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A first step towards the revision of *Cicurina*: redescription of type specimens of 60 troglobitic species of the subgenus *Cicurella* (Araneae: Dictynidae), and a first visual assessment of their distribution

PIERRE PAQUIN & NADINE DUPÉRRÉ



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Abstract

The intraspecific variability recently documented in the genus *Cicurina* strongly suggests a reassessment of the taxonomy, particularly for the troglobitic members. Adult troglobitic *Cicurina* (subgenus *Cicurella*) are rare and most of the 60 nominal species of troglobitic *Cicurina* (*Cicurella)* were originally described upon the examination of only one or two females, resulting in numerous species differing only in minor variations of the female genitalia. In many cases, such morphological differences could also be interpreted as intraspecific variability. We present the first step of the taxonomic revision of the genus with the redescription of all troglobitic species of the subgenus *Cicurella* based on type specimens to provide a reliable and comparable morphological basis: *Cicurina bandera* Gertsch 1992, *C. bandida* Gertsch 1992, *C. baronia* Gertsch 1992, *C. barri* Gertsch 1992, *C. browni* Gertsch 1992, *C. brunsi* Cokendolpher 2004, *C. bullis* Cokendolpher 2004, *C. buwata* Chamberlin & Ivie 1940, *C. caliga* Cokendolpher & Reddell 2001, *C. caverna* Gertsch 1992, *C. coahuila* Gertsch 1971, *C. coryelli* Gertsch 1992, *C. cueva* Gertsch 1992, *C. delrio* Gertsch 1992, *C. ezelli*

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Gertsch 1992, *C. gruta* Gertsch 1992, *C. holsingeri* Gertsch 1992, *C. hoodensis* Cokendolpher & Reddell 2001, *C. leona* Gertsch 1992, *C. loftini* Cokendolpher 2004, *C. machete* Gertsch 1992, *C. madla* Gertsch 1992, *C. maya* Gertsch 1977, *C. mckenziei* Gertsch 1992, *C. medina* Gertsch 1992, *C. menardia* Gertsch 1992, *C. mirifica* Gertsch 1992, *C. mixmaster* Cokendolpher & Reddell 2001, *C. neovespera* Cokendolpher 2004, *C. obscura* Gertsch 1992, *C. orellia* Gertsch 1992, *C. pablo* Gertsch 1992, *C. pastura* Gertsch 1992, *C. patei* Gertsch 1992, *C. platypus* Cokendolpher 2004, *C. porteri* Gertsch 1992, *C. puentecilla* Gertsch 1992, *C. rainesi* Gertsch 1992, *C. reclusa* Gertsch 1992, *C. reddelli* Gertsch 1992, *C. reyesi* Gertsch 1992, *C. russelli* Gertsch 1992, *C. sansaba* Gertsch 1992, *C. selecta* Gertsch 1992, *C. serena* Gertsch 1992, *C. sheari* Gertsch 1992, *C. sprousei* Gertsch 1992, *C. stowersi* Gertsch 1992, *C. suttoni* Gertsch 1992, *C. travisae* Gertsch 1992, *C. troglobia* Cokendolpher 2004, *C. ubicki* Gertsch 1992, *C. uvalde* Gertsch 1992, *C. venefica* Gertsch 1992, *C. venii* Gertsch 1992, *C. vespera* Gertsch 1992, *C. vibora* Gertsch 1992, *C. wartoni* Gertsch 1992, *C. watersi* Gertsch 1992 and *C. wiltoni* Gertsch 1992. We provide, in a series of maps, a first visual assessment of the distribution of these troglobites. Several problems became evident from our examination of the data, including potential synonymies, conflicting distributions, damaged types, potential mislabeling, species known only from one sex, misevaluation of intraspecific variability, and unknown location of type localities. A reliable taxonomic basis for the eyeless members of this genus is particularly important for cave conservation and management because the particular conservation status of these troglobites, particularly for four species that are included on the U.S. Federal list of endangered species.

Key words: cave adaptation, species radiation, endangered species, troglobite, cave conservation, spiders

Introduction

The State of Texas (USA) is remarkable for its cave fauna. More than 1000 cavernicole species have been recorded for the state, including 160 cave obligate species (Reddell 1994; James R. Reddell, pers. comm.). These numbers exclude known troglobitic taxa awaiting formal taxonomic descriptions. Most cave arthropod species are known from few caves and are likely true examples of narrow distributions. Texas counties such as Bexar, Travis and Williamson are considered cave biodiversity hotspots because of their richness and high level of endemism (Culver *et al*. 2003, 2006). To date, sixteen species of cave arthropods from Texas have been included on the U.S. Federal list of endangered species (Drewry 1994; Johnson Linam 1995; Longacre 2000; Rappaport Clark 1998; Stanford & Shull 1993; U.S. Fish and Wildlife Service 1988, 1993, 2002, 2003), while most other troglobites are considered "species of concern" by the state (Bender *et al*. 2005). The most impressive radiation is found in the troglobitic members of the spider genus *Cicurina* (subgenus *Cicurella*), which includes 60 recognized species, almost all endemic to Texas caves.

The first troglobitic species of the genus, *Cicurina* (*Cirurella*) *buwata* was described by Chamberlin & Ivie (1940) based on an eyeless immature specimen collected near Austin (Texas). In the 1970s, Gertsch added two species collected in Mexican caves (Gertsch 1971, 1977), and in 1992 he described the bulk of the diversity with 49 new troglobitic species (Gertsch 1992). Cokendolpher & Reddell (2001) and Cokendolpher (2004a, b) subsequently added nine species and synonymized one name under *Cicurina* (*Cirurella*) *buwata*. Presently, *Cicurina* (*Cirurella*) *madla* Gertsch, *Cicurina* (*Cirurella*) *vespera* Gertsch, *Cicurina* (*Cirurella*) *venii* Gertsch and *Cicurina* (*Cirurella*) *baronia* Gertsch are included on the U.S. Federal list of endangered species.

A major problem for management and cave conservation in Texas is insufficient data to assess species distributions. Collections are lacking for most of the ~6000 caves and sinkholes in the state; identifiable material (adult *Cicurina* (*Cicurella*) specimens) is rare and taxonomic uncertainties also cause major difficulties. Spider taxonomy largely depends on genitalic structures to delimit species: male genitalia usually provide the best characters, but female genitalia are also widely used. Almost all troglobitic *Cicurina* (*Cicurella)* species have been defined with the configuration of female genitalia only, as males are known for only a few species. For most spiders, female genitalia are reliable and stable characters but, in the case of *Cicurina*, important intraspecific variability of female genitalia has been reported (Cokendolpher 2004a; Paquin & Hedin 2004) and likely applies to all members of the genus. Many *Cicurina* (*Cicurella)* species

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display very similar genitalic configurations, and it is not possible at this point to objectively determine if these configurations support distinct species or intraspecific variation. This is especially true for troglobitic *Cicurina* (*Cicurella)*, which have been described from a small number of specimens, usually only one or two females.

So far, only *Cicurina (Cicurella) madla* has received attention since its original description. Its endangered status and urban development pressure in its known distribution area triggered the immediate need for additional data. Additional collections allowed Cokendolpher (2004a: 46) to document the variability of female genitalia of the species, while Paquin & Hedin (2004) assessed its distribution using similarity in DNA sequences of immature and adult specimens. *Cicurina (Cicurella) madla* is now known from about 20 adjacent caves found in a 20 x 10 km region, and likely occurs in many more caves in this area. These studies showed that both intraspecific variability and distribution were underestimated. Unfortunately, other *Cicurina (Cicurella)* species have not yet attracted similar attention, despite the need for better distribution data to orient conservation policies and management.

To solve taxonomic uncertainties, a first response would be to initiate a taxonomic revision. Unfortunately, the existing material is not sufficient to assess the variability of most nominal species (except *Cicurina (Cicurella) madla*) or propose sound synonymies. Additional data are badly needed to accomplish any progress, but the gathering of new material is a difficult task because of the number of species involved, the rarity of adults, and because cave accessibility has become a very sensitive issue in Texas. While a sound revision based on a large number of adults would be ideal, such data may never be acquired. Of more immediate concern are conservation issues involving *Cicurina* (*Cicurella)*, regardless of the state of the taxonomy or the difficulties in determining species distribution.

A careful reassessment of the type material and published data is presented here to address these problems and provide a first step in the taxonomic revision of this difficult genus. The goals of this paper are threefold: (*i*) Provide redescriptions and accurate illustrations of the 60 troglobitic *Cicurina (Cicurella)* holotypes. Comparable angles and accurate illustrations of diagnostic features are badly needed for all nominal species. Gertsch (1992) did not pay attention to spermathecal pores found in the female genitalia, which are valuable morphological characters. (*ii*) Document the distribution of eyeless *Cicurina* (*Cicurella)* species with distribution maps that show ranges of all species. Unfortunately, information about cave locations is difficult to obtain in Texas, in part due to concern about cave vandalism. We believe, however, that such information is essential to adequately address biological and conservation questions. Therefore, in this paper we provide the first visual assessment of the distribution of all eyeless troglobitic *Cicurina* (*Cicurella)* and their spatial relationship to one another. We use a resolution fine enough to allow identification of potential taxonomic incongruities, but vague enough to preserve the confidentiality of cave locations. (*iii*) Include comments about caves, specimens or any other issue that may be useful for further taxonomic assessment. At this stage, the treatment of all species is necessary because it is not possible to predict where conservation/development issues will emerge or which nominal *Cicurina* (*Cicurella)* species will be involved.

Material and methods

Material examined

All type material is located at the American Museum of Natural History in New York City. Cokendolpher (2004a: 53) reported that many holotypes could not be found and were presumed lost, but our efforts of 2005 were successful in locating all holotypes of the troglobitic species. This material is referred to here as the AMNH holotype collection. We also studied a set of specimens that Gertsch had put aside to build a synoptic collection of *Cicurina* (both of surface and troglobitic species). This collection (identified here as Gertsch's synoptic collection, AMNH) contains holotypes that should have been in the type collection, as well as other specimens mentioned in Gertsch's 1992 paper. We also studied all known immature eyeless specimens from the following collections: AMNH, American Museum of Natural History, New York, USA; CNC, Canadian

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National Collection, Ottawa, Ontario, Canada; MCZ, Museum of Comparative Zoology, Cambridge, Massachusetts, USA; TMM, Texas Memorial Museum, Austin, Texas, USA; JCC, James Cokendolpher private collection, Lubbock, Texas, USA, now part of TTU-Z, Museum of Texas Tech University, Invertebrate Zoology, Lubbock, Texas, USA; CPAD, Collection Paquin-Dupérré, Shefford, Québec, Canada. These specimens, particularly the immature ones, greatly improved our understanding of the global distribution of troglobitic *Cicurina* (*Cicurella)*.

Specimen examination and description

Specimens were examined in 70% ethanol under an SMZ-U Nikon dissection microscope. A Nikon Coolpix 950 digital camera attached to the microscope was used to photograph the structure to be illustrated. The digital photo was then used to trace proportions, and the drawing detailed and shaded by referring back to the structure under the microscope. Female genitalia were excised using a sharp entomological needle and transferred to lactic acid to clear non-chitinous tissues. A temporary lactic acid mount was used to examine the genitalia under an AmScope XSG Series T-500 compound microscope, where genitalia were photographed and illustrated as explained above. Special attention was given to the location and configuration of the different spermathecal pores. All measurements are in millimeters and were made using a micrometric ruler fitted on the eyepiece of the microscope. Epigyna were measured at their widest point. In some cases however, the structure was broken and only half of it could be found; therefore, the width measurement given for spermathecae in that condition was for that half structure and indicated by "(half size)" in the description. This corresponds to illustrations showing a partial spermathecae (Figs 8–9, 30–31, 66–67, 84–85, 112–113, 116–121). Halogene lighting conditions were used to view specimens for color descriptions using traditional color names. Subsequently, we matched the color to a reference Pantone© chart and added the color code to the description. The coloration of troglobitic *Cicurina* (*Cicurella)* is rather uniform, as expected for troglobitic species, showing only minor variation in intensity. No species-level variability was observed; therefore, to avoid useless repetition, we describe coloration only in the subgeneric section.

Morphology and terminology

General morphological terminology follows Ubick *et al*. (2005), and terminology for genitalia follows Chamberlin & Ivie (1940), Bennett (1992, 2005) and Cokendolpher (2004a). Careful study of the epigyna of troglobitic members of the subgenus *Cicurella* revealed two different configurations. The most common one (Figs 1–2) consists of a spermathecal base formed by only a large primary lobe, which may or may not be constricted medially (Fig. 2 shows a constriction). The second type of configuration (Figs 3–4) possesses a primary lobe that may or may not be constricted medially AND a second constriction creating a duct of variable thickness leading from the primary lobe into a blind secondary lobe. This is similar to the configuration observed in *Cicurina (Cicurusta)* as defined by Chamberlin & Ivie (1940; see also Cokendolpher 2004a: 15, figs 3–4). This observation questions the homology previously used in the genus that identifies primary and secondary lobe of the spermathecae (labeled as spermathecal base anterior and posterior lobes by Cokendolpher (2004a)). In that regard, the position of the fertilization canal (FC) is a useful character. In this paper, we distinguish fertilization canal (FC) from fertilization duct (FD) to facilitate the interpretation of the structures: fertilization canal refers to the portion inside the spermathecae (Figs 2, 4) forming a canal leading to the fertilization duct, which is external to the spermathecae (Fig. 2). In *Cicurina (Cicurella)* type-1 (Fig. 2), the fertilization canal reaches inside the primary lobe, sometimes up to the median constriction. In *Cicurina (Cicurella)* type-2 (Fig. 4) and in *Cicurina (Cicurusta)*, the fertilization canal is located inside the primary lobe, but is not attached, nor does it pass through the secondary lobe, or the spermathecal base as defined in Cokendolpher (2004a). Therefore, the constriction in the primary lobe observed in *Cicurina (Cicurella)* type-1 is not homologous to the secondary lobe found in *Cicurina (Cicurella)* type-2 or in *Cicurina (Cicurusta)*. This distinction requires the refinement of part of the terminology previously used for the spermathecae of *Cicurina* and is explained here. The spermathecal head (*sensu* Cokendolpher 2004a) consists in the portion found between the atrium (AT) include the copulatory

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ducts constriction (arrow Figs 1–3). The constriction is located either apically (*Cicurina (Cicurella) platypus*, Figs 76–77), medially (*Cicurina (Cicurella) bandida*, Figs 10–11), basally, or sub-basally (*Cicurina (Cicurella) barri*, Figs 14–15) in relation to the primary lobe, and is associated with the primary pores (Fig. 2). Then, the stalk joins from the constriction to the primary lobe at the aperture of the dictynoid pore. The last portion is called the spermathecal base (in opposition to the spermathecal head), and includes all structures located beyond the external aperture of the dictynoid pore and is sometimes divided into two distinct regions. (a) The primary lobe is characterized by the presence of the internal portion of the dictynoid pore, the fertilization canal, and the fertilization duct attachment (Figs 1–2) and may be constricted medially but does not represent a secondary lobe. (b) A secondary lobe may be attached to the primary lobe, but lacks all structures previously mentioned (see *Cicurina (Cicurella) holsingeri*, Figs 3–4 and members of the subgenus *Cicurina (Cicurusta)*).

In the synonymy section of some species, we used bold type face to indicate which page constitutes the main entry of the species description when the name was found in numerous pages of the paper. Species are presented in alphabetical order as no phylogenetic affinities or potential synonymies are explored in this paper. However, the mapping of distribution ranges and the plotting of the type illustrations (Figs 128–138) provide a powerful comparative approach to test species hypotheses based on either morphological similarity or spatial proximity. Latitude and longitude are not provided and exact locations are purposely vague to preserve the confidentiality of many of these localities. We intended to provide the best possible summary of the species distributions and confirmed the identity of the species occurring in a given cave for almost all known locations (see additional material examined). The published localities that could not be confirmed are however included on the maps but indicated with a different symbol. Maps were produced using ArcGis V9.2, modified with Adobe Illustrator CS3 and Adobe InDesign CS3.

In the taxonomy and discussion sections, we have included references to peer-reviewed literature only. Grey literature has not been considered. Readers interested in the legal documents related to the status of *Cicurina (Cicurella)* species as endangered are referred to Cokendolpher (2004a), who included these documents in his bibliography. Also, we did not include the results of Paquin *et al*. (2008) about a synonymy involving three nominal *Cicurina (Cicurella)* species, as their conclusions are largely based on newly acquired specimens, while the goal of the present paper is to document the situation prior to additonal work on the group.

On several occasions while examining Gertsch's holotypes, we found additional specimens not mentioned in the original descriptions. These specimens, usually immature individuals, are unidentifiable to species and are not considered to have type status. In all cases, the type specimens have been clearly fixed by Gertsch and matched the data of the specimens we used for descriptions.

Taxonomy

Family Dictynidae O. Pickard-Cambridge 1871

Genus *Cicurina* Menge 1871

Subgenus *Cicurella* Chamberlin & Ivie 1940

The subgenus *Cicurella* includes 80 species, with both surface and troglobitic members. Both ecomorphs are included in the diagnosis and description sections of the subgenus, but only troglobitic species are subsequently treated.

Diagnosis. Members of the subgenus *Cicurella* can be distinguished from other *Cicurina* by the combination of the following characters: 6 or 8 eyes for surface species (8 eyes is only found in one surface *Cicurella*), totally lacking for all troglobitic species except two, for which eyes are highly reduced to remnant

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pale spots difficult to properly assign to a number. All other members of *Cicurina* have 8 eyes, sometimes slightly reduced. Female epigynum with single atrium, small to large, bare to partly intruded by dorsal plate; bursa variable, not fused (eyeless species) to fused (eyed species and *Cicurina (Cicurella) wiltoni* Gertsch); copulatory ducts rounded, simple, never exceedingly convoluted, slightly constricted and enlarging at the location of the primary pores; stalk rather short joining the spermathecal base at the aperture of the dictynoid pore; spermathecal base with primary lobe present, sometimes constricted, secondary lobe absent in most species (except *Cicurina (Cicurella) coahuila*, *Cicurina (Cicurella) holsigneri*, *Cicurina (Cicurella) mirifica* and *Cicurina (Cicurella) wiltoni*). *Cicurina (Cicurella)* may be distinguished from the other subgenera defined by Chamberlin & Ivie (1940) based on the following genitalic characters of the female: members of the subgenus *Cicurina* (*Cicurina*) have spermathecae that are not constricted and shorter copulatory ducts; the subgenus *Cicurina* (*Cicurusta*) have a blind spermathecal secondary lobe and copulatory ducts exceedingly convoluted. *Cicurina* (*Cicurella*) males have the apex of the tegulum of the genital bulb with a notch and this character state is absent in all other *Cicurina*. *Cicurina* (*Cicurella*) have a simple retrolateral tibial apophysis; it is highly reduced or simple in the subgenus *Cicurina* (*Cicurina*); species actually placed in that subgenus that do not show that character state are likely misplaced. Males of *Cicurina* (*Cicurusta*) have a complex retrolateral tibial apophysis.

Description. Members of the subgenus *Cicurina* (*Cicurella*) range in size from ~2.25–7.50. The prosoma is longer than wide, off-white (7506M), light yellow (7508M) or light brown (7510M). Eyes are present (8, 6), reduced to remnant pale spots or completely absent. The chelicerae are light yellow-orange (131M) to orange-brown (145M), solid, geniculate, with a small condyle, and bearing each one mid-apical large seta and a brush of setae near the promargin on each side. The promargin harbors three teeth, while the retromargin is highly variable, bearing 4–9 denticles, often not symmetrical. Legs are robust, off-white (7506M), or light yellow (7508M) to light orange-brown (472M), with leg formula 4–1–2–3. The opisthosoma is oval, longer than wide, off-white (7506M) to light gray (cool grey 3M). The female epigynum (Figs 1–4), consists of an epigynal ventral plate with a short to long transverse slit (Tsl), bearing a medial inverted U- or V-shaped indentation that ranges from shallow to very deep, or absent. The atrium (AT) is simple, squared or rectangular, partly intruded by the dorsal plate (DP). Atrial aperture ranges from minuscule to very large. Bursa (B) regular to enlarged, fused to not fused. Rounded copulatory ducts (CD) separated or touching at midpoint; reaching over, equal to, or under the apex of the primary lobe (PL). Primary pores (PPo) are located at the copulatory ducts constriction, which is located apically, medially, basally or sub-basally (in relation to the primary lobe). Stalks (St) are short (Fig. 1) or long (Fig. 3), procurved (Fig. 3), recurved (Fig. 10) or straight; when straight they can be directed obliquely (Fig. 1) or horizontally (Fig. 24). Dictynoid pore (DPo) is rounded or elongated. The shape of the primary lobes varies from almost rounded (*Cicurina (Cicurella) baronia*, Fig. 13) to elongate (*Cicurina (Cicurella) barri*, Fig. 15). Secondary lobes (SL) are present or absent, and, when present, positioned ventro-basally in relation to primary lobe (Fig. 3). Fertilization canal (FC) is short to long, reaching the dictynoid pore or beyond and sometimes running past the constriction of the primary lobe; it is positioned externally or internally from the dictynoid pore. Fertilization duct (FD) can be internally, medially or externally attached to the primary lobe base. The male palp (Figs 5–6) is composed of a large, smooth tegulum (T). The embolus (E) originates on the prolateral side of the tegular apex, curves around the subtegulum, and penetrates the furrow of the tegular apophysis (TA). The retrolateral side of the tegular apex is notched to varying degrees (Fig. 5, arrow), forming a round swelling. The tegular apophysis fold can be smooth or rugose, with various bumps. The proximal end of the tegular apophysis (P) is spine-like, short to long. The retrolateral tibial apophysis (RTA) is simple, with only one fold, bearing from 2 to 6 setae, with a straight to slightly triangular spur (Spu). The apex of the retrolateral tibial apophysis varies from pointed to rounded (Fig. 6).

Distribution of troglobitic *Cicurina (Cicurella)* species. Because immature specimens could be assigned to *Cicurella* based on lack of eyes (with one known exception, see remark below), we compiled records to provide a visual assessment of the distribution of all troglobitic *Cicurella*. This is based on published data reporting the occurrence of eyeless *Cicurina* in particular caves [Anonymous 1994,

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Cokendolpher & Reddell 2001, Cokendolpher 2004a, b, Gertsch 1971, 1977, 1992, Kunath 1995, McKenzie & Reddell 1964, Paquin & Hedin 2004, Reddell 1962, 1964, 1965, 1967, 1973, 1977, 1981, 1988, 1994, 1995, Reddell & Finch 1963, Reddell & Smith 1965, Taylor *et al.* 2005] and records from the invertebrate database of James Reddell (TMM). The latter source of information contains unpublished records of eyeless *Cicurina (Cicurella)*, or published in obscure publications that may have been overlooked. The range of the troglobitic members of the subgenus extends from Mexico to Central Texas, with one enigmatic species occurring in Alabama (Fig. 7). In Reddell (1965), an eyeless *Cicurina (Cicurella)* was reported from Big Mouth Cave in Wheeler County (TX). After verification of the original correspondence with W.J. Gertsch, this record is incorrect and refers to *Cicurina (Cicurusta) varians* (James R. Reddell, pers. comm.), a fully eyed species, commonly found at the surface and in cave entrances of Texas.

Confirmed localities. Troglobitic *Cicurina (Cicurella)* are known from the following caves and these localities are included on the map shown in figure 7. Most records are based on a reasonable approximation of their location. Eyeless *Cicurina (Cicurella)* are known from 457 cave locations to date. Numbers in brackets sum up the number of caves reported from the particular area.

MEXICO (8). *Coahuila*: Cueva de los Lagos, Gruta de Cuevecillas; *Nuevo Leon*: Zaragoza Region, Cueva de Cuchillo, Pozo la Gloria; *Puebla*: San Pablo Zoquitlan Region; *Taumalipas*: Cueva de la Nieve (Altas Cumbres); *Yucatan*: Yucatan Actun Tucil.

UNITED STATES. **Alabama (1): *Jefferson Co***.: Crystal Cavern. **Texas: *Bandera Co. (8):*** Fossil Cave; Bob Clark Cave; Fog Fissure; Haby Swallow Cave; Keese Cave; Melanie's Cave; Station 'C' Cave #1; Sutherland Hollow Cave. ***Bell Co. (19):*** Adam's Gold Mine; Buchanan Cave; Camp 6, cave no 1; Fellers Cave; Figure 8 Cave; Fools Cave; Lucky Rock Cave; Owl Mountain Cave; Peep in the Deep Cave; Rugger's Rift Cave; Sanford Pit Cave; Seven Mile Mountain Cave; Streak Cave; Talking Crows Cave; Treasure Cave; Triple J Cave; Valentine Cave; Violet Cave; Witt's Cave. ***Bexar Co. (72):*** Adam Wilson's Cave; B-52 Cave; Backhole Cave; Black Cat Cave; Braken Bat Cave; Breached Dam Cave; Breathless Cave; Bunny Hole; Cannonball Cave; Caracol Creek Coon Cave; Cave in the Woods; Christmas Cave; Cranes Bat Cave; Cross the Creek Cave; Crownridge Canyon Cave; Dancing Rattler Cave; Eagle's Nest Cave; Elm Springs Cave; Encino Park Cave; Fatman Nightmare Cave; Feature 50; Firing Lane 11 Cave; Genesis Cave; Government Canyon Bat Cave; Gubbs Cave #23; Hackberry Sink Cave; Hairy Tooth cave; Headquarters Cave; Helotes Blowhole Cave; Helotes Hilltop Cave; Here Today, Gone Tomorrow Cave; Hilger Hole; Hills and Dale Pit Cave; Iron Horse Ranch Cave (C5); Isocow Cave; Javalina Cave; John Wagner Ranch Cave no 3; Kamikazi Cricket Cave; King Toad Cave; La Cantera #1; La Cantera #3; Lithic Ridge Cave; Logan's Cave; Lone Gunman Pit; Lost Pothole Cave; Low Priority Pit; Madla's Cave; Madla's Drop Cave; MARS Pit; Mattke Cave; Pain in the Glass Cave; Phil’s Frigg in Line Cave; Platypus Pit; Porcupine Squeeze Cave; Power Pole 60 Feature; Ragin' Cajun Cave; Robber Baron Cave; Robber's Cave; Root Canal Cave; San Antonio Ranch Pit; SBC Cave; Scenic Overlook Cave; Scorpion Cave; Sharron Spring Cave; Sir Doug's Cave; Stahl Cave; Stevens Ranch Trash Hole Cave; Surprise Sink; Three fingers Cave; Unnamed Helotes; Crane's Bat Cave; Up the Creek Cave; Young Cave no 1. ***Blanco Co. (1):*** Forest View Cave. ***Burnett Co. (4):*** Fenceline Cave; Longhorn Caverns; Resurection Well; Simons Persimon Sink. ***Comal Co. (14):*** Big Red Cave; Coreth Bat Cave; Diamond Cave; Double Decker Cave; Egypt Cave; Kappelman Cave; Kappelman Salamander Cave; Lewis Cave; Mixmaster Cave; Natural Bridge Caverns; Rocket River Cave; Spring Branch Cave; Startszville Bat Cave; Tippit Cave. ***Edwards Co. (8):*** 3–Bounce Pit; Deep Cave; Devil's Sinkhole; Dunbar Cave; Jacoby Cave; Jenkins Main Drain Cave; Kahn's Cave; Wyatt Cave. ***Hays Co. (24):*** Backyard Cave; Boggus Cave; Boyett's Cave; County Line Bat Cave; Donaldson Cave; Ezell's Cave; Fern Cave; Grapevine Cave; Halifax Bat Cave; Hays Ranch Bat Cave; Hoskin's Hole; Kiras Karst Park; Ladder Cave; Magens Cave; McCarty Cave; McGlothlin Cave; Michaelis Cave; Morton's Cave; Root Beard Cave; Sky Ranch cave; Taylor Bat Cave; Tricopherous Cave; Wimberley Bat Cave; Wiseman Sink No 2 Cave. ***Kendall Co. (2):*** Cave-without-a-name; Gertrude's Unknown Cave. ***Kerr Co. (2):*** Stowers Cave; Water Pond Pasture Cave. ***Kimble Co. (1):*** Fleming's Bat Cave. ***Medina Co. (5):*** Boehme's Cave; Davenport Cave; Marguerite Cave; Valdina Farms Sinkhole; Weynand Cave. ***Menard Co. (1):*** Powell's Cave. ***Pecos Co. (1):*** Amazing Maze Cave. ***Real Co. (3):***

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Cave of the Lakes; Orell Crevice Cave; Ramseys Bat Cave. ***San Saba Co. (9):*** Cicurina Cave; Clarck's Branch Well Cave; Gorman Cave; Harrell's Cave; Lemons Ranch Cave; Middle Cave; Unknown Cave; Wedge Cave; Whiteface Cave. ***Sutton Co*. (2):** Caverns of Sonora; Felton Cave. ***Terrell Co. (1):*** Wizard's Well. ***Travis Co. (84):*** Adobe Springs Cave; Airman's Cave; Amber Cave; Another Cave; Arrow Cave; Bandit Cave; Barker Bat Cave; Barker Ranch Cave; Beckett's Cave; Bee Creek Cave; Blowing Sink; Bowie Cave; Brew Pot Sink; Broken Straw Cave; Cave X; Cave Y; Ceiling Slot Cave; Cotterell Cave; Dead Dog Cave No 2; Disbelievers Cave; District Park Cave; Down Dip Sink; Driskill Cave; Eluvial Cave; Flint Ridge Cave; Fossil Garden Cave; Four Points Karst Feature #8a; Gallifer Cave; GCWA Cave; Geode Cave; Get Down Cave; Goat Cave; Grapevine Cave; Homestead Cave; Ireland's Cave; Jack's Joint Cave; Jest John Cave; Jester Estates Cave; Jollyville Jewel Cave; Jollyville Plateau Cave; Kretschmarr Cave; Kretschmarr Double Pit; Lamm Cave; Little Bee Creek; Lost Gold Cave; Lost Oasis Cave; Lunsford's Cave; Macdonald Cave; Maple Run Cave; Midnight Cave; Moonmilk Cave; Moss Pit Cave; M.W.A. Cave; New Comanche Trail Cave; No Rent Cave; North Root Cave; Northside Cave; Northwoods Cave; Outhouse Hole Sink; Paleospring Cave; Pickle Pit; Pisarowicz Cave; Plethodon Cave; Puzzle Pit Cave; Rock Top Cave; Rolling Rock Cave; Root Cave; Salamander Cave; Salamander Mountain Cave; Seibert Sink; Slaughter Cave; Spyglass Cave; Stoneworks Sink; Stovepipe Cave; Sunset Valley Cave; Tardus Hole Cave; Three-Holer Cave; Tooth cave; Tres Amigos Cave; Twisted Elm Cave; Two Trunks Cave; Weldon Cave; Whirlpool Cave; White Opossum Cave. ***Uvalde Co. (16):*** Dripstone Cave; Frio Bat Cave; Frio King Cave; Frio Queen Cave; Grape Hollow Cave; Indian Creek Cave; Margaritaville Cave; Moon Mountain Cave; Moss Pit Cave; North Well Cave; Pablo's Cave; Picture Cave No 1; Rambie's Cave; Sandtleben Cave; Tampke Ranch Cave; Whitecotton Bat Cave. ***Val Verde Co. (8):*** Diablo Cave; Emerald Sink; Fawcett's Cave; Ladder Cave; Oriente Milestone Molasses Bat Cave; Seminole Canyon Cave; Sunset Cave; Unnamed (No. 8). ***Williamson Co*. *(163):*** A.J. & B.L. Wilcox Cave; Abused Cave; Abyss Cave; Agave Cave; Air Chase Cave; Animal Canyon Cave; Apache Cave; Arboreal Cave; Argo Cave; Avery Ranch Cave; Bat Well Cave; Beck Bat Cave; Beck Bridge Cave; Beck Horse Cave; Beck Pride Cave; Beck Ranch Cave; Beck Sewer Cave; Bev's Grotto; Black Cat Cave; Blowhole Cave; Blue Wasp Cave; Blue Water Cave #1; Blue Water Cave #2; Bone Cave; Bonito Sink Cave; Boyd's Void Cave; Brown's Cave; Buttercup River Cave; Buzzard Feather Cave; Cannibal Lector Cave; Cat Cave; Cat Hollow #1; Cave Coral Cave; Cedar Elm Sink; Chagas Cave; Clan Cave; Cobb's Cavern Cave, shovel Pit #6; Cobb's Caverns; Cole Cave H 29; Convoluted Canyon Cave; Corn Cobbs Cave; Cresent Cave; Cricket Cave; Critchfield Bat Cave; Deliverance Cave No. 1; Dion Cave; Do Drop in Cave; Double Dog Hole Cave; Double Nickle Cave; Dragonfly Cave; Duckworth Bat Cave; Dungeon Master Cave; East Fork Fissure Cave; Eclipse Cave; ElectroMag Cave; Emancipation Cave; Ronald Regan Feature #1 Cave; Flat Rock Cave; Flint Wash Cave; Floral Cave; Four Corners Cave; Four Fangs Cave; Goat Cave; Godwin's Goat Cave; Good Friday Cave; Grapevine Cave; Grimace Cave; Hole in the Ground Cave; Holler Hole Cave; Ilex Cave; Inner Space Cavern; Joint Effort Cave; Joseph Cave; Kamikazi Crack Cave; Karankawa Cave; Killian Cavern; Kiva Cave No. 1; Knife Cave; Lakeline Cave; Lineament Cave; Little Demon Cave; Lobo's Lair Cave; Lorfing's Unseen Rattler Cave; Man-with-a-spear Cave; Marigold Cave; Maverick Cave; Mayor Elliott Cave; McNeil Bat Cave; McNeil Quarry Cave; Medicine Man Cave; Middle Fork Fissure Cave; Mini-Mag cave; Mongo Cave; Mosquito Cave; Mustard Cave; Nelson Ranch Cave; Nostromos Cave; Off Campus Cave; On-Campus Cave; Onion Branch Cave; Papoose Cave; Pauls' Tuna Can Cave; Pemmican Cave; Phraetica Cave; Polaris Cave; Pomegranate Pit Cave; Posh Cave; Pow Wow Cave; Prairie Flats Cave; Price-Is-Right Cave; Primrose Cave; Priscilla's Cave; Priscilla's Well Cave; Pugilist Cave; Pussy Cat Cave; Quincenera Cave; Rattlesnake Filled Cave; Rattlesnake Inn Cave; Reach Around Cave; Red Crevice Cave; Rock Ridge Cave; Rootin Tootin Cave; Sam Bass Hideaway Cave; Shaman Cave; Short Stack Cave; Steam Cave; Steiner Telephone Pole Cave; Stepstone Cave; Stone Well Cave No. 2; Sunless City Cave; T.W.A.S. a Cave; Temples of Thor Cave; Testudo Tube Cave; Texella Cave; Thin Top Cave; Three Miles Cave; Turner Goat Cave; Two Hole Cave; Undercut Cave; Underline Cave; Undertaker Cave; Unearthed Cave; UTE Cave; Vault Cave; Velcro Cave; Venom Cave; Venturi Cave; Vericose Cave; Villa-De-Los-Indios Cave; Walsh Ranch Cave; Water Pipe Cave; Water Tank Cave; Water Tower Cave; Waterfall Canyon Cave; Whitestone Cave; Whitewater Cave;

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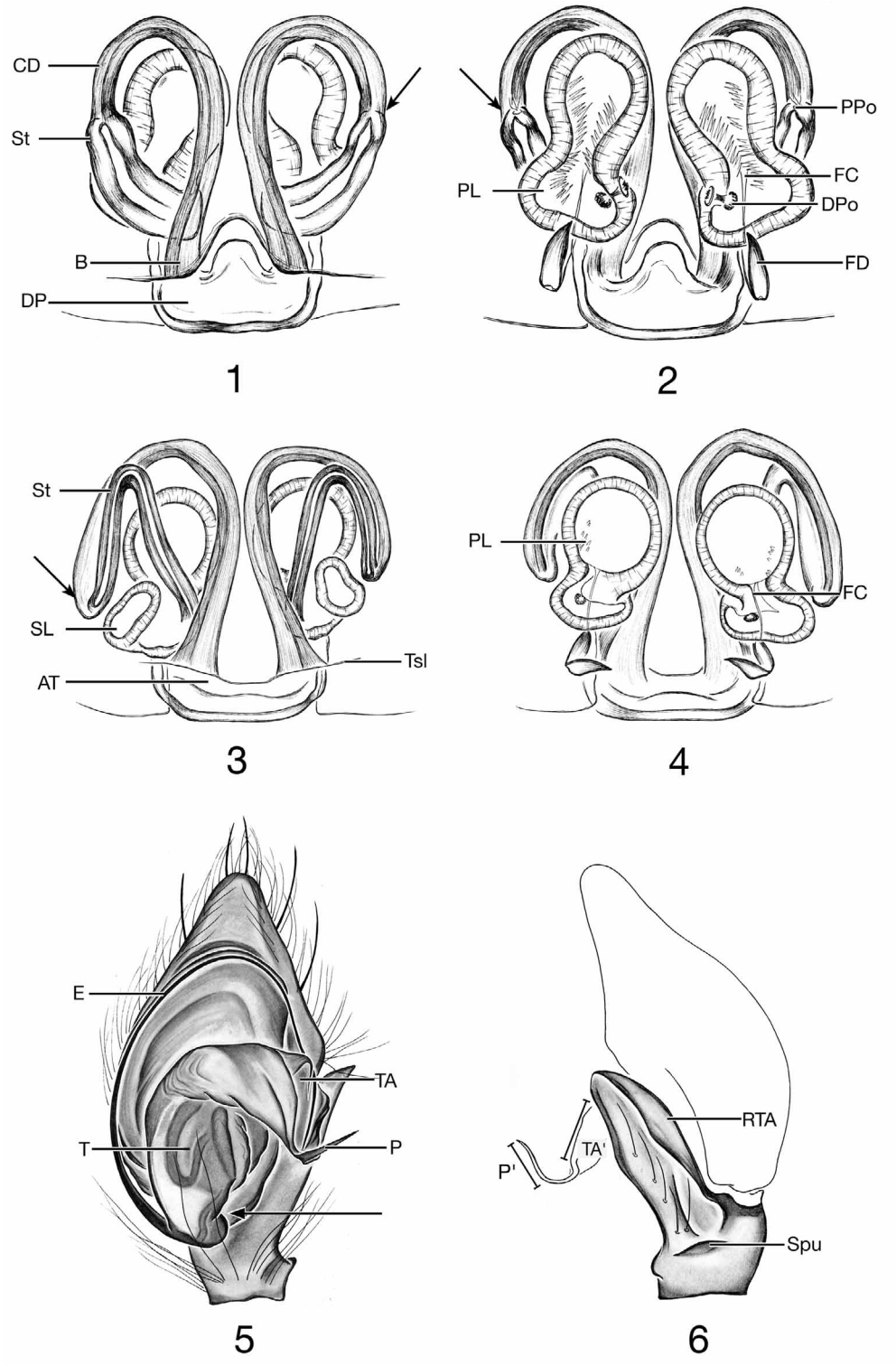
Wigglewise Cave; Williams Cave No. 1; Wolf Cave; Yammas Cave; Yearwood Gold mine Cave; Yellow Hand Cave; You-Dig-It Cave.



FIGURES 1–6. Genitalic characters and terminology used. **1–2** *Cicurina ezelli*, cleared epigynum (1, ventral view; 2, dorsal view). **3–4** *Cicurina holsingeri* cleared epigynum (3, ventral view; 4, dorsal view). **5–6** *Cicurina medina*, male left palp (5, ventral view; 6, retrolateral view). Abbreviations used: AT, atrium; B, bursa; CD, copulatory ducts; DP, dorsal plate; DPo, dictynoid pore; E, embolus; FC, fertilization canal; FD, fertilization duct; P, proximal end of TA; P', proximal end length; PL, primary lobe; PPo, primary pore; RTA, retrolateral tibial apophysis; SL, secondary lobe; Spu, spur; St, stalk; T, tegulum; TA, tegular apophysis; TA', tegular apophysis length; T, tegulum; Tsl, transverse slit. Arrows in 1–3 point to the constriction of the copulatory ducts, and in figure 5, to the notch.

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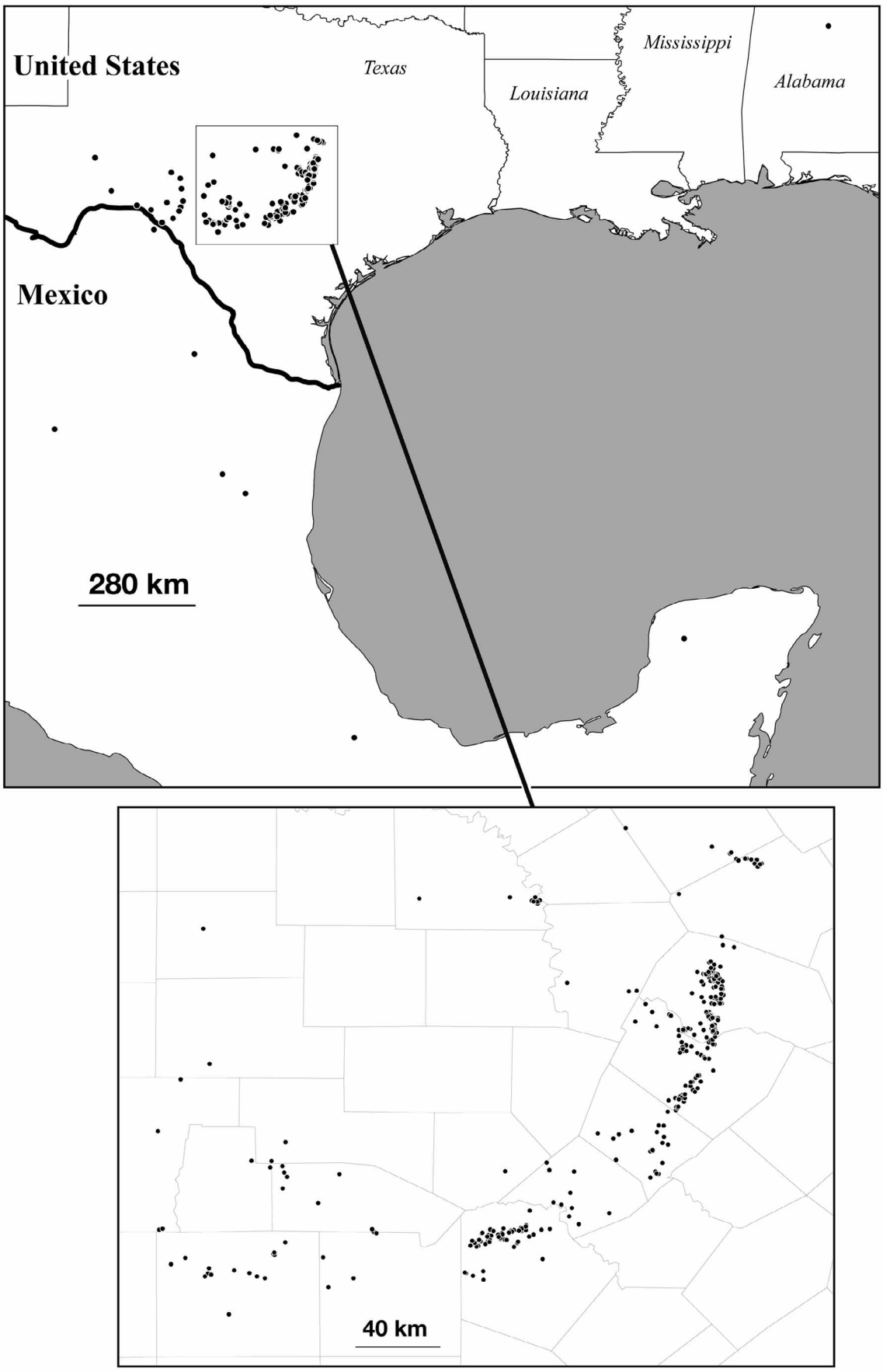

FIGURE 7. Distribution range of troglobitic *Cicurina* (*Cicurella).* This map is based on published and unpublished records including immatures specimens assigned to the group on the basis of absence of eyes.

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Unknown localities. Troglobitic *Cicurina (Cicurella)* have been collected in the following caves, but despite numerous attempts, the location of these caves remain unknown.

Bandera Co.: Love Creek Ranch Cave. ***Bexar Co***.: 8A-12 Sink Dig; Black Hole cave; Cave No. 21. ***Kerr Co***.: Mingus Swallow Cave. ***Kinney Co***.: Baker's Crossing Cave. ***Real Co***.: Skeleton Cave. ***San Saba Co***.: Surprise Cave. ***Uvalde Co***.: Cement Tank Cave; Story Cave.

Remarks. The subgenus *Cicurina (Cicurusta)* also includes an eyeless species, *Cicurina (Cicurusta) mina* Gertsch 1971, only known from Cueva de la Capilla and Cueva de la Mina in Mexico (Reddell 1981). All other described troglobitic *Cicurina* belongs to the subgenus *Cicurella. Cirurina (Cicurella) buwata* was originally assigned to the subgenus *Cicurata* Chamberlin & Ivie 1940, but this subgenus has since been synonymyzed under *Cicurella* by Cokendolpher (2004a).

Cicurina (Cicurella) bandera Gertsch 1992
(Figs 8–9, 135)

Cicurina bandera Gertsch 1992: 111, figs 113–114 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Fossil Cave, Bandera County, W99 N29, July 23, 1966 J. Reddell, D. McKenzie colls.". Examined (AMNH).

Description. *Female holotype*

Total length: 4.20; carapace length: 2.10; carapace width: 1.40; opisthosoma length: 2.10. Eyes absent. Cheliceral promargin right side with 4 teeth (1 large, 3 small), left side 3 teeth (2 large, 1 small); retromargin right side with 5 denticles (2 large, 3 small), left side 6 denticles (2 large, 4 small). Leg I: total length: 6.40; femur: 1.80; patella: 0.65; tibia: 1.55; metatarsus: 1.45; tarsus: 0.95; leg IV: total length: 7.20; femur: 1.95; patella: 0.65; tibia: 1.70; metatarsus: 1.90; tarsus: 1.00. Tarsal claw IV: 0.14. Epigynum: 0.182 (half size). Epigynal ventral plate with long transverse slit; bursa not enlarged nor fused; copulatory ducts reaching over primary lobe apex; primary pores not visible; stalk short, procurved joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Fossil Cave (Bandera County, Texas, Fig. 135).

Remarks. Male unknown. The description of the epigynum is incomplete because the holotype was damaged.

Cicurina (Cicurella) bandida Gertsch 1992
(Figs 10–11, 132)

Cicurina bandida Gertsch 1992: 107, figs 79–80 (description of female).— Jackman 1997: 162, 171; Reddell 2005: 557.

HOLOTYPE female: "Texas; Bandit Cave, Travis County, W97 N30, May 26 1966, J. Reddell & J. Fish colls.". Examined (AMNH).

Additional material examined. UNITED STATES: *Travis County*: Ireland's Cave, 14.iii.1964, 1f# [TMM #11790], B. Russell (TMM); 23.i.1989, 2f# [TMM #11785], J. Reddell, M. Reyes, E. Grimm, M. Grimm (TMM).

Description. *Female holotype*

Total length: 5.65; carapace length: 2.75; carapace width: 1.80; opisthosoma length: 2.90. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side with 7 denticles (3 large, 4 small). Leg I: total length: 9.30; femur: 2.60;

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patella: 1.00; tibia: 2.35; metatarsus: 2.25; tarsus: 1.10; leg IV: total length: 11.05; femur: 2.95; patella: 1.05; tibia: 2.60; metatarsus: 3.00; tarsus: 1.45. Tarsal claw IV: 0.15. Epigynum: 0.328 mm. Epigynal ventral plate with long transverse slit, bearing medial, very deep, inverted V-shaped indentation; atrium rectangular, almost completely intruded by triangular dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts touching at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located medially, primary pores not visible; stalk, short, recurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore not observed; primary lobe hat-shaped; secondary lobe absent; fertilization canal not observed; fertilization duct internally attached to the primary lobe base.

Distribution. Known from two caves in Travis County (Texas): Bandit Cave (type locality) and Ireland's Cave (Fig. 132).

Remarks. Male unknown. Gertsch added in his 1992 paper: "Rollingwood" referring to the general location of the cave. The illustrations presented in Gertsch's paper (1992: figs 79–80) are not of the holotype, as the specimen was not dissected. A dissection is necessary to present the dorsal view of his figure 80. Gertsch (1992) reported the existence of an aberrant specimen for that species.

Cicurina (Cicurella) baronia Gertsch 1992

(Figs 12–13, 134)

Cicurina baronia Gertsch 1992: 109, chart 2, figs 89–90, 155–156 (description of male and female). — Jackman 1997: 162, 171; Cokendolpher 2004a: 19–20, 24, 27, 34, 38–41, 54, figs 28–31; Reddell & Cokendolpher 2004: 79; Paquin & Hedin 2004: 3249.

HOLOTYPE female: "Holotype. Robber Baron's Cave, San Antonio, Bexar County, Tex. April 1969. Roger Bartholomew". Examined (AMNH).

Description. *Female holotype*

Total length: 5.45; carapace length: 2.30; carapace width: 1.55; opisthosoma length: 3.15. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 small), left side likewise; retromargin right side with 7 denticles (3 large, 4 small), left side likewise. Leg I: total length: 6.68; femur: 1.80; patella: 0.75; tibia: 1.53; metatarsus: 1.65; tarsus: 0.95; leg IV: total length: 7.90; femur: 2.05; patella: 0.80; tibia: 2.15; metatarsus: 1.08; tarsus: 0.48. Tarsal claw IV: 0.17. Epigynum: 0.462. Epigynal ventral plate with moderate transverse slit, bearing medial, shallow, inverted U-shape indentation; atrium rectangular, half-intruded by slightly rounded dorsal plate, atrial aperture moderate; bursa slightly enlarged, not fused; copulatory ducts widely separated at midpoint, reaching primary lobe apex; copulatory ducts constriction located basally; primary pores visible (1 seen); stalk short, straight, horizontal, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe ear-shaped; secondary lobe absent; fertilization canal short, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Robber Baron Cave (Bexar County, Texas, Fig. 134).

Remarks. Both sexes are described. The official name for the type locality is Robber Baron Cave and not Robber Baron's Cave. This species is included on the U.S. Federal list of endangered species (Longacre 2000).

Cicurina (Cicurella) barri Gertsch 1992

(Figs 14–15, 137)

Cicurina barri Gertsch 1992: 117, figs 141–142 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Mayfield Cave (Caverns of Sonora), Sutton County W100.N30, August 29, 1959. T.C. Barr collector". Examined (AMNH).

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Description. *Female holotype*

Total length: 5.85; carapace length: 2.90; carapace width: 1.70; opisthosoma length 2.95. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 7.95; femur: 2.25; patella: 0.80; tibia: 1.80; metatarsus: 2.00; tarsus: 1.10; leg IV: total length: 8.79; femur: 2.45; patella: 0.85; tibia: 2.25; metatarsus: 2.00; tarsus: 1.24; Tarsal claw IV: 0.20. Epigynum length: 0.392. Epigynal ventral plate with long transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium squared, half intruded by dorsal plate, atrial aperture moderate; bursa slightly enlarged, not fused; copulatory ducts touching at midpoint, reaching over primary lobe apex; copulatory ducts constriction located sub-basally, primary pores not visible; stalk short, straight, horizontal, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore large and rounded; primary lobe elongated; secondary lobe absent; fertilization canal long, reaching over dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Caverns of Sonora (Sutton County, Texas, Fig. 137).

Remarks. Male unknown. Caverns of Sonora is the actual name used for this locality, one of the better known commercial caves of Texas.

Cicurina (Cicurella) browni Gertsch 1992

(Figs 16–17, 130)

Cicurina browni Gertsch 1992: 98, figs 53–54 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Williamson County; Brown's Cave, 23 April 1989. W. Elliott, J. Reddell, M. Reyes". Examined (AMNH).

Description. *Female holotype*

Total length: 5.20; carapace length: 2.10; carapace width: 1.35; opisthosoma length: 3.10. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (2 large, 4 small), left side with 5 denticles (2 large, 3 small). Leg I: total length: 6.34; femur: 1.75; patella: 0.65; tibia: 1.55; metatarsus: 1.45; tarsus: 0.93; leg IV: total length: 7.35; femur: 2.00; patella: 0.65; tibia: 1.70; metatarsus: 2.00; tarsus: 1.00. Tarsal claw IV: 0.20. Epigynum: 0.420. Epigynal ventral plate with short transverse slit, bearing medial, very deep, inverted U-shaped indentation; atrium squared, almost completely intruded by dome-shaped dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts widely separated at midpoint, reaching below primary lobe apex; copulatory ducts constriction located medially, primary pores visible (1 seen); stalk, short, straight, slightly oblique, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe light-bulb shape; secondary lobe absent; fertilization canal long, internally positioned from dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Brown's Cave (Williamson County, Texas, Fig. 130).

Remarks. Male unknown.

Cicurina (Cicurella) brunsi Cokendolpher 2004

(Figs 18–19, 134)

Cicurina brunsi Cokendolpher 2004a: 19–20, 22, 24, 27, 34, **38**–40, figs 32–33 (description of female). — Jackman 1997: 162; Reddell & Cokendolpher 2004: 79; Paquin & Hedin 2004: 3243–3245, 3249, 3253.

HOLOTYPE female: "Texas: Bexar Co., Camp Bullis, Stahl Cave, 1 Nov. 2001, J.R. Reddell and M. Reyes (molted 14 Dec. 2001, 2 Aug. 2002)". Examined (AMNH).

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Description. *Female holotype*

Total length: 3.51; carapace length: 1.53; carapace width: 1.08; opisthosoma length: 1.98. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 small), left side likewise; retromargin right side with 7 denticles (3 large, 4 small), left side with 6 denticles (3 large, 3 small). Leg I: total length: 4.30; femur: 1.25; patella: 0.45; tibia: 1.05; metatarsus: 0.95; tarsus: 0.60; leg IV: total length: 4.75; femur: 1.15; patella: 0.50; tibia: 1.10; metatarsus: 1.25; tarsus: 0.75. Tarsal claw IV: 0.15. Epigynum: 0.294 mm. Epigynal ventral plate with long transverse slit, bearing medial, shallow, inverted V-shaped indentation; atrium rectangular, half intruded by dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts scarcely separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk, short, straight, horizontal, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe ear-shaped; secondary lobe absent; fertilization canal long, externally positioned from dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Stahl Cave (Bexar County, Texas, Fig. 134).

Remarks. Male unknown.

Cicurina (Cicurella) bullis Cokendolpher 2004

(Figs 20–21, 134)

Cicurina bullis Cokendolpher 2004a: 16, 18–22, 24–27, 34, **39**–41, 52, 54, figs 34–36 (description of female). — Reddell & Cokendolpher 2004: 80; Paquin & Hedin 2004: 3243–3246, 3253.

HOLOTYPE female: "Texas: Bexar County: Isocow Cave. Zone 3. 2 March 1994,W. Elliot, G. Veni". Examined (AMNH).

Additional material examined. UNITED STATES: *Bexar County*: Platypus Pit, 30.iii.1995, 1♀ [TMM #35354], J. Reddell, M. Reyes, PARATYPE (TMM); Root Canal Cave (Camp Bullis), 20.iv.1999 (molted on 25.viii.1999, 09.iv.2000 and matured on 03.xii.2000), 1♀, J. Reddell, M. Reyes, PARATYPE (TMM); Eagles Nest Cave (Camp Bullis), 01.xi.2001, 1♀ [TMM #34452] J. Reddell, M. Reyes, PARATYPE (TMM); Hilger Hole (Camp Bullis), 15.xii.2000, 1♀, J. Reddell, M. Reyes, PARATYPE (TMM).

Description. *Female holotype*

Total length: 3.96; carapace length: 1.80; carapace width: 1.26; opisthosoma length: 2.16. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 small), left side likewise; retromargin right side with 7 denticles (3 large, 4 small), left side likewise. Leg I: total length: 5.15; femur: 1.35; patella: 0.55; tibia: 1.25; metatarsus: 1.20; tarsus: 0.80; leg IV: total length: 5.95; femur: 1.65; patella: 0.55; tibia: 1.35; metatarsus: 1.55; tarsus: 0.85. Tarsal claw IV: 0.15. Epigynum: 0.350 mm. Epigynal ventral plate with long transverse slit, bearing medial, shallow indentation; atrium rectangular, half intruded by dorsal plate, atrial aperture small; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching slightly over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk, short, straight, horizontal, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe ear-shaped; secondary lobe absent; fertilization canal short, externally positioned from dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Known from five caves in Bexar County (Texas, Fig. 134): Eagles Nest Cave, Hilger Hole, Isocow Cave (type locality), Platypus Pit, and Root Canal Cave.

Remarks. Male unknown. Data added in Cokendolpher (2004a) for holotype "top of 3.6 m drop to top of 4.6 m Pit". According to Cokendolpher (2004a), *C. bullis* and *C. platypus* are found in sympatry in Platypus Pit, the type locality of *C. platypus*.

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***Cicurina (Cicurella) buwata* Chamberlin & Ivie 1940**
(Figs 22–23, 131)

Cicurina buwata Chamberlin & Ivie 1940: 74, fig. 94 (description of juvenile). — Nicolas 1960: 156; Reddell & Finch 1963: 40; Reddell 1965: 169; Vogel 1970: 2; Brignoli 1972: 151; Gertsch 1992: 97 *nomen inquirendum*; Platnick 1998: 643 *nomen dubium*; Jackman 1997: 162; Cokendolpher 2004a: 13, 29, 32–33, figs 19–20; Paquin & Hedin 2004: 3243–3245, 3253.

Cicurina elliotti Gertsch 1992: 101, figs 73–74 (description of female) (placed in synonymy by Cokendolpher 2004a: 32).

HOLOTYPE juvenile: "Cave near Austin, Marsh 12-18 1903. J.H. Comstock". Examined (AMNH). Based on the information provided by Finch & Reddell (1963), Barr (1974) and Cokendolpher (2004a), this cave is Sam Bass Cave (see remarks below).

Comment. The holotype of *Cicurina (Cicurella) buwata* is an immature specimen, and consequently, genitalic features could not be described. However, the holotype *Cicurina (Cicurella) elliotti*, a synonym of *Cicurina (Cicurella) buwata* (see Cokendolpher 2004a), is a mature female with recognizable characters (see remarks below). To facilitate species level recognition, we are providing the description of the holotype of *Cicurina (Cicurella) elliotti*, because the description of an immature *Cicurina (Cicurella)* does not provide any characters useful to species recognition.

***Cicurina (Cicurella) elliotti* holotype, female**: "Beck's Sewer Cave, Williamson Co. Tex. 9-27-65. J. Calvert, J. Reddell". Examined (AMNH).

Additional material examined. UNITED STATES: *Travis County*: Cotterell Cave, 10.iii.1967, 1♀, E.E. Remington (AMNH); Fossil Garden Cave, 06.vi.1990, 1♀ [TMM #34444], J. Reddell, M. Reyes (TMM); Gallifer Cave, 20.iv.1991, 1♀, J. Reddell, M. Reyes (AMNH); *Williamson County:* Bev's Grotto, 16.iv.1989, 1♀, W. Elliott, J. Reddell, M. Reyes (AMNH); Buttercup River Cave, 16.ii.1991, 1♀ 1 juv., B. Larsen, W. Russell (AMNH); Good Friday Cave, 07.v.1989, 1♀, W. Elliott, M. Reyes (AMNH); Marigold Cave, 18.ix.1988, 1♀ 2 juvs, P. Sprouse (AMNH); Testudo Tube, 29.v.1991, 1♀ 2 juvs, J. Reddell, M Reyes (AMNH); T.W.A.S. a Cave, 16.iv.1989, 1♀ 1 juv., W. Elliott, J. Reddell, M. Reyes (AMNH).

Description. *Female holotype*

Total length: 3.40; carapace length: 1.55; carapace width: 1.00; opisthosoma length: 1.85. Eyes absent. Cheliceral promargin right side with 4 teeth (2 large, 2 small), left side with 3 teeth (2 large, 1 small); retromargin right side with 5 denticles (2 large, 3 small), left side with 6 denticles (2 large, 4 small). Leg I: total length: 4.60; femur: 1.35; patella: 0.55; tibia: 0.97; metatarsus: 1.03; tarsus: 0.70; leg IV: total length: 5.45; femur: 1.45; patella: 0.55; tibia: 1.25; metatarsus: 1.45; tarsus: 0.75. Tarsal claw IV: 0.11. Epigynum: 0.336 mm. Epigynal ventral plate with short transverse slit, bearing medial, inverted U-shaped indentation; atrium square, almost completely intruded by rounded shaped dorsal plate going under epigynal slit, atrial aperture minuscule; bursa not enlarged nor fused; copulatory ducts touching at midpoint, reaching top of primary lobe apex; primary pores not visible; stalk, short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe elongated; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. The species has been reported from eleven caves (as *Cicurina (Cicurella) elliotti*): *Travis County*: Cotterell Cave, Fossil Garden Cave, Gallifer Cave, *Williamson County:* Beck's Sewer Cave (type locality of *Cicurina (Cicurella) elliotti*), Bev's Grotto, Buttercup River Cave, Good Friday Cave, Marigold Cave, Sam Bass Cave (=McNeil Quarry Cave, type locality of *Cicurina (Cicurella) buwata*), Testudo Tube, T.W.A.S. a Cave (Fig. 131).

Remarks. Male unknown. Reddell & Finch (1963:40) reported that an immature eyeless *Cicurina* collected from Sam Bass Cave (=McNeil Quarry Cave) was described by Chamberlin & Ivie (1940) as *Cicurina buwata*. The name of the cave was not indicated on the holotype label (only "cave near Austin") and Gertsch (1992), being unable to associate this specimen with any species because of the uncertain locality,

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declared *C. buwata* as *nomen inquirendum.* Cokendolpher (2004a) restored *Cicurina (Cicurella) buwata* from this *nomen dubium* and placed *Cicurina (Cicurella) elliotti* Gertsch in synonymy, as Sam Bass Cave is a known locality for *Cicurina (Cicurella) elliotti* (see Gertsch 1992). This is also supported by the fact that Sam Bass Cave is the type locality of an eyeless carabid beetle, *Rhadine subterranea* van Dyke; also collected by J.H. Comstock on Marsh 12-18, 1903 (see Barr 1974), presumably along with *Cicurina (Cicurella) buwata*, because no other collection of Comstock is known from this area. The epigynum description presented here is incomplete given that the epigynum was somewhat damaged. Gertsch (1992) listed Gallifer Cave as a locality for *Cicurina (Cicurella) buwata*. However, the location of that cave is not in the geographical range delimited by the other locations given for *Cicurina (Cicurella) buwata*. Gallifer Cave is located on the Jollyville Plateau, where Gertsch described *Cicurina (Cicurella) travisae* (see Fig. 131). Cotterell Cave listed in the distribution of *Cicurina (Cicurella) buwata*, is the type locality of *Cicurina (Cicurella) reddelli.* Apparently, this slipped Gertsch's attention as he did not believe that two troglobitic *Cicurina (Cicurella)* could inhabit the same cave (James R. Reddell, pers. comm.).

Cicurina (Cicurella) caliga Cokendolpher & Reddell 2001
(Figs 24–25, 129)

Cicurina caliga Cokendolpher & Reddell 2001: 38, figs 1–2 (description of female). — Cokendolpher 2004b: 61; Paquin & Hedin 2004: 3243–3245, 3247–3248, 3253; Taylor *et al*. 2005: 98.

HOLOTYPE female: "Texas: Bell County: Triple J Cave, Nov. 1994, M. Warton". Examined (AMNH).

Additional material examined. UNITED STATES: *Bell County*: Buchanan Cave (Fort Hood), 05.v.1999, 1♀ [TMM #14189], J. Reddell, M. Reyes PARATYPE (TMM); Streak Cave (Fort Hood), 13.vi.2000, 1♀ [TMM #31589], J. Krejca, J. Reddell, M. Reyes, P. Sprouse PARATYPE (TMM).

Description. *Female holotype*

Total length: 3.96; carapace length: 1.98; carapace width: 1.26; opisthosoma length: 1,98. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 7 denticles (3 large, 4 small), left side with 6 denticles (3 large, 3 small). Leg I: total length: 5.53; femur: 1.40; patella: 0.60; tibia: 1.40; metatarsus: 1.28; tarsus: 0.85; leg IV: total length: 6.30; femur: 1.65; patella: 0.55; tibia: 1.50; metatarsus: 1.70; tarsus: 0.90. Tarsal claw IV: 0.16. Epigynum: 0.336 mm. Epigynal ventral plate with short transverse slit, bearing medial, very deep, inverted V-shaped indentation; atrium squared, almost completely intruded by dome-shaped dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts separated at midpoint, reaching primary lobe apex; copulatory ducts constriction located basally; primary pores visible (1 seen); stalk, short, straight, horizontal, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal short, externally positioned from dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Reported from three caves: Buchanan Cave, Streak Cave, and Triple J Cave (type locality), (Bell County, Texas, Fig. 129).

Remarks. Male unknown. According to Cokendolpher & Reddell (2001), *C. caliga* is found in sympatry with *C. hoodensis* in Buchanan Cave, the type locality of *C. hoodensis.*

Cicurina (Cicurella) caverna Gertsch 1992
(Figs 26–27, 137)

Cicurina caverna Gertsch 1992: 115, figs 131–132 (description of female). — Jackman 1997: 162.

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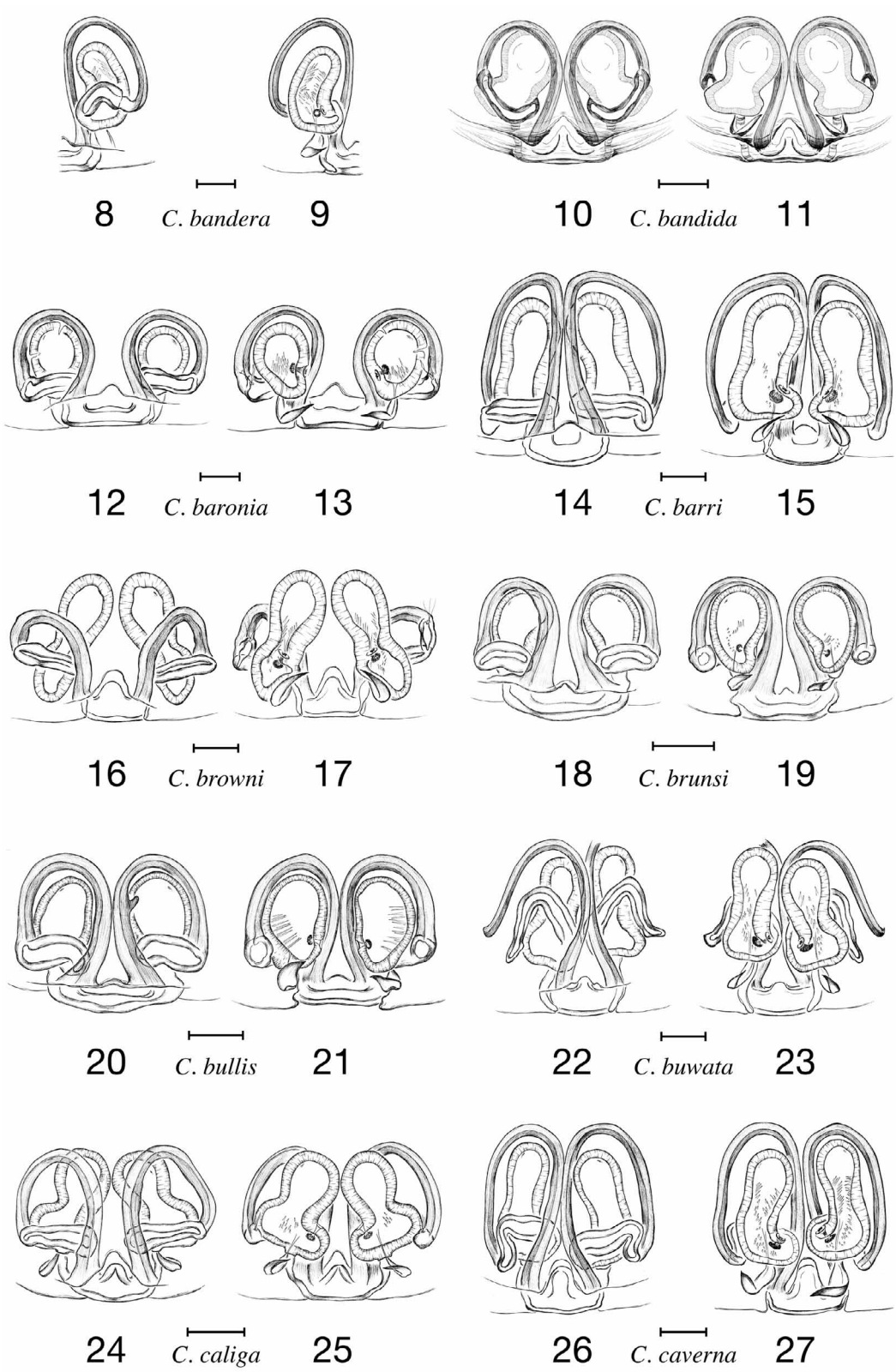

FIGURES 8–27. Cleared epigynum of troglobitic *Cicurina* (*Cicurella*) holotypes. For each species, a ventral and a dorsal view of the cleared epigynum are presented; the low number refers to the ventral view and the high number refers to the dorsal view. **8–9** *Cicurina bandera* Gertsch 1992. **10–11** *Cicurina bandida* Gertsch 1992. **12–13** *Cicurina baronia* Gertsch 1992. **14–15** *Cicurina barri* Gertsch 1992. **16–17** *Cicurina browni* Gertsch 1992. **18–19** *Cicurina brunsi* Cokendolpher 2004. **20–21** *Cicurina bullis* Cokendolpher 2004. **22–23** *Cicurina buwata* Chamberlin & Ivie 1940. **24–25** *Cicurina caliga* Cokendolpher & Reddell 2001. **26–27** *Cicurina caverna* Gertsch 1992. Scale bar = 0.1 mm.

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HOLOTYPE female: "Kimble County. Fleming's Cave, 4 miles No. Telegraph, February 21, 1964. Bill Russell coll. ". Examined (AMNH).

Description. *Female holotype*

Total length: 3.90; carapace length: 1.90; carapace width: 1.15; opisthosoma length: 2.00. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (2 large, 4 small), left side 5 denticles (2 large, 3 small). Leg I: total length: 5.60; femur: 1.60; patella: 0.60; tibia: 1.25; metatarsus: 1.30; tarsus: 0.85; leg IV: total length: 6.55; femur: 1.75; patella: 0.60; tibia: 1.55; metatarsus: 1.70; tarsus: 0.95. Tarsal claw IV: 0.13. Epigynum: 0.35. Epigynal ventral plate with long transverse slit, bearing medial, very deep, inverted U-shaped indentation; atrium squared, almost completely intruded by dome-shaped dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts touching at midpoint, reaching over primary lobe apex; copulatory ducts constriction located sub-basally; primary pores not visible; stalk short, procurved joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe elongated; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Fleming's Bat Cave (Kimble County, Texas, Fig. 137).

Remarks. Male unknown. Data added by Gertsch (1992): "Fleming's Bat Cave", which is the actual name for that cave.

Cicurina (Cicurella) coahuila Gertsch 1971

(Figs 28–29, 138)

Cicurina coahuila Gertsch 1971: 110, fig. 108 (description of female). — Brignoli 1972: 151; Reddell 1973: 33, 38; Hoffman 1976: 46; Reddell 1981: 135; Reddell 1982: 264; Gertsch 1992: 120, figs 163–164.

HOLOTYPE female: "Coahuila; Cueva de los Lagos, 15 mi west of Ciudad Acuna & 2 mi. N of the Rio Grande at Diablo Cave, 23 January 1964. J. Reddell, D. McKenzie, J. Porter. In small domes". Label 2 added by Gertsch: "Coahuila; Cave 15 mi. W. Ciudad Acuna w101.n29. J. Reddell, D. McKenzie, J. Porter". Examined (AMNH).

Description. *Female holotype*

Total length: 3.10; carapace length: 1.35; carapace width: 0.75. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 5 denticles (2 large, 3 small) left side likewise. Leg I: total length: 3.78; femur: 1.10; patella: 0.43; tibia: 0.90; metatarsus: 0.80; tarsus: 0.55; leg IV: total length: 4.33; femur: 1.15; patella: 0.45; tibia: 1.05; metatarsus: 1.10; tarsus:0.58. Tarsal claw IV: 0.09. Epigynum: 0.280. Epigynal ventral plate with long transverse slit, indentation absent; atrium rectangular, half intruded by straight dorsal plate, atrial aperture large; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching over the primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk, long, acutely procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe light-bulb shape; secondary lobe present, positioned ventro-basally from primary lobe; fertilization canal very long, internally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality, Cueva de los Lagos, Coahuila, Mexico (Fig. 138).

Remarks. Male unknown. The data from the holotype label slightly differs from Gertsch's (1992) type data. "In small domes" refers to the microhabitat on the ceiling of the cave (James R. Reddell, pers. comm.). Reddell (1981) mentioned that Cueva de los Lagos has unfortunately been inundated by the waters of the Amistad Reservoir.

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***Cicurina (Cicurella) coryelli* Gertsch 1992**
(Figs 30–31, 129)

Gertsch 1992: 103, figs 71–72 (description of female). — Jackman 1997: 162; Cokendolpher & Reddell 2001: 40, figs 4–7; Cokendolpher 2004b: 59–61; Paquin & Hedin 2004: 3243–3245, 3249, 3253; Taylor *et al*. 2005: 98.

HOLOTYPE female: "Texas; Coryell County; Tippit Cave. 31 Jan. 1992 J. Reddell, M. Reyes". Examined (AMNH).

Additional material examined. UNITED STATES: *Coryell County*: Big Red Cave (Fort Hood), 06.v.1999, 1♀, J. Reddell, M. Reyes (TMM); Egypt Cave (Fort Hood), 07.iv.1999, 1♀ [TMM #14230], J. Reddell, M. Reyes (TMM).

Description. *Female holotype*

Total length: 3.80; carapace length: 1.70; carapace width: 1.10; opisthosoma length: 2.10. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side with 3 teeth (2 large, 1 small); retromargin right side with 7 denticles (2 large, 5 small), left side with 6 denticles (2 large, 4 small). Leg I: total length: 5.00; femur: 1.40; patella: 0.55; tibia: 1.20; metatarsus: 1.05; tarsus: 0.80; leg IV: total length: 5.43; femur: 1.45; patella: 0.55; tibia: 1.25; metatarsus: 1.55; tarsus: 0.83. Tarsal claw IV: 0.13. Epigynum: 0.196 mm (half). Epigynal ventral plate with short transverse slit, bearing medial, deep, inverted U-shaped indentation; stalk, short, straight, horizontally directed.

Distribution. Reported from three caves: Big Red Cave, Egypt Cave, Tippit Cave (type locality), all located in Coryell County (Texas, Fig. 129). The map provided by Cokendolpher & Reddell (2001) places one of these three caves in Bell County, which appears incorrect.

Remarks. Male unknown. The epigynum description of the type specimen presented here is incomplete because this structure is heavily damaged. To bypass this problem and provide useable characters for species identification, Cokendolpher & Reddell (2001) illustrated another female collected in the same cave, that Gertsch (1992) also examined. As pointed by Cokendolpher & Reddell (2001), the holotype specimen epigynum was likely crushed when Gertsch described the species, as shown by his illustrations that do not show connecting ducts.

***Cicurina (Cicurella) cueva* Gertsch 1992**
(Figs 32–33, 132)

Cicurina cueva Gertsch 1992: 107, figs 81–82 (description of female). — Jackman 1997: 162, 171; Reddell 2005: 557.

HOLOTYPE female: "Texas: Cave X, 6 miles south of Austin, W 97.45; N 30.12 Sept., 1962. Bill Bell, Sharon Woosley, 200 feet inside cave". Examined (AMNH).

Additional material examined. UNITED STATES: *Travis County*: Flint Ridge Cave, 19.i.1989, 1f# [TMM #11792] M. Grimm, J. Reddell, M. Reyes (TMM); iv.1989, 1f# [TMM #11787] M. Grimm (TMM).

Description. *Female holotype*

Total length: 4.15; carapace length: 1.80; carapace width: 1.17; opisthosoma length: 2.35. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (4 large, 2 small), left side likewise. Leg I: total length: 6.20; femur: 1.80; patella: 0.65; tibia: 1.50; metatarsus: 1.40; tarsus: 0.85; leg IV: total length: 7.05; femur: 1.85; patella: 0.65; tibia: 1.65; metatarsus: 1.85; tarsus: 1.05. Tarsal claw IV: 0.14. Epigynum: 0.378 mm. Epigynal ventral plate with long transverse slit, bearing medial, deep, inverted V-shaped indentation; atrium rectangular, two-thirds intruded by dome-shaped dorsal plate, atrial aperture moderate; bursa not enlarged nor fused; copulatory ducts touching at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located apically; primary pores not visible; stalk, short, recurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore not seen;

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primary lobe hat-shaped; secondary lobe absent; fertilization canal not observed; fertilization duct internally attached to the primary lobe base.

Distribution. Also reported from Flint Ridge Cave (Travis County, Texas, Fig. 132).

Remarks. Male unknown. Gertsch (1992) mentioned the existence of aberrant specimens for this species.

Cicurina (Cicurella) delrio Gertsch 1992

(Figs 34–35, 138)

Cicurina delrio Gertsch 1992: 96, charts 1–2, figs 21–22 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Sunset Cave, Val Verde Co., 12 mi. NW Del Rio (on Ellison Brit Ranch), on slit 50' from entrance. December 14, 1962. Reddell & Russell". Examined (AMNH).

Additional material examined. UNITED STATES: *Val Verde County*: Diablo Cave (Calyx hole entrance), 11.viii.1963, 1♀ 1 juv., under a rotting shirt, J. Reddell, D. McKenzie (AMNH).

Description. *Female holotype*

Total length: 3.90; carapace length: 1.65; carapace width: 1.25; opisthosoma length 2.25. Six eyes reduced to pale remnant spots. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise, retromargin right side with 7 denticles (2 large, 5 small), left side 6 denticles (2 large, 4 small). Leg I total length: 4.95; femur: 1.35; patella: 0.50; tibia: 1.20; metatarsus: 1.00; tarsus: 0.70. Leg IV missing. Epigynum length: 0.462 mm. Epigynal ventral plate with long transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium rectangular, half intruded by straight dorsal plate; atrial aperture large; bursa slightly enlarged, not fused; copulatory ducts scarcely separated at midpoint, reaching over the top of primary lobe apex; copulatory ducts constriction located sub-basally; primary pores not visible; stalk short, procurved, joining primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe light-bulb shape; secondary lobe absent; fertilization canal short, reaching the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Known from Diablo Cave, Sunset Cave (type locality) and Unnamed Cave No 8, all three caves in Val Verde County (Texas, Fig. 138). The specimen from Unnamed Cave No 8 could not be located and examined to confirm the occurrence of *Cicurina (Cicurella) delrio* in that cave. However, the locality is included in Fig. 138 based on Gertsch's (1992) record and indicated by an open symbol.

Remarks. Male unknown. Gertsch (1992) added the information "on wall 50 feet from cave entrance" for that specimen, but that information does not appear on the label. Gertsch (1992) considered *Cicurina (Cicurella) delrio* as an eyed taxon, along with other epigean species. Examination of the type and other specimens of that species however suggest that the eyes are not functional and the species is clearly a troglobite. See also *Cicurina (Cicurella) mirifica*.

Cicurina (Cicurella) ezelli Gertsch 1992

(Figs 36–37, 133)

Cicurina ezelli Gertsch 1992: 99, figs 61–62 (description of female). — Jackman 1997: 162; Paquin & Hedin 2004: 3241, 3243–3245, 3253.

HOLOTYPE female: "Texas; Hays County, Ezell's Cave, Located at San Marcos, September 7, 1963 J. Reddell, D. McKenzie, R. Ballinger". Examined (AMNH).

Description. *Female holotype*

Total length: 5.40; carapace length: 2.65; carapace width: 1.80. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (2 large, 4 small),

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left side with 5 denticles (2 large, 3 small). Leg I: total length: 8.85; femur: 2.45; patella: 0.90; tibia: 2.20; metatarsus:2.10; tarsus: 1.20; leg IV: total length: 9.55; femur: 2.55; patella: 0.80; tibia: 2.35; metatarsus: 2.60; tarsus: 1.25. Tarsal claw IV: 0.20. Epigynum: 0.308. Epigynal ventral plate with moderate transverse slit, bearing medial, very deep, inverted U-shaped indentation; atrium square, almost completely intruded by dome-shaped dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts hardly separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located medially; primary pores visible (1 seen); stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Ezell's Cave (Hays County, Texas, Fig. 133).

Remarks. Male unknown. The holotype vial contained the female holotype and three immature specimens that are not mentioned in Gertsch (1992). The holotype label was written as "*Cirucina ezzelli*", and this misspelling was corrected in Gertsch (1992).

***Cicurina (Cicurella) gruta* Gertsch 1992**

(Figs 38–39, 138)

Cicurina gruta Gertsch 1992: 117, figs 147–148 (description of female). — Reddell 1995: 23; Jackman 1997: 162; Cokendolpher 2004a: 24, 52.

HOLOTYPE female: "Texas: Dunbar Cave, Edwards County, w100;n29, September 29, 1956 W. McAlister coll.". Examined (AMNH).

Description. *Female holotype*

Total length: 3.78; carapace length: 1.80; carapace width: 1.26; opisthosoma length 1.98. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 7 denticles (3 large, 4 small), left side 6 denticles (3 large, 3 small). Leg I: total length: 5.45; femur: 1.53; patella: 0.58; tibia: 1.30; metatarsus: 1.25; tarsus: 0.80; leg IV: total length: 6.14; femur: 1.54; patella: 0.55; tibia: 1.50; metatarsus: 1.60; tarsus: 0.95. Tarsal claw IV: 0.15. Epigynum length: 0.434. Epigynal ventral plate with moderate transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium squared, two-thirds intruded by rounded dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts barely separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe elongated; secondary lobe absent; fertilization canal short, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Dunbar Cave (Edwards County, Texas, Fig. 138).

Remarks. Male unknown. Data added by Gertsch (1992): "20 miles sw Rocksprings" to facilitate the location of the cave.

***Cicurina (Cicurella) holsingeri* Gertsch 1992**

(Figs 40–41, 138)

Cicurina holsingeri Gertsch 1992: 98, figs 57–58 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Seminole Canyon Cave, Seminole Canyon State Park, Val Verde Co., Texas, 4 March 1983. William R. Elliott". Examined (AMNH).

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Description. *Female holotype*

Total length: 2.88; carapace length: 1.44; carapace width: 0.90; opisthosoma length 1.44. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 small), left side 3 teeth (2 large, 1 small), retromargin right side with 5 denticles (3 large, 2 small), left side likewise. Leg IV: total length: 4.35; femur: 1.10; patella: 0.45; tibia: 1.05; metatarsus: 1.05; tarsus: 0.70. Tarsal claw IV: 0.15. Epigynum length: 0.294 mm. Epigynal ventral plate with moderate transverse slit, indentation absent; atrium rectangular; half intruded by slightly rounded dorsal plate; atrial aperture moderate; bursa enlarged, not fused; copulatory ducts almost touching at midpoint, reaching well over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk long, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe light-bulb shaped; secondary lobe present, positioned ventro-basally in relation to primary lobe; fertilization canal very long internally or externally positioned from the dictynoid pore; fertilization duct medially positioned on primary lobe base.

Distribution. Only reported from the type locality: Seminole Canyon Cave (Val Verde County, Texas, Fig. 138).

Remarks. Male unknown. There are some inconsistencies in the illustrations of this specimen (Gertsch 1992: figs 57–58). In the dorsal view (fig. 58), the copulatory ducts should be illustrated as presented here (Fig. 41), over the primary lobe.

Cicurina (Cicurella) hoodensis Cokendolpher & Reddell 2001

(Figs 42–43, 129)

Cicurina hoodensis Cokendolpher & Reddell 2001: 43, figs 10–11 (description of female). — Cokendolpher 2004b: 59, 61; Paquin & Hedin 2004: 3243–3245, 3247–3248, 3253; Taylor *et al*. 2005: 98.

HOLOTYPE female: "Texas: Bell County: Buchanan Cave, Fort Hood, 7 May 1998, L.J. Graves, J. Reddell, M. Reyes". Examined (AMNH).

Additional material examined. UNITED STATES: *Bell County*: Camp 6 Cave No. 1 (Fort Hood), 02.xi.1998, matured 22.xi.1998, 1♀, J. Cokendolpher, J. Reddell, PARATYPE (TMM); Peep in the Deep Cave (Fort Hood), 03.xi.1998 (matured 20.i.1999), 1♀ [TMM #14188], J. Cokendolpher, J. Reddell, PARATYPE (TMM); Talking Crows Cave (Fort Hood), 02.xi.1998, 1♀ [TMM #14186], M. Reyes, PARATYPE (TMM); Treasure Cave (Fort Hood), 02.xi.1998 (matured 05.xii.1998), 1♀ [TMM #14187], J. Cokendolpher, J. Reddell, M. Reyes, PARATYPE (TMM); Triple J Cave (Fort Hood), 13.vi.2000, 1♀ [TMM #31594], J. Krejca, J. Reddell, M. Reyes, P. Sprouse, PARATYPE (TMM).

Description. *Female holotype*

Total length: 2.90; carapace length: 1.40; carapace width: 0.95; opisthosoma length: 1,50. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 7 denticles (2 large, 5 small), left side likewise. Leg I: total length: 4.25; femur: 1.20; patella: 0.40; tibia: 1.00; metatarsus: 0.95; tarsus: 0.70; leg IV: total length: 5.10; femur: 1.35; patella: 0.45; tibia: 1.20; metatarsus: 1.30; tarsus: 0.80. Tarsal claw IV: 0.11. Epigynum: 0.308 mm. Epigynum ventral plate with moderate transverse slit, bearing medial, deep, inverted V-shaped indentation; atrium rectangular, half intruded by rounded dorsal plate, atrial aperture moderate; bursa not enlarged nor fused; copulatory ducts touching at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located medially; primary pores not visible; stalk, short, slightly procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal long, externally positioned from dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Reported from six caves: Buchanan Cave (type locality), Camp 6 Cave No. 1, Peep in the Deep Cave, Talking Crows Cave, Treasure Cave, Triple J Cave (all in Bell County, Texas, Fig. 129).

Remarks. Male unknown. According to Cokendolpher & Reddell (2001), *C. hoodensis* is found in sympatry with *C. caliga* in Buchanan Cave.

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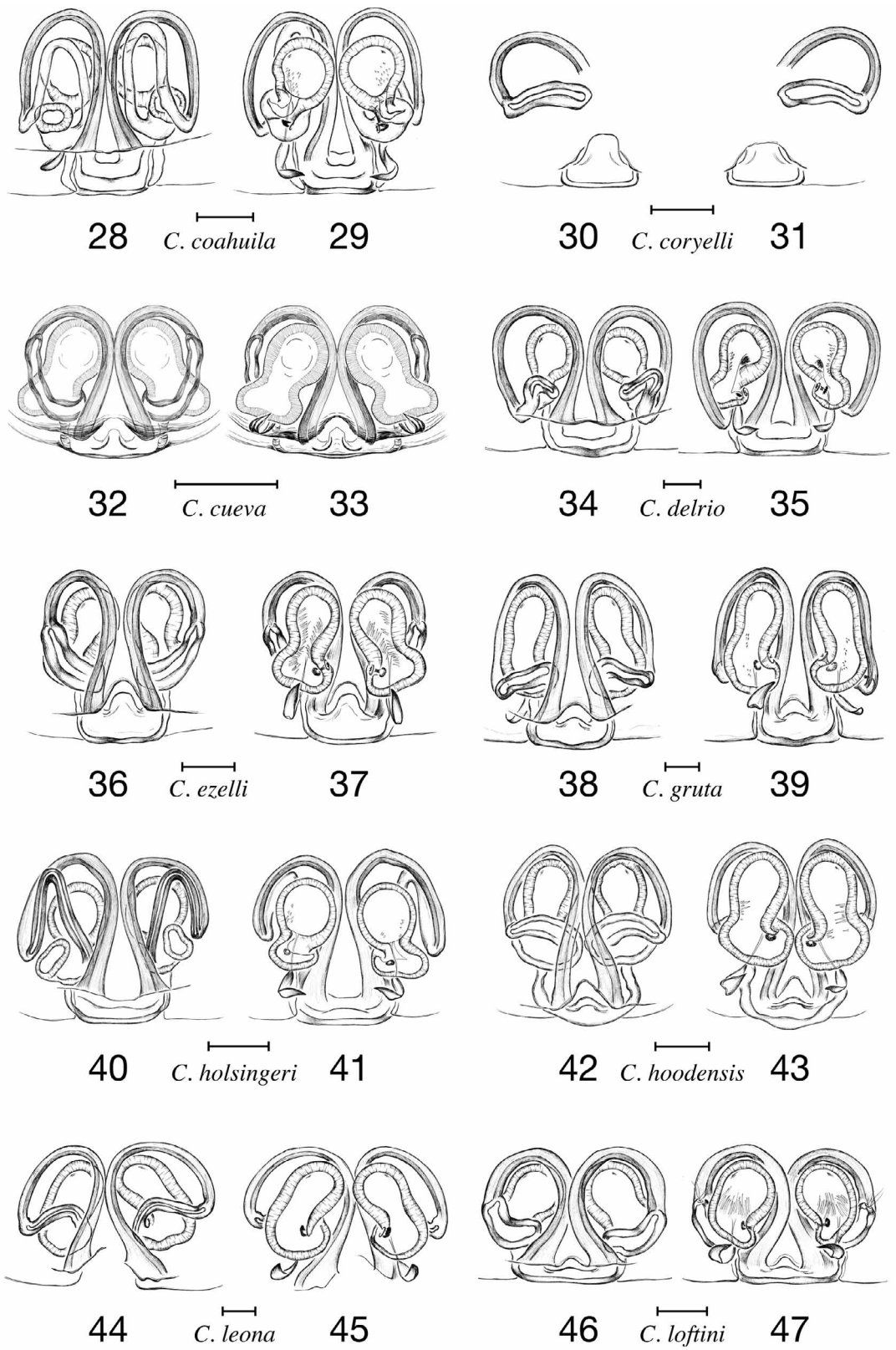

FIGURES 28–47. Cleared epigynum of troglobitic *Cicurina* (*Cicurella*) holotypes. For each species, a ventral and a dorsal view of the cleared epigynum are presented; the low number refers to the ventral view and the high number refers to the dorsal view. **28–29** *Cicurina coahuila* Gertsch 1971. **30–31** *Cicurina coryelli* Gertsch 1992. **32–33** *Cicurina cueva* Gertsch 1992. **34–35** *Cicurina delrio* Gertsch 1992. **36–37** *Cicurina ezelli* Gertsch 1992. **28–29** *Cicurina gruta* Gertsch 1992. **40–41** *Cicurina holsingeri* Gertsch 1992. **42–43** *Cicurina hoodensis* Cokendolpher & Reddell 2001. **44–45** *Cicurina leona* Gertsch 1992. **46–47** *Cicurina loftini* Cokendolpher 2004. Scale bar = 0.1 mm.

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***Cicurina (Cicurella) leona* Gertsch 1992**
(Figs 44–45, 128)

Cicurina leona Gertsch 1992: 129, figs 165–166 (description of female).

HOLOTYPE female: "Nuevo Leon: Cueva de Cuchillo, 2.5 km S. of Minas Viejas, 1270m. 22 April 1988. Peter Sprouse". Examined (AMNH).

Additional material examined. MEXICO: *Nuevo Leon:* Pozo la Gloria, 1 km WSW Minas Viejas, 21.i.1989, 1♀, 1280m. P. Sprouse (AMNH).

Description. *Female holotype*

Total length: 3.11; carapace length: 1.346; carapace width: 0.99. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (2 large, 4 small) left side likewise. Leg I: total length: 4.45; femur: 1.27; patella: 0.47; tibia: 1.13; metatarsus: 0.99; tarsus: 0.59; leg IV: total length: 5.25; femur: 1.42; patella: 0.47; tibia: 1.23; metatarsus: 1.32; tarsus:0.81. Tarsal claw IV: 0.11. Epigynum: 0.394. Epigynum with bursa enlarged; copulatory ducts touching at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located medially; primary pores not visible; stalk, short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe kidney-shaped; secondary lobe absent; fertilization canal short, reaching the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Known from two caves in Nuevo Leon (Mexico): Cueva de Cuchillo (type locality) and Pozo la Gloria (see remarks) (Fig. 128).

Remarks. Male unknown. The vial that contains the holotype label of *C. leona* in the AMNH type collection does not match the data published by Gertsch (1992) for this species. The label reads "Mexico; Nuevo Leon; Pozo la Gloria, 1 km WSW Minas Viejas, 1280m. 21 Jan. 1989 P. Sprouse". However, in Gertsch's synoptic collection we located a specimen identified as *C. leona* that bears the data pertaining to the holotype. It appears that the holotype label was not assigned to the correct specimen, i.e., the specimen that matches the data published for the holotype of that species. We corrected the situation by adding a holotype label to the type specimen. These data, however, add a second location for the species. Unfortunately the description provided here is incomplete given that the epigynum of the type was damaged.

***Cicurina (Cicurella) loftini* Cokendolpher 2004**
(Figs 46–47, 134)

Cicurina loftini Cokendolpher 2004a: 16, 19–20, 22–25, 27, 34, **41**–43, 47, figs 37–39 (description of female). — Reddell & Cokendolpher 2004: 80; Paquin & Hedin 2004: 3243–3245, 3253.

HOLOTYPE female: "Texas: Bexar County: Caracol Creek Coon Cave. 15 June 1993. J. Loftin, J. Reddell, M. Reyes, G. Veni". Examined (AMNH).

Additional material examined. UNITED STATES: *Bexar County*: SBC Cave (TxDOT loop 1604), 20.ii.2003, 1♀, K. White (CPAD).

Description. *Female holotype*

Total length: 4.41; carapace length: 2.16; carapace width: 1.35; opisthosoma length: 2.25. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 small), left side likewise; retromargin right side with 6 denticles (2 large, 4 small), left side with 6 denticles (3 large, 3 small). Leg I: total length: 5.85; femur: 1.65; patella: 0.60; tibia: 1.45; metatarsus: 1.35; tarsus: 0.80; leg IV: total length: 6.75; femur: 1.80; patella: 0.70; tibia: 1.60; metatarsus: 1.75; tarsus: 0.90. Tarsal claw IV: 0.17. Epigynum: 0.364 mm. Epigynum with moderate transverse slit, bearing medial, shallow, U-shaped indentation; atrium rectangular, almost completely intruded by slightly rounded dorsal plate, atrial aperture small; bursa enlarged, not fused;

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copulatory ducts touching at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located medially; primary pores visible (1 and 2 seen); stalk, short, recurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe ear-shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only known from Caracol Creek Coon Cave (type locality) and SBC Cave (Bexar County, Texas, Fig. 134).

Remarks. Male unknown.

Cicurina (Cicurella) machete Gertsch 1992

(Figs 48–49, 130)

Cicurina machete Gertsch 1992: 114, figs 125–126 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; San Saba Co. Whiteface Cave, 20 mi. South of Richland Springs, February 9, 1964 J. Reddell; D. McKenzie & K. Garrett". Examined (AMNH).

Description. *Female holotype*

Total length: 4.68; carapace length: 2.43; carapace width: 1.53; opisthosoma length: 2.25. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 5 denticles (3 large, 2 small), left side with 7 denticles (3 large, 4 small). Leg I: total length: 7.45; femur: 2.05; patella: 0.65; tibia: 1.85; metatarsus: 1.80; tarsus: 1.10; leg IV: total length: 8.98; femur: 2.35; patella: 0.75; tibia: 2.20; metatarsus: 2.48; tarsus: 1.20. Tarsal claw IV: 0.15. Epigynum: 0.365. Epigynal ventral plate with short transverse slit, indentation absent; atrium rectangular, two-thirds intruded by slightly rounded dorsal plate, atrial aperture moderate; bursa not enlarged nor fused; copulatory ducts separated at mid-point, reaching over primary lobe apex; copulatory ducts constriction located medially; primary pores visible (1 seen); stalk short, straight, horizontal, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal long, externally positioned from dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Whiteface Cave (San Saba County, Texas, Fig. 130).

Remarks. Male unknown. The data given in Gertsch (1992) "30 mi. South" slightly differs from the data found on the label. The description of the epigynum is somewhat incomplete: the primary pore position is not given because these structures are displaced from their original position on the damaged holotype.

Cicurina (Cicurella) madla Gertsch 1992

(Figs 50–51, 134–135)

Cicurina madla Gertsch 1992: 109, figs 91–92 (description of female). — Jackman 1997: 162, 171; Cokendolpher 2004a: 16, 19–20, 24–25, 27–28, 34, 42–46, 52, 54, figs 7–8, 40–47; Paquin & Hedin 2004: 3239, 3243–3250, 3253–3254; Reddell & Cokendolpher 2004: 80.

HOLOTYPE female: "Texas; Bexar County, Madla's Cave, located 1 mile west of Adam Wilson's Cave Jr. October 4, 1963 J. Reddell, D. McKenzie". Examined (AMNH).

Additional material examined. Christmas Cave, 06.ix.1993, 1♀ [TMM #34448] J. Reddell, M. Reyes (TMM); Headquarters Cave (Camp Bullis) 20.x.1995, 1♀, J. Reddell, M. Reyes (TMM); Helotes Blowhole, no date, 1♀ 4 juvs [TMM #34447], A. Grubbs, K. Kinsley, K. White (TMM); Hills and Dales Pit (UTSA area), 28.x.2000,1♀ [TMM #34457] K. White, H. Becthol (TMM); Lost Pothole (Government Canyon State Park), 04.ii.1995, 1♀, [TMM #34449], A. Grubbs, G. Hoese, C. Vreeland (TMM); Madla's Drop Cave, 08.vi.1993, 1♀, [TMM #34451], J. Loftin, J. Reddell, M. Reyes, G. Veni (TMM); Robber's Cave, 14.vii.1993, 1♀, J. Reddell, M. Reyes (TMM).

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Description. *Female holotype*

Total length: 7.29; carapace length: 2.70; carapace width: 1.67; opisthosoma length: 2.70. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (2 large, 4 small), left side likewise. Legs I and IV missing. Epigynum: 0.448. Epigynal ventral plate with short transverse slit, bearing medial, very shallow indentation; atrium squared, two-thirds intruded by dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts touching at midpoint, reaching slightly over of primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe elongated; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Reported from twenty caves in Bexar County, and one from Uvalde county. (Texas, Figs 134–135): Christmas Cave, Headquarters Cave, Helotes Blowhole, Hills and Dales Pit, Lost Pothole, Madla's Cave (type locality), Madla's Drop Cave, and Robber's Cave. Paquin & Hedin (2004) provided localities for the species using codes. Here are the cave names that supported these records and the codes that were used: Fatman's Nightmare Cave (NMF), Feature 50, UTSA (YFF), Helotes Hilltop Cave (LHH), Javelina Cave (CVJ), John Wagner Cave #3 (GWJ), La Cantera #1 (CAL), Lithic Ridge Cave (CRL), Margaritaville Cave (RAM) San Antonio Ranch Pit (RAS), Scenic Overlook Cave (LOS), Surprise Sink (SSC), Cranes Bat Cave (UEH, identity previously unknown). The Margaritaville Cave record from Uvalde County requires confirmation given the distance between the known distribution area and this locality (see figs 134–135).

Remarks. Male unknown. Data added by Gertsch (1992): "4 miles NW of Helotes" to facilitate location of the type locality. The occurrence of the species in some localities is based on a DNA match of immature specimens (see Paquin & Hedin 2004) and these specimens are not listed in the examined material. This species is included on the U.S. Federal list of endangered species (Longacre 2000).

***Cicurina (Cicurella) maya* Gertsch 1977**
(Figs 52–53, 128)

Cicurina maya Gertsch 1977: 127, fig. 86 (description of the female). — Reddell 1977: 232; Reddell 1981: 136; Gertsch 1992: 119, figs 161–162.

HOLOTYPE female: "Mexico: Yucatan Actun Tucil, 2 km S Muna, 27 March 1973 J. Reddell". Examined (AMNH).

Description. *Female holotype*

Total length: 3.13; carapace length: 1.43; carapace width: 0.95; opisthosoma length: 1.70. Four eyes highly reduced to pale remnant spots. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 9 denticles, left side likewise. Leg I: total length: 6.64; femur: 1.43; patella: 0.45; tibia: 0.90; metatarsus: 0.75; tarsus: 0.49; leg IV: total length: 4.15; femur: 1.15; patella: 0.45; tibia: 0.95; metatarsus: 1.05; tarsus:0.55. Tarsal claw IV: 0.12. Epigynum: 0.294 mm. Epigynal ventral plate with short transverse slit, indentation absent; atrium rectangular, half intruded by slightly rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk, short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal long, internally positioned from the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only known from the type locality Actun Tucil, Yucatan, Mexico (Fig. 128).

Remarks. Male unknown. Gertsch mentioned that this species is an eyeless troglobite, but the female holotype bears visible eye remnants. There are also some difficulties in interpreting the original figures for the species: Gertsch (1992): figs 161–162 are supposedly of a ventral and a dorsal view of the holotype, the only

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known specimen of the species. However, it is not clear that figure 161 is a ventral view as the spermathecal stalks are not illustrated (compare to Fig. 52, present paper), and looks as the figure could be of a dorsal view. However, the obvious atrium and the ventral position of the connecting ducts in relation to the spermathecae, suggest that this is simply an inaccurate illustration, likely inspired from Gertsch (1977): fig. 86 of the original description. Gertsch (1992): fig. 162 matches Fig. 53 (present paper), and allows the recognition of the type specimen.

Cicurina (Cicurella) mckenziei Gertsch 1992
(Figs 54–55, 136)

Cicurina mckenziei Gertsch 1992: 115, figs 139–140 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Bandera County, Fog Fissure, 5 mi. N of Vanderpool, October 30, 1963 D. McKenzie coll.". Examined (AMNH).

Description. *Female holotype*

Total length: 4.77; carapace length: 2.00; carapace width: 1.30; opisthosoma length: 2.35. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise (the two large ones are fused at base); retromargin right side with 6 denticles (2 large, 4 small), left side with 7 denticles (2 large, 5 small). Leg I: total length: 6.65; femur: 1.89; patella: 0.70; tibia: 1.58; metatarsus: 1.55; tarsus: 0.95; leg IV: missing. Tarsal claw IV: missing. Epigynum: 0.378. Epigynal ventral plate with short transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium rectangular, two-thirds intruded by straight dorsal plate, atrial aperture moderate; bursa enlarge, not fused; copulatory ducts touching at midpoint, reaching over primary lobe apex; copulatory ducts constriction located medially; primary pores not visible; stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe light-bulb shaped; secondary lobe absent; fertilization canal long, internally positioned from dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Fog Fissure (Bandera County, Texas, Fig. 136).

Remarks. Male unknown.

Cicurina (Cicurella) medina Gertsch 1992
(Figs 56–57, 135)

Cicurina medina Gertsch 1992: 117, figs 149–150 (description of male). — Jackman 1997: 162.

HOLOTYPE male: "Texas; Medina County Boehme's Cave, 3 mi. So. of main dam, February 16, 1964 J. Reddell, D. McKenzie & J. Porter." Examined (AMNH).

Description. *Male holotype*

Total length: 3.60; carapace length: 1.71; carapace width: 1.35; opisthosoma length: 1.75. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 6.10; femur: 1.60; patella: 0.60; tibia: 1.50; metatarsus: 1.40; tarsus: 1.00; leg IV: total length: 7.03; femur: 1.85; patella: 0.60; tibia: 1.58; metatarsus: 1.93; tarsus: 1.08. Tarsal claw IV: 0.11. Cymbium length: 0.70; cymbium and tibia: 0.91. Apex of cymbium as long as wide; apex of tegulum with deep notch, generating a large swelling; tegular apophysis fold smooth, with two uniformly rounded swelling; proximal end (P) recurving on base of tegular apophysis, long, slim, straight and pointed; ratio P'\TA'= 0.41; retrolateral tibial apophysis (RTA) apical end pointed, simple, only one fold and bearing 5 setae; spur (Spu) slightly triangular.

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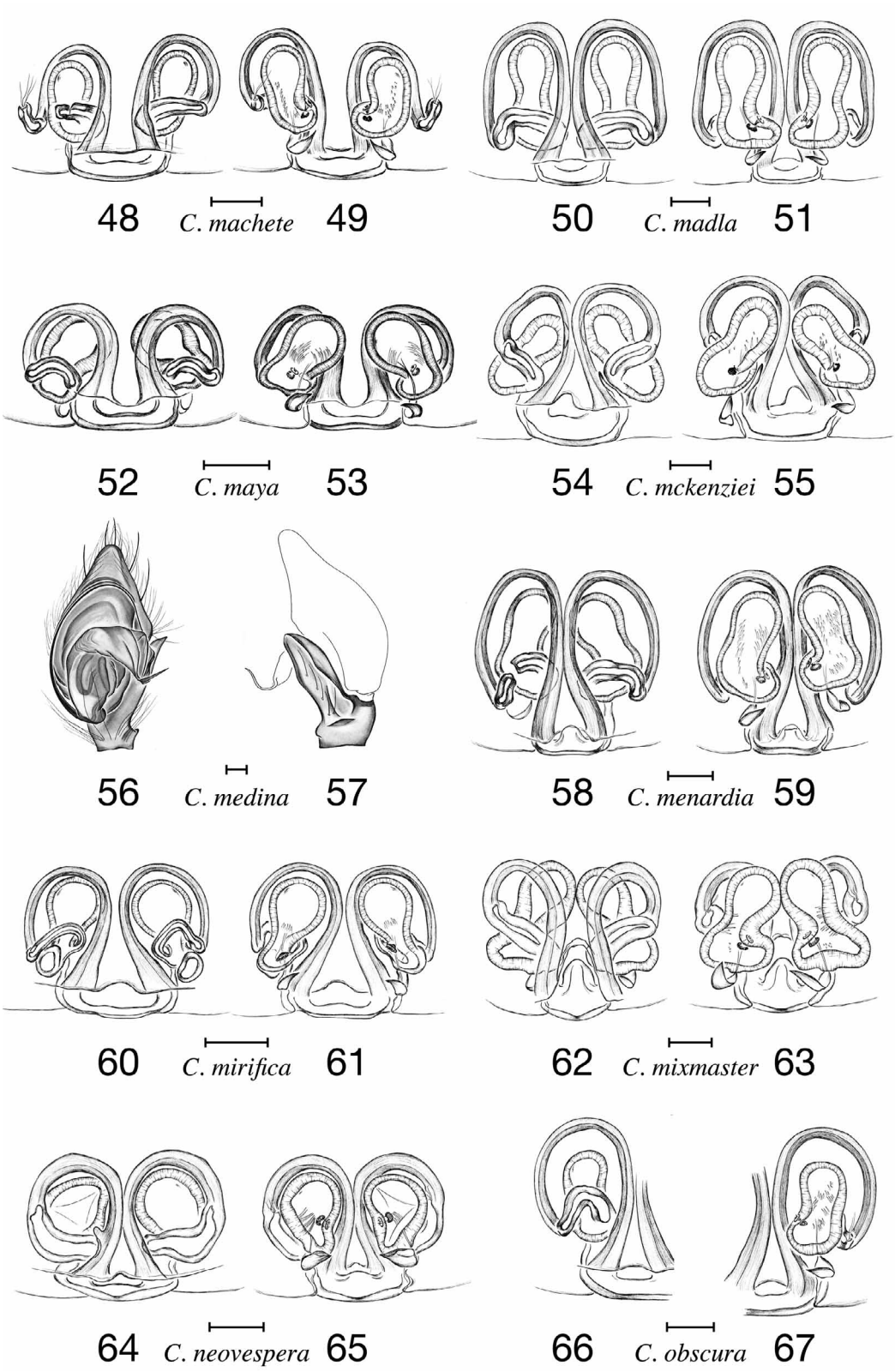

FIGURES 48–67. Genitalic structure of troglobitic *Cicurina* (*Cicurella*) holotypes. For each female holotype, a ventral and a dorsal view of the cleared epigynum are presented; the low number refers to the ventral view and the high number refers to the dorsal view. For the male holotype, a ventral and a lateral view of the left palp are presented, respectively. **48–49** *Cicurina machete* Gertsch 1992. **50–51** *Cicurina madla* Gertsch 1992. **52–53** *Cicurina maya* Gertsch 1977. **54–55** *Cicurina mckenziei* Gertsch 1992. **56–57** *Cicurina medina* Gertsch 1992. **58–59** *Cicurina menardia* Gertsch 1992. **60–61** *Cicurina mirifica* Gertsch 1992. **62–63** *Cicurina mixmaster* Cokendolpher & Reddell 2001. **64–65** *Cicurina neovespera* Cokendolpher 2004. **66–67** *Cicurina obscura* Gertsch 1992. Scale bar = 0.1 mm.

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Distribution. Only reported from the type locality: Boehme's Cave (Medina County, Texas, Fig. 135).

Remarks. Female unknown. Data added by Gertsch in his 1992 paper: "on Lake Medina" to facilitate the location of the type locality. *Cicurina (Cicurella) medina* is the only eyeless *Cicurina (Cicurella)* described from a male only. The collection of a female from this locality is needed to clarify the taxonomic status of that species that could have been described from an adjacent locality (Fig. 135).

Cicurina (Cicurella) menardia Gertsch 1992

(Figs 58–59, 137)

Cicurina menardia Gertsch 1992: 98, figs 59–60, 157–158 (description of male and female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Menard Co. Powell's Cave, 16 September 1978 J. Reddell". Examined (AMNH).

Description. *Female holotype*

Total length: 3.55; carapace length: 1.60; carapace width: 0.90; opisthosoma length: 1.95. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side 7 denticles (3 large, 4 small). Leg I: total length: 4.45; femur: 1.25; patella: 0.45; tibia: 1.10; metatarsus: 1.00; tarsus: 0.65; leg IV: total length: 5.25; femur: 1.45; patella: 0.45; tibia: 1.20; metatarsus: 1.40; tarsus: 0.75. Tarsal claw IV: 0.10. Epigynum: 0.392. Epigynal ventral plate with moderate transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium squared, intruded by dome-shaped dorsal plate, going over the epigynal slit, atrial aperture minute; bursa not enlarged nor fused; copulatory ducts touching at midpoint, reaching over primary lobe apex; copulatory ducts constriction located sub-basally; primary pores not visible; stalk short, procurved, joining the primary lobe upon aperture of the dictynoid pore; dictynoid pore rounded; primary lobe elongated; secondary lobe absent; fertilization canal long, externally reaching the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Powell's Cave (Menard County, Texas, Fig. 137).

Remarks. Both sexes described. The figures 59 and 60 of Gertsch (1992) clearly show that they are not of the same specimen. The copulatory ducts in ventral view extend below the primary lobe and in the dorsal view they extend beyond the primary lobe. The epigynum of the holotype is somewhat damaged on the left side. Gertsch added: "8 miles west of Menard, from M-section maze" in his paper to facilitate location of the type locality, and the precise location of the collection.

Cicurina (Cicurella) mirifica Gertsch 1992

(Figs 60–61, 137)

Cicurina mirifica Gertsch 1992: 88, charts 1–2, figs 5–6 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas: Pecos County: Amazing Maze Cave, near Fort Stockton. 1 March 1986. A. Cobb". Examined (AMNH).

Description. *Female holotype*

Total length: 2.91; carapace length: 1.50; carapace width: 0.95; opisthosoma length 1.57. Six eyes reduced to pale spots. Cheliceral promargin right side with 2 large teeth and one small, left side likewise; retromargin right side with 4 denticles (2 large, 2 small), left side with 5 denticles (3 large, 2 small). Leg I: total length: 3.38; femur: 1.03; patella: 0.42; tibia: 0.80; metatarsus: 0.71; tarsus: 0.42; leg IV: total length: 4.09; femur: 1.03; patella: 0.47; tibia: 0.94; metatarsus: 1.08; tarsus: 0.57. Tarsal claw IV: 0.15. Epigynum length: 0.275. Epigynal ventral plate with long transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium rectangular, one third intruded by straight dorsal plate; atrial aperture large; bursa enlarged, not fused;

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copulatory ducts separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore triangular; primary lobe light-bulb shaped; secondary lobe present, positioned ventro-basally from the primary lobe; fertilization canal very long, reaching over the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Amazing Maze Cave (Pecos County, Texas, Fig. 137).

Remarks. Male unknown. The holotype vial contained the female holotype and one prosoma. Gertsch (1992) considered *Cicurina (Cicurella) mirifica* as an eyed taxon, along with other epigean species. Examination of the type however suggested that eyes are not functional and the species is clearly a troglobite. See also *Cicurina (Cicurella) delrio*.

Cicurina (Cicurella) mixmaster Cokendolpher & Reddell 2001
(Figs 62–63, 129)

Cicurina mixmaster Cokendolpher & Reddell 2001: 41, figs 8–9 (description of female). — Paquin & Hedin 2004: 3243–3246, 3249, 3253; Taylor *et al*. 2005: 98.

HOLOTYPE female: "Texas: Coryell County: Mixmaster Cave, Fort Hood. 5 Nov. 1998. J. Cokendolpher, J. Krejca, J. Reddell, M. Reyes". Examined (AMNH).

Description. *Female holotype*

Total length: 5.76; carapace length: 2.79; carapace width: 1.98; opisthosoma length: 2.97. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 7 denticles (3 large, 4 small), left side likewise. Leg I: total length: 7.98; femur: 2.30; patella: 0.83; tibia: 1.80; metatarsus: 1.85; tarsus: 1,20; leg IV: total length: 9.35; femur: 2.50; patella: 0.80; tibia: 2.25; metatarsus: 2.55; tarsus: 1.25. Tarsal claw IV: 0.17. Epigynum: 0.406 mm. Epigynal ventral plate with short transverse slit, bearing medial, very deep, inverted U-shaped indentation; atrium square, almost completely intruded by dome-shaped dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts separated at midpoint, reaching top primary lobe apex; copulatory ducts constriction located medially; primary pore visible (1 seen); stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal short, reaching primary pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Mixmaster Cave (Coryell County, Texas, Fig. 129).

Remarks. Male unknown.

Cicurina (Cicurella) neovespera Cokendolpher 2004
(Figs 64–65, 134)

Cicurina neovespera Cokendolpher 2004a: 19–20, 22, 24, 27, 34, 41, **47–**49, figs 52–53 (description of female). — Reddell & Cokendolpher 2004: 80.

HOLOTYPE female: "Texas: Bexar Co.: Elm Springs Cave, A.G. Grubbs, date ?". Examined (AMNH).

Description. *Female holotype*

Total length: 4.23; carapace length: 1.98; carapace width: 1.35; opisthosoma length: 2.25. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 4 denticles (3 large, 1 small), left side with 6 denticles (2 large, 4 small). Leg I: total length: 5.65; femur: 1.60; patella: 0.60; tibia: 1.40; metatarsus: 1.25; tarsus: 0.80; leg IV: total length: 6.20; femur: 1.70; patella: 0.60; tibia: 1.45; metatarsus: 1.60; tarsus: 0.85. Tarsal claw IV: 0.15. Epigynum: 0.364 mm. Epigynal ventral plate

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with long transverse slit, bearing medial, shallow indentation; atrium rectangular, almost intruded by slightly rounded dorsal plate, atrial aperture small; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching slightly over primary lobe apex; copulatory ducts constriction located medially; primary pores visible (1 seen); stalk short, recurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore large, rounded; primary lobe ear-shaped; secondary lobe absent; fertilization canal short, externally positioned from dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Known from two caves in Bexar County (Fig. 134): Elm Spring Cave (=Grubbs Cave ES), and Grubbs Cave No. 23, 8 km NE Helotes.

Remarks. Male unknown. The exact location of cave no 23 could not be verified and is only approximate (Fig. 134), while Elm Spring Cave is now partially sealed with concrete for safety, and is not accessible. This makes the reassessment of the validity of that species by recollection impossible in the actual conditions. In addition, the specimen from Grubbs Cave No. 23, 8 km NE Helotes could not be located and examined to confirm the occurrence of *Cicurina (Cicurella) neovespera* in that cave. However, the locality is included in Fig. 134 based on Cokendolpher's (2004a) record and indicated by an open symbol.

Cicurina (Cicurella) obscura Gertsch 1992
(Figs 66–67, 135)

Cicurina obscura Gertsch 1992: 113, figs 115–116 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Bandera Co., Sutherland Hollow C., 4 August 74, S. Sweet". Examined (AMNH).

Description. *Female holotype*

Total length: 3.87; carapace length: 1.98; carapace width: 1.35; opisthosoma length: 1.89. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 5.20; femur: 1.45; patella: 0.60; tibia: 1.25; metatarsus: 1.15; tarsus: 0.75; leg IV: total length: 6.15; femur: 1.45; patella: 0.60; tibia: 1.50; metatarsus: 1.65; tarsus: 0.95. Tarsal claw IV: 0.15. Epigynum: 0.266. Epigynal ventral plate with short transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium rectangular, two-thirds intruded by straight dorsal plate, atrial aperture small; bursa enlarged, not fused; copulatory ducts almost touching at midpoint, reaching considerably over primary lobe apex; copulatory ducts constriction located basally; primary pores visible (1 seen); stalk short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Sutherland Hollow Cave (Bandera County, Texas, Fig. 135).

Remarks. Male unknown.

Cicurina (Cicurella) orellia Gertsch 1992
(Figs 68–69, 135)

Cicurina orellia Gertsch 1992: 105, figs 107–108 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas: Real County, Orell Crevice Cave, 100 yards west of Orell Bat Cave; most found hanging from webs on wall. August 18, 1963 J. Reddell, D. McKenzie". Examined (AMNH).

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Description. *Female holotype*

Total length: 5.13; carapace length: 2.52; carapace width: 1.62; opisthosoma length 2.61. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 7.40; femur: 2.00; patella: 0.75; tibia: 1.85; metatarsus: 1.75; tarsus: 1.05; leg IV: total length: 8.40; femur: 2.15; patella: 0.70; tibia: 2.05; metatarsus: 2.35; tarsus: 1.15. Tarsal claw IV: 0.15. Epigynum length: 0.434. Epigynal ventral plate with short transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium rectangular, half intruded by rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching top of primary lobe apex (left side) and over primary lobe apex (right side); copulatory ducts constriction located basally; primary pores not visible; stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal short reaching the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Orell Crevice Cave (Real County, Texas, Fig. 135).

Remarks. Male unknown. On the type label the information stating "most found hanging from webs on wall" does not refer to *Cicurina*, but to *Agyneta llanoensis* (Gertsch & Davis 1936) (James R. Reddell, pers. comm.).

***Cicurina (Cicurella) pablo* Gertsch 1992**

(Figs 70–71, 135)

Cicurina pablo Gertsch 1992: 105, figs 105–106 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Pablo's Cave, (2 mi. N Burial Cave), 5 April 1963, J. Reddell, D. McKenzie, in total darkness 50 feet from entrance". Label 2: "Texas: Pablo's Cave, Uvalde County, April 5 1963, Reddell & McKenzie". Label 3: "*Cicurina pablo* Gertsch Holotype". Examined (AMNH).

Description. *Female holotype*

Total length: 4.95; carapace length: 2.43; carapace width: 1.62; opisthosoma length 2.40. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 left side likewise; retromargin right side with 7 denticles (3 large, 4 small), left side 6 denticles (3 large, 3 small). Leg I: total length: 7.92; femur: 2.16; patella: 0.81; tibia: 1.98; metatarsus: 1.80; tarsus: 1.17; leg IV: total length: 9.18; femur: 2.34; patella: 0.81; tibia: 2.25; metatarsus: 2.52; tarsus: 1.26. Tarsal claw IV: 0.16. Epigynum length: 0.355. Epigynal ventral plate with extremely short transverse slit, indentation absent; atrium rectangular, half intruded by straight dorsal plate, atrial aperture moderate; bursa not enlarged nor fused; copulatory ducts almost touching at midpoint, reaching well over primary lobe apex; copulatory ducts constriction located medially; primary pores not visible; stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal long, internally located from the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Pablo's Cave (Uvalde County, Texas, Fig. 135).

Remarks. Male unknown. Two vials were found at the AMNH containing the label "*Cicurina pablo*, holotype". The first vial was among the AMNH type collection. The locality label stated: "Texas; Uvalde County North Well Cave 2 miles north of Pablo's Cave, April 5 1963, J Reddell; D. McKenzie, in ante room and in main room (2 vials, one containing scorpions)" and contained one mature female dissected and four immature spiders. This data does not correspond to the type data published for *C. pablo*, but to a record of *Cicurina serena* (not the holotype). The second vial found in Gertsch's synoptic collection, matches the holotype data of *C. pablo*, and this specimen was used here for the description and illustrations.

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***Cicurina (Cicurella) pastura* Gertsch 1992**
(Figs 72–73, 136)

Cicurina pastura Gertsch 1992: 114, figs 123–124 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Water Pond Pasture Cave, Kerr Co., Texas. 16 Oct. 1976. D. Pate, R. Fieseler, C. Yates". Examined (AMNH).

Description. *Female holotype*

Total length: 3.78; carapace length: 1.98; carapace width: 1.26; opisthosoma length: 1.80. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 7 denticles (5 large, 2 small), left side 6 denticles (3 large, 3 small). Leg I: total length: 5.85; femur: 1.60; patella: 0.60; tibia: 1.45; metatarsus: 1.35; tarsus: 0.85; leg IV: total length: 6.60; femur: 1.75; patella: 0.65; tibia: 1.60; metatarsus: 1.70; tarsus: 0.90. Tarsal claw IV: 0.15. Epigynum: 0.346. Epigynal ventral plate with long transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium rectangular, half intruded by slightly rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching well over primary lobe apex; copulatory ducts constriction located medially; primary pores visible (1 seen); stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal short, externally positioned from dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Water Pond Pasture Cave (Kerr County, Fig. 136).

Remarks. Male unknown. The holotype vial contained the female holotype and four immature spiders not reported in Gertsch (1992). The position of the copulatory ducts may have been altered from their original position as the epigynum is damaged.

***Cicurina (Cicurella) patei* Gertsch 1992**
(Figs 74–75, 138)

Cicurina patei Gertsch 1992: 113, figs 117–118 (description of female). — Jackman 1997: 162; Cokendolpher 2004a: 24, 52–53.

HOLOTYPE female: "Texas: Val Verde County: Fawcett's Cave, 8 Aug. 1987. Dale Pate". Examined (AMNH).

Description. *Female holotype*

Total length: 4.86; carapace length: 2.25; carapace width: 1.44; opisthosoma length 2.61. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side 4 teeth (3 large, 1 small); retromargin right side with 6 denticles (3 large, 3 small), left side with 5 denticles (2 large, 3 small). Leg I: total length: 6.88; femur: 1.95; patella: 0.63; tibia: 1.70; metatarsus: 1.60; tarsus: 1.00; leg IV: total length: 8.16; femur: 2.18; patella: 0.68; tibia: 2.00; metatarsus: 2.20; tarsus: 1.10. Tarsal claw IV: 0.15. Epigynum length: 0.434. Epigynal ventral plate with long transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium rectangular, half intruded by slightly rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching somewhat over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe elongated; secondary lobe absent; fertilization canal short, reaching the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Fawcett's Cave (Val Verde County, Texas, Fig. 138).

Remarks. Male unknown. Gertsch (1992) added "36 miles N of Del Rio" in his paper.

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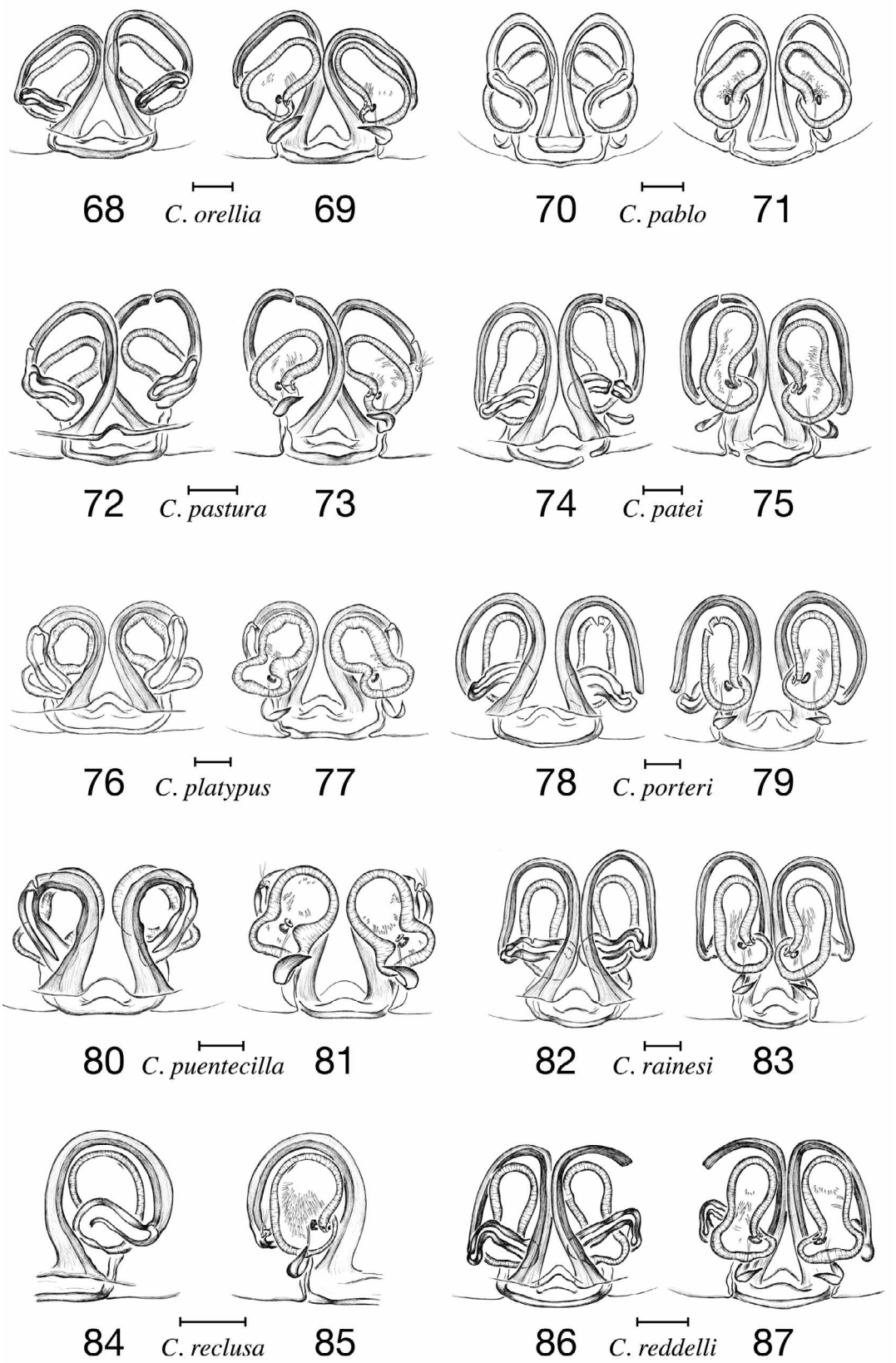

FIGURES 68–87. Cleared epigynum of troglobitic *Cicurina* (*Cicurella*) holotypes. For each species, a ventral and a dorsal view of the cleared epigynum are presented; the low number refers to the ventral view and the high number refers to the dorsal view. **68–69** *Cicurina orellia* Gertsch 1992. **70–71** *Cicurina pablo* Gertsch 1992. **72–73** *Cicurina pastura* Gertsch 1992. **74–75** *Cicurina patei* Gertsch 1992. **76–77** *Cicurina platypus* Cokendolpher 2004. **78–79** *Cicurina porteri* Gertsch 1992. **80–81** *Cicurina puentecilla* Gertsch 1992. **82–83** *Cicurina rainesi* Gertsch 1992. **84–85** *Cicurina reclusa* Gertsch 1992. **86–87** *Cicurina reddelli* Gertsch 1992. Scale bar = 0.1 mm.

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***Cicurina (Cicurella) platypus* Cokendolpher 2004**
(Figs 76–77, 134)

Cicurina platypus Cokendolpher 2004a: 18–20, 22, 24, 26–27, 34, 41, **51**–52, 54 (description of female). — Paquin & Hedin 2004: 3243–3245, 3247, 3253–3254; Reddell & Cokendolpher 2004: 80–81.

HOLOTYPE female: "Texas: Bexar County: Platypus Pit. 20 March 1995. J. Reddell, M. Reyes". Examined (AMNH).

Additional material examined. UNITED STATES: Bexar County: MARS Pit (Camp Bullis), 29.x.2001 (molted on the 20.v.2002, 25.xi.2002, 15.viii.2003, 04.i.2004, matured on 03.iv.2005), 1♀, J. Krejca, P. Sprouse (TMM).

Description. *Female holotype*

Total length: 5.67; carapace length: 2.70; carapace width: 1.80; opisthosoma length: 2.97. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 small), left side likewise; retromargin right side with 7 denticles (4 large, 3 small), left side likewise. Leg I: total length: 9.45; femur: 2.40; patella: 0.85; tibia: 2.45; metatarsus: 2.30; tarsus: 1.45; leg IV: total length: 10.65; femur: 2.65; patella: 0.85; tibia: 2.65; metatarsus: 3.05; tarsus: 1.70. Tarsal claw IV: 0.20. Epigynum: 0.462. Epigynal ventral plate with long transverse slit, bearing medial, deep, inverted V-shaped indentation; atrium rectangular, almost intruded by rounded dorsal plate, atrial aperture small; bursa enlarged, not fused; copulatory ducts scarcely separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located apically; primary pores not visible; stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal short, externally positioned from dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Known only from two caves in Bexar County (Texas): MARS Pit and Platypus Pit (type locality) (Fig. 134).

Remarks. Male unknown. According to Cokendolpher (2004a: 52), *C. bullis* and *C. platypus* are found in sympatry in Platypus Pit.

***Cicurina (Cicurella) porteri* Gertsch 1992**
(Figs 78–79, 138)

Cicurina porteri Gertsch 1992: 115, figs 133–134 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Val Verde Co. Oriente Milestone Molasses Bat Cave, about 20 mi. NE Del Rio, January 25, 1964 J. Reddell; D. McKenzie & J. Porter, under rock beyond Bat room". Examined (AMNH).

Description. *Female holotype*

Total length: 5.22; carapace length: 2.34; carapace width: 1.53; opisthosoma length 2.88. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 6.91; femur: 1.80; patella: 0.63; tibia: 1.75; metatarsus: 1.65; tarsus: 1.08; leg IV: total length: 8.08; femur: 2.20; patella: 0.60; tibia: 1.95; metatarsus: 2.18; tarsus: 1.15. Tarsal claw IV: 0.15. Epigynum length: 0.490. Epigynal ventral plate with moderate transverse slit, bearing medial, shallow indentation; atrium rectangular, almost completely intruded by the rounded dorsal plate reaching over the epigynal slit, atrial aperture small; bursa enlarged, not fused; copulatory ducts separated at midpoint, reaching over of primary lobe apex; copulatory ducts constriction located basally; primary pores visible (1 seen); stalk short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe kidney-shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

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Distribution. Only reported from the type locality: Oriente Milestone Molasses Bat Cave (Val Verde County, Texas, Fig. 138).

Remarks. Male unknown. Since the epigynum was damaged, the position of the bursa, copulatory ducts and primary pores may be slightly displaced in the illustration.

Cicurina (Cicurella) puentecilla Gertsch 1992

(Figs 80–81, 134)

Cicurina puentecilla Gertsch 1992: 111, figs 99–100 (description of female). — Jackman 1997: 162; Reddell & Cokendolpher 2004: 81; Paquin & Hedin 2004: 3243–3245, 3247, 3254.

HOLOTYPE female: "Texas; Natural Bridge Caverns, Comal County, Texas, 2 Sept. 1978. A.G. Grubbs". Examined (AMNH).

Description. *Female holotype*

Total length: 5.22; carapace length: 2.61; carapace width: 1.89; opisthosoma length: 2.61. Eyes absent. Cheliceral promargin right side with 2 teeth (2 large), left side with 3 teeth (2 large, 1 small); retromargin right side with 5 denticles (3 large, 2 small), left side with 6 denticles (3 large, 3 small). Leg I: total length: 9.80; femur: 2.50; patella: 0.95; tibia: 2.50; metatarsus: 2.40; tarsus: 1.45; leg IV: total length: 10.70; femur: 2.65; patella: 0.90; tibia: 2.65; metatarsus: 3.05; tarsus: 1.45. Tarsal claw IV: 0.15. Epigynum: 0.462 mm. Epigynal ventral plate with moderate transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium rectangular, half intruded by rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts separated at midpoint, nearly reaching top of primary lobe apex; copulatory ducts constriction located apically; primary pores visible (1 seen); stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal short, internally positioned from the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only known from B-52 cave, Black Cat Cave, and Natural Bridge Caverns (type locality) (Comal County, Texas, Fig. 134). The occurrence of the species in B-52 Cave and Black Cat Cave is based on a DNA match of immature specimens (see Paquin & Hedin 2004).

Remarks. Male unknown.

Cicurina (Cicurella) rainesi Gertsch 1992

(Figs 82–83, 138)

Cicurina rainesi Gertsch 1992: 117, figs 143–144 (description of female). — Jackman 1997: 162; Reddell 1995: 23; Cokendolpher 2004a: 24, 52.

HOLOTYPE female: "Texas; Edwards Co. 3–Bounce Pit, Carta Valley, Feb., 1974. R. Raines, J. Lewis, R. Fieseler". Examined (AMNH).

Description. *Female holotype*

Total length: 4.59; carapace length: 2.61; carapace width: 1.64; opisthosoma length 1.98. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 7 denticles (3 large, 4 small), left side likewise. Leg I: total length: 7.45; femur: 1.90; patella: 0.75; tibia: 1.90; metatarsus: 1.80; tarsus: 1.10; leg IV: total length: 8.55; femur: 2.10; patella: 0.80; tibia: 2.05; metatarsus: 2.40; tarsus: 1.20. Tarsal claw IV: 0.15. Epigynum length: 0.406. Epigynal ventral plate with moderate transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium rectangular, half intruded by rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching well over primary lobe apex; copulatory ducts constriction located medially; primary

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pores not visible; stalk short, straight, horizontal, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe elongated; secondary lobe absent; fertilization canal short, externally positioned from dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: 3–Bounce Pit (Edwards County, Texas, Fig. 138).

Remarks. Male unknown. The holotype vial also contained one immature specimen not mentioned in Gertsch (1992).

Cicurina (Cicurella) reclusa Gertsch 1992
(Figs 84–85, 134)

Cicurina reclusa Gertsch 1992: 111, figs 97–98 (description of female). — Jackman 1997: 162; Reddell & Cokendolpher 2004: 81.

HOLOTYPE female: "Texas; Comal County, Kappelman Salamander Cave, 100 yards N.E. of Kappelman Cave, March 15, 1964, B. Russell & J. Reddell". Examined (AMNH).

Description. *Female holotype*

Total length: 4.14; carapace length: 1.89; carapace width: 1.26; opisthosoma length: 2.25. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side with 3 teeth likewise; retromargin right side with 5 denticles (3 large, 2 small), left side with 6 denticles (3 large, 3 small). Leg I: total length: 5.10; femur: 1.35; patella: 0.60; tibia: 1.20; metatarsus: 1.25; tarsus: 0.70; leg IV: total length: 5.95; femur: 1.55; patella: 0.60; tibia: 1.35; metatarsus: 1.60; tarsus: 0.85. Tarsal claw IV: 0.15. Epigynum: 0.182 mm (half). Epigynal ventral plate with moderate transverse slit; bursa enlarged; copulatory ducts reaching top of primary lobe apex; copulatory ducts constriction located basally; primary pores visible (1 seen); stalk short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe ear-shaped; secondary lobe absent; fertilization canal short, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Reported from two caves: Kappelman Cave and Kappelman Salamander Cave (Comal County, Texas, Fig. 134).

Remarks. Male unknown. The data slightly differ in Gertsch's (1992) paper: "N.W. of Kappelman Cave". The description of the epigynum is incomplete, because it is damaged. The specimen from Kappelman Cave could not be located and examined to confirm the occurrence of *Cicurina (Cicurella) reclusa* in that cave. However, the locality is included in Fig. 134 based on Gertsch's (1992) record and indicated by an open symbol.

Cicurina (Cicurella) reddelli Gertsch 1992
(Figs 86–87, 131)

Cicurina reddelli Gertsch 1992: 105, figs 77–78 (description of female). — Jackman 1997: 162; Cokendolpher 2004a: 24, 52; Paquin & Hedin 2004: 3241, 3243–3245, 3254.

HOLOTYPE female: "Texas; Travis County Cotterell Cave, 2 miles NW of Austin, March 11, 1964 Bill Russell coll.". Examined (AMNH).

Description. *Female holotype*

Total length: 6.57; carapace length: 3.42; carapace width: 2.34; opisthosoma length: 3.15. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side with 7 denticles (3 large, 4 small). Leg I: total length: 9.30; femur: 2.60; patella: 1.00; tibia: 2.35; metatarsus: 2.25; tarsus: 1.10; leg IV: total length: 11.05; femur: 2.95; patella: 1.05; tibia: 2.60; metatarsus: 3.00; tarsus: 1.45. Tarsal claw IV: 0.15. Epigynum: 0.328 mm. Epigynal ventral plate

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with moderate transverse slit, bearing medial, deep, inverted V-shaped indentation; atrium rectangular, two-thirds intruded by rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe elongated; secondary lobe absent; fertilization canal short, externally positioned from dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Cotterell Cave (Travis County, Texas, Fig. 131).

Remarks. Male unknown. Data added in Gertsch (1992) for the holotype: "near Spicewood Springs Road and Mesa Drive" to provide precision about the location of the cave. Cotterell Cave is the only known locality for *C. reddelli*. In the distribution of *C. buwata* however, Gertsch (1992) also listed Cotterell Cave as a locality for that species (under the name *C. elliotti*). Apparently, this slipped Gertsch's attention as he did not believed that two troglobitic *Cicurina* could inhabit the same cave (James R. Reddell, pers. comm.).

Cicurina (Cicurella) reyesi Gertsch 1992
(Figs 88–89, 132)

Cicurina reyesi Gertsch 1992: 107, figs 85–86 (description of female). — Jackman 1997: 162; Paquin & Hedin 2004: 3243–3245, 3254.

HOLOTYPE female: "Texas; Travis County; Airman's Cave, 3 Sept. 1989. J. Reddell, M. Reyes". Examined (AMNH).

Description. *Female holotype*

Total length: 4.41; carapace length: 2.07; carapace width: 1.35. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 6.20; femur: 1.80; patella: 0.65; tibia: 1.50; metatarsus: 1.40; tarsus: 0.85; leg IV: total length: 7.05; femur: 1.85; patella: 0.65; tibia: 1.65; metatarsus: 1.85; tarsus: 1.05. Tarsal claw IV: 0.14. Epigynum: 0.378 mm. Epigynal ventral plate with short transverse slit, bearing medial, very deep, inverted V-shaped indentation; atrium rectangular, almost completely intruded by dome-shaped dorsal plate going over epigynal slit, atrial aperture small; bursa slightly enlarged, not fused; copulatory ducts separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located apically; primary pores visible (1 seen); stalk, short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal short, reaching dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Airman's Cave (Travis County, Texas, Fig. 132).

Remarks. Male known, but not described (Gertsch 1992). The epigynum is slightly damaged, but the copulatory ducts and their position seem to be intact.

Cicurina (Cicurella) russelli Gertsch 1992
(Figs 90–91, 133)

Cicurina russelli Gertsch 1992: 107, figs 83–84 (description of female). — Jackman 1997: 162; Cokendolpher 2004a: 24, 52.

HOLOTYPE female: "Texas; Hays County Boyett's Cave, south of Wimberley on the Hays-Comal Co. line, March 30, 1963 J. Reddell & B. Russell". Label 2: "Large spiders found at bottom of entrance, others under rocks throughout cave". Examined (AMNH).

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Description. *Female holotype*

Carapace length: 2.70; carapace width: 1.85. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side with 7 denticles (3 large, 4 small). Leg I: total length: 8.50; femur: 2.20; patella: 0.70; tibia: 2.25; metatarsus: 2.15; tarsus: 1.20; leg IV: total length: 10.05; femur: 2.60; patella: 0.95; tibia: 2.40; metatarsus: 2.75; tarsus: 1.35. Tarsal claw IV: 0.15. Epigynum: 0.420 mm. Epigynal ventral plate with moderate transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium rectangular, almost completely intruded by dome-shaped dorsal plate, atrial aperture small; bursa enlarged, not fused; copulatory ducts scarcely separated at midpoint, reaching over primary lobe apex; copulatory ducts constriction located apically: primary pores visible (1 seen); stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal short, internally positioned from dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Boyett's Cave (Hays Co., Texas, Fig. 133).

Remarks. Male unknown. The opisthosoma of the holotype is missing.

***Cicurina (Cicurella) sansaba* Gertsch 1992**

(Figs 92–93, 130)

Cicurina sansaba Gertsch 1992: 114, figs 127–128, 153–154 (description of male and female). — Jackman 1997: 162.

HOLOTYPE female: "Texas: San Saba Co. Gorman Cave, 6 mi. S.E. of Bend, March 15, 1963. J. Reddell & D. McKenzie. Throughout cave". Examined (AMNH).

Description. *Female holotype*

Total length: 3.69; carapace length: 1.80; carapace width: 1.17; opisthosoma length: 1.89. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 small), left side likewise; retromargin right side with 6 denticles (2 large, 4 small), left side likewise. Leg I: total length: 5.10; femur: 1.45; patella: 0.50; tibia: 1.25; metatarsus: 1.15; tarsus: 0.55; leg IV: total length: 5.78; femur: 1.55; patella: 0.50; tibia: 1.35; metatarsus: 1.55; tarsus: 0.83. Tarsal claw IV: 0.15. Epigynum: 0.308. Epigynal ventral plate with moderate transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium rectangular, half intruded by rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts scarcely separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located medially; primary pores visible (1 seen); stalk short, recurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Gorman Cave (San Saba County, Texas, Fig. 130).

Remarks. Both sexes are described. The holotype vial contained the female holotype, one mature female (not dissected) not mentioned by Gertsch (1992), and three immature specimens. Gertsch had "SW of Bend" in his paper, which slightly differs from the label data.

***Cicurina (Cicurella) selecta* Gertsch 1992**

(Figs 94–95, 135)

Cicurina selecta Gertsch 1992: 105, figs 111–112 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas: Davy Crockett Cave, Uvalde Co., Oct. 18, 1964 J. Reddell". Label 2: "*C. uvalde* female". Examined (AMNH).

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Description. *Female holotype*

Total length: 4.78; carapace length: 2.43; carapace width: 1.42; opisthosoma length 2.35. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small, left side likewise); retromargin right side with 6 denticles (2 large, 4 small), left side likewise. Leg I: total length: 7.00; femur: 1.85; patella: 0.70; tibia: 1.70; metatarsus: 1.70; tarsus: 1.05; leg IV: total length: 7.93; femur: 2.15; patella: 0.70; tibia: 1.95; metatarsus: 2.10; tarsus: 1.05. Tarsal claw IV: 0.15. Epigynum length: 0.378. Epigynal ventral plate with short transverse slit, bearing medial, inverted U-shaped indentation; atrium rectangular, two-thirds intruded by slightly rounded dorsal plate, atrial aperture small; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching well over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, straight, horizontally directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal short, reaching the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Sandtleben Cave (=Davy Crockett Cave) (Uvalde County, Texas, Fig. 135).

Remarks. Male unknown. There is a label with the determination *Cicurina uvalde* in the holotype vial of *Cicurina selecta*. The data however matches the published data of the holotype of *C. selecta* and this specimen is treated as such. Gertsch (1992) added "Sandtleben Cave" in his paper, which is the name actually used for this cave.

***Cicurina (Cicurella) serena* Gertsch 1992**
(Figs 96–97, 135)

Cicurina serena Gertsch 1992: 105, figs 109–110 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Picture Cave No.1, on Fred Mason Ranch, 23 mi. N.W. Uvalde, at bottom of vertical entrance shaft. November 3, 1962". Label 2: "Texas; Picture Cave #1, 23 mi. N.W. Uvalde, W100.12; N29.30, November 3, 1962, James Reddell coll". Examined (AMNH).

Description. *Female holotype*

Total length: 3.60; carapace length: 1.62; carapace width: 1.17; opisthosoma length 1.98. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 left) side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 5.10; femur: 1.45; patella: 0.50; tibia: 1.20; metatarsus: 1.20; tarsus: 0.75; leg IV: total length: 6.15; femur: 1.60; patella: 0.55; tibia: 1.45; metatarsus: 1.65; tarsus: 0.90. Tarsal claw IV: 0.15. Epigynum length: 0.336. Epigynal ventral plate with long transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium rectangular, almost completely intruded by rounded dorsal plate, atrial aperture small; bursa particularly enlarged, not fused; copulatory ducts touching at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located medially; primary pores not visible; stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe bean-shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Reported from two caves: North Well Cave and Picture Cave No. 1 (type locality) (Uvalde County, Texas, Fig. 135).

Remarks. Male unknown. The specimen in the holotype vial of *Cicurina serena* was not dissected. This implies that Gertsch did not illustrate the holotype in his paper (Figs 109–110) because a dissection is necessary to provide the dorsal view of his figure 110. Likely, he illustrated and described the specimen from North Well Cave – erroneously labeled as *Cicurina pablo* holotype – which matches the illustrations that he gave for *C. serena*. We are however providing the description and illustrations of the specimen that bears the holotype label, and matches the holotype data published by Gertsch. Also, the holotype vial contained another

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dissected *Cicurina* epigynum (without a specimen), which does not belong in *Cicurella*. The specimen from North Well Cave could not be located and examined to confirm the occurrence of *Cicurina (Cicurella) serena* in that cave. However, the locality is included in Fig. 135 based on Gertsch's (1992) record and indicated by an open symbol.

Cicurina (Cicurella) sheari Gertsch 1992

(Figs 98–99, 136)

Cicurina sheari Gertsch 1992: 115, figs 135–136 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Ramsey Bat Cave, Real Co., Texas. 2 Oct. 1976. D. Pate, R. Hemperly, K. Heuss". Examined (AMNH).

Description. *Female holotype*

Total length: 4.59; carapace length: 2.34; carapace width: 1.62; opisthosoma length 2.25. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side with 7 denticles (3 large, 4 small). Leg I: total length: 6.65; femur: 1.80; patella: 0.70; tibia: 1.65; metatarsus: 1.55; tarsus: 0.95; leg IV: total length: 7.65; femur: 2.00; patella: 0.65; tibia: 1.95; metatarsus: 2.00; tarsus: 1.05. Tarsal claw IV: 0.15. Epigynum length: 0.476. Epigynal ventral plate with short transverse slit, bearing minute, medial, inverted U-shaped indentation; atrium rectangular, half intruded by straight dorsal plate, atrial aperture moderate; bursa not enlarged nor fused; copulatory ducts touching at midpoint, reaching over primary lobe apex; copulatory ducts constriction located basally; primary pores visible (1 seen); stalk short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal long, positioned externally from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Ramseys Bat Cave (Real County, Texas, Fig. 136).

Remarks. Male unknown. The holotype vial contained two immature specimens not mentioned in Gertsch (1992). The correct spelling of the cave name is Ramseys, and not Ramsey.

Cicurina (Cicurella) sprousei Gertsch 1992

(Figs 100–101, 136)

Cicurina sprousei Gertsch 1992: 113, figs 119–120 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas: Bandera County: Station 'C' Cave. 4 Sept. 1988. P. Sprouse". Examined (AMNH).

Description. *Female holotype*

Total length: 5.04; carapace length: 2.43; carapace width: 1.64; opisthosoma length: 2.62. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 7.20; femur: 2.05; patella: 0.75; tibia: 1.75; metatarsus: 1.60; tarsus: 1.05; leg IV: total length: 8.20; femur: 2.15; patella: 0.70; tibia: 2.00; metatarsus: 2.25; tarsus: 2.10. Tarsal claw IV: 0.17. Epigynum: 0.434. Epigynal ventral plate with long transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium rectangular, half intruded by slightly rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts separated at midpoint, reaching over primary lobe apex; copulatory ducts constriction located medially; primary pores visible (2 seen); stalk short, slightly procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from the type locality: Station 'C' Cave (Bandera County, Texas, Fig. 136).

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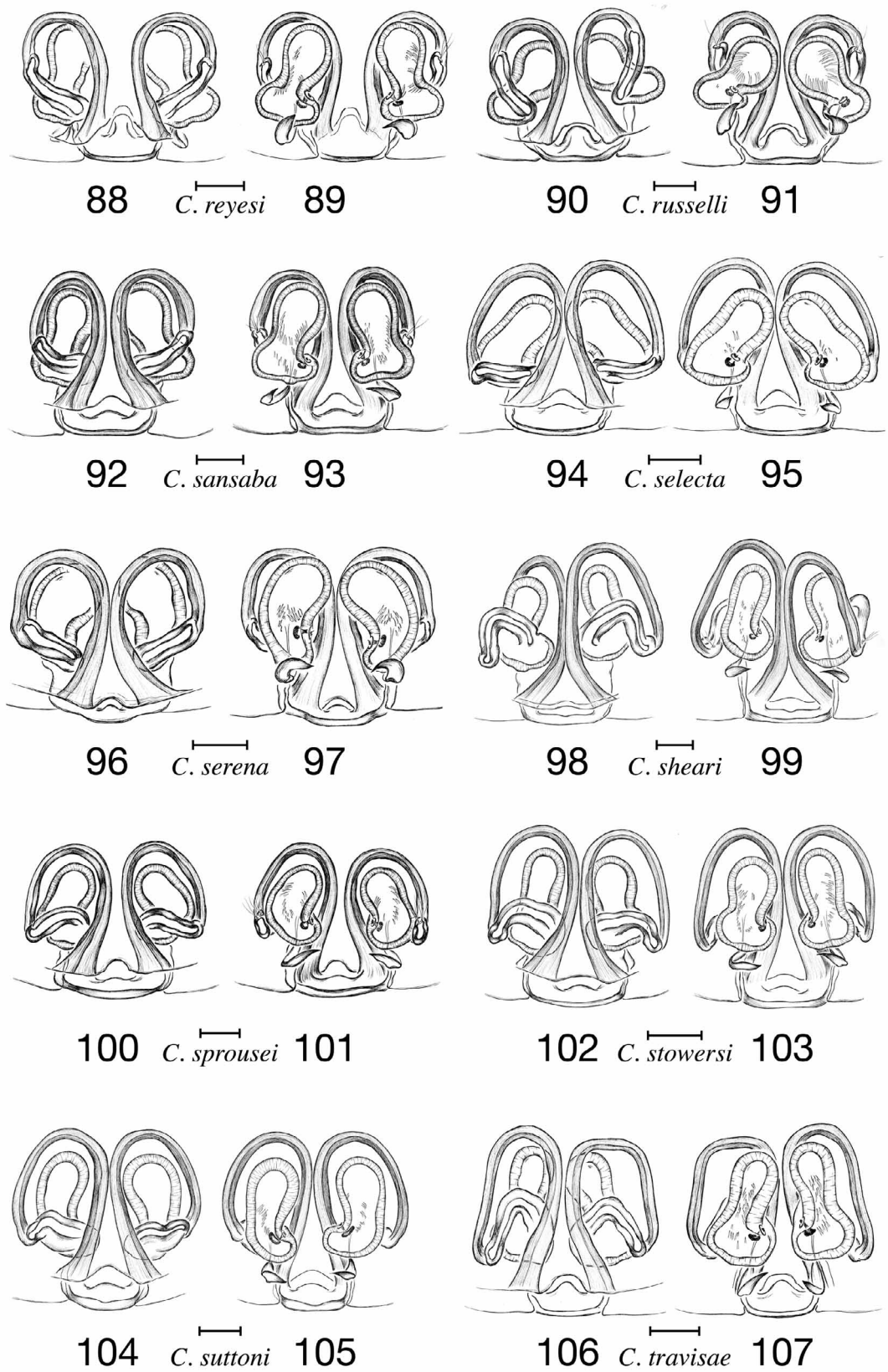

FIGURES 88–107. Cleared epigynum of troglobitic *Cicurina* (*Cicurella*) holotypes. For each species, a ventral and a dorsal view of the cleared epigynum are presented; the low number refers to the ventral view and the high number refers to the dorsal view. **88–89** *Cicurina reyesi* Gertsch 1992. **90–91** *Cicurina russelli* Gertsch 1992. **92–93** *Cicurina sansaba* Gertsch 1992. **94–95** *Cicurina selecta* Gertsch 1992. **96–97** *Cicurina serena* Gertsch 1992. **98–99** *Cicurina sheari* Gertsch 1992. **100–101** *Cicurina sprousei* Gertsch 1992. **102–103** *Cicurina stowersi* Gertsch 1992. **104–105** *Cicurina suttoni* Gertsch 1992. **106–107** *Cicurina travisae* Gertsch 1992. Scale bar = 0.1 mm.

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Remarks. Male unknown. The holotype vial only contains the female holotype; the seven immature spiders mentioned by Gertsch (1992) were not found. Data added by Gertsch (1992): "C Cave #1, 15 miles N. of Vanderpool".

Cicurina (Cicurella) stowersi Gertsch 1992
(Figs 102–103, 136)

Cicurina stowersi Gertsch 1992: 113, figs 121–122 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Stowers Cave, 24 mi. W. Kerrville, Kerr Co., Tex. 3 May 1969. Roger Bartholomew". Examined (AMNH).

Description. *Female holotype*

Total length: 3.33; carapace length: 1.62; carapace width: 1.17; opisthosoma length: 1.71. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 7 denticles (3 large, 4 small), left side 6 denticles (3 large, 3 small). Leg I: total length: 4.53; femur: 1.15; patella: 0.50; tibia: 1.15; metatarsus: 1.05; tarsus: 0.68; leg IV: total length: 5.30; femur: 1.40; patella: 0.50; tibia: 1.25; metatarsus: 1.45; tarsus: 0.70. Tarsal claw IV: 0.15. Epigynum: 0.35. Epigynal ventral plate with short transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium rectangular, almost intruded by rounded dorsal plate, atrial aperture small; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching well over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe elongated; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Stowers Cave (Kerr County, Texas, Fig. 136).

Remarks. Male unknown. The holotype was dehydrated.

Cicurina (Cicurella) suttoni Gertsch 1992
(Figs 104–105, 137)

Cicurina suttoni Gertsch 1992: 115, figs 137–138, 151–152 (description of male and female). — Jackman 1997: 162.

HOLOTYPE female: "Felton Cave, Sutton Co., Tex. 4–7–64, J. Reddell, Root". Label 2: "2 females, 2 males, 10 imm.". Examined (AMNH).

Description. *Female holotype*

Total length: 5.31; carapace length: 2.34; carapace width: 1.62; opisthosoma length 2.97. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (2 large, 4 small), left side likewise. Leg I: total length: 6.88; femur: 1.78; patella: 0.75; tibia: 1.80; metatarsus: 1.55; tarsus: 1.00; leg IV: total length: 8.03; femur: 2.18; patella: 0.75; tibia: 1.90; metatarsus: 2.10; tarsus: 1.10. Tarsal claw IV: 0.15. Epigynum length: 0.448. Epigynal ventral plate with short transverse slit, bearing medial, deep, inverted V-shaped indentation; atrium squared, half intruded by rounded dorsal plate, atrial aperture moderate; bursa enlarged, not fused; copulatory ducts touching at midpoint, reaching over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, slightly procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe kidney-shaped; secondary lobe absent; fertilization canal short, reaching the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Felton Cave (Sutton Co., Texas, Fig. 137).

Remarks. Both sexes are known. According to label 2 found in the holotype vial, two females, two males and ten immatures should have been present in the vial. Only the female holotype and two mature females

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were found. Gertsch (1992) only mentioned the female holotype in the type data. Gertsch (1992) added: "15 mi. SW Sonora. In rotting root 2000 feet from entrance" in his paper.

Cicurina (Cicurella) travisae Gertsch 1992
(Figs 106–107, 131)

Cicurina travisae Gertsch 1992: 101, figs 63–70 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Travis County, Tooth Cave, 15 miles N.W. of Austin; found under rocks. August 5, 1963 James Reddell coll.". Examined (AMNH).

Additional material examined. UNITED STATES: *Travis County*: Amber Cave, 08.iv.1984, 1♀ [TMM# 11799], J. Reddell, M. Reyes (TMM); Kretschmarr Cave, 21.ii.1988, 1♀, M. Reyes (TMM); McDonald Cave, 29.v.1989, 1♀ 14 juvs, W. Elliott, J. Reddell, M. Reyes (TMM); Pisarowicz Cave, 21.iv.1984, 1♀ [TMM# 10156], J. Reddell, M. Reyes (TMM); Root Cave (north entrance), 01.iv.1989, 1♀ 2 juvs, J. Reddell & M. Reyes (AMNH); Salamander Cave, 06.iv.1966, 1♀ 1 juv., J. Reddell (TMM).

Description. *Female holotype*

Opisthosoma length: 1.98. Epigynum: 0.370 mm. Epigynal ventral plate with long transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium square, almost completely intruded by rounded dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts almost touching at midpoint, acute, reaching top or slightly over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk strongly procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe elongated; secondary lobe absent; fertilization canal short, reaching dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Reported from a few caves in the Jollyville Plateau of Travis County: Amber Cave, Kretschmarr Cave, McDonald Cave (=Schulze Cave), Pisarowicz Cave, Root Cave, Salamander Cave, and Tooth Cave (type locality) (Fig. 131).

Remarks. Male unknown. Gertsch (1992) illustrated four specimens representing *Cicurina (Cicurella) travisae* (his figs 63–70) without mentioning which one is the holotype. The holotype vial contained the holotype opisthosoma, and one mature female. Cokendolpher (2004a) believed that Gertsch (1992) illustrated more than one species for *Cicurina (Cicurella) travisae*. In the distribution of *Cicurina (Cicurella) buwata*, Gertsch listed Gallifer Cave as a known locality (under *Cicurina (Cicurella) elliotti*). Gallifer Cave is however located on the Jollyville plateau, nearby the cave listed for *Cicurina (Cicurella) travisae*. Pisarowicz Cave and Salamander Cave listed here as known localities for the species, have unfortunately been destroyed by urban development.

Cicurina (Cicurella) troglobia Cokendolpher 2004
(Figs 108–109, 130)

Cicurina troglobia Cokendolpher 2004b: 60, figs 1–3 (description of female). — Paquin & Hedin 2004: 3243–3245, 3249, 3254; Taylor *et al*. 2005: 98.

HOLOTYPE female: "Texas: Bell Co. Seven Mile Mt. Cave, 28 June 2000, J. Reddell, M. Reyes, Molted 20 Oct. 2000, 14 July 2001". Examined (AMNH).

Description. *Female holotype*

Total length: 4.32; carapace length: 2.07; carapace width: 1.53; opisthosoma length: 2.25. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 small), left side likewise; retromargin right side with 7 denticles (2 large, 5 small), left side likewise. Leg I: total length: 6.23; femur: 1.60; patella: 0.70; tibia: 1.55;

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metatarsus: 1.43; tarsus: 0.95; leg IV: total length: 7.30; femur: 1.95; patella: 0.60; tibia: 1.75; metatarsus: 2.00; tarsus: 1.00. Tarsal claw IV: 0.15. Epigynum: 0.420 mm. Epigynal ventral plate with moderate transverse slit, bearing medial, very deep, inverted V-shaped indentation; atrium square, almost completely intruded by dome-shaped dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts widely separated at midpoint, reaching under primary lobe apex; copulatory ducts constriction located basally; primary pores visible (1 seen); stalk short, straight, horizontal, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe hat-shaped; secondary lobe absent; fertilization canal short, reaching the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Seven Mile Mountain Cave (Bell County, Texas, Fig. 130).

Remarks. Male unknown. Data added in Cokendolpher (2004b): "Molted in captivity 02.x.2000, molted to maturity 14 July 2001, right legs removed for DNA studies".

Cicurina (Cicurella) ubicki Gertsch 1992
(Figs 110–111, 133)

Cicurina ubicki Gertsch 1992: 109, figs 87–88 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Hays Co., Fern Cave, 2 September 1989, D. Ubick, S. Fend, S. Renkes". Examined (AMNH).

Additional material examined. UNITED STATES: *Hays County*: McGlothlin Cave, 26.v.1989, 1♀ 2 juvs, A. Grubbs, J. Reddell, M. Reyes (AMNH).

Description. *Female holotype*

Epigynum: 0.364 mm. Epigynal ventral plate with short transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium square, completely intruded by dome-shaped dorsal plate, atrial aperture minuscule; bursa not enlarged nor fused; copulatory ducts scarcely separated at midpoint, reaching slightly over of primary lobe apex; copulatory ducts constriction located apically; primary pores visible (1 seen); stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe hat-shaped; secondary lobe absent; fertilization canal short, internally positioned from dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Known from Fern Cave (type locality) and McGlothlin Cave (Hays County, Texas, Fig. 133).

Remarks. Male unknown. The holotype vial contained only one epigynum and three immature specimens.

Cicurina (Cicurella) uvalde Gertsch 1992
(Figs 112–113, 135)

Cicurina uvalde Gertsch 1992: 103, figs 101–102 (description of female). — Jackman 1997: 162.

HOLOTYPE female: "Texas; Uvalde County. Rambie's Cave, 8 miles N of Uvalde, April 6, 1963 J. Reddell, D. McKenzie". Examined (AMNH).

Description. *Female holotype*

Epigynum length: 0.161 (half size). Epigynal ventral plate with short transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium squared, two-thirds intruded by rounded dorsal plate, atrial aperture moderate; bursa not enlarged nor fused; copulatory ducts touching at midpoint.

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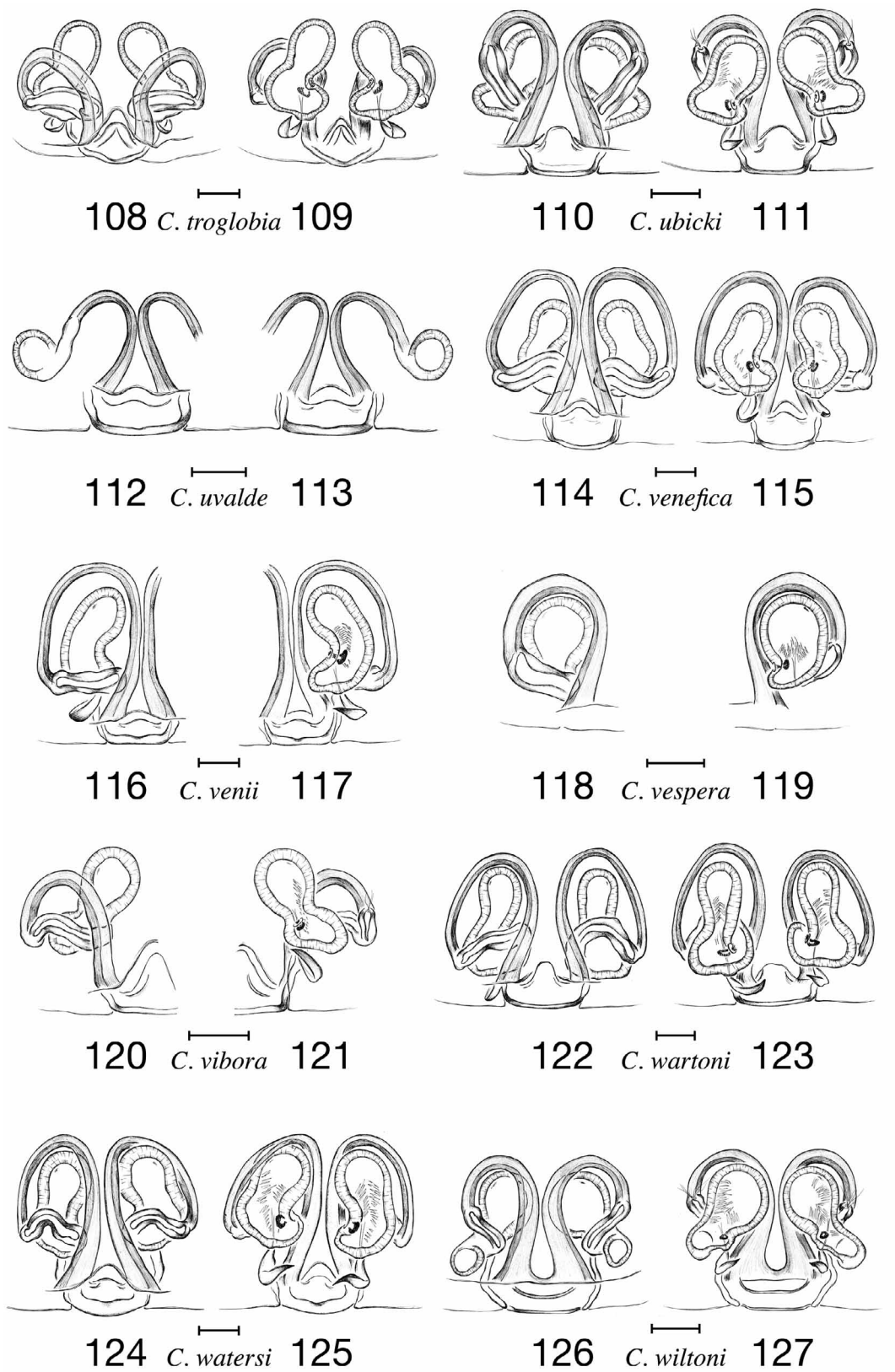

FIGURES 108–127. Cleared epigynum of troglobitic *Cicurina* (*Cicurella*) holotypes. For each species, a ventral and a dorsal view of the cleared epigynum are presented; the low number refers to the ventral view and the high number refers to the dorsal view. **108–109** *Cicurina troglobia* Cokendolpher 2004. **110–111** *Cicurina ubicki* Gertsch 1992. **112–113** *Cicurina uvalde* Gertsch 1992. **114–115** *Cicurina venefica* Gertsch 1992. **116–117** *Cicurina venii* Gertsch 1992. **118–119** *Cicurina vespera* Gertsch 1992. **120–121** *Cicurina vibora* Gertsch 1992. **122–123** *Cicurina wartoni* Gertsch 1992. **124–125** *Cicurina watersi* Gertsch 1992. **126–127** *Cicurina wiltoni* Gertsch 1992. Scale bar = 0.1 mm.

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Distribution. Only reported from the type locality: Rambie's Cave (Uvalde County, Texas, Fig. 135).

Remarks. Male unknown. The holotype vial contained a broken epigynum and one mature female not dissected. We are presuming that the broken epigynum is the remnant of the holotype represented by Gertsch because he drew ventral and dorsal views (Figs 101–102) that could only be seen with a dissected specimen. Gertsch (1992) did not mentioned any other mature specimen other than the holotype for the species, only 18 immatures that were not found in the vial. The description presented here for *Cicurina uvalde* is incomplete because the holotype is damaged.

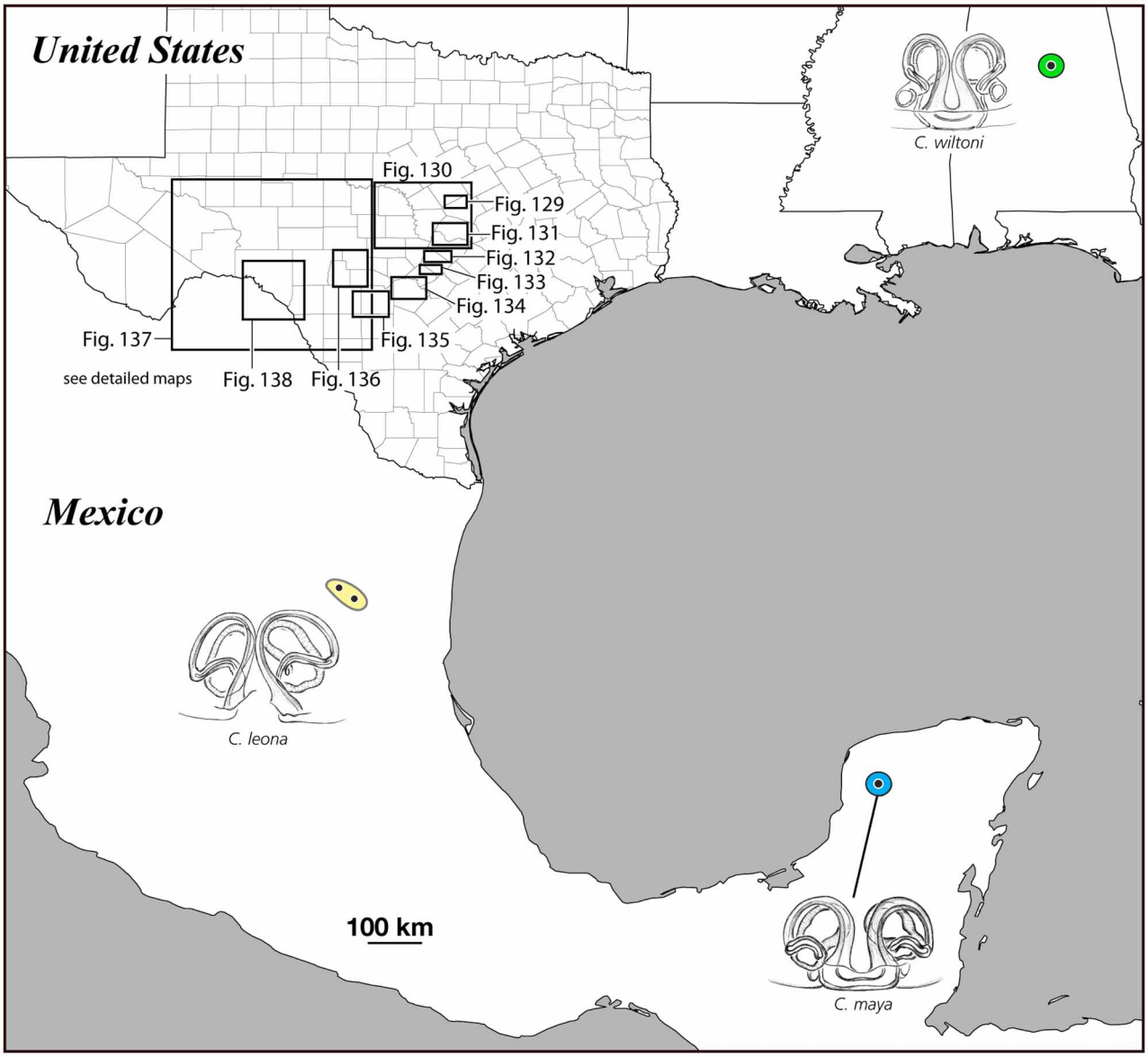

FIGURE 128. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species over the total range. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view). See figures 129 to 138 for more detailed coverage of certain areas.

Cicurina (Cicurella) venefica Gertsch 1992
(Figs 114–115, 137)

Cicurina venefica Gertsch 1992: 114, figs 129–130 (description of female). — Jackman 1997: 162; Cokendolpher 2004a: 24, 52.

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HOLOTYPE female: "Texas: Terrell Co.: Wizard's Well. 12–13 Feb. 1983. Eric Short, Randy Waters". Examined (AMNH).

Description. *Female holotype*

Total length: 4.57; carapace length: 2.42; carapace width: 1.60; opisthosoma length 2.17. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 6.95; femur: 2.15; patella: 0.60; tibia: 1.75; metatarsus: 1.55; tarsus: 0.90; leg IV: total length: 8.45; femur: 2.55; patella: 0.65; tibia: 1.95; metatarsus: 2.20; tarsus: 1.10. Tarsal claw IV: 0.15. Epigynum length: 0.452. Epigynal ventral plate with short transverse slit, bearing medial deep, inverted U-shaped indentation; atrium squared, almost completely intruded by rounded dorsal plate; atrial aperture small; bursa not enlarged, nor fused; copulatory ducts touching at midpoint, reaching well over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, curved, horizontally directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal short, reaching the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Wizard's Well (Terrell County, Texas, Fig. 137).

Remarks. Male unknown.

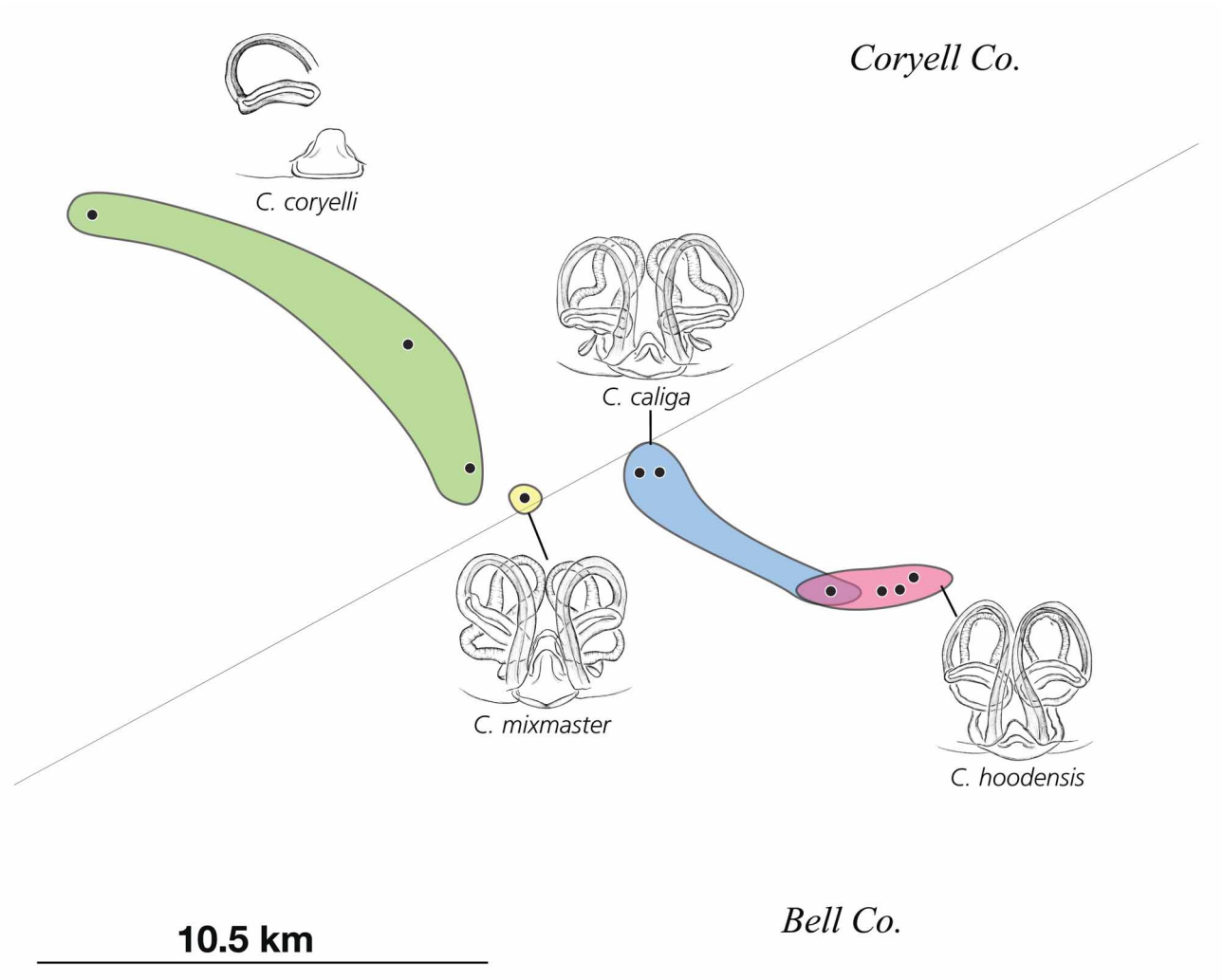

FIGURE 129. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species in Coryell and Bell Counties. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view). Buchanan Cave apparently harbors two species: *C. caliga* and *C. hoodensis*, as indicated by the overlap of the two ranges.

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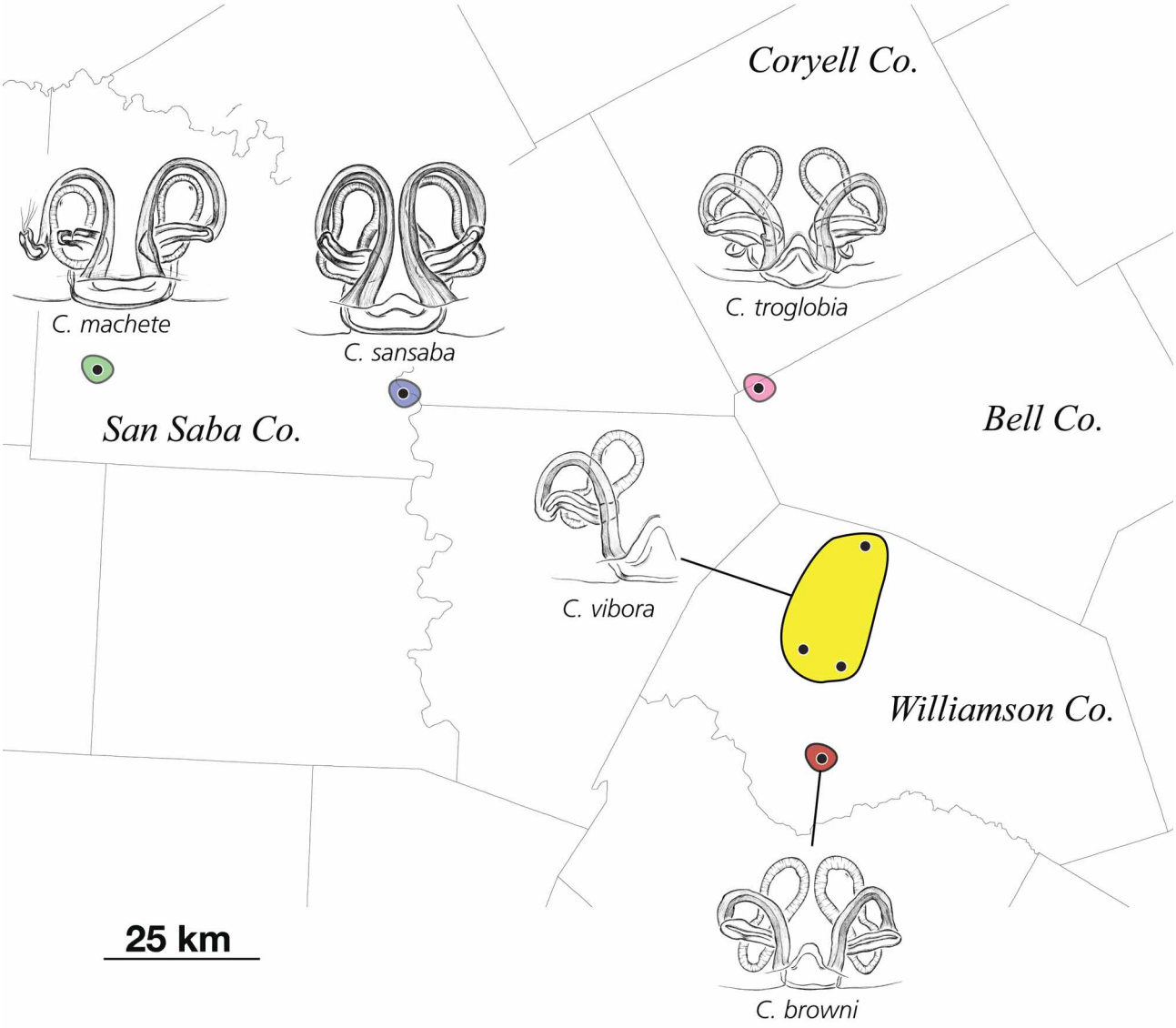

FIGURE 130. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species in Williamson (North), Bell and San Saba Counties. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view).

***Cicurina (Cicurella) venii* Gertsch 1992**
(Figs 116–117, 134)

Cicurina venii Gertsch 1992: 111, figs 95–96 (description of female). — Jackman 1997: 162, 171; Cokendolpher 2004a: 19–20, 24–25, 27–28, 34, 52–54, figs 63–64; Reddell & Cokendolpher 2004: 81; Paquin & Hedin 2004: 3249.

HOLOTYPE female: "Texas; Braken Bat Cave, Bexar Co., 22 November 1980. George Veni". Examined (AMNH).

Description. *Female holotype*

Carapace length: 1.62; carapace width: 1.17. Eyes absent. Cheliceral promargin right side with 3 teeth (1 large, 2 small), left side likewise; retromargin right side with 6 denticles (3 large, 3 small), left side likewise. Leg I: total length: 4.75; femur: 1.40; patella: 0.53; tibia: 1.13; metatarsus: 1.05; tarsus: 0.65; leg IV: total length: 5.28; femur: 1.40; patella: 0.55; tibia: 1.23; metatarsus: 1.35; tarsus: 0.75. Tarsal claw IV: 0.15.

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Epigynum: 0.28 (half size). Epigynal ventral plate with short transverse slit, bearing medial, shallow, inverted U-shaped indentation; atrium squared, two-thirds intruded by rounded dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts touching at midpoint, rounded, reaching over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, straight, horizontally directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe bean-shaped; secondary lobe absent; fertilization canal short, internally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Braken Bat Cave (Bexar County) (Fig. 134).

Remarks. Male unknown. Even though the epigynum is damaged, the remnants were enough to produce a complete description. The opisthosoma however, is missing. The entrance of Bracken Bat Cave has unfortunately been sealed with concrete. This species is included on the U.S. Federal list of endangered species (Longacre 2000).

Cicurina (Cicurella) vespera Gertsch 1992
(Figs 118–119, 134)

Cicurina vespera Gertsch 1992: 111, figs 93–94 (description of female). — Jackman 1997: 162, 171; Cokendolpher 2004a: 19–20, 24, 27, 34, 41, 47–48, 53, 57 figs 65–66; Paquin & Hedin 2004: 3239, 3241, 3243–3249, 3254; Reddell & Cokendolpher 2004: 81.

HOLOTYPE female: "Texas; Bexar County, Government Canyon Bat Cave, 5 miles SW of Helotes, August 11 1965, J. Reddell, J. Fish". Examined (AMNH).

Description. *Female holotype*

Total length: 2.48; carapace length: 0.81; carapace width: 0.59; opisthosoma length: 1.68. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 4 denticles (2 large, 2 small), left side likewise. Leg I: total length: 2.58; femur: 0.78; patella: 0.28; tibia: 0.60; metatarsus: 0.50; tarsus: 0.43; leg IV: total length: 2.82; femur: 0.78; patella: 0.29; tibia: 0.62; metatarsus: 0.65; tarsus: 0.48. Tarsal claw IV: 0.06. Epigynum: 0.175 (half size). Epigynal ventral plate with short transverse slit; bursa enlarged; copulatory ducts, reaching slightly over primary lobe apex; copulatory ducts constriction located medially; primary pores not visible; stalk short, straight, obliquely directed, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe ear- shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore.

Distribution. Only reported from the type locality: Government Canyon Bat Cave (Bexar County, Texas, Fig. 134).

Remarks. Male unknown. The holotype identification label was "*Cicurina verpsera*". This misspelling was corrected in Gertsch (1992). The description of the epigynum is incomplete because the epigynum is heavily damaged. This species is included on the U.S. Federal list of endangered species (Longacre 2000).

Cicurina (Cicurella) vibora Gertsch 1992
(Figs 120–121, 130)

Cicurina vibora Gertsch 1992: 98, figs 55–56 (description of female). — Jackman 1997: 162; Paquin & Hedin 2004: 3243–3245, 3254.

HOLOTYPE female: "Texas; Williamson Co. Rattlesnake Filled Cave; 100 yds. S.E. of Cricket Cave, 24 August 1963, J. Reddell & B. Russell". Examined (AMNH).

Additional material examined. UNITED STATES: *Williamson County*: Temples of Thor Cave, 13.iv.1991, 1♀ 5 juvs, J. Reddell, M Reyes (AMNH).

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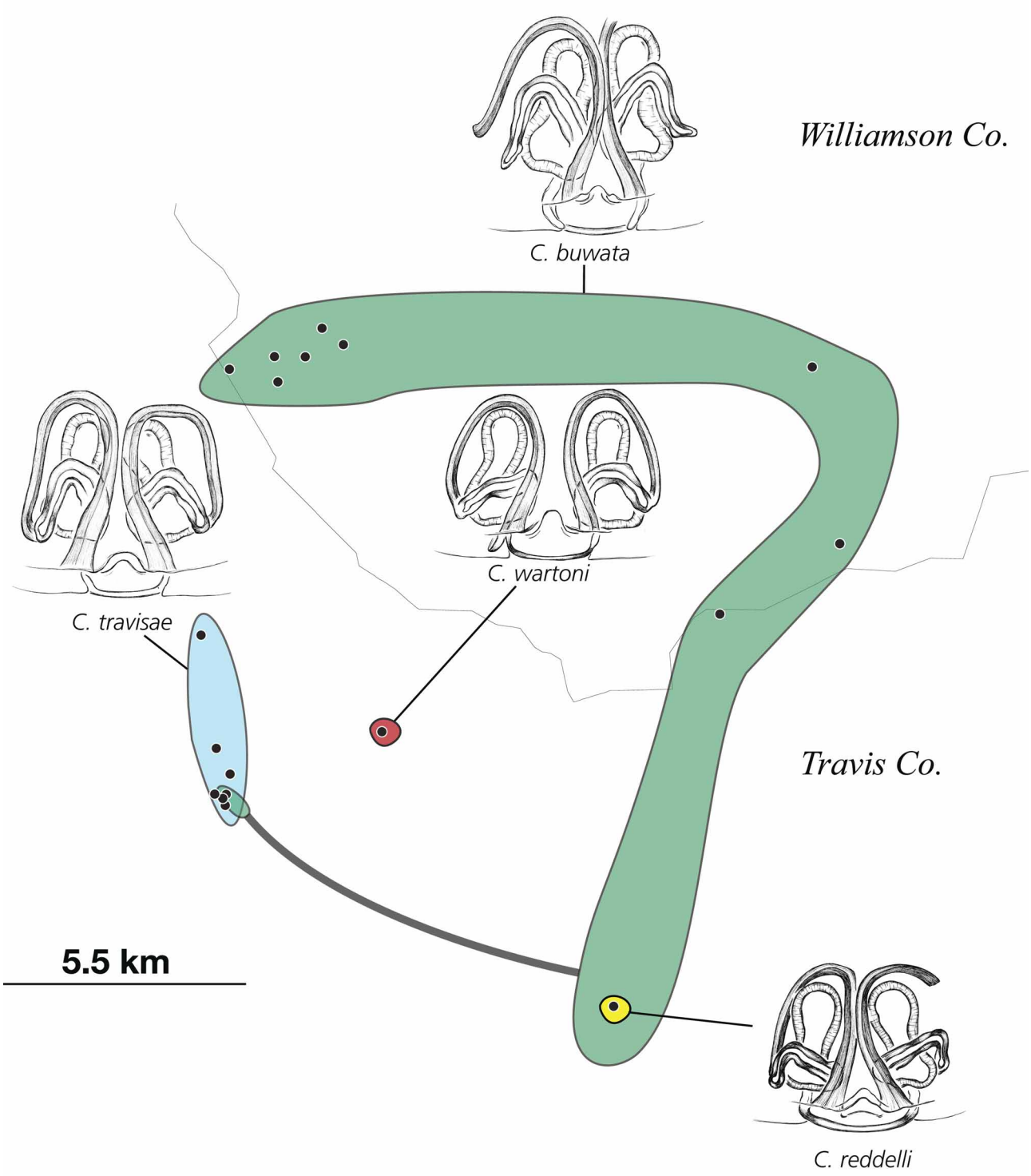

FIGURE 131. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species in Williamson (South), and Travis (North) Counties. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view). The type locality of *C. reddelli*, Cotterell Cave, was also reported to harbor *C. buwata* (as *C. elliotti* in Gertsch 1992). Gertsch (1992) reported the occurrence of *C. buwata* in Gallifer Cave (Jollyville Plateau), a region otherwise know to harbor *C. travisae*.

Description. *Female holotype*

Total length: 4.55; carapace length: 2.30; carapace width: 1.50; opisthosoma length: 2.25. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 6

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denticles (2 large, 4 small), left side likewise. Leg I: total length: 6.55; femur: 1.80; patella: 0.70; tibia: 1.70; metatarsus: 1.50; tarsus: 0.90; leg IV: total length: 7.90; femur: 2.10; patella: 0.70; tibia: 1.90; metatarsus: 2.10; tarsus: 1.10. Tarsal claw IV: 0.20. Epigynum: 0.210 mm (half). Epigynal ventral plate with short transverse slit, bearing medial, very deep, inverted V-shaped indentation; atrium almost completely intruded by a triangular dorsal plate, atrial aperture small; bursa not enlarged nor fused; copulatory ducts widely separated at midpoint, reaching below primary lobe apex; copulatory ducts constriction located; primary pores visible (1 seen); stalk, short, slightly curved, horizontal, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe light-bulb shape; secondary lobe absent; fertilization canal long, internally positioned from dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Known from Rattlesnake Filled Cave (type locality), Temples of Thor Cave, and Sunless City Cave (Williamson County, Texas, Fig. 130). The record from Sunless City Cave was identified to species by a DNA match of an immature specimen (see Paquin & Hedin 2004).

Remarks. Male unknown. Gertsch (1992) gives "southwest of Cricket Cave" in his paper, which differs slightly from the label data. The precise location of Rattlesnake Filled Cave (type locality) has been forgotten and recent efforts to clarify the situation were not successful (James R. Reddell, pers. comm.). Similarly, the location of Cricket Cave is also a mystery. However, Reddell & Finch (1963) provided enough information to estimate the location of Rattlesnake Filled Cave, and these data are judged precise enough for our purposes (see Fig. 130).

Cicurina (Cicurella) wartoni Gertsch 1992
(Figs 122–123, 131)

Cicurina wartoni Gertsch 1992: 101, figs 75–76 (description of female). — Jackman 1997: 162, 171.

HOLOTYPE female: "Travis County: Pickle Pit Cave. 21 May 1990. J. Reddell, M. Reyes, L. Sherod". Examined (AMNH).

Description. *Female holotype*

Total length: 4.23; carapace length: 1.90; carapace width: 1.40. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 7 denticles (2 large, 5 small), left side with 6 denticles (2 large, 4 small). Leg I: total length: 6.20; femur: 1.78; patella: 0.70; tibia: 1.43; metatarsus: 1.40; tarsus: 0.85; leg IV: total length: 7.23; femur: 1.85; patella: 0.70; tibia: 1.68; metatarsus: 1.95; tarsus: 1.05. Tarsal claw IV: 0.15. Epigynum: 0.518 mm. Epigynal ventral plate with short transverse slit, bearing medial, deep, inverted U-shaped indentation; atrium squared, completely intruded by dome-shaped dorsal plate, atrial aperture minuscule; bursa not enlarged nor fused; copulatory ducts separated at midpoint, reaching over primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk, short, straight or procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore elongated; primary lobe elongated; secondary lobe absent; fertilization canal long, reaching over dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from Pickle Pit, the type locality (Travis County, Texas, Fig. 131).

Remarks. Male unknown.

Cicurina (Cicurella) watersi Gertsch 1992
(Figs 124–125, 135)

Cicurina watersi Gertsch 1992: 103, figs 103–104 (description of female). — Jackman 1997: 163.

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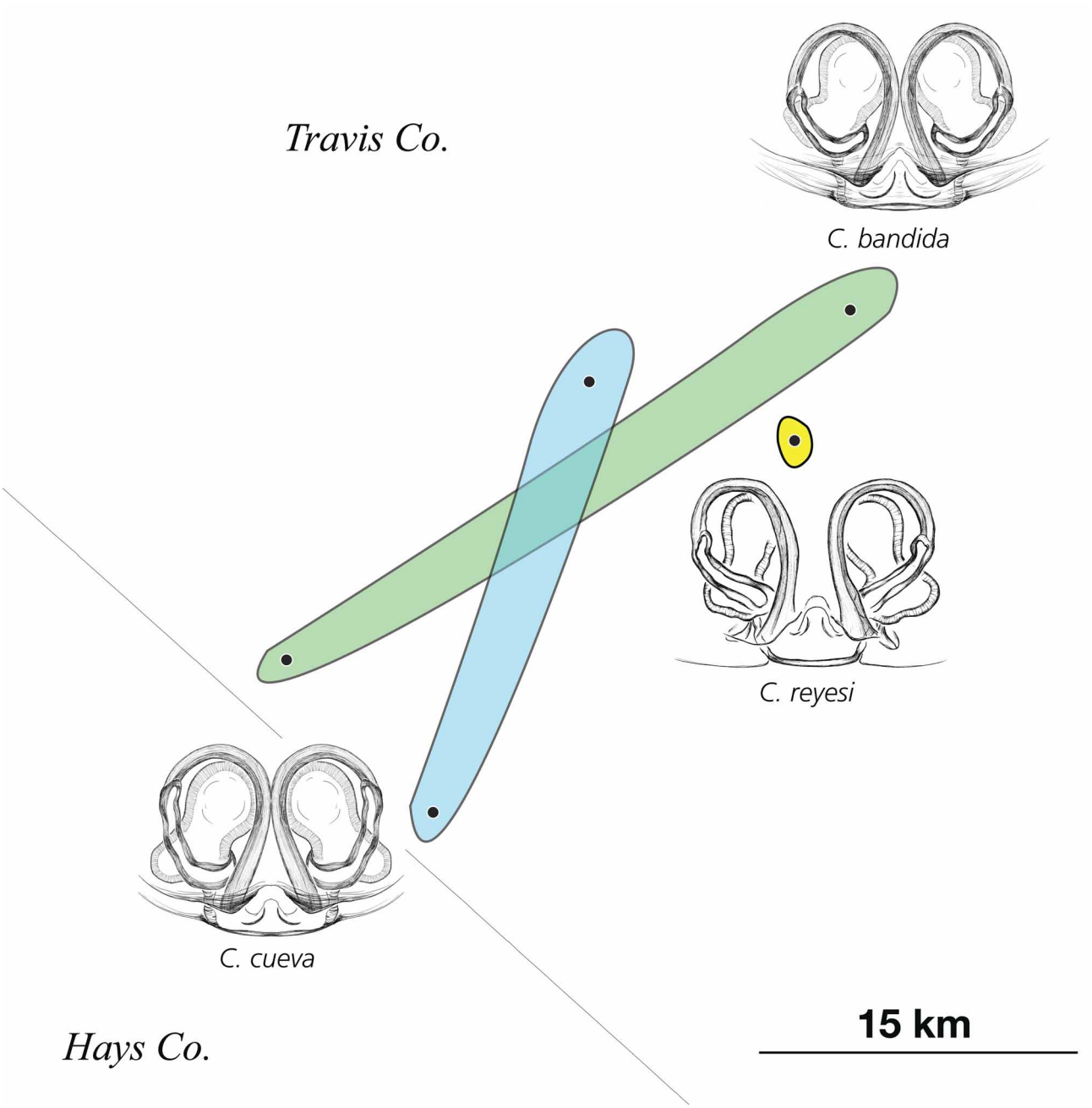

FIGURE 132. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species in south Travis County. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view). The known range of *C. cueva* and *C. bandida* is overlapping.

HOLOTYPE female: "Texas; Uvalde County; Frio Queen Cave. Summer 1983, Randy M. Waters". Examined (AMNH).

Description. *Female holotype*

Total length: 4.15; carapace length: 2.00; carapace width: 1.20; opisthosoma length 2.15. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side likewise; retromargin right side with 7 denticles (2 large, 5 small), left side likewise. Leg I: total length: 7.10; femur: 2.00; patella: 0.70; tibia: 1.80; metatarsus: 1.60; tarsus: 1.00; leg IV: total length: 7.93; femur: 2.10; patella: 0.70; tibia: 1.85; metatarsus: 2.13; tarsus: 1.15. Tarsal claw IV: 0.18. Epigynum length: 0.420. Epigynal ventral plate with short transverse

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slit, bearing medial, deep, inverted U-shaped indentation; atrium squared, two-thirds intruded by rounded dorsal plate, atrial aperture small; bursa enlarged, not fused; copulatory ducts slightly separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located basally; primary pores not visible; stalk short, procurved, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore rounded; primary lobe kidney-shaped; secondary lobe absent; fertilization canal long, externally positioned from the dictynoid pore; fertilization duct medially attached to the primary lobe base.

Distribution. Only reported from the type locality: Frio Queen Cave (Uvalde County, Texas, Fig. 135).

Remarks. Male unknown.

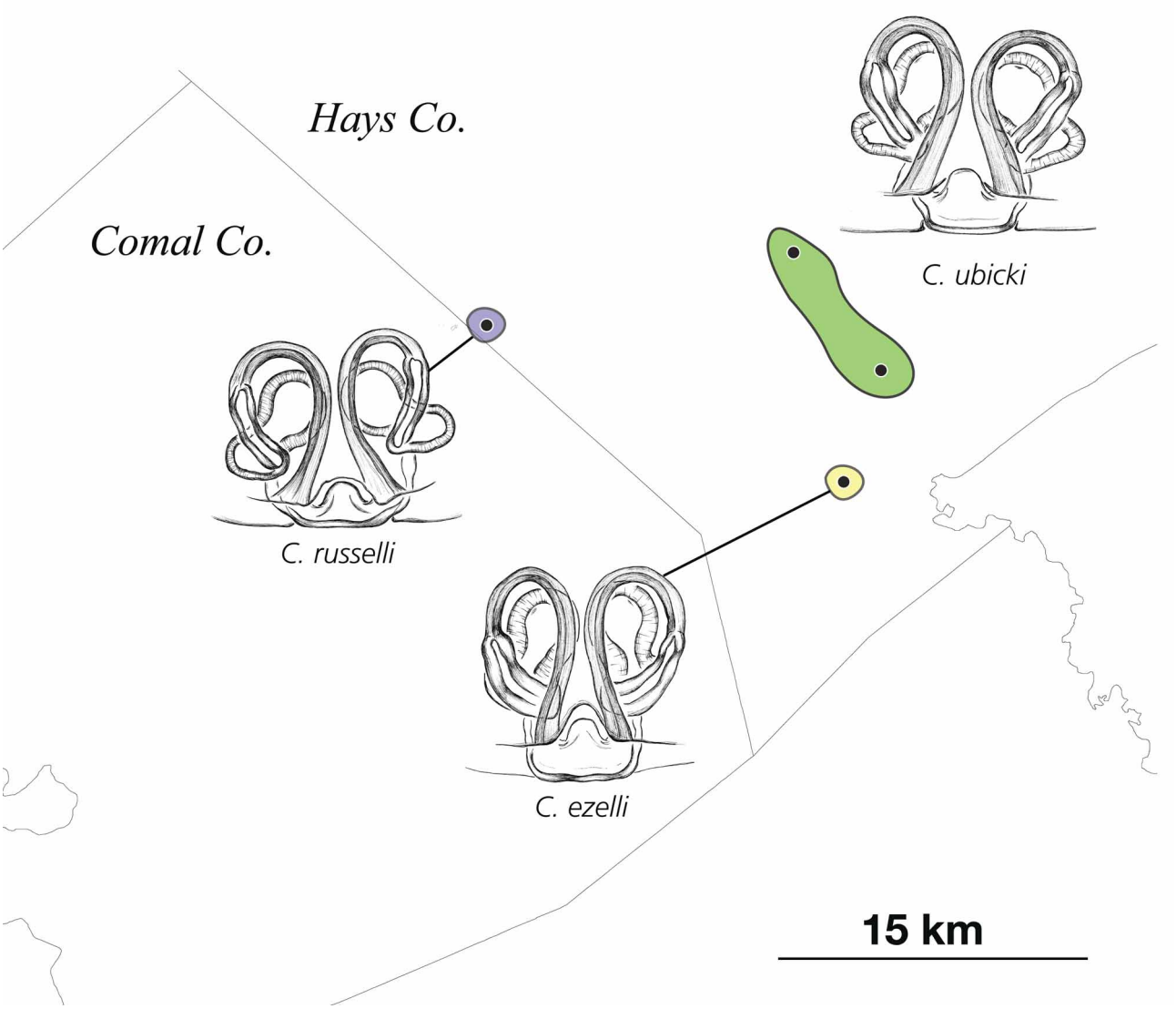

FIGURE 133. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species in Hays County. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view).

***Cicurina (Cicurella) wiltoni* Gertsch 1992**
(Figs 126–128)

Cicurina wiltoni Gertsch 1992: 119, figs 145–146, 159–160 (description of male and female).

HOLOTYPE female: "Alabama; Crystal Caverns, 1 Mi. N. of Clay, w86; n33, July 12, 1951. Jones & Valentine". Examined (AMNH).

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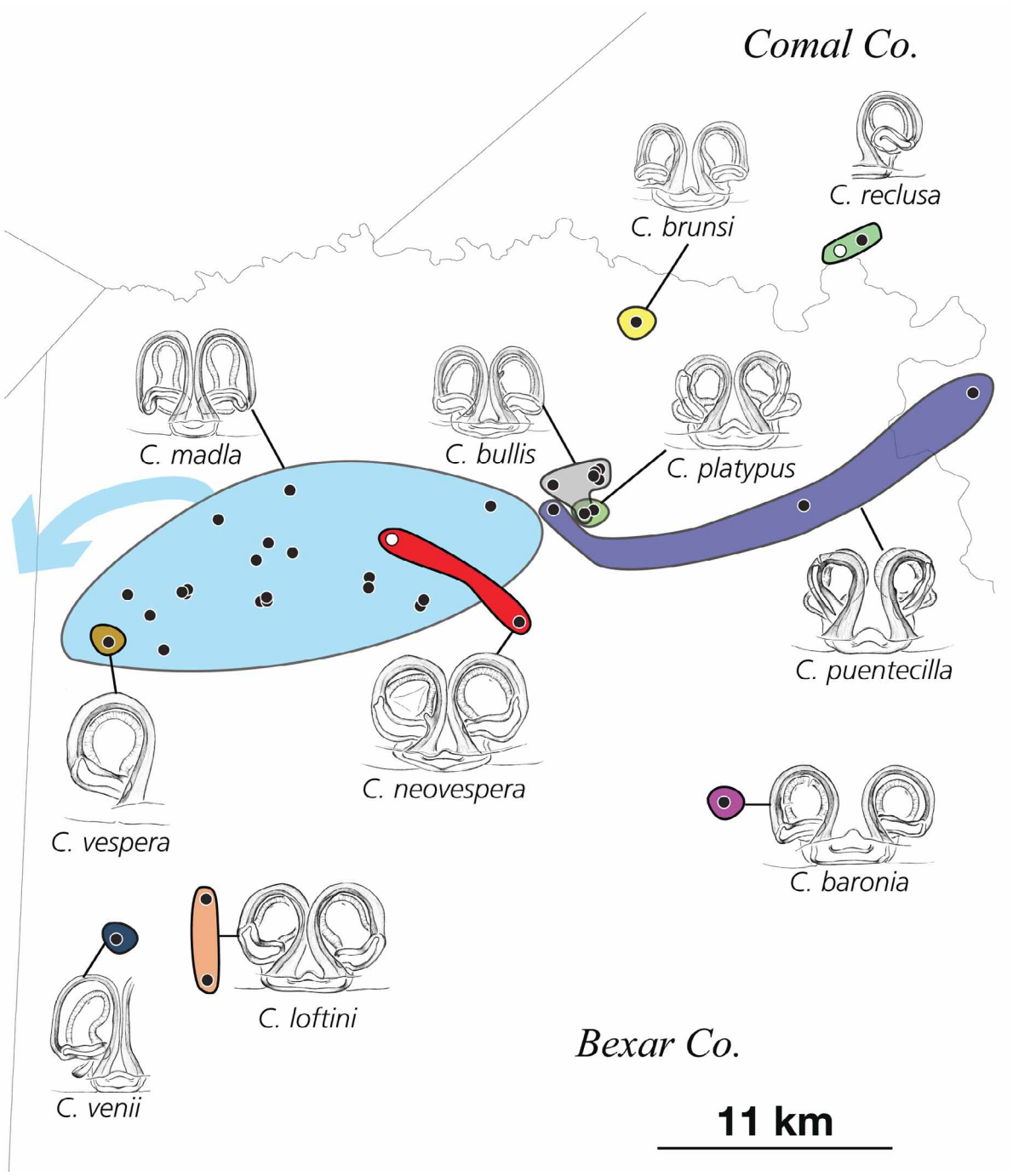

FIGURE 134. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species in Bexar and Comal Counties. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view). The type locality of *C. platypus*, Platypus Pit, apparently also harbors *C. bullis*, as indicated by the overlap of the ranges. The distribution range of *C. madla* includes a locality in Uvalde County (see Fig. 135), as suggested by the arrow pointing to the South West. *Cicurina vespera* is known from a single specimen apparently collected from Government Canyon Bat Cave. The DNA samples included in the analysis of Paquin & Hedin (2004) from this locality suggested that the immature *Cicurina* collected from Government Canyon Bat Cave are conspecific with *C. madla*, questioning the identity of the cave at the origin of the specimen used to describe *C. vespera*. The two localities harboring *C. neovespera* are rather obscure and could not be established with certainty, other than by an approximate location, resulting in a conflicting range of at least one of the two localities with the range of *C. madla*. Dark circle symbols refer to confirmed localities, open circles to literature records.

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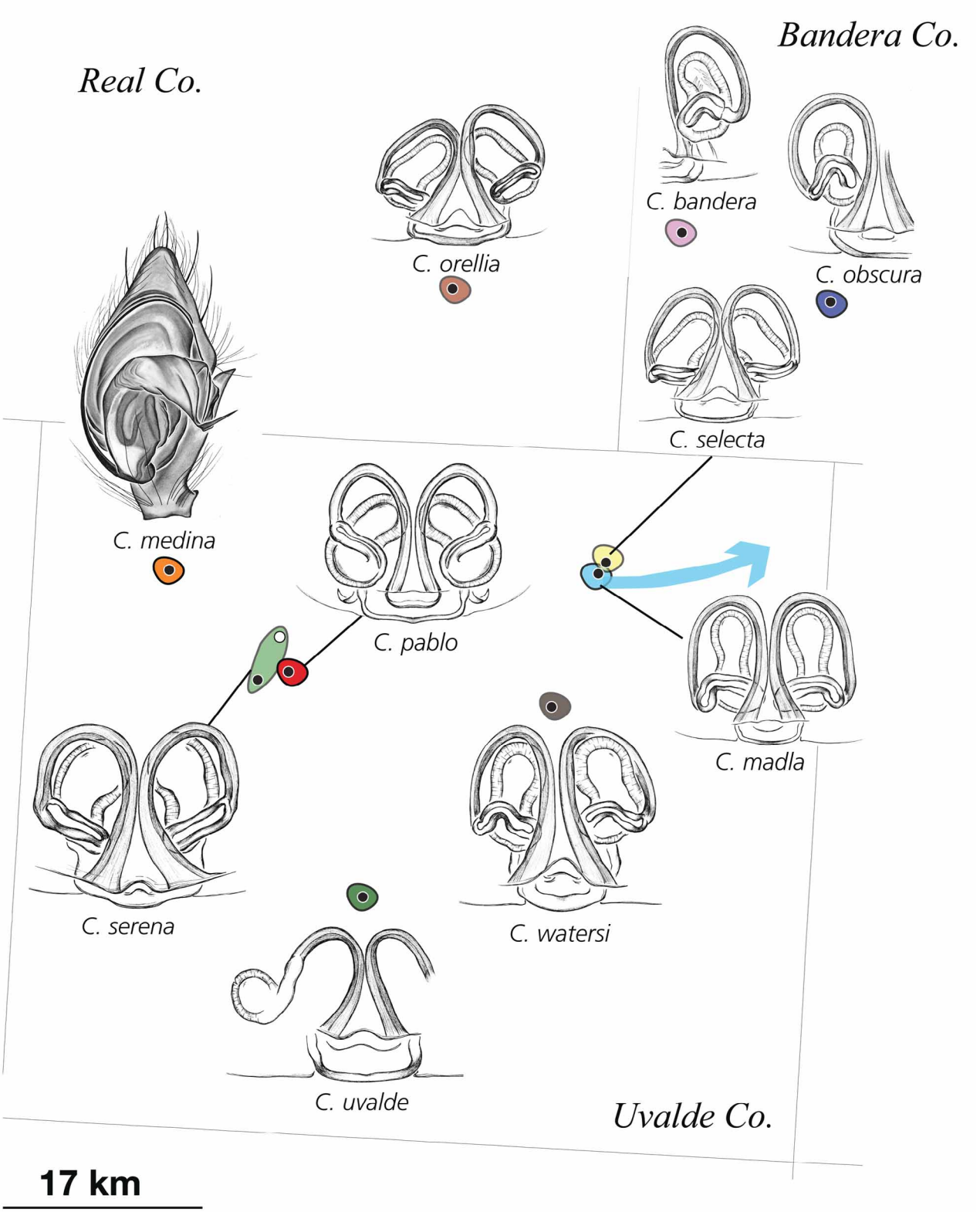

FIGURE 135. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species in Uvalde, Real and Bandera Counties. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum or palp (in ventral view). The record of *C. madla* from Uvalde County is based on a DNA match of an immature published in Paquin & Hedin (2004), extending the range from Bexar County, as suggested by the arrow pointing to the North East. *Cicurina medina* is only known from the male holotype and the female remains unknown. Dark circle symbols refer to confirmed localities, open circles to literature records.

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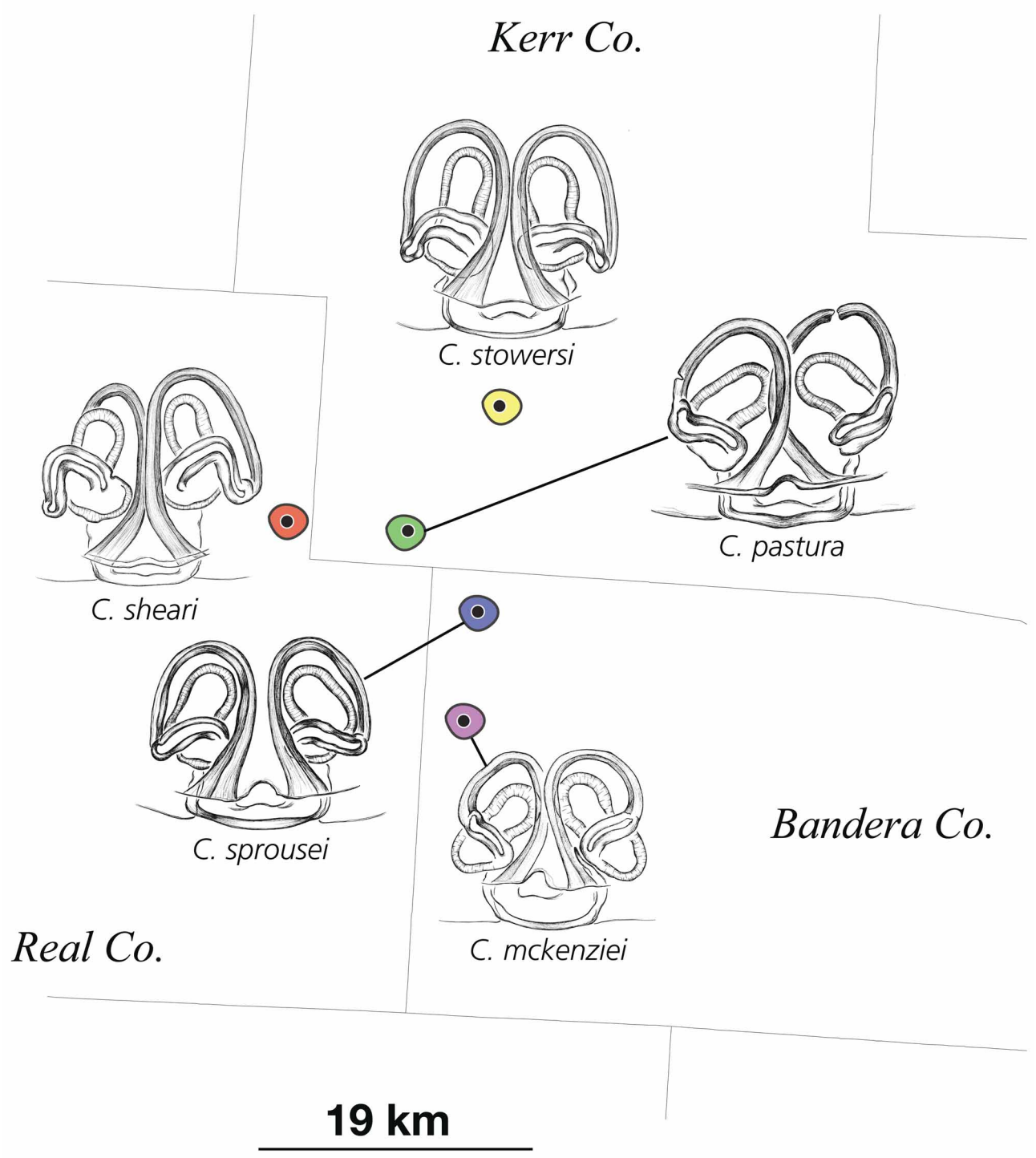

FIGURE 136. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species in Kerr, Real and Bandera Counties. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view).

Description. *Female holotype*

Total length: 4.68; carapace length: 2.25; carapace width: 1.45. Eyes absent. Cheliceral promargin right side with 3 teeth (2 large, 1 small), left side with 3 teeth (2 large, 1 small), the two large teeth are fused at base; retromargin right side with 8 denticles (3 large, 5 small), left side with 7 denticles (3 large, 4 small). Leg I: total length: 6.95; femur: 1.95; patella: 0.75; tibia: 1.75; metatarsus: 1.60; tarsus: 0.90; leg IV: total length: 8.13; femur: 2.15; patella: 0.80; tibia: 1.95; metatarsus: 2.20; tarsus: 1.05. Tarsal claw IV: 0.20. Epigynum:

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0.364 mm. Epigynal ventral plate with long transverse slit, indentation absent; atrium rectangular, half intruded by straight dorsal, atrial aperture moderate; bursa enlarged, fused; copulatory ducts slightly separated at midpoint, reaching top of primary lobe apex; copulatory ducts constriction located medially; primary pores visible (1 seen), positioned dorsally; stalk, short, straight, oblique, joining the primary lobe at the aperture of the dictynoid pore; dictynoid pore triangular; primary lobe light-bulb shaped; secondary lobe present, positioned ventro-basally; fertilization canal long, reaching over the dictynoid pore; fertilization duct internally attached to the primary lobe base.

Distribution. Only reported from Crystal Caverns (Jefferson County, Alabama, Fig. 128).

Remarks. Both sexes are described. The holotype vial contained the female holotype and two immature specimens not mentioned in Gertsch (1992). Gertsch listed McClunney-Alabama Caverns for the species, which is another name for Crystal Caverns. This species is the only eyeless member of the subgenus occurring north of Texas (Fig. 128).

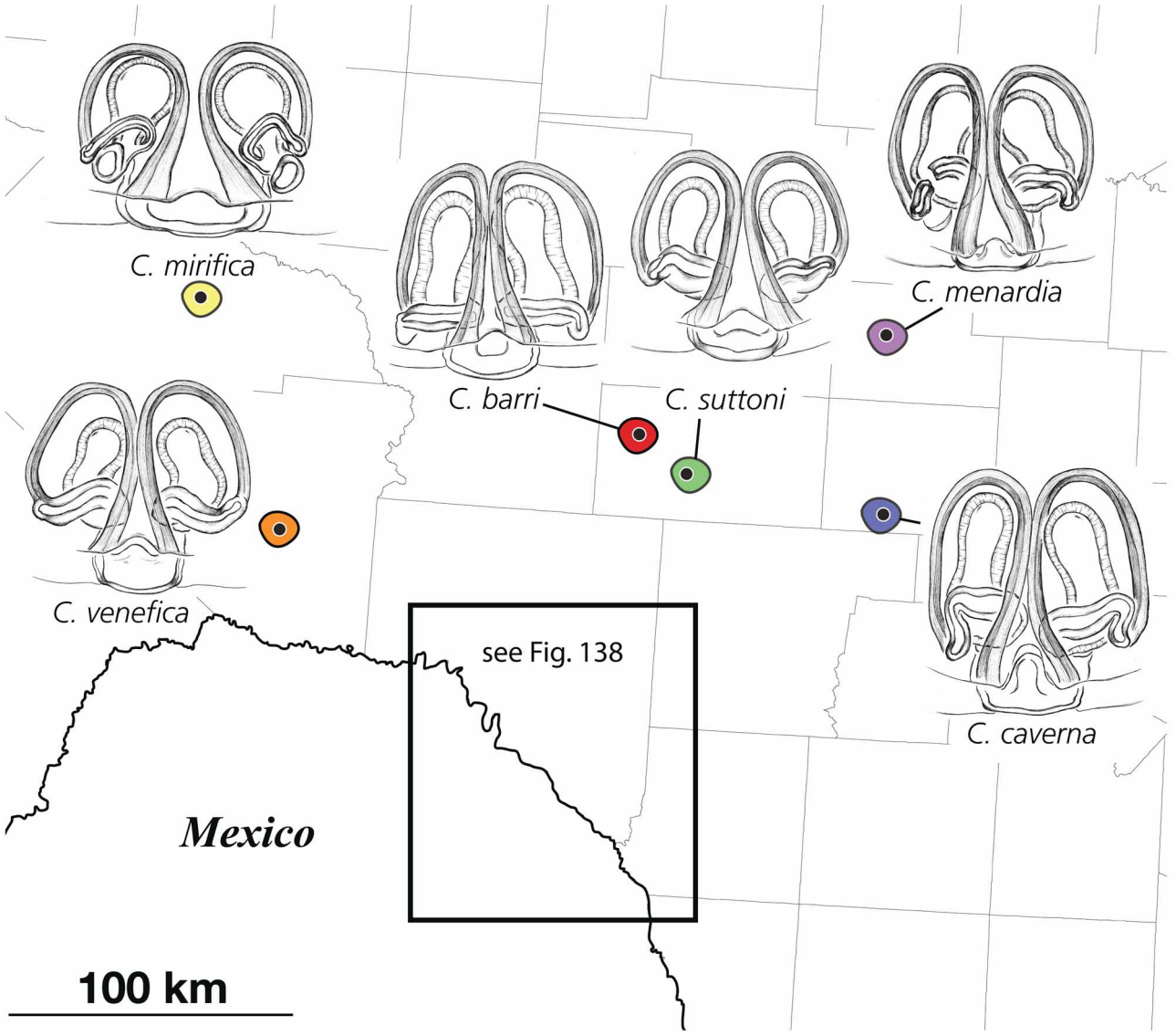

FIGURE 137. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species in West Texas. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view). See figure 138 for more detailed coverage of Val Verde and Edwards Counties.

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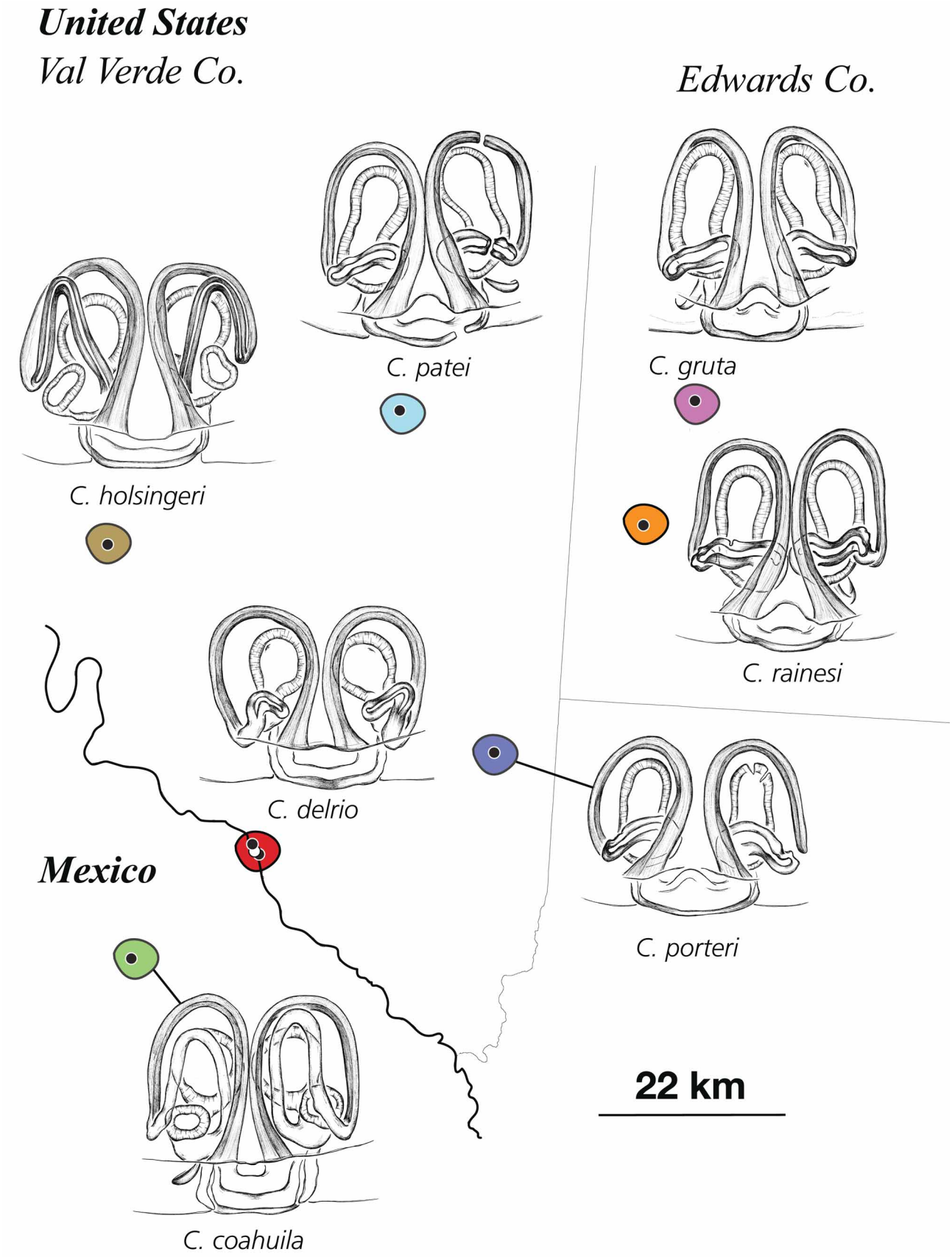

FIGURE 138. Distribution of troglobitic *Cicurina* (subgenus *Cicurella)* species of Val Verde and Edwards Counties, and Mexico. The range of the species is indicated by an area that includes all known locations. Each cave is indicated by a dot. The species ranges are accompanied by the illustration of the holotype epigynum (in ventral view). Dark circle symbols refer to confirmed localities, open circles to literature records.

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Discussion

The study of troglobitic *Cicurina (Cicurella)* is a difficult task. The rarity of adults (particularly males) and the newly reported intraspecific variability (see Cokendolpher 2004a, Paquin & Hedin 2004) suggest a taxonomy that badly needs reassessment. The delicate political context that involves endangered species, cave conservation and urban development encumbers taxonomic work with these organisms and intensifies the need for such work. While we recognize that revising the genus will be difficult, we have taken a first step in that process by conducting a thorough study of the type material of troglobitic *Cicurina (Cicurella)*, which, in most cases, constitutes the only known specimens. We believe the results of this study provide a reliable morphological basis to compare the females of all known troglobitic *Cicurina (Cicurella)* species. This is particularly important given the imprecise illustrations of the original descriptions and, in some case, confusion around type specimens. We discovered that some of Gertsch types were not dissected and, therefore, the illustrations he provided showing a dorsal view of the epigynum are not of the types but of other specimens. Differences between our illustrations and those provided by Gertsch may also be due to the fact that some parts of the female genitalia (e.g., the copulatory ducts) are translucent and particularly difficult to see. The fertilization canal, primary pores and dictynoid pores are best observed with a temporary slide mount under a microscope or SEM. However, the observation of the primary pores is not always possible with standard microscopy because their position may coincidently be in line with the axis of view. The present effort allows the identification of potential flaws in actual species hypothesis, particularly in the light of the species distribution, which is visually rendered here for the first time.

Based on the data presented, we believe the following points need attention to improve the robustness of species hypothesis:

1) There are potential synonymies of highly similar species. For instance, *Cicurina (Cicurella) russelli* and *Cicurina (Cicurella) reyesi* (Figs 88–89 and 90–91); *Cicurina (Cicurella) buwata* and *Cicurina (Cicurella) travisae* (Figs 22–23 and 106–107); *Cicurina (Cicurella) platypus* and *Cicurina (Cicurella) puentecilla* (Figs 76–77 and 80–81). This is a generalized problem in the genus *Cicurina.*

2) The plotting of the distribution of the species reveals that many adjacent “species” present only minor variations of the epigynum (Figs 129–138). For instance, *Cicurina (Cicurella) troglobia*, *Cicurina (Cicurella) vibora* and *Cicurina (Cicurella) browni* (Fig. 130) are very similar. To sort such problems and test the proposed species hypothesis, it is imperative to better assess intraspecific variability by additional collecting from type localities. Based on actual knowledge of troglobitic organisms, evidence for the coexistence of troglobitic sister-species – suggesting sympatric speciation resulting in multiple species in the same cave – still remains to be fully demonstrated. In the rare cases that are known, the species involved belong to different lineages within a genus and likely represent different invasions of the same cave system (Barr 1974; Barr & Holsinger 1985; Sbordoni *et al.* 2000). Existing data suggest that the troglobitic members of *Cicurina (Cicurella)* represent a monophyletic lineage: this was initially proposed by Chamberlin and Ivie (1940), supported by the taxonomic treatment of Gertch (1992) and the synapomorphies reported here for the subgenus. The results of Paquin & Hedin (2004) and DNA sequences (Paquin, unpublished) are also supporting the monophyly of *Cicurina (Cicurella)*. Evidence that *Cicurina (Cicurella)* represents a single lineage provides support for the widespread assumption that only one troglobitic *Cicurina (Cicurella)* species could occupy a given cave; White *et al.* (in press) hypothesised that the speciation of eyeless *Cicurina (Cicurella)* in Texas caves occurs from a group of connected caves to another, through the faulting that evolved since the formation of this karstic system. This was first suggested by Barr (1974) to explain the distribution of troglobitic *Rhadine* spp. (Coleoptera: Carabidae) in Central Texas, where a group of connected caves (actual or past connexions) harbor the same species, and could colonize a previously inaccesible group of caves through faults. This subterranean island biogeography dynamic is termed *progressive habitat availability* by White *et al.* (in press) that imply speciation through this complex subterranean space characterized by a high degree of connections suspected for Central Texas caves (Paquin & Hedin 2007). In the light of this principle, the cases where more than one species per cave have been reported or described are

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suspicious and deserve attention (see Figs 129, 131, 134), particularly because of the previously unrecognized intraspecific variability. Additional specimens from the same locality will allow better quantification of this variability and help redefine species limits. In most cases, we predict that additional material will show that intraspecific variation (within the same cave) is similar to the variability used by Gertsch (1992), Cokendolpher & Reddell (2001), Cokendolpher (2004 a, b) to establish different species in adjacent localities.

3) The type specimens of *Cicurina (Cicurella) coryelli* (Figs 30–31) and *Cicurina (Cicurella) uvalde* (Figs 112–113) are heavily damaged, and additional females from these type localities must be collected to adequately document the morphology of the two species.

4) *Cicurina (Cicurella) medina* is the only species known only from a male (Figs 56–57). A female from this locality is needed to allow a comparison with adjacent species known only from females (Fig. 135).

5) The collection of fresh material is imperative to better document the morphology of many species that are defined by the female genitalia; key structures such as the primary pores, the shape of the dictynoid pore, and the length of the fertilization canal are better seen in fresh material. Some of the types are quite old, and these structures could not be sufficiently documented.

6) An independent assessment of species hypothesis using male morphology would be an important asset; much more sampling is required to collect males of most species.

7) The present data suggest that eyeless *Cicurina (Cicurella)* occur in most caves of the Edwards Plateau (Central Texas), from Coryell County in the northeast to Pecos County in the west, and become scarce southwest of the Balcones Fault. One isolated species is known from Alabama. While eyeless *Cicurina* are known to occur in Mexico, their density is difficult to evaluate because such a scarce distribution could be the result of a lack of adequate collections, but could also represent a biological reality that simply differ from the one observed in Texas. In Central Texas, eyeless *Cicurina (Cicurella)* may be present in approximately 3000 caves. Such a large number of caves that potentially harbor these troglobites highly contrasts with the low number of adult specimens known. In our collecting experience, the ratio between juveniles/adult females/adult males found in the field is approximately of 100/10/1. This explains in part the rarity of males in collections, but also stresses the usefulness of a molecular approach to assign immature specimens to a species name in order to document species distributions (see Paquin & Hedin 2004).

8) The collection of additional adults is badly needed for a better morphological assessment of intraspecific variability. Fresh material also allows the gathering of quality DNA to test species limits and provide an independent assessment of intraspecific variability (see Paquin & Hedin 2004).

9) As far as is known, the distribution of a given species is contiguous in adjacent caves (Cokendolpher 2004a; Paquin & Hedin 2004), resulting in clusters of caves that harbor the same eyeless species, and this species does not overlap with other eyeless species. Cases where such overlaps have been reported (*Cicurina (Cicurella) caliga* and *Cicurina (Cicurella) hoodensis*, Fig. 129) (*Cicurina (Cicurella). reddelli* and *Cicurina (Cicurella) buwata*, Fig. 131) (*Cicurina (Cicurella) cueva* and *Cicurina (Cicurella) bandida*, Fig. 132) (*Cicurina (Cicurella). vespera*, *Cicurina (Cicurella) neovespera* and *Cicurina (Cicurella) madla*, Fig. 134) are anomalous and deserve attention.

10) The secrecy around cave locations is a real problem for scientists and taxonomists working on cave fauna in Texas. For example, acquisition of the data depicted in Figs 7, 128–138 was a long and painful process that was resolved successfully only through the personal involvement of the individuals thanked in the acknowledgment section. Many of the cave locations showed on the maps should only be considered approximate. Two important localities — Fossil Cave (Bandera County) type locality and only known record of *Cicurina (Cicurella) bandera*, and Orell Crevice Cave (Real County) type locality and only known record of *Cicurina (Cicurella) orellia* — could not be precisely located, but the information gathered about the general location was judged sufficient for the purpose of the present paper.

11) No records are exempt from the possibility of mislabeling or switching of labels when specimens are examined. The best way to avoid or catch such mistakes is to have additional specimens and collections that can verify results provided by the first specimen. Unfortunately for *Cicurina (Cicurella)*, this is not possible because only one specimen or locality is known. In some cases, the repercussions of such errors may not be

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trivial. For instance, Paquin & Hedin (2004) sequenced immature specimens collected in Government Canyon Bat Cave, the type locality and only known location for *Cicurina (Cicurella) vespera*, and found these sequences to cluster within *Cicurina (Cicurella) madla*. Given that more than one troglobitic *Cicurina (Cicurella)* species is not expected to occupy a single cave, and given that the examination of the type specimen of *Cicurina (Cicurella) vespera* leaves no doubt that it is not conspecific with *Cicurina (Cicurella) madla* (see Fig. 134), the finding that the sequences from Government Canyon Bat Cave belong to *Cicurina (Cicurella) madla* suggests that an error was made. It is unlikely that the specimen used to describe *Cicurina (Cicurella) vespera* was collected in Government Canyon Bat Cave, and the real locality remains undetermined. In cases where a species acquires a legal status, especially if the species is added to the U.S. Federal list of endangered species, additional specimens from the same locality should be gathered to exclude the possibility of mislabeling.

Conclusion

Paquin *et al.* (2008) commented about the problems involving taxonomy, conservation and politics for cave invertebrates of Texas. Here, we urge U.S. Fish and Wildlife Service to modify the sampling protocols used for troglobitic fauna to insure that collected *Cicurina* (adults and immatures), or any other cave invertebrates, are preserved properly for traditional morphology and DNA studies. Actually, immature *Cicurina* are not collected or curated to insure DNA preservation, resulting in irreversible degradation (Vink *et al*. 2005). In addition, there is no mechanism to insure that specimens (and usable DNA) are transferred to taxonomists and systematists that are actively working on a group. This results in practices that are not justifiable on any scientific grounds, and unfortunately, the taxonomy of Texas cave invertebrates is greatly suffering from this lack of vision. While scientific ethic should be enough to prevent the situation, it might be necessary to include this provision in the legal permit required to collect endangered species in Texas caves. We hope that the present paper will help to bring elements together in order to help understanding the delicate taxonomic context of troglobitic *Cicurina* in Texas for the uninitiated, and the need to gather additional material (adults and DNA) to accomplish progress for this group of troglobitic spiders. The convergence of results provided by additional specimens, detailed morphological analysis, DNA data in concordance with geographical and geological information is the only fully reliable option to better understand this impressive radiation of troglobites.

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