* Simon, 1878 have been described from caves and show marked adaptive characters to the underground environment, being considered troglobitic species. They have also recently been captured in the MSS (Mesovoid Shallow Substratum), a poorly known but species-rich habitat that lies between the superficial ground and the deep ground environment. Given the particular habitat of *Cybaeodes* and the difficulty of studying it, the diversity, biology and geographic distribution of this genus remain poorly known. The Prebaetic Mountain Range, in the Iberian Peninsula, appears to be a suitable region for this genus, from which three species are described from caves. In this work, we report on the taxonomic results of MSS samplings focused on the genus *Cybaeodes* in the region. Specimens were collected in alluvial and colluvial MSS using subterranean sampling devices. Samplings provided two new species for science, namely *Cybaeodes bernia* Ribera & Domènech sp. nov. and *Cybaeodes gallinera* Ribera & Domènech sp. nov. We also describe the male of *Cybaeodes magnus* Ribera & De Mas, 2015, previously unknown, and contribute new biogeographic data for *Cybaeodes dosaguas* Ribera & De Mas, 2015. This work increases our knowledge on the diversity and distribution of this still poorly known genus, and it highlights the importance of studying undersampled habitats such as the MSS.

Keywords. Cave spiders, Iberian Peninsula, spider, subterranean, taxonomy.

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Introduction

With thirteen species described, the genus *Cybaeodes* Simon, 1878 is found in the western Mediterranean, ranging from Morocco and Spain to Tunisia and Italy (World Spider Catalog 2024). Despite being widely distributed throughout the western Mediterranean, most species have few records. Many of them are only known from a small number of nearby localities or from their typical locality. Additionally, the majority are known from a small number of specimens. For these reasons, some authors refer to them as hidden or rare species. Four species are known in the Iberian-Balearic region: *C. mallorcensis* Wunderlich, 2008, *C. indalo* Ribera & De Mas, 2015, *C. dosaguas* Ribera & De Mas, 2015, and *C. magnus* Ribera & De Mas, 2015.

The ground and cave spider *C. mallorcensis* is known from several localities in the province of Barcelona and the islands of Mallorca and Menorca (Domènech *et al.* 2024). *Cybaeodes indalo* is a species that has clearly adapted to life underground, showing a pale pigmentation and no eyes. It has been found in four cavities in the province of Almeria, with a total of 3 ♂♂ and 1 ♀. *Cybaeodes magnus* ♀ (male unknown) is only known from two adjacent caves in the province of Alacant. It also exhibits characteristic adaptations to the subterranean habitat, such as very pale pigmentation and reduced, depigmented eyes. Finally, *C. dosaguas* was described from La Cova de les Meravelles, in the south of València Province and shows a slight reduction in eye size and depigmentation. It has also been collected in the edaphic environment of the Serra d'Espadà (Castelló Province) (Hernández-Corral & Barrientos 2021), as well as in the soil environment and alluvial MSS of the Serra d'Aitana (Alacant Province) (Jiménez-Valverde *et al.* 2015; Barrientos & Hernández-Corral 2022).

The Mesovoid Shallow Substratum (MSS) is a poorly known habitat that houses a large number of arthropod species, many of which are regarded as rare in both the epigean and hypogean environments (Ortuño & Jiménez-Valverde 2024). This subterranean habitat was originally described by Juberthie *et al.* (1980, 1981) in the Pyrenees with the name "*Milieu Souterrain Superficiel*" (MSS), and Uéno (1980, 1981) made similar observations in Japan. It is a shallow underground habitat located just below the ground (if it exists at all) and above the deep underground environment (Ortuño *et al.* 2013; Mammola *et al.* 2016).

Sampling in the study area was carried out in the karst reliefs of the eastern Prebaetic Mountain Range, located north of the Alacant Province and south of the province of València, in eastern Spain. A total of 26 localities were sampled, 9 in colluvial substratum (loose sediment deposited at the base of hillslopes) and 17 in alluvial substratum (unconsolidated sediment located in a stream bed or plain) (Ortuño *et al.* 2013; Gilgado *et al.* 2015). Species of *Cybaeodes* appeared in 15 localities (Fig. 1).

This work aims to report the taxonomic results for the genus *Cybaeodes*, which were collected from the sampling of the MSS in the eastern Prebaetic Mountain Range. It includes the description of two new species and of the male of *C. magnus*, which was unknown until now. The study also analyzes the abundance and distribution of these species and their ecological requirement, and also demonstrates the key role the MSS plays in the survival of these species.

Material and methods

Specimens of *Cybaeodes* were collected from 15 localities across the karstic reliefs of the eastern Prebaetic Range, spanning from the northern Alacant Province to the southern València Province (eastern Spain) (Fig. 1). All samples were collected from the colluvial and alluvial Mesovoid Shallow Substratum (MSS) at depths ranging from 50 to 100 cm in the alluvial MSS and up to 100 cm in the colluvial MSS. Subterranean sampling devices (SSD) were employed for this purpose, consisting of PVC cylinders with a diameter of 11 cm and lengths of either 100 or 50 cm. The cylinders were multi-perforated (8 mm diameter perforations) from the midpoint to one end (Fig. 2B) and buried vertically at ground level, with the perforated section facing downward (Fig. 2A). A pitfall-type collecting container

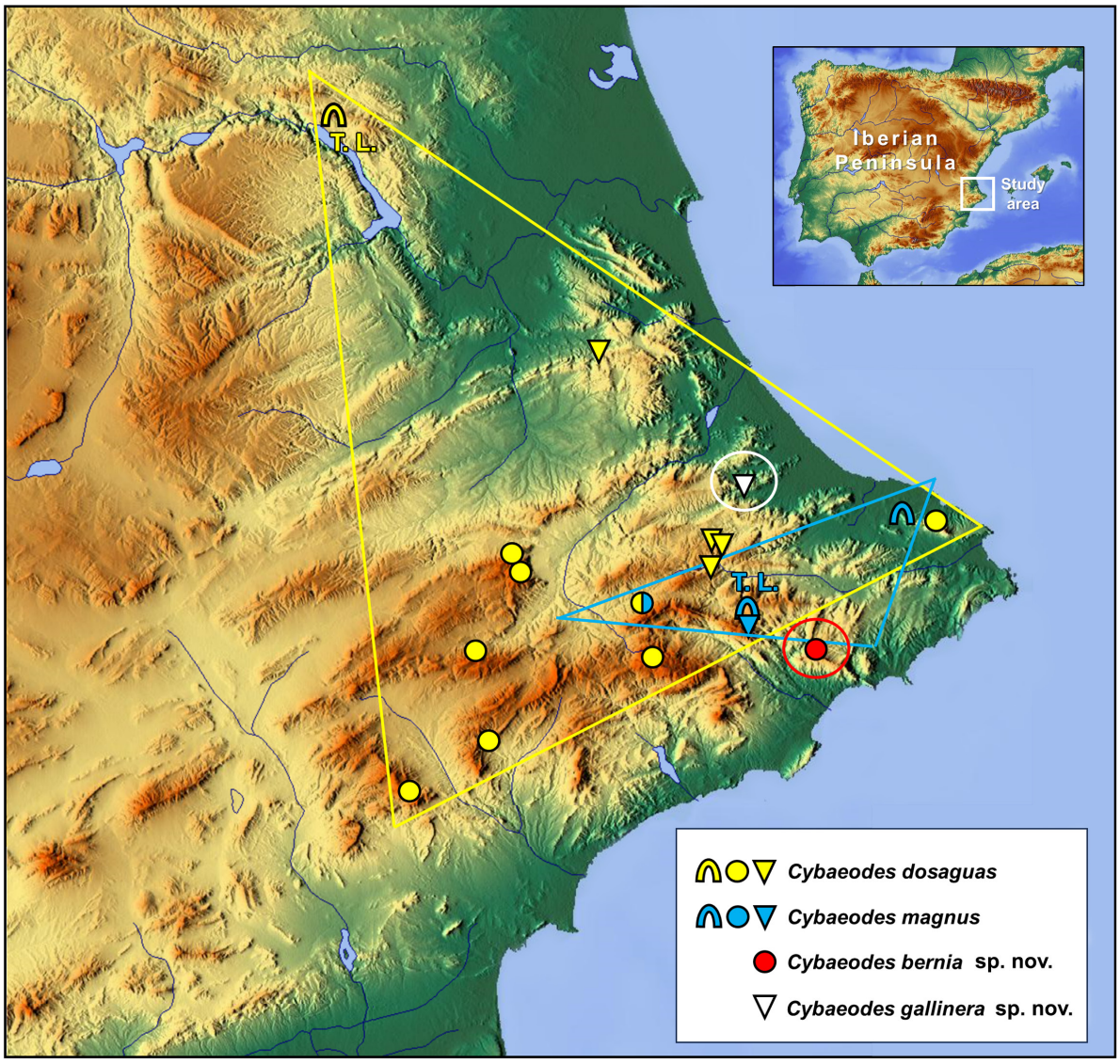

Fig. 1. Sampling points in the study area with the presence of *Cybaeodes* Simon, 1897. Symbols: arch (cave); circle (colluvial MSS); triangle (alluvial MSS). Colours: yellow (presence of *C. dosaguas* Ribera & De Mas, 2015); blue (presence of *C. magnus* Ribera & De Mas, 2015); red (presence of *C. bernia* Ribera & Domènech sp. nov.); white (presence of *C. gallinera* Ribera & Domènech sp. nov.). Type locality (T.L.).

(Fig. 2C–D), containing a preservative liquid (1,2-propanediol) and a vial with odorous bait (cheese), was placed inside at the bottom of the cylinder, following the standard procedure for this type of studies (Gers 1992; López & Oromí 2010; Ortuño *et al.* 2022).

The initial sampling and installations began on the 25th of July, 2011 in the Serra d'Aitana and gradually expanded to new locations, reaching a total of 26 sites. Of these, 9 were colluvial MSS (with a total of 40 SSDs installed) and 17 were alluvial MSS (with a total of 17 SSDs installed). The sampling process concluded at the end of 2013. The material was collected by V.M. Ortuño, A. Jiménez-Valverde, J.D. Gilgado, G. Pérez-Suárez, A. Sendra, and J.J. Herrero-Borgoñón.

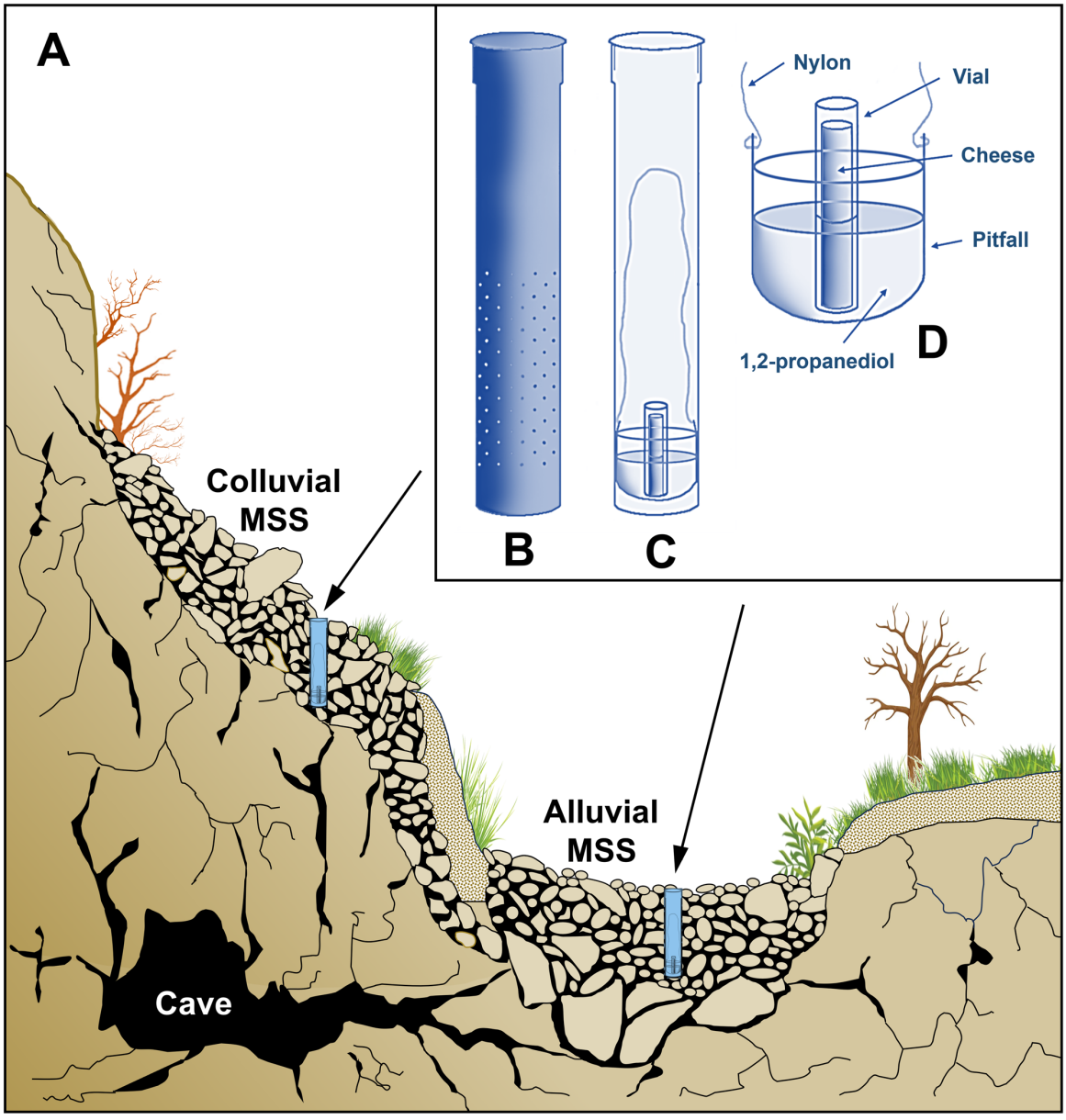

Fig. 2. Sampling approach. **A**. Colluvial and alluvial Mesovoid Shallow Substratum (MSS), and the connection network with the deep subterranean habitat. **B–D**. An example of a Subterranean Sampling Device (SSD) is shown in detail.

Specimens were examined using a LEICA MZ16A stereoscopic microscope with a camera lucida and a ZEISS Axio LAB.A1 microscope. Digital images were taken with a high-resolution digital camera LEICA DFC 450 and the software Leica Application Suite ver. 4.4, as well as with a FLIR digital camera with a THORLABS C-mount CML15 lens attached to the microscope. Images were stacked with the Helicon Focus software (Helicon Soft, Ltd.) The vulvas were removed and digested using a tablet of total Care Enzima product (protein removal system originally for cleaning contact lenses and containing Subtisilin A, 0.4 mg/tablet), subsequently washed in distilled water, and stored in 75% ethanol with the specimen. The total body length was measured as the sum of the prosoma and the opisthosoma, excluding the pedicel. All measurements are given in millimeters. Terminology for copulatory organs follows Ribera & De Mas (2015). Types and paratypes of the Iberian species (*C. indalo*, *C. dosaguas* and *C. magnus*) were examined. All specimens are deposited at Centre de Recursos de Biodiversitat Animal, University of Barcelona (CRBA-UB).

Type material examined for comparison: *C. indalo* Ribera & De Mas, 2015, ♀♀ and ♂♂ (holotype and paratypes); *C. magnus* Ribera & De Mas, 2015, ♀ (holotype); *C. dosaguas* Ribera & De Mas, 2015, ♀ (holotype).

Other material examined: *C. mallorcensis* Wunderlich, 2008, 1 ♀ from Cova Novella de na Llebrona (Manacor, Mallorca) and ♀♀ from four localities in the Barcelona Province.

Abbreviations used in the text and figures

Body

OL = opisthosoma length
OW = opisthosoma width
PL = prosoma length
PW = prosoma width

Legs

Fem = femur
Met = metatarsus
Pat = patella
Tars = tarsus
Tib = tibia
Troc = trochanter

Eyes

ALE = anterior lateral eyes
AME = anterior median eyes
PLE = posterior lateral eyes
PME = posterior median eyes

Male palp

aet = apical extension of the tegulum
are = anterior rim of epigyne
e = embolus
eb = embolus base
ma = median apophysis
ol = oval lobes of the epigyne
rta = retrolateral tibial apophysis
s = spermatheca
t = tegulum

Results

Taxonomy

Class Arachnida Lamarck, 1801
Order Araneae Clerck, 1757
Family Liocranidae Simon, 1897
Genus *Cybaeodes* Simon, 1878

Cybaeodes bernia Ribera & Domènech sp. nov.
urn:lsid:zoobank.org:act:7FDBBD93-E506-44B4-A33B-DDD52D02440E
Figs 3–4

Diagnosis

Males differ from those of other species of the genus, especially from those of *C. magnus* (Fig. 6), *C. dosaguas*, *C. indalo*, and *C. gallinera* Ribera & Domènech sp. nov. (Fig. 5), which are the most morphologically similar and geographically closest species, by the shape and size of the tibial apophysis, the median apophysis, the embolar base, and the embolus itself. Females clearly differ by the shape of the epigynum, the shape and size of the spermathecae and the associated ducts. Males of *C. bernia* Ribera & Domènech sp. nov. show a median apophysis similar to those of *C. magnus* and *C. gallinera*, although slightly smaller. In *C. dosaguas* and *C. indalo*, the median apophysis is longer, thinner, and its apical hook is less developed. Tegulum triangular in appearance, its apical extension longer than in *C. gallinera* and slightly thinner than in *C magnus*. The new species shows an elongated embolar base similar to those of *C. magnus* and *C. indalo*, while in *C. gallinera* it is less elongated and its base is wider and rectangular in appearance. Embolus laminar forming a complete loop occupying the distal area of the alveolus, and its end is shorter and clearly thinner than in *C. gallinera* and located behind the median apophysis. Females clearly differ from those of the other species; they have long, thick, and cylindrical spermathecae extending from the base of the vulva to its apical part (Fig. 4B). In the rest of the species, the spermatheca is not so developed, showing thick and recurved insemination ducts located in the center of the vulva.

Etymology

The species epithet is a noun in apposition derived from the type locality: Bèrnia. The Bèrnia mountain range belongs to the Pre-Baetic Mountain Range in the Alacant Province (eastern Spain).

Type material

Holotype

SPAIN – **Alacant** • ♂; Bèrnia, SSD-3, Xaló, Serra de Bèrnia; 38°37.999′ N, 0°7.675′ W; 890 m a.s.l.; Oct. 2012; V.M. Ortuño *et al.* leg.; SSD 100 cm long; CRBA-UB 199-5305B.

Paratypes

SPAIN – **Alacant** • 6 ♂♂; same data as for holotype; CRBA-UB 199-5305 • 3 ♂♂; same data as for holotype; CRBA-UB 199-5305A • 1 ♂; Bèrnia, SSD-4, Xaló, Serra de Bèrnia, Alacant; 38°37.999′ N, 0°7.675′ W; 890 m a.s.l.; Oct. 2012; V.M. Ortuño *et al.* leg.; SSD 100 cm long; CRBA-UB 199-5301 • 1 ♀; same data as for preceding; Apr. 2012; CRBA-UB 199-5302 • 1 ♀; same data as for preceding; Jan. 2012; CRBA-UB 199-5303 • 2 ♀♀; same data as for preceding; CRBA-UB 199-5303A • 1 ♀; same data as for preceding; Oct. 2012; CRBA-UB 199-5304. Specimens were caught in the colluvial MSS by subterranean sampling devices (SSD) (V.M. Ortuño *et al.* leg.).

Description

Male (holotype)

MSS-dwelling species with evident adaptations to underground environment: showing pale pigmentation and reduced, depigmented eyes.

Coloration. Prosoma pale brownish yellow with the cephalic part yellowish brown. Fovea brown. Chelicerae yellowish brown, slightly darker than the prosoma. Sternum, labium, endites and appendices pale yellowish brown. Opisthosoma pale yellowish.

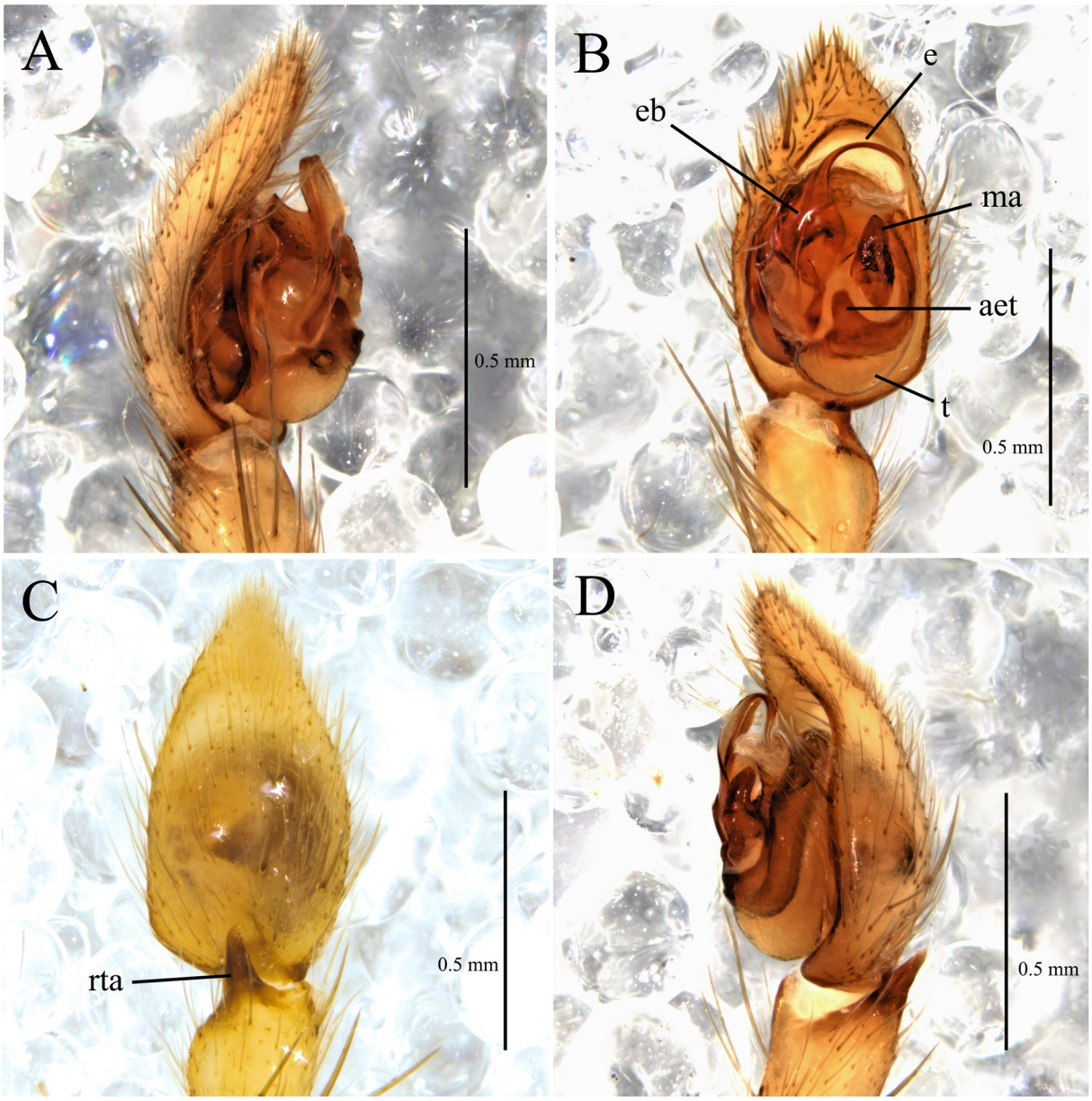

Fig. 3. *Cybaeodes bernia* Ribera & Domènech sp. nov., holotype, ♂ (CRBA-UB 199-5305B), palp. **A**. Prolateral view. **B**. Ventral view. **C**. Dorsal view. **D**. Retrolateral view. Abbreviations: aet = apical extension of the tegulum; e = embolus; eb = embolus base; ma = median apophysis; rta = retrolateral tiblial apophysis; t = tegulum.

Prosoma. Longer (2.04) than wide (1.62) in dorsal view, fovea clearly visibly. Cephalic region slightly differentiated from the rest of the prosoma. Eyes clearly reduced and totally depigmented except for the AME, which retain a slight pigmentation (Fig. 4C). Eye size (diameter): AME 0.05, ALE 0.07, PME 0.04, PLE 0.08.

Opisthosoma. Cylindrical with a slight hairiness on its dorsal side and a series of characteristic long black hairs on its anterodorsal part. Spinnerets exhibit the typical sexual dimorphism of the genus (Platnick & Di Franco 1992): elongated and sclerotized anterior lateral ones bearing 5 enlarged spigots. Posterior spinnerets also cylindrical, but shorter and thinner than the anterior lateral ones; the medium ones smaller.

Appendages. Robust and prominent chelicerae with a long pilosity along the promarginal rim. Promargin with 3 basal teeth, the middle tooth largest. Retromargin with 2 small apical teeth. Long and robust fangs. Labium slightly longer than wide. Endites subrectangular, slightly convergent, with an oblique

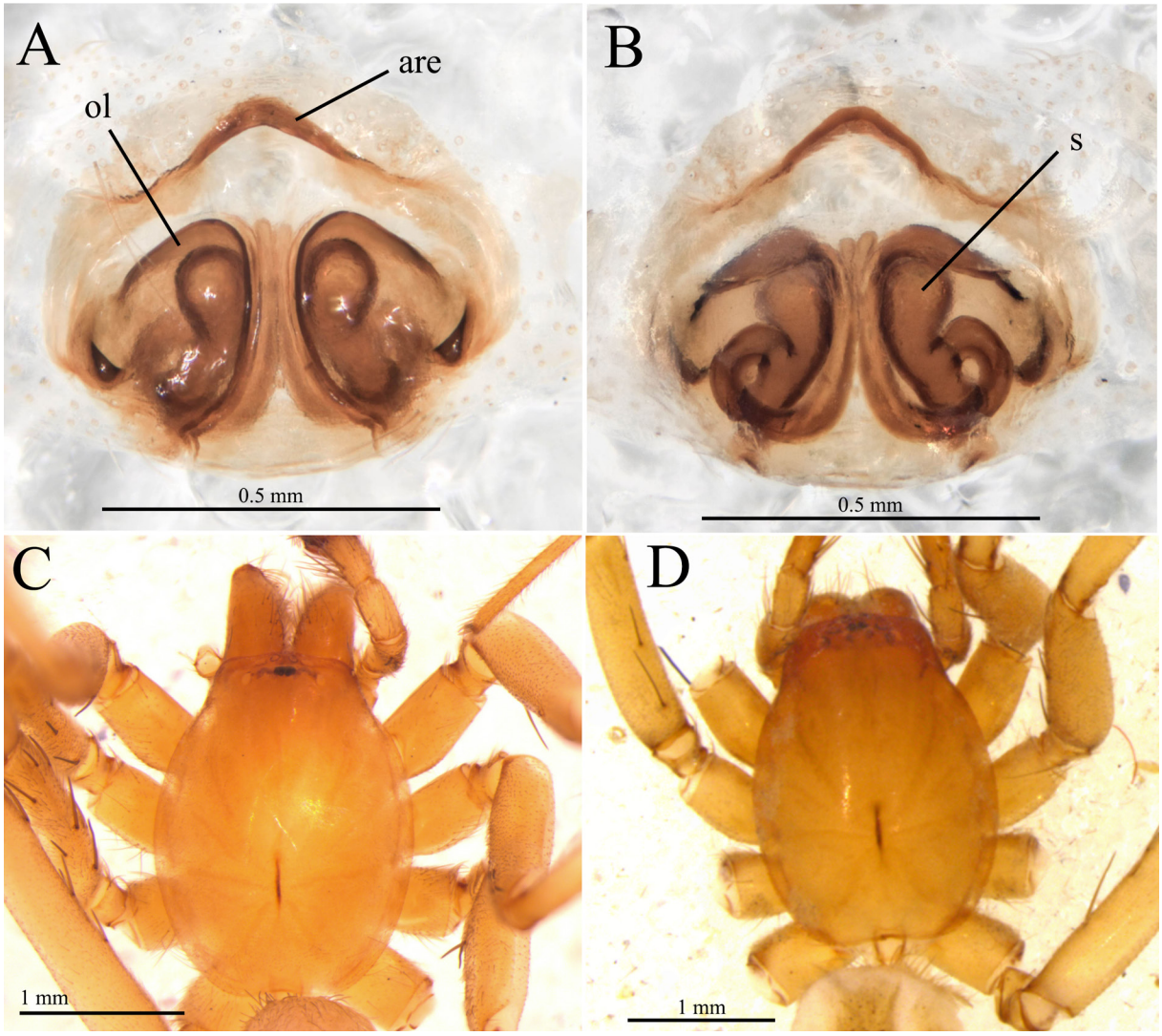

Fig. 4. *Cybaeodes bernia* Ribera & Domènech sp. nov. **A–B, D**. Paratype ♀ (CRBA-UB 199-5302). **C**. Holotype, ♂ (CRBA-UB 199-5305B). **A**. Epyginum, ventral view. **B**. Vulva, dorsal view. **C–D**. Habitus. Abbreviations: are = anterior rim of epigyne; ol = oval lobes of the epigyne; s = spermatheca.

Table 1. Leg and palp measurements of the male holotype of *Cybaeodes bernia* Ribera & Domènech sp. nov. (CRBA-UB 199-5305B).

Leg	Troc	Fem	Pat	Tib	Met	Tars	Total
I	0.30	2.47	1.15	2.52	2.07	1.47	9.99
II	0.28	2.02	0.73	1.76	1.48	1.23	7.49
III	0.25	1.69	0.66	1.40	1.66	1.08	6.74
IV	0.33	2.47	0.80	2.21	2.61	1.42	9.83
Palp	0.30	0.76	0.38	0.41	–	0.79	2.64

depression and an apical hair tuft located on the internal side of the apical margin, and a long serrula located on its apical margin. Long legs with deeply notched trochanters. Tarsal claws with 5 teeth and 5 pairs of tenent hairs on the tarsal tips. Leg formula 1423.

Male palp (Fig. 3). Tibia with long, robust setae on the prolateral and retrolateral margins and armed with 4 spines: one dorsal and 3 prolateral. Retrolateral tibial apophysis long and triangular, 1.2 times as long (0.14) as wide at its base (0.12) and pointed distally. Tegulum located in the basal part of the bulb and triangular in appearance, its anterior edge is chitinized and shows a long, wide apical extension located between the median apophysis and the embolus base. Robust and elongated median apophysis, rounded at its apical end, with a conspicuous tooth located near the center and directed posteriorly. Long, elongated embolar base. Embolus laminar forming a complete loop, curved inwards, which occupies the distal area of the alveolus; its apical end is thinner and ends behind the apex of the median apophysis.

Measurements. PL: 2.04, PW: 1.62, OL: 2.12, OW: 1.29. Total body length: 4.16. Leg and palp measurements in Table 1.

Female (paratype CRBA-UB 5302-100)
Same as male except for the following:

Prosoma. Longer (2.24) than wide (1.68) in dorsal view, fovea clearly visibly. Cephalic region slightly higher than the rest of the prosoma. Eyes clearly reduced and totally depigmented except the AME (Fig. 4D). Eye size (diameter): AME 0.05, ALE 0.10, PME 0.05, PLE 0.08.

Opisthosoma. Cylindrical with slight hairiness on its dorsal side with several black hairs (shorter than in the male) on its anterodorsally part. Anterior lateral spinnerets conical, almost contiguous on its base. Posterior spinnerets also conical, thinner than the anterior ones, but the same length. Median spinnerets thinner and shorter, about half the length of the posterior ones.

Appendages. Chelicerae and pedipalps yellowish brown, with the apical segments darker. Chelicerae with a pilosity along promarginal rim. Endites with an apical hair tuft located at the internal side of the apical margin, and a long serrula located on its apical margin. Tarsal claws with 5 teeth and 5 pairs of tenent hairs on the tarsal tips.

Epigyne (Fig. 4A). Oval genital area bounded on the upper part by a strongly sclerotized convex anterior rim, extending laterally until almost reaching the epigynum width, and forming a well-defined hood in its central part. Two oval lobes strongly sclerotized are located on both sides of the center of the genital area. Both lobes show two conspicuous sclerotized pits in their lateral margins. In between and below the lateral lobes, some internal ducts of the vulva are visible due to transparency.

Table 2. Leg and palp measurements of the described female paratype of *Cybaeodes bernia* Ribera & Domènech sp. nov. (CRBA-UB 5302-100).

Leg	Troc	Fem	Pat	Tib	Met	Tarsus	Total
I	0.27	2.13	1.1	1.89	1.53	–	–
II	0.26	1.89	0.98	1.56	1.40	1.03	7.12
III	0.21	1.68	0.77	1.35	1.58	1.02	6.62
IV	0.31	2.42	0.89	2.16	1.22	–	–
Palp	0.24	0.69	0.47	0.51	–	0.77	2.67

Vulva (Fig. 4B). Thick insemination ducts spiral down through the center of the vulva and between the lateral lobes, reaching the base of the spermatheca. Long, thick and cylindrical spermathecae extending from the base of the vulva to its apical part and located below two sclerotized helmet-shaped structures.

Measurements. PL: 2.24, PW: 1.68, OL: 2.39, OW: 1.58. Total body length: 4.63. Legs I and IV were missing tarsus. Leg and palp measurements in Table 2.

Habitat and distribution

MSS-dwelling species showing adaptations to underground environments: pale pigmentation, reduced and depigmented eyes. *Cybaeodes bernia* sp. nov. is only known from the type locality, in a colluvial MSS sampled with a 100 cm long SSD. The five females were caught in January (3 ex.), April (1 ex.) and October (1 ex.) of 2012, while the 11 males were caught in October 2012.

Cybaeodes gallinera Ribera & Domènech sp. nov.
urn:lsid:zoobank.org:act:CA95C201-6E59-4D2E-8BD4-55AFF06AAD6D
Fig. 5

Diagnosis

Males differ from those of other species of the genus, in particularly from those of *C. magnus* (Fig. 6), *C. dosaguas*, *C. bernia* sp. nov. (Fig. 3), and *C. indalo*, which are the most morphologically similar and geographically closest species, by the shape and size of the cymbium, the tibial apophysis, the median apophysis, the embolar base, and the embolus itself. In *C. gallinera* sp. nov. the cymbium is markedly wider in its basal part than in the rest of the species due to a pair of bulging expansions located on both sides of its base (Fig. 5). The median apophysis is long, thick and hook-shaped similar to those of *C. magnus* and *C. bernia* sp. nov. although in *C. gallinera* the apical hook is more developed. *Cybaeodes dosaguas* and *C. indalo* have a longer and thinner median apophysis and their apical hooks are less pronounced. The new species shows a wide, rectangular embolar base, and the laminar embolus loop is completely in the distal area of the alveolus, which ends behind the median apophysis. In *C. bernia*, *C. magnus*, and *C. indalo* the embolar base is more elongated, and the embolus itself is markedly shorter and thinner, especially at the end.

Etymology

The species epithet is a noun in apposition derived from the type locality: La Vall de la Gallinera (the Gallinera Valley). The noun ‘gallinera’, which the Arabs called ‘galinar’, is a pre-Roman word formed by ‘kal’ + ‘inar’, where ‘kal’ means ‘rock’ and ‘inar’ means ‘cut’ or ‘hole’, resulting in the ‘Vall de la Foradada’ in the Catalan language.

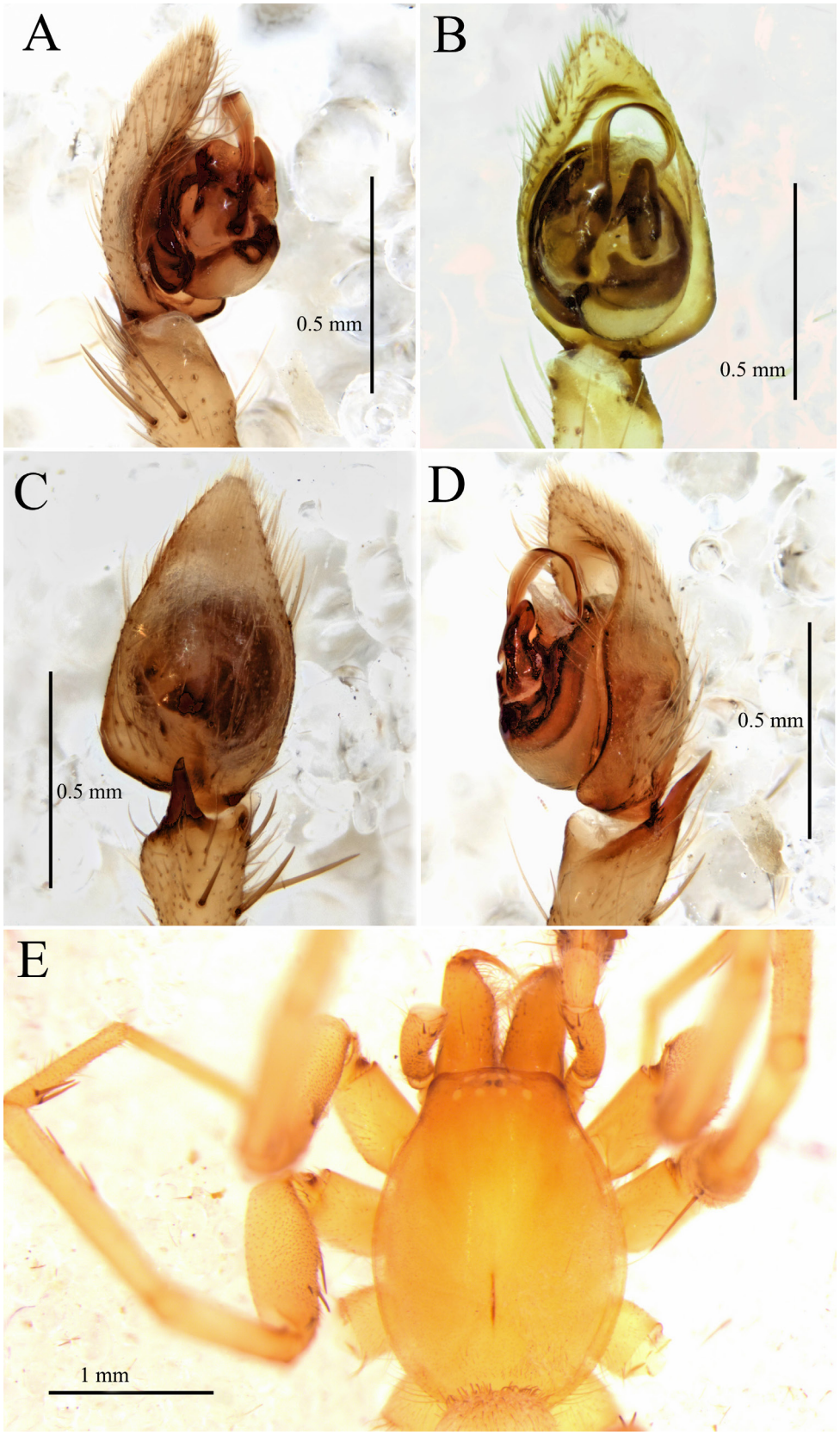

Fig. 5. *Cybaeodes gallinera* Ribera & Domènech sp. nov., holotype, ♂ (CRBA-UB 5337-200). **A–D**. Palp. **A**. Prolateral view. **B**. Ventral view. **C**. Dorsal view. **D**. Retrolateral view. **E**. Habitus.

Table 3. Leg and palp measurements of the male holotype of *Cybaeodes gallinera* Ribera & Domènech sp. nov. (CRBA-UB 5337-200).

Leg	Troc	Fem	Pat	Tib	Met	Tars	Total
I	0.20	2.35	1.01	2.34	2.01	1.37	9.28
II	0.21	1.90	0.47	1.58	1.57	1.17	6.91
III	0.17	1.59	0.59	1.36	1.53	1.07	6.30
IV	0.27	2.14	0.73	1.94	2.44	1.36	8.88
Palp	0.16	0.75	0.34	0.40	–	0.78	2.43

Type material

Holotype

SPAIN – **Alacant** • ♂; Barranc de la Vall de la Gallinera, Benirrama; 38°48.966′ N, 0°14.145′ W; 160 m a.s.l.; Sep. 2012; V. M. Ortuño *et al.* leg.; SSD 50 cm long (SSD-Alu1, alluvial MSS); CRBA-UB 5337-200.

Description

Male

Coloration. Prosoma pale yellowish with the cephalic part slightly darkened, anterior margins pale brown. Fovea brown. Chelicerae pale yellowish-brown, slightly darker than the prosoma. Sternum and appendices pale yellowish, with apical segments slightly darker. Opisthosoma pale yellowish with slight pubescence on dorsal part.

Prosoma. Longer (1.97) than wide (1.60) in dorsal view, fovea clearly visibly, radial grooves scarcely marked. Cephalic region slightly differentiated from the rest of the prosoma. Eyes clearly reduced and depigmented (Fig. 5E). Eye size (diameter): AME 0.05, ALE 0.08, PME 0.05, PLE 0.07.

Opisthosoma. Cylindrical with light pilosity on dorsal side and some short, thick and curved hairs located on its anterior end, above the pedicel. Elongated and sclerotized anterior lateral spinnerets (the typical extended spigots are missing, likely due to poor preservation). Posterior spinnerets also cylindrical, but shorter and thinner than the anterior lateral ones, the medium ones are smaller.

Appendages. Robust and prominent chelicerae with pilosity along the promarginal rim. Long and robust fangs. Promargin with 3 basal teeth, middle tooth largest. Retromargin with 2 small apical teeth. Labium slightly longer than wide. Palpal endites subrectangular and slightly convergent. Endites with an apical hair tuft located at the internal side of the apical margin along with a long serrula of tiny teeth (difficult to see). Long legs with deeply notched trochanters. Tarsal claws with 5 teeth and 5 pairs of tenent hairs on the tarsal tips. Leg formula 1423.

Male palp (Fig. 5A–D). Tibia with robust 4 spines: one dorsal and 3 prolateral. Retrolateral tibial apophysis long and triangular, 2 times as long (0.20) as wide at its base (0.10) and distally pointed (Fig. 5C–D). Tegulum wide, located in the basal part of the bulb, its anterior edge is chitinized and shows a short, wide apical extension located between the base of the embolus and the median apophysis. Robust and elongated median apophysis, cylindrical in appearance and rounded at its apical end, with a conspicuous tooth located near the center and directed posteriorly. Wide, rectangular embolar base. Long, laminar embolus forming a complete loop, curved inwards in the distal area of the alveolus and ending behind the apex of the median apophysis.

Measurements. PL 1.97; PW 1.55; OL 2.33; OW 1.16; total body length 4.30. Leg and palp measurements in Table 3.

Female

Unknown.

Habitat and distribution

MSS-dwelling species showing adaptations to underground environment: pale pigmentation, reduced, depigmented eyes. Only known from the type locality, an alluvial MSS sampled with a 50 cm long SSD.

Cybaeodes magnus Ribera & De Mas, 2015
Fig. 6

non *Cybaeodes liocraninus* (Simon, 1913) – Fage 1931: 209 (misidentification) (see Bosselaers 2009).

Diagnosis

Males of *C. magnus* differ from those of other species of the genus, especially from those of *C. bernia* sp. nov. (Fig. 3), *C. dosaguas*, *C. indalo* and *C. gallinera* sp. nov. (Fig. 5), which are the most morphologically similar and geographically closest species, by the shape and size of the tibial apophysis and the copulatory bulb, the median apophysis, the embolar base and the embolus itself. *Cybaeodes magnus* shows a median apophysis similar to those of *C. bernia* and *C. gallinera*, whereas in *C. dosaguas* and *C. indalo*, the median apophysis is longer and thinner, and its apical hook is less developed. Tegulum taller than in the other species, occupying almost half of the alveolus; its apical extension longer than in *C. gallinera* and wider than in *C. bernia*. Embolar base elongated and similar to those of *C. bernia* and *C. indalo*. Laminar embolus reaches the apical area of the alveolus, and its end is shorter and clearly thinner than in *C. bernia* and *C. gallinera*, and it is lodged behind the median apophysis. For diagnosis of the female see Ribera & De Mas (2015).

Material examined

SPAIN – **Alacant** • 1 ♂; Serrella, Quatretondeta, La Serrella, SSD-3; 38°38.324′ N, 0°21.447′ W; 1000 m a.s.l.; Oct. 2012; V.M. Ortuño *et al.* leg.; SSD 100 cm long, colluvial MSS; CRBA 5311B-199 • 1 ♂; same data as for preceding; CRBA 5311-199 • 1 ♀; same data as for preceding; CRBA 5311A-199 • 1 ♀; same data as for preceding; CRBA 5308-199 • 4 ♀♀; same data as for preceding; Jul. 2012; CRBA 5307-199 • 4 ♀♀; same data as for preceding, SSD-4; SSD 100 cm long; CRBA 5312-199 • 1 ♀; Barranc del Xarquet, Tárbena; 38°38.165′ N, 0°14.561′ W; 537 m a.s.l.; Sep. 2012; V.M. Ortuño *et al.* leg.; SSD 50 cm long (SSD-Alu6), alluvial MSS; CRBA 5306-199.

Description of the male (CRBA-UB 5311-B-199)

MSS and cave-dwelling species with evident features of underground adaptation: very pale pigmentation and reduced, depigmented eyes.

Coloration. Prosoma yellowish brown, fovea brownish. Chelicera the same colour as the carapace but slightly darker. Appendages pale yellowish brown, the apical segments slightly darker. Opisthosoma yellowish.

Prosoma. Longer (2.16) than wide (1.52) in dorsal view. Fovea clearly visible, radial grooves scarcely marked (Fig. 6E). Cephalic region slightly higher than the rest of the prosoma. Eyes greatly reduced to small unpigmented lenses, except the AME, which retain a slight pigmentation. Eye size (diameter): AME 0.05, ALE 0.09, PME 0.05, PLE 0.08.

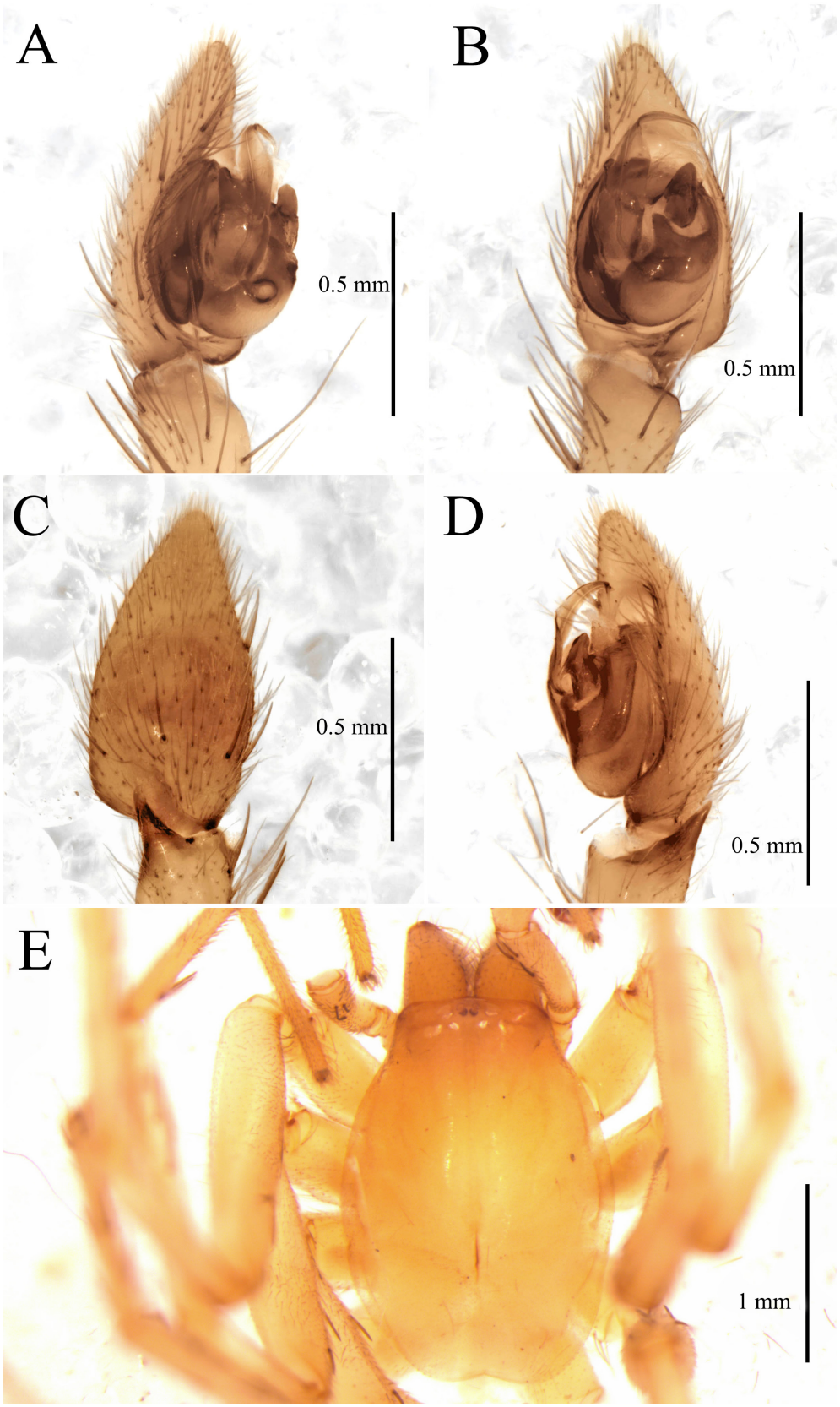

Fig. 6. *Cybaeodes magnus* Ribera & De Mas, 2015, described ♂ (CRBA-UB 5311-B-199), palp. **A**. Prolateral view. **B**. Ventral view. **C**. Dorsal view. **D**. Retrolateral view. **E**. Habitus.

Table 4. Leg and palp measurements of the described male specimen of *Cybaeodes magnus* Ribera & De Mas, 2015 (CRBA-UB 5311-B-199).

Leg	Troc	Fem	Pat	Tib	Met	Tars	Total
I	0.34	2.36	1.14	2.22	1.94	1.29	9.30
II	0.21	1.99	1.00	1.81	1.55	1.14	7.71
III	0.25	1.63	0.55	1.41	1.61	1.11	6.55
IV	0.27	2.45	0.86	2.23	2.61	1.43	9.85
Palp	0.17	0.79	0.36	0.47	–	0.75	2.54

Opisthosoma. With a slight pubescence on the dorsal part, and in its anterior end it has some long, black hairs located above the pedicel. Spinnerets show the typical sexual dimorphism of the genus: elongate and sclerotized anterior lateral spinnerets bearing five enlarged spigots; posterior spinnerets also cylindrical but are shorter and thinner; the medium ones smaller.

Appendages. Robust chelicerae with pilosity along promarginal rim. Long and robust fangs. Promargin with 3 teeth in basal position, middle tooth largest. Retromargin with 2 small teeth on apical position. Labium slightly longer than wide. Endites subrectangular, slightly convergent, with an oblique depression and a small apical hair tuft located at the internal side of the apical margin, along with a long serrula of tiny teeth (difficult to see) on its apical margin. Long legs with deeply notched trochanters. Tarsal claws with 5 teeth and 5 pairs of tenent hairs on the tarsal tips. Leg formula 4123.

Male palp (Fig. 6A–D). Tibia with long, robust setae on the prolateral side and armed with 6 spines: one dorsal, 2 retrolateral and 3 prolateral. Retrolateral tibial apophysis long and triangular, 1.5 times as long (0.12) as wide (0.08) at its base and distally pointed. Tegulum wide and tall, occupying almost the basal half of the alveolus, and its apical extension longer and wider than in other nearby species. Robust and elongated median apophysis, rounded at its apical end with a conspicuous tooth located near the center, directed backwards. Embolar base elongated similar to that of *C. bernia* sp. nov. and *C. indalo*. Embolus laminar, curved inwards and reaching the apical area of the alveolus; its end is short, thin, and it is lodged behind the median apophysis (Fig. 6B).

Measurements. PL 2.16; PW 1.52; OL 2.10; OW 1.16; total body length 4.74. Leg and palp measurements in Table 4.

Habitat and distribution

Cybaeodes magnus is a colluvial and alluvial MSS cave-dwelling species showing adaptations to the underground environment, including very pale pigmentation and reduced, depigmented eyes.

Females of this species were described from two caves: Cova del Somo in the municipality of Castell de Castells (1 ♀) and Cova de la Punta de Benimaquia in the municipality of Denia, Alcoi (2 ♀♀). The capture of this species in Tárbena (10 km from the type locality, 1 ♀) and Serrella (20 km from the type locality, 10 ♀♀, 5 ♂♂) significantly expands its distribution area. Given that the caves of this large karst area are well studied, it is probable that *C. magnus* is a typical MSS species that only occasionally colonizes the caves. It should be noted that in Tárbena, only *C. magnus* was caught (1 ♀), while in Serrella, located 10 km from Tárbena, two species were captured: *C. magnus* (2 ♂♂, 10 ♀♀) and *C. dosaguas* (5 ♂♂, 1 ♀). Serrella is the only locality where two different species appeared. *Cybaeodes magnus* was caught in two localities: Serrella, colluvial MSS at 1000 m a.s.l. and with a 100 cm long SSD

(8 ♀♀, in July 2012, and 2 ♂♂ and 2 ♀♀, in October 2012), and Tárbena, alluvial MSS at 704 m a.s.l. and with a 50 cm long SSD (1 ♀, September 2012).

Cybaeodes dosaguas Ribera & De Mas, 2015

Cybaeodes dosaguas – Barrientos & Hernández-Corral 2022: 91 (♂ description).

This species was described from a cave in the south of the province of Valencia: Cova de les Meravelles, municipality of Dos Aguas (type locality). It has also been cited in the Serra d'Aitana, Alacant Province, in the alluvial MSS collected with a 100 cm long SSD (Jiménez-Valverde *et al.* 2015) and in the edaphic environment with pitfall traps (Barrientos & Hernández-Corral 2022) as well as in the Serra d'Espadà, Castelló Province, also with pitfall traps (Hernández-Corral & Barrientos 2021). In the sampled area, of the 15 locations where specimens of *Cybaeodes* were captured, *C. dosaguas* was present in 12 of them. In 11 of these localities, it was the only species found, whereas in Serrella two species were collected together (*C. dosaguas* and *C. magnus*), thus being the only locality where more than one species appeared. A total of 278 adult specimens were caught in the alluvial and colluvial MSS (89 ♂♂, 189 ♀♀). Of the 278 specimens collected, 270 came from the colluvial MSS (8 sampled localities) and only 8 from the alluvial MSS (4 localities). It is also worth pointing out that all the males (89 ex.) appeared only in colluvial MSS in October, while females appeared throughout the year (sampled dates: January, April, June, July, September and October) in colluvial (181 ex.) and alluvial (8 ex.) MSS. These data suggest that this species preferentially inhabits the colluvial MSS, at least in the studied area. The scarce presence in the alluvial MSS may be explained because this type of underground environment is more dynamic and unstable due to the hydrological reactivation of the riverbed (Ortuño *et al.* 2013; Ortuño & Jiménez-Valverde 2024). Despite this, it functions as an underground corridor, which explains the presence of many different species, including this spider. *Cybaeodes dosaguas* is the most abundant species and has a large distribution area (provinces of Castelló, València and Alacant) and has been reported from the edaphic environment, MSS and caves.

Discussion

The two new species, *C. bernia* sp. nov. and *C. gallinera* sp. nov., together with *C. magnus*, show morphological characters that suggest a common origin. In these three species, the median apophysis is robust and elongated, rounded at its apical end, with a conspicuous tooth located near the center, directed backwards. Conversely, in *C. dosaguas*, *C. indalo* and *C. mallorcensis* (the other three Iberian species) the median apophysis is much thinner and elongated, with a shorter terminal tooth. Their joint distribution is another evidence that could point towards a common origin of these tree species, which live in the easternmost part of the studied area (Fig. 1). *Cybaeodes bernia*, *C. gallinera* and *C. magnus* also show adaptive characteristics to the underground environment, such as eyes reduced to small, unpigmented lenses, except the AME which retain a slight pigmentation. These species also have small distribution areas, which are not sufficiently known. This is typical of the species adapted to the MSS, while the edaphic species have larger distribution areas.

The leg formula of the Iberian species shows two differentiated groups: in *C. bernia* and *C. gallinera*, it is I–IV–II–III, while in *C. magnus*, *C. indalo* and *C. mallorcensis* it is IV–I–II–III. This suggests that both groups might have different ecological adaptations to the underground environment and/or different strategies for capturing their potential prey. During field observations of non-web-building cave-dwelling spiders, longer first legs have been observed to be related to exploring the environment and tracking prey, while longer fourth legs seemed to be associated with higher body mobility and jumping (C. Ribera pers. obs.).

The MSS has been recognized as an especially important habitat for spiders (Ledesma *et al.* 2019, and references therein), a dominant taxon in this subterranean environment. Explorations of the MSS consistently yield new species discoveries and novel records of already known species, thus expanding both the known distribution and the ecological understanding of these species. Given the rarity of most species inhabiting the MSS (Ledesma *et al.* 2019), this is particularly true in intensive samplings, whether by surveying a large area or by doing it over an extended period of time, or both, as was the case in this study. A significant percentage of the collected spider species in the MSS can be classified as troglophiles (Ledesma *et al.* 2019), as they exhibit some of the classical morphological adaptations of living in subterranean environments, as seen in the species described herein. These are species that would likely be difficult to discover using classical sampling techniques in surface environments. Thus, a systematic and intensive study of the MSS can significantly advance our knowledge of the arachnological fauna in relatively well-known regions, such as the Iberian Peninsula. At the same time, the subterranean environment faces numerous threats, making it urgent to adopt measures for its protection (Mammola *et al.* 2019).

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