

## **A NEW *NEOLEPTONETA* SPIDER FROM A CAVE AT CAMP BULLIS, BEXAR COUNTY, TEXAS (ARANEAE: LEPTONETIDAE)**

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### **ABSTRACT**

A new species of *Neoleptoneta* is described and illustrated from caves in Bexar County, Texas, U.S.A. Some notes on its biology are presented with photographs of the egg sacs.

### **INTRODUCTION**

Leptonetids are minute, web-building spiders restricted to subterranean and litter habitats around the world. Most species are known from caves. Two of these troglobitic species are currently listed as U.S.A. federally protected endangered species (Longacre, 2000). Members of this family are restricted to the northern Hemisphere in three disjunct areas: U.S.A. to Panama, Mediterranean region, and southeast Asia. Two subfamilies are recognized with about 150 species. The Nearctic fauna is currently recognized as consisting of four genera and 45 species. *Neoleptoneta* Brignoli is recorded (Gertsch, 1974; Brignoli, 1983; Cokendolpher and Reddell, 2001) from scattered localities from Georgia to Arizona in the U.S.A. and from Nuevo León and Tamaulipas to Oaxaca in Mexico. Almost half of the described 28 species of *Neoleptoneta* are known from

Texas. Because of their minute size and uniform general morphology, characters for separating species are difficult to detect and examine. Looking at the variation in general morphology of larger series from single caves in Texas has convinced me that some of the “diagnostic” characters used by Gertsch (1974) in his revision are not valid. This does not mean that his species are invalid, but rather that these characters upon which he placed “weight” are not that useable. Also, as noted by Brignoli (1977) and myself, this problem is compounded by the fact that Gertsch’s illustrations are not sufficiently detailed. Females are proving to be quite difficult to distinguish by traditional methods and Gertsch based several of his species solely on females. As noted by Joel Ledford (in press), information is there but it must be gathered using specialized techniques, i.e., trypsin digestion, Coddington style slide mounts, 3-D imaging, etc.

The purpose of this contribution is to describe a new species of *Neoleptoneta* from caves at Camp Bullis, which is known by both males and females. Some notes on biology are also provided as well as the first description of the egg-sac for this genus.

## MATERIALS AND METHODS

The depositories for the specimens are: American Museum of Natural History (AMNH); California Academy of Sciences (CAS); Jeffrey Shultz Collection, University of Maryland (JSC); Texas Memorial Museum (TMM); Museum of Texas Tech University (TTU).

Examination of *Neoleptoneta* proved a challenge. The specimens are small, delicate and easily damaged. It is very important to correctly position the pedipalp when viewing it. A slight rotation can make it appear to be quite different. It is best to rotate the pedipalps from side to side while looking for the diagnostic details. The male pedipalps were generally removed and placed in glycerin on a depression slide for viewing. The female genitalia were examined while they were immersed in lactophenol. In some cases the entire animal was soaked in lactophenol to reveal the orientation of the undisturbed spermathecae. On other specimens the genitalia were removed and examined on slides. In such cases, the coverslips over the genitalia are supported so that it would not distort the natural morphology of the genitalia, especially the position of the spermathecae in respect to each other. Care should be used in exposing the entire animals to clearing solutions like lactophenol because the pigment in/around the eyes (a diagnostic character) is quickly destroyed.

## RESULTS AND DISCUSSION

Gertsch (1974) used number and sizes of eyes as an important taxonomic character. But, he was inconsistent in his descriptions and illustrations of Texas *Neoleptoneta*. The eyes of *N. coeca* were described as small, those of *N. concinna* as medium, and *N. uvaldea* as average. Yet all appear the same in his drawings. Checking fresh material of the former two also revealed that they are essentially the same "average size." In an examination of *Neoleptoneta* specimens from various localities in Bexar and adjoining Comal Counties, most specimens have "average sized" eyes. Like *N. concinna*, *N. coeca*, and *N. valverde*, the front row of eyes (posterior lateral eyes + anterior lateral eyes; anterior median eyes missing) is strongly recurved, eyes subequal and contiguous; posterior median eyes contiguous, slightly smaller than eyes in front row, separated from posterior lateral eyes by about 1-1.5 diameters of lateral eye (see Gertsch, 1974: figs. 50, 52, 57). In all of the Bexar and Comal counties specimens examined, except those from Government Canyon Bat Cave (type locality for *N. microps*) and one from the nearby Surprise Sink, the eyes are lightly pigmented and opalescent/reflective with the eyes being narrowly ringed with black. A single female

from Surprise Sink has no pigment in or around the eyes. Possibly the female was damaged during examinations. I drew the female genitalia a few years before I realized that lactophenol could destroy the eye pigment and I did not note whether the entire animal was soaked in this solution. Long term storage in ethanol also removes pigment. Joel Ledford (pers. comm., 2003) also found a lot of intraspecific variation with this character in his study of *Calileptoneta*. Two subsequent expeditions to this cave resulted only in the capture of five adults with pigmented eyes. The four known specimens from Government Canyon Bat Cave all have the eyes slightly reduced in size and the eyes and surrounding areas are unpigmented. One female of the new species described below was missing the right posterior eye, but the left was present and normally pigmented. Preliminary studies do not reveal any differences besides the eyes of *N. microps* and congeneric individuals from other nearby caves. The only known male from Surprise Sink is one with pigment around the eyes and no males are known from Government Canyon Bat Cave. Until a male can be collected from Government Canyon Bat Cave (*N. microps*), it is not possible to determine for certain if this species is the same as the pigmented populations in Surprise Sink and caves further east in Bexar County. As noted above the female genitalia do not differ significantly. These specimens from central and western Bexar County have eyes similar to the species described below but differ noticeably in the morphology of the male pedipalp and cheliceral dentition.

Thus far, the only species of *Neoleptoneta* from Texas with the pedipalp illustrated in any detail is that of *N. paraconcinna* Cokendolpher and Reddell (2001). So many details were not mentioned by Gertsch (1974) that it is difficult to recognize described Texas species without examination of topotypes. A new revision of this genus is needed, especially in the central Texas area where two species are currently listed as federally protected endangered species (Longacre, 2000). The new species is very restricted in distribution, but as long as the conservation efforts at Camp Bullis continue it should remain safe from extinction.

### *Neoleptoneta* Brignoli

**Diagnosis.**—Eyeless or 6-eyed (lacking anterior median eyes). With retrodorsal spur-bearing apophysis on the male palpal tibia; without prolateral lobe on the male palpal tarsus. Legs with patellar, without tibial, integumentary glands; glands elongated to triangular without a longitudinal median ridge, gland pores small and located near edge of gland. From Arizona east to Georgia, U.S.A., and south to Oaxaca, Mexico.

*Neoleptoneta* spp.

**Comments.**—Members of *Neoleptoneta* are known from three caves on Camp Bullis. Those from Up the Creek Cave (south-central Camp Bullis) are described herein as a new species. The single female known from Cross the Creek Cave, (31 March 1995, J. Reddell, M. Reyes, TMM) differs from the new species in the number of cheliceral teeth (seven promarginal teeth) but otherwise appears similar. Up the Creek and Cross the Creek Caves are only slightly over 1.5 miles apart. More material is needed, especially a male, to properly place the Cross the Creek Cave population. The setae on the cephalothorax next to the eyes are broken off so it is not possible to determine if they are straight or curved. A single male known from western Camp Bullis (Constant Sorrow Cave, 6 March 2001, G. Veni, TMM) differs from the new species by having seven promarginal teeth, having the setae next to the posterior median eyes straight (at least the seta on right side was before it was accidentally detached while examining the pedipalps), and by differences in the pedipalps. The male from Constant Sorrow Cave has the tibial spur on an elongated tubercle and the tarsus lacks a retrolateral enlargement or lobe.

*Neoleptoneta bullis*, new species

Figs. 1-9

**Diagnosis.**—Pale cavernicole from northeastern Bexar County caves; eyes present, relatively large, subcontiguous to touching in front row; posterior median eyes separated from anterior lateral eyes by 1-1.5 diameters of eyes; some surrounding cuticle with dark pigment; promargin of chelicerae with eight teeth, retromargin with three teeth; tibia of male pedipalp with retrolateral apophysis bearing a spur and five overlap-

ping flattened setae that are finely pointed; pedipalpal bulb with single retrolateral apophysis ventrally and bluntly rounded embolus; tarsus not curved, with retrolateral enlargement distally; bulb of seminal receptacle medium sized without loop in copulatory duct; first leg of male 5.2 times, of female 4.8 times as long as cephalothorax.

In Gertsch's key (1974) to the species of *Neoleptoneta* from Texas, the new species will almost key to *N. coeca* for males and will not work for females [couplet 5: has legs eight times longer than cephalothorax, but femur I is only 1.4 (should be at least 1.8 to match couplet) times as long as cephalothorax]. *Neoleptoneta bullis* shares with *N. myopica* the presence of 8 promarginal teeth on the chelicerae. These two also share the fact that they are the longest-legged species with pigmented eyes, but this seems to be more of a convergence due to habitat than to close phylogenetic relationship. The male pedipalps are quite dissimilar and suggest that these are not each other's nearest relative. The male pedipalp is most like that of *N. coeca*, but that species differs from *N. bullis* by having the spur somewhat shorter and only slightly enlarged at the base, the seven setae overlapping the spur are little if any different from the other setae on the tibiae (not noticeably flattened or widened).

**Etymology.**—The specific name is a noun in apposition taken from the type locality, Camp Bullis.

**Type Specimens.**—Texas: Bexar County: Camp Bullis: Up the Creek Cave, 30 March 1995, J. Reddell, M. Reyes, 4 female paratypes (TMM); 5 Oct. 1995, J. Reddell, M. Reyes, 1 male, 1 female paratypes (CAS), 1 male, 3 female paratypes (eye pigment of one female cleared with lactophenol; TMM); 1 male, 1 female paratypes (AMNH); 14 Nov. 1995, J. C. Cokendolpher, J. R. Reddell, M. Reyes, 1 female allotype (AMNH), 1 male paratype (TTU); 10 Sept. 1998, J. C. Cokendolpher,



Fig. 1.—Dorsal aspect of female *Neoleptoneta bullis*, new species, from Up the Creek Cave.



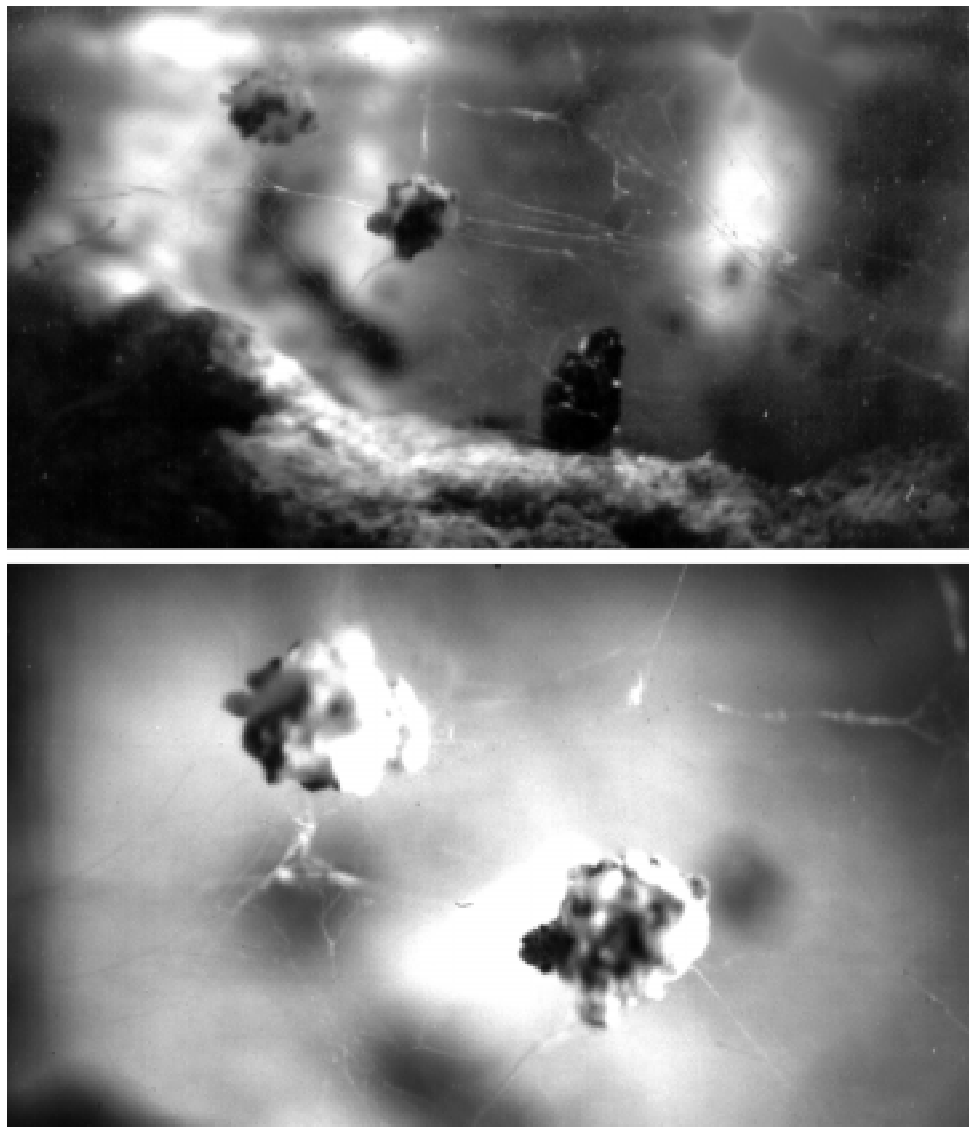
Figs. 2-7.—Male holotype of *Neoleptoneta bullis*, new species, from Up the Creek Cave: 2, eyes and front of cephalothorax; 3, retrolateral view of pedipalp; 4, enlarged retrolateral view of retrolateral spur; 5, enlarged retrolateral view of flattened spines which overlap the retrolateral spur; 6, dorsal view of pedipalpal tibia and tarsus; 7, enlarged retrolateral view of pedipalpal embolus.

J. Krejca, J. R. Reddell, M. Reyes, 1 female paratype (laid 3 egg sacs on or near 24 Sept., preserved 4 Oct. 1998, TTU), 1 male holotype (preserved 4 Oct. 1998, AMNH), 1 male paratype (preserved 4 Oct. 1998, TMM), 1 male paratype (molted in captivity 26 Sept., preserved 4 Oct. 1998, TMM); 16 Jan. 2002, J. Krejca, T. Engelhard, T. Schumann, 1 female paratype (TMM).

**Additional material.**—TEXAS: Bexar Co., Camp Bullis, Up the Creek Cave, 14 Nov. 1995 J. C. Cokendolpher, J. R. Reddell, M. Reyes (preserved in 100% ethanol for DNA study 1996, JSC); 30 March 1995, J. Reddell, M. Reyes, 1 immature (TMM); 5 Oct. 1995, J. Reddell, M. Reyes, 4 immatures (TMM).

**Distribution.**—This species is known with certainty only from a single cave on Camp Bullis. A single female known from a nearby cave possibly belongs to this species but cannot be verified until further material is collected (see under “*Neoleptoneta* spp.” above).

**Description.**—Cephalothorax and appendages dusky yellow to creamy brown, abdomen creamy yellow without markings (Fig. 1). In life, coxae to tibiae of all legs (male and female) and all segments of female pedipalp iridescent. Promargin of chelicerae with 8 teeth, retromargin with three teeth. Four to six (males), 12-16 (females) short setae on anterior edge of cephalothorax; pair of setae lateral to posterior eyes distinctly curved



Figs. 8-9.—Egg sacs of *Neoleptoneta bullis*, new species, from Up the Creek Cave: 8, two egg sacs suspended from center of web; 9, enlarged view of egg sacs showing covering of debris.

distally (more so on males); row of four (males), three (females; 2nd from anterior end missing) setae behind eyes (Fig. 2). Eyes relatively large; anterior row (posterior lateral eyes + anterior lateral eyes: anterior median eyes missing) strongly recurved, subequal in size; posterior median eyes slightly smaller than anterior row eyes, contiguous; anterior lateral eyes separated by less than half diameter of eye, posterior eyes contiguous, separated from posterior laterals by about 1.5 diameter of lateral eye; dark pigment between eyes; some individuals with more or less pigment between posterior eyes than illustrated (Fig. 2). One female missing the right posterior median eye, left eye present, normally pigmented. Series of small semicircular raised areas behind anterior row of eyes (Fig. 2; appearing similar to those illustrated by Platnick, 1994: fig. 1 for *Archoleptoneta*). Leg formula 1423.

Male (holotype): Cephalothorax 0.74 mm long, 0.58 mm wide; abdomen 0.96 mm long, 0.66 mm wide. Femora I-IV lengths (in mm): 1.12, 0.92, 0.76, 1.02; patella + tibia I, II: 1.36, 1.08. Legs relatively long, thin; femur I 7.47 times longer than maximum width; leg I (excluding coxa + trochanter) 3.84 mm long, leg IV 3.44 mm long.

Pedipalp with lyriform sensilla on both lateral and retrolateral sides of femur and patella (Fig. 3); tibia with retrolateral spur on small tibial apophysis; spur about 1/2 length of tarsus; with ridges running most of length of spur, not twisted (Fig. 4); spur overlain by series of five, smooth, sharply pointed, flattened, only slightly twisted setae (Fig. 5); tibia dorsally with three trichobothria (Figs. 3, 6); tarsus with relatively deep transverse groove in apical part, retrolateral side with group of short stout setae distal to groove and very thin, short setae starting at groove and extending basally (Fig. 3), setae of tarsus finely serrated; tarsus with retrolateral enlargement distally; bulb with single smooth apophysis on retrolateral side near ventral border (Fig. 3); embolus wide, bluntly rounded at tip (Fig. 7).

Female (allotype): Cephalothorax 0.68 mm long, 0.52 mm wide; abdomen 0.92 mm long, 0.66 mm wide. Femora I-IV lengths (in mm): 0.96, 0.80, 0.64, 0.94; patella + tibia I, II: 1.16, 0.95. Legs relatively long and thin; femur I 8.0 times longer than maximum width; leg I (excluding coxa + trochanter) 3.26 mm long; leg IV 3.24 mm long.

Genitalia: Seminal receptacles relatively large; bulb directed slightly to strongly posteriorly, covered with many minute pores; spermathecal duct without coil; long thin sclerotized plate (or flattened duct?) attached at junction of the copulatory and spermathecal ducts, posterior edge covered with minute pores.

**Comments.**—From incidental laboratory studies of two females from Up the Creek Cave, it was revealed

that animals which were collected as adults of unknown age could remain alive beyond one year and to carry sperm for an extended period (detailed records not kept, but many months). Unlike other Texas cave spiders (and spiders in general), *N. bullis* lay a single egg per sac. The first female kept captive only produced two eggs on or near 13 May 1996. Another female laid three egg sacs on or near 24 Sept. 1998. The egg sacs are about 0.8-1 mm in diameter and are covered with debris (Figs. 8, 9). The sacs are suspended from near the center of the small web. Unfortunately, data were not obtained on the time intervals and numbers of molts of the immatures but the time in culture from egg to adult female is about a year. A male, female and their young can all live peacefully together in a small container (plastic box 10.5 X 10.5 X 4 cm filled about half full of moist plaster of Paris) in the laboratory. Their webs can be touching but each tends to stay in its own area. The container also housed a few mites, collembola and some fungi growing on small pieces of organic matter. The spiders were never observed to feed, so it is uncertain what they were eating.

Fage (1913) remarked, about European species, that the number of eggs contained in each sac is always very small (2-6 eggs), but that it seemed to decrease with an increase in the degree of troglomorphy of the species. He also noted that as egg numbers decreased the mass of each egg increased, resulting in more robust young leaving the egg. Machado and Ribera (1986) reported observations on captive egg laying in three specimens of a leptonetid species native to caves in Portugal. One female laid a single egg in a finely woven egg sac that was transparent. The other two females covered the sac with sand grains; one female laid two eggs, one laid three eggs per sac. Machado and Ribera (1986) also reported that a female lived in a moist tube without food for nine months.

The 3rd leg metatarsus of both sexes has a transverse row of approximately 8-10 fine setae basoventrally. I am unable to locate mention of this preening comb in the older literature. It is also present on other *Neoleptoneta* from Bexar County as well as *Appaleptoneta* spp. I have seen. Ledford (in press) also reported it from *Calileptoneta* spp. It might be a unique character for the family.

#### ACKNOWLEDGMENTS

This project was funded by the U.S. Army's Camp Bullis. Norman I. Platnick (American Museum of Natural History, New York) and Joel Ledford (California Academy of Sciences, San Francisco) are thanked for their helpful discussions on leptonetids and comments on the manuscript.

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