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Chaetaspis aleyorum, a new species of milliped from
Tumbling Creek Cave, Missouri, with a synopsis
of the cavernicolous species of *Chaetaspis*
(Diplopoda: Polydesmida)

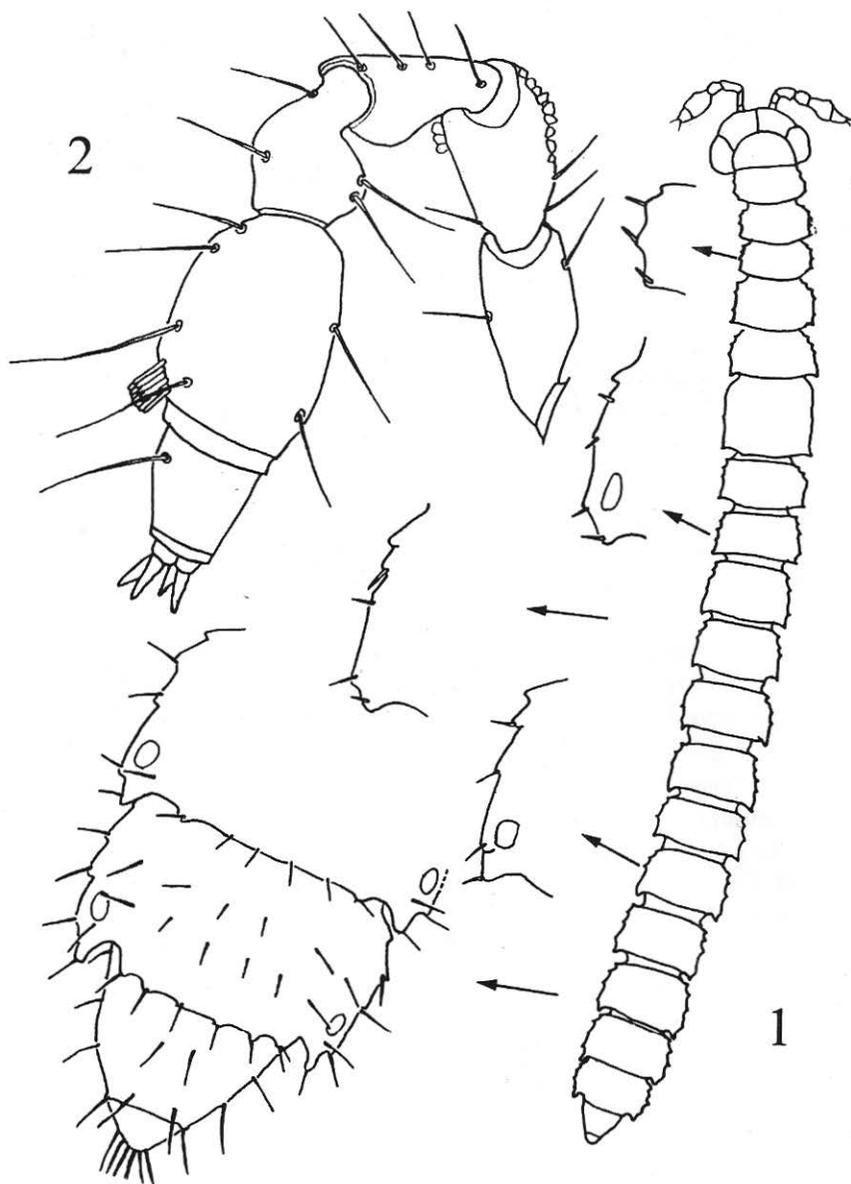
By Julian J. Lewis

ABSTRACT

Chaetaspis aleyorum, n. sp., a troglobitic polydesmid milliped endemic to Tumbling Creek Cave in the Ozark Plateau of southwestern Missouri, is described and illustrated. Comparative illustrations are also provided of the gonopods of three other poorly known troglobites from Kentucky and Tennessee, *C. fragilis* (Loomis), *C. debilis* (Causey) and *C. mollis* (Causey), as well as the more widespread humicolous *C. albus* Bollman. The relationships of these and four other undescribed troglobitic species of *Chaetaspis* in Alabama, Illinois, Arkansas and Oklahoma are also discussed.

A unique polydesmid milliped has long been known from Tumbling Creek Cave, Taney County, Missouri. Examination of the collection of the late Dr. Nell Causey, now deposited in the Florida State Collection of Arthropods (FSCA), revealed that she had studied specimens collected there from 1968-1973, designated types and named the species with reference to its occurrence in the Ozarks. Unfortunately, Causey's paper describing this and several other undescribed species now in the FSCA never became a reality, leaving her designated names and type specimens as meaningless artifacts in the vials. Censusing now indicates that the community inhabiting Tumbling Creek Cave is seriously declining, to the point that the endemic

stygobitic snail *Antrobia culveri* Hubricht has been listed as a federal endangered species. Due to this decline an urgent effort is underway to name undescribed species in the cave to enhance conservation efforts.



Figures 1-2. *Chaetaspis aleyorum* male, Tumbling Creek Cave, Taney Co., Missouri: (1) habitus with selected paranota enlarged, (2) antenna (macrosetae only shown)

Description of the Tumbling Creek Cave *Chaetaspis* was problematic due to the meager descriptions of the established taxa. The type species, the edaphic *Chaetaspis albus* Bollman 1887, was described without illustrations and the verbal description of the gonopods did not embody specific characters. Three troglobitic species were also poorly described and remained of uncertain status: *C. fragilis* (Loomis 1943, from White's Cave in Mammoth Cave National Park, Edmonson Co., Kentucky), *C. mollis* (Causey 1959, from Cumberland Caverns, Warren County, Tennessee), and *C. debilis* (Causey 1959, from Walker Spring Cave, Wayne County, Tennessee). *Chaetaspis ohionis* (Causey 1950, from Ohio) is incorrectly assigned to this genus and may even belong in a different family (Hoffman 1999); it is not considered further herein.

Illustrations of the gonopods of all of the described species of *Chaetaspis* are provided, a combination of new drawings as well as several prepared by Richard L. Hoffman and kindly made available for use herein. In examining the samples in the FSCA and Virginia Museum of Natural History (VMNH), it became apparent that other undescribed species were also known to exist, they are listed here because of their importance in understanding the zoogeography and evolution of the group, as well as their potential conservation value to the caves they inhabit.

The taxonomy used below is that of Hoffman (1999). Clearly the genus *Chaetaspis* needs revision and its family placement remains open to interpretation (Shear, 1969), but these issues lie beyond the scope of the present work.

FAMILY MACROSTERNODESMIDAE

Chaetaspis Bollman

Chaetaspis Bollman, 1887, Entom. Americana, 3: 45. Type species: *Chaetaspis albus* Bollman, 1887, by monotypy.

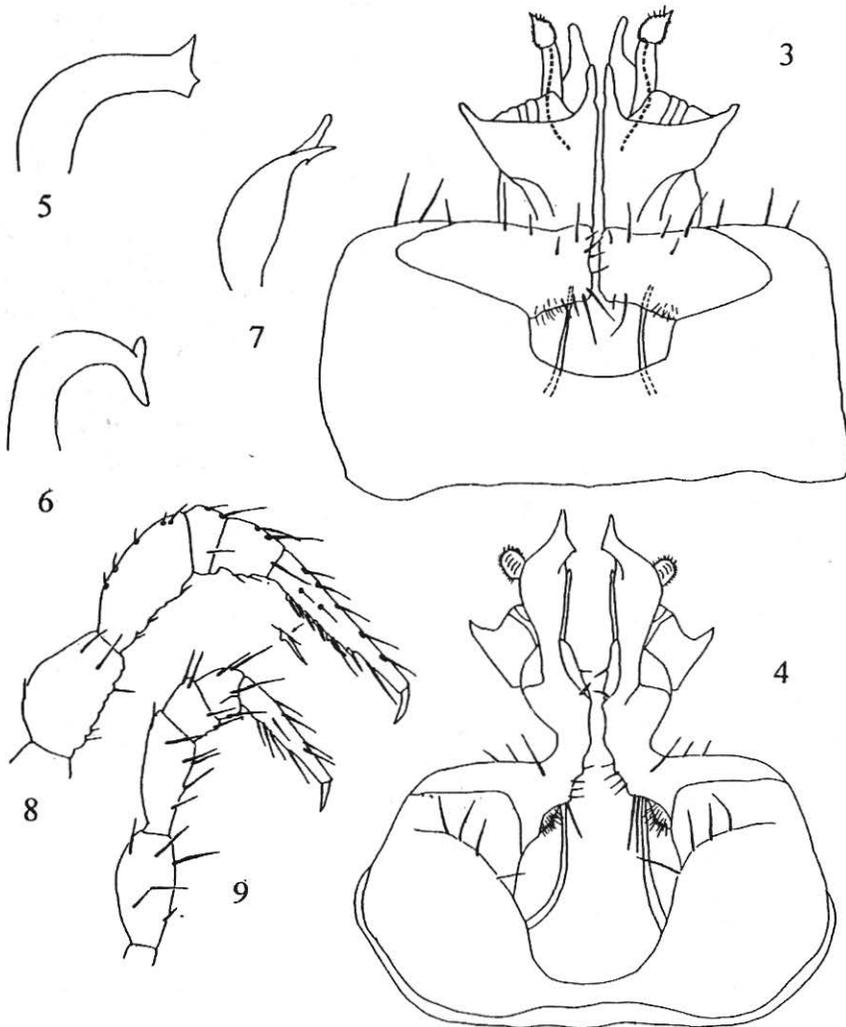
Antriadesmus Loomis, 1943, Bull. Mus. Comp. Zool., 92: 408. Type species: *Antriadesmus fragilis* Loomis, 1943, by original designation.

Chaetaspis aleyorum new species

Figures 1-9

MATERIAL EXAMINED: MISSOURI: Taney Co., Tumbling Creek Cave, 22 September 1968, T. Aley (FSCA); 21 June 1969, T. Aley & D. Walley (FSCA); August 1969, T. Aley (FSCA); 26 May 1973, N. Causey (FSCA); April 2001, C. Aley, T. Aley. A 5 mm male from the collection of April 2001 is designated as the holotype; five males and three females are paratypes, deposited in the Virginia Museum of Natural History, Martinsville. The specimens examined from the Florida State Collection of Arthropods are designated as paratypes and remain in the Gainesville repository.

DESCRIPTION: Length to about 5.5 mm, width about 0.45 mm, unpigmented, white in appearance, body about $12\times$ as long as wide (fig. 1). Head wider than collum, epicranial suture distinct. Antenna with numerous macrosetae (fig. 2), article 6 longest, expanded and clavate, with row of microsensilla along distal margin; articles 2-4 subequal, about $0.75\times$ as long as article 6, article 7 tapering slightly to apical disc, 4 sensory cones present.



Figures 3-9 *Chaetaspis aleyorum*, Tumbling Creek Cave, Taney Co., Missouri: (3) gonopods, posterior, (4) gonopods, anterior, (5) gonopod posterior process, lateral, (6) same, compressed under coverslip, (7) slightly posterior to lateral, (8) leg 6, male, (9) leg 6, female.

Twenty segments, pore formula normal. Collum broadly rounded anteriorly, subequal in width to segment 2, with four transverse rows of setae; segments 3 and 4 slightly smaller than 2 and 5; segment 7 nearly 2× length of preceding segment; metatergites with three rows of setae; lateral margins of paranota slightly dentate, posterior lateral corners of anterior segments rounded, becoming progressively more produced on posterior segments, becoming a distinct toothlike lobe directed posteriad in segments 17-19 (fig. 1). Posterior margin of segments unenhanced in anterior segments except for row of setae along margin, in segments 18-19 with a row of produced, rounded projections directed posteriad and each bearing a seta.

Leg 6 sexually dimorphic (figs. 8-9), thicker in males than females; male with numerous knobs on mesial margin, those of tarsus bearing a spine with a basal tooth.

Gonopods (figs. 3-4), coxae subglobose, concave on ventral surface to receive telopodite in repose, subtriangular sternum present. Prefemora attached laterally to coxae, transverse, setose, extending mesiad, bent abruptly cephalad, cannula prominent. Three prefemoral processes present: (1) posterior process prominent, increasing in width as it curves up, then over the other two processes, then narrowing and terminating in 2 terminal lobes (figs. 3-7); (2) solenomerite slender, cylindrical, sigmoidally curved, distal end with minute denticles and setules; and (3) anterior process expanding distally into a structure of alate appearance, terminating in two fingerlike lobes mesially and laterally.

NAME: This species is named in honor of Catherine and Thomas Aley, owners of Tumbling Creek Cave and the Ozark Underground Laboratory, as a tribute to their long commitment to the conservation of caves and karst. The suggested common name is Aleys' cave milliped.

RELATIONSHIPS: The species of *Chaetaspis* can be divided into three groups based on the structure of the gonopods. In group 1, including *C. aleyorum*, *C. fragilis*, *C. albus* and undescribed species 1 and 2 (see below), the posterior prefemoral process curves over the others, terminating in 2-3 lobes (figs. 5-7, 11, 13). The gonopod configuration of *Chaetaspis aleyorum* is most closely approximated by undescribed species 1 (from Cushman Cave in northern Arkansas), which also has a solenomerite that is distally ornamented with tiny teeth and setules, but is separable based on differences in the anterior prefemoral process. The cavernicolous species of this assemblage occur in the northern part of the Interior Low Plateaus and the Ozark Plateau.

In group 2, comprised of *C. mollis* and undescribed species 4, the posterior prefemoral process (telopodite of Causey 1959, figure 1) is broad, forming a structure that is wider than long, curving laterally to partially enclose the solenomerite and anterior gonopodal process (fig. 14). These species occur associated with the southern Interior Low Plateaus and the adjacent edge of the Cumberland Escarpment.

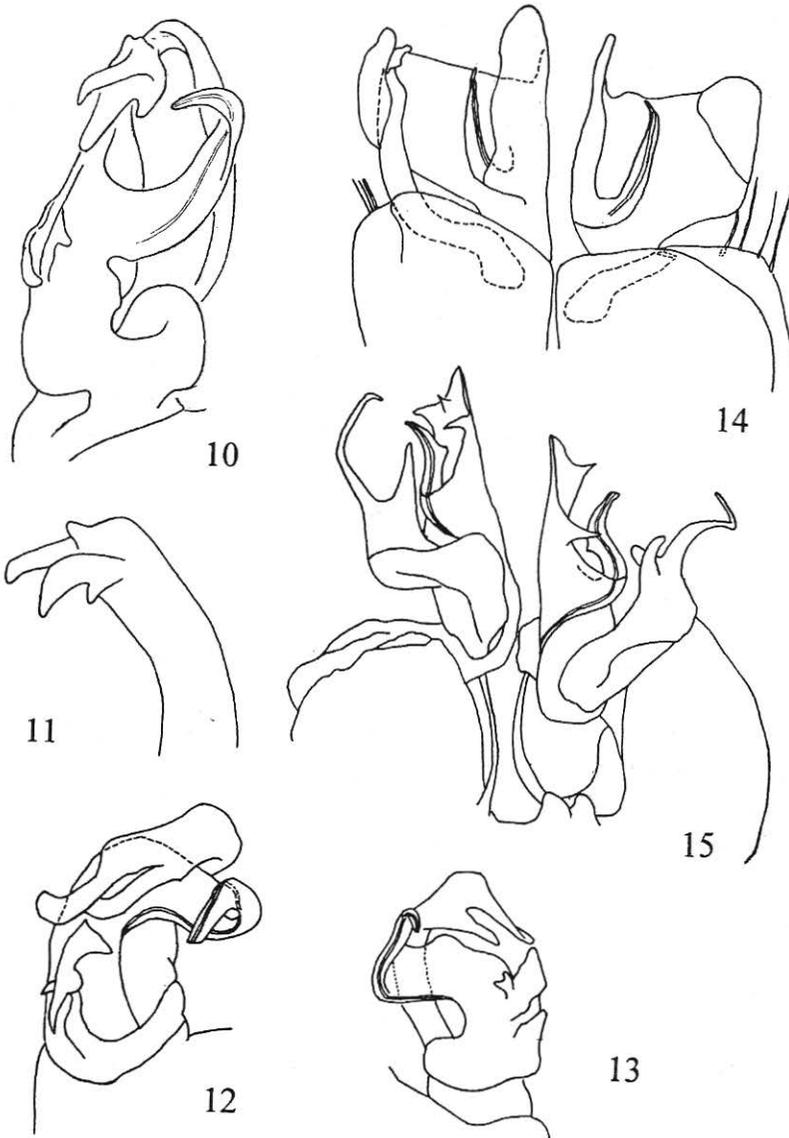


Figure 10. *Chaetaspis albus*, upland woods, Pickett Co., Tennessee, gonopod. Figure 11. *Chaetaspis albus*, Ohio River bluff, 1 mile north Marble Hill, Jefferson Co., Indiana, gonopod posterior process, lateral. Figure 12. *Chaetaspis fragilis*, Mammoth Cave, Edmonson Co., Kentucky, gonopod. Figure 13. *C. fragilis*, White's Cave, Edmonson Co., Kentucky, gonopod, posterior and slightly lateral aspect. Figure 14. *Chaetaspis mollis*, paratype, Cumberland Caverns, Warren Co., Tennessee, gonopods. Figure 15. *Chaetaspis debilis*, holotype, Walker Spring Cave, Wayne Co., Tennessee, gonopod. (Figures 10, 12, 15 from drawings by R. L. Hoffman).

Chaetaspis group 3 contains a single species, *C. debilis*, in which the posterior prefemoral process is longer than wide and does not curve broadly over the solenomerite and anterior process, the latter a complex structure terminating in three prongs of differing lengths (fig. 15). *Chaetaspis debilis* is known from a single locality in Tennessee.

Hoffman (1999) suggested that the species listed here as *Chaetaspis* groups 2 and 3 are not congeneric with *C. albus* and should be placed in separate genera. In my view the stated differences in gonopods as well as the zoogeography of the groups confirm Hoffman's opinion, as a subject for future attention and implementation.

HABITAT & RANGE. *Chaetaspis aleyorum* is an obligate cavernicole known only from Tumbling Creek Cave, where it is usually found associated with bat guano or organic litter. The cave lies in the southwestern Ozark Plateau.

Chaetaspis fragilis (Loomis)

Figures 12-13

Antriadesmus fragilis Loomis, 1943, Bull. Mus. Comp. Zool., 93: 408, fig. 18a,b.

MATERIAL EXAMINED: KENTUCKY: *Edmonson Co.*, Mammoth Cave National Park: unspecified site, 8 April 1956, L.J. Stannard; unspecified site, 25 August 1961, N.B. Causey; White's Cave, 0.5 mile SW Mammoth Cave, 17 March 1957, L. Hubricht (VMNH); same locality, 19 June 1957, C. Krekeler, J. Rittmann; Mammoth Cave, 30 March 1957, T.C. Barr; same locality/collector, 23 March 1960.

HABITAT & RANGE: This species is a troglobite reported only from White's and Mammoth caves in Mammoth Cave National Park, where the milliped is typically found on guano of the cave cricket *Hadenoeus subterraneus* (Barr, 1967).

Chaetaspis mollis (Causey)

Figure 14

Antriadesmus mollis Causey, 1959, Journ. Tennessee Acad. Sci., 34: 230, fig. 1.

MATERIAL EXAMINED: TENNESSEE: *Van Buren Co.*, mudbank adjacent to cave stream in large room, Camps Gulf Cave, Fall Creek Falls State Park, 4 m. E. Spencer 30 August 2002, J. Lewis, S. Rafail, T. Mann, B. Roebuck; Warren Co., Cumberland Caverns, T. C. Barr, paratype male (FSCA).

HABITAT & RANGE: *Chaetaspis mollis* is a troglobite previously known only from the type locality at Cumberland Caverns. The discovery of *C. mollis* in Camps Gulf Cave extends its range about 20 miles to the east. A juvenile *Chaetaspis* taken in Thunder Run Cave (Rumbling Falls Cave System), Van Buren Co. is probably also *C. mollis* (Lewis 2001).

Chaetaspis debilis (Causey)

Figure 15

Antriadesmus debilis Causey, 1959, Journ. Tennessee Acad. Sci., 34: 231, fig. 2.

This species is known only from Walker Spring Cave, Wayne County, Tennessee. No material of this species could be obtained on loan, but the holotype was examined some years ago by Dr. Hoffman and a drawing of the gonopod made at the time was kindly supplied for use here.

Chaetaspis undescribed species 1

MATERIAL EXAMINED: ARKANSAS: *Independence Co.*, Cushman Cave, 5 October 1974, G.L. Harp; same locality, 19 October 1974, V.R. McDaniel (FSCA).

HABITAT & RANGE: Material of this troglobitic species has been examined from a single cave in the Ozarks of northern Arkansas.

Chaetaspis undescribed species 2

MATERIAL EXAMINED: OKLAHOMA: *Murray Co.*, 1400 feet into unspecified cave, 3 July 1959, R.C. Harrel (FSCA).

HABITAT & RANGE: Material of this species has been noted only from the dark zone of an unspecified cave in the western part of the Ozark Springfield Plain.

Chaetaspis undescribed species 3

Antriadesmus undescribed species, Peck & Lewis, 1978: 48.

MATERIAL EXAMINED: ILLINOIS: *Monroe Co.*, Pautler Cave, 3 miles WSW Waterloo, 27 November 1965, S.B. Peck (FSCA); 6 July 1999, J. Lewis, S. Rafail, P. Moss, D. Tecic; Icebox Cave, Camp Vandeventer Boy Scout Camp, 29 May 2000, J. Lewis, S. Rafail.

HABITAT & RANGE. This milliped was identified for Peck & Lewis (1978) by N. B. Causey as an undescribed species. The collection examined contains only females, thus the identity as an undescribed taxon must have been an assumption by Causey based on the locality and cave habitat. Other specimens collected subsequently from Pautler Cave and another downstream part of the same cave system, Icebox Cave, were also females. The Pautler Cave System occurs in an isolated sliver of the Salem Plateau in western Illinois, separated from the rest of the Ozarks by the Mississippi River.

Chaetaspis undescribed species 4

MATERIAL EXAMINED: ALABAMA: *Madison Co.*, Hurricane Cave, 5 miles east of New Market, 25 June 1967, S. Peck (FSCA-labeled by N.B. Causey as *Antriadesmus* n. sp. near *mollis*).

HABITAT & RANGE. This species is known with certainty only from the above locality, but collections in the FSCA from Alabama and Tennessee (mostly unidentified females and juveniles) demonstrate the presence of this or other species of *Chaetaspis* from several other caves in the same region.

Chaetaspis albus Bollman

Figure 10-11

MATERIAL EXAMINED: ALABAMA: *Etowah Co.*, wooded hillside 1.8 m. W. Attalla, 23 February 1961, L. Hubricht (VMNH); ILLINOIS: *Johnson Co.*, Vienna, 25 January 1947, Burks et al. (FSCA); INDIANA: *Jefferson Co.*, Ohio River bluff 1 m. N. Marble Hill, 6 April 1958, L. Hubricht (VMNH); KENTUCKY: *Breckinridge Co.*, 4 m SW High Plains, 5 April 1958, L. Hubricht (VMNH); *Butler Co.*, ravine below Granny's Rockhouse, 3.5 m. SE Welch's Creek, 23 February 1957, L. Hubricht (VMNH); *Christian Co.*, 5 m. N. Chafton, 3 May 1958, L. Hubricht (VMNH); *Edmonson Co.*, Mammoth Cave National Park, ravine near Turnhole Bend, 16 March 1957, L. Hubricht (VMNH); *Fayette Co.*, site unspecified, 6 May 1947, Ritchie & Sanderson (FSCA); *Warren Co.*, ravine below Friendship Spring, 1.4 m. S Alvaton, 23 February 1957, L. Hubricht (VMNH); *Webster Co.*, 1 m. S. Sebree, 3 May 1958, L. Hubricht (VMNH); MISSISSIPPI: *Lowndes Co.*, 4 m. E. Caledonia, 20 February 1965, L. Hubricht (VMNH); *Marshall Co.*, mixed woods, 2 m. E. Slayden, 27 February 1961, L. Hubricht (VMNH); *Tishomingo Co.*, wooded hillside, 5.4 m. SE Iuka, 27 Feb 1961, L. Hubricht (VMNH); TENNESSEE: *Macon Co.*, ravine 4 m. SW Lafayette, 20 April 1958, L. Hubricht (VMNH); *Pickett Co.*, upland woods, 0.8 m. E Static, 2 April 1960; *Sequatchie Co.*, 5.4 m. S. Dunlap, 3 April 1960, L. Hubricht (VMNH); VIRGINIA: *Dickenson Co.*, rhododendron thicket, Breaks Interstate Park, near Haysi, 14 July 1961, L. Hubricht (VMNH).

HABITAT & RANGE: *Chaetaspis albus* is an edaphic species frequently associated with karst terrain. The species is included in this paper since its range overlaps that of *C. aleyorum*. It occurs from the southern Appalachians of Virginia and Tennessee west across northern Alabama and Mississippi to central Arkansas, north to the type-locality at Bloomington, in southcentral Indiana. This is a species of deciduous forests where it occurs in deep soil habitats. Although associated with areas near caves, springs and rockhouses, it has not been found in caves.

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