

***Caecidotea cumberlandensis*, a new species of troglobitic isopod from  
Virginia, with new records of other subterranean *Caecidotea*  
(Crustacea: Isopoda: Asellidae)**

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*Abstract.*—*Caecidotea cumberlandensis* is a subterranean asellid isopod described from two caves in Cumberland Gap National Historic Park in southwestern Virginia. New records of several other subterranean *Caecidotea* are also discussed: *C. incurva*, *C. jordani*, *C. barri*, *C. paurotrigonus* and *C. teresae*. Comparison of the descriptions of *C. paurotrigonus* and *C. dauphina* suggest that these species are conspecific.

In 1976 Dr. John Holsinger told me of a subterranean isopod collected from Cliff Cave in the Cumberland Gap area of southwestern Virginia that had been identified by Fleming (1972a) as *Asellus scrupulosus* (a troglomorphic species with eyes and pigmentation). Dr. Holsinger had related that this identification might be in error since the Cliff Cave specimen was eyeless and unpigmented, and suggested that I look at the specimen if the opportunity presented. Fleming's identification was subsequently rejected entirely by Holsinger & Culver (1988).

In 1997 I visited the Smithsonian Institution to assist in the sad task of curating collections that remained in the office of my mentor and friend, Dr. Thomas E. Bowman, at the time of his death. During this process I came upon the Cliff Cave specimen as well as another vial of isopods from Indian Cave, Lee Co., Virginia. Examination of these specimens proved Dr. Holsinger's suspicion correct, that the Cliff Cave specimens represented a distinct taxon new to science.

Family Asellidae G. O. Sars, 1897

*Caecidotea* Packard, 1871

*Caecidotea cumberlandensis*, new species

Figs. 1–3

*Asellus scrupulosus*.—Fleming, 1972a:  
241.

*Caecidotea* species A.—Holsinger & Culver, 1988: 30–31, 37.

*Material examined.*—Virginia: Lee Co., Indian Cave, David A. Hubbard, Jr., 16 Mar 1993, 5.5 mm male holotype (USNM 291204), 4.5 mm male paratype, 6 female paratypes (USNM 291205); Cliff Cave, Russell M. Norton, 24 Nov 1966, 5.8 mm male paratype (USNM 291206), including a glass slide labelled “8-K *A. scrupulosus*” and signed “LEF” (L. E. Fleming) containing the first and second pleopods.

All specimens remain in the National Museum of Natural History, Smithsonian Institution.

*Description.*—Eyeless, unpigmented, longest male 5.8 mm, female 4.7 mm; body slender, about 5.2× as long as wide. Head about 1.5× as wide as long, anterior margin concave, postmandibular lobes moderately produced. Pleotelson about 1.4× as long as wide, sides subparallel, caudomedial lobe moderately produced.

Mandibles with 4-cusped incisors and lacinia mobilis, palp with rows of plumose setae on distal segments. Maxilla 1 with 5 robust plumose setae on inner lobe, 13 spines on outer lobe. Antenna 1 reaching to about mid-point of last segment of antenna 2 peduncle, flagellum of 6–7 segments, esthetes present on last 4 segments. Antenna

2, last segment of peduncle about  $1.5\times$  length of preceding segment, flagellum of holotype with 40 segments.

Male pereopod 1, propus  $2.6\times$  as long as wide, palmar margin with 2 large spines, processes absent; female pereopod  $1.2\times$  as long as wide, palmar margin similar to male. Pereopods 2-7 similar, with moderate setation, sexual dimorphism of pereopod 4 for grasping negligible, carpus about  $2.2\times$  as long as wide.

Male pleopod 1, protopod about  $0.5$  length of exopod, with 2-3 retinacula; exopod about  $1.8\times$  as long as wide; lateral margin slightly concave, distolateral margin setae not plumose. Pleopod 2 exopod proximal segment with 2 plumose setae, distal segment with 3-5 plumose setae along margin. Endopod with rounded basal apophysis; tip with 2 distinct processes extending subparallel to one another and approximately perpendicular to the axis of the endopod: (1) lateral process subterminal, slender, tapering slightly, and (2) cannula beak-shaped. Pleopods 3-5, endopods present, but unremarkable. Pleopod 3 exopod distal margin with 3-4 short, non-plumose setae. Pleopod 4 exopod, proximal setae absent; sutures indistinct, suggestive of 2 barely discernible, unconnected false sutures. Pleopod 5 exopod with faint transverse sutures. Uropods of male about  $0.5\times$  length of pleotelson, female similar.

*Etymology.*—The name refers to the Cumberland Gap area in which the species occurs. The suggested vernacular name is the Cumberland Gap cave isopod.

*Range.*—This species is known only from Cliff and Indian caves in the Cumberland Gap National Historic Park, Lee Co., Virginia. Descriptions of the caves were presented by Holsinger (1975). The caves are about 500 meters apart, occur in the same rock formation (Greenbrier Limestone), and are probably disconnected parts of the large Cudjos-Cumberland Saltpeter Cave system (Holsinger, in litt.). The amphipod *Stygobromus Cumberlandus* occurs with *C. Cumberlandensis* in Cliff Cave

(Holsinger 1978). The range of this amphipod also includes Scott and Wise counties in Virginia, suggesting the possibility of a wider range for *C. Cumberlandensis*.

*Relationships.*—*Caecidotea Cumberlandensis* most closely resembles two other subterranean species, *C. bicrenata* (northern Alabama to southern Illinois; Lewis 1982a) and *C. richardsonae* (Tennessee and Virginia; Steeves 1963). These three species have in common a male pleopod 2 endopod tip with a terminal beak-shaped cannula and subterminal lateral process, both extending approximately perpendicular to the axis of the endopod. These species are most easily separated from one another by the shape of the lateral process, which in *C. Cumberlandensis* is thin and tapered distally, in *C. bicrenata* thicker and cylindrical, and in *C. richardsonae* finger-shaped and overlapped by the cannula (the tip processes shown by Lewis & Bowman 1977 for *C. richardsonae* had been spread by pressure from a coverslip; the appearance depicted by Steeves 1963 is more typical). Differences and similarities of key structures in these three species are summarized in Table 1.

*Caecidotea jordani* (Eberly, 1966)

*Material examined.*—Indiana: Crawford Co., seep spring flowing from bank of Blue River at former site of Rothrock Mill, Wyandotte, Julian J. Lewis, Victor M. Lewis, James J. Lewis, 30 Jul 1998, 5 males, 12 females; same locality, Julian J. Lewis, Salisa T. Rafail, 1 Aug 1998, 4 males, 5 females.

*Range.*—The only previously known population (a spring under Jordan Hall on the campus of Indiana University, Bloomington) was extirpated by termiticides. The site reported above is a parafluvial habitat where water seeps from a gravel bed that extends under the floodplain of the Blue River.

*Caecidotea incurva* (Steeves & Holsinger, 1968)

*Material examined.*—Tennessee: Blount Co., Whiteoak Blowhole Cave, W. Reeves,

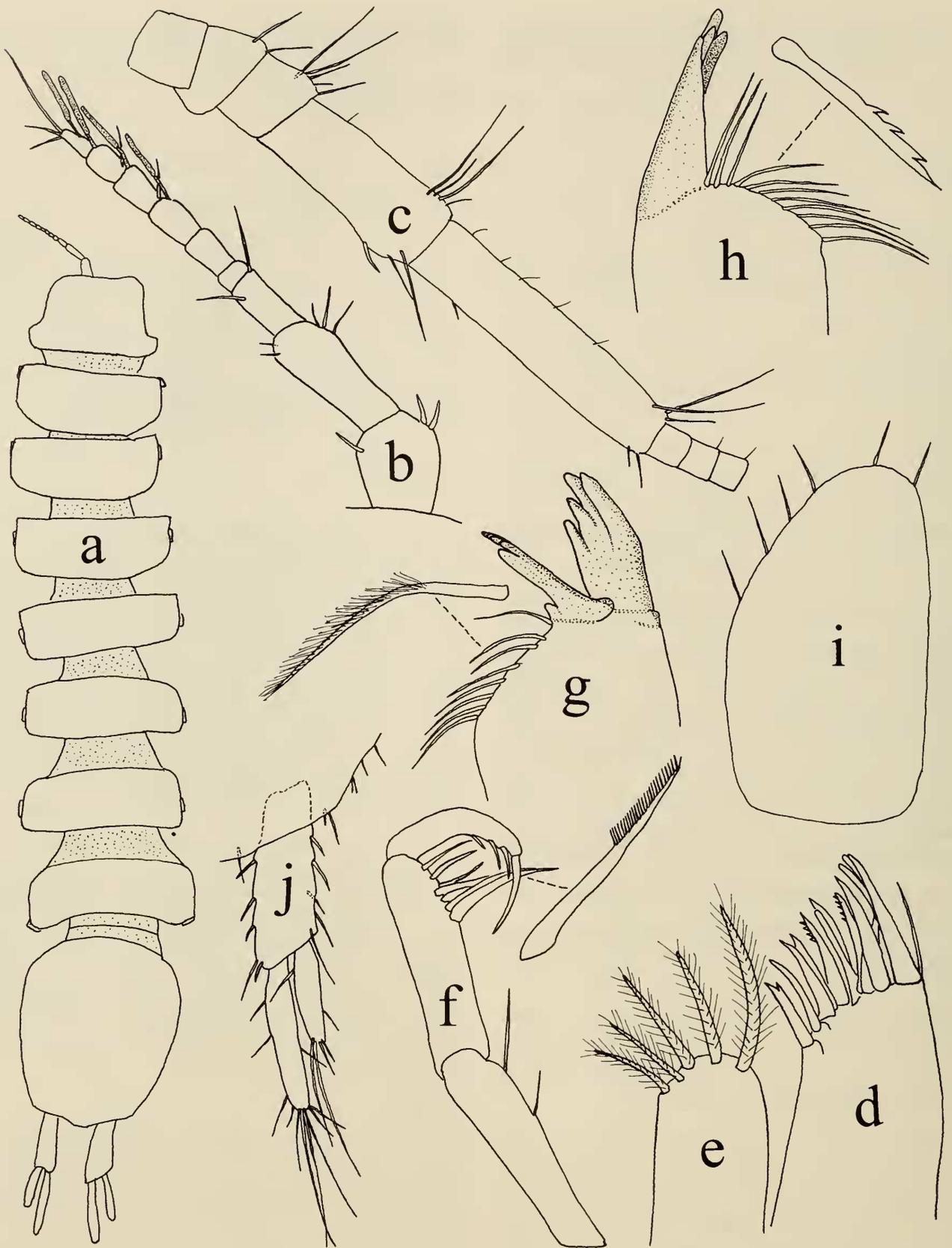


Fig. 1. *Caecidotea cumberlandensis*, 4.5 mm paratype male, Indian Cave, Lee Co., Virginia (a-b, d-h, j); 5.5 mm holotype male, same locality (c); 4.7 mm paratype female, same locality, (i): (a) habitus, (b) antenna 1, (c) antenna 2, (d) maxilla 1, outer lobe, (e) maxilla 1, inner lobe, (f) mandibular palp, (g) left mandible, incisor and lacinia mobilis, (h) right mandible, incisor, (i) pleopod 2, (j) uropod.

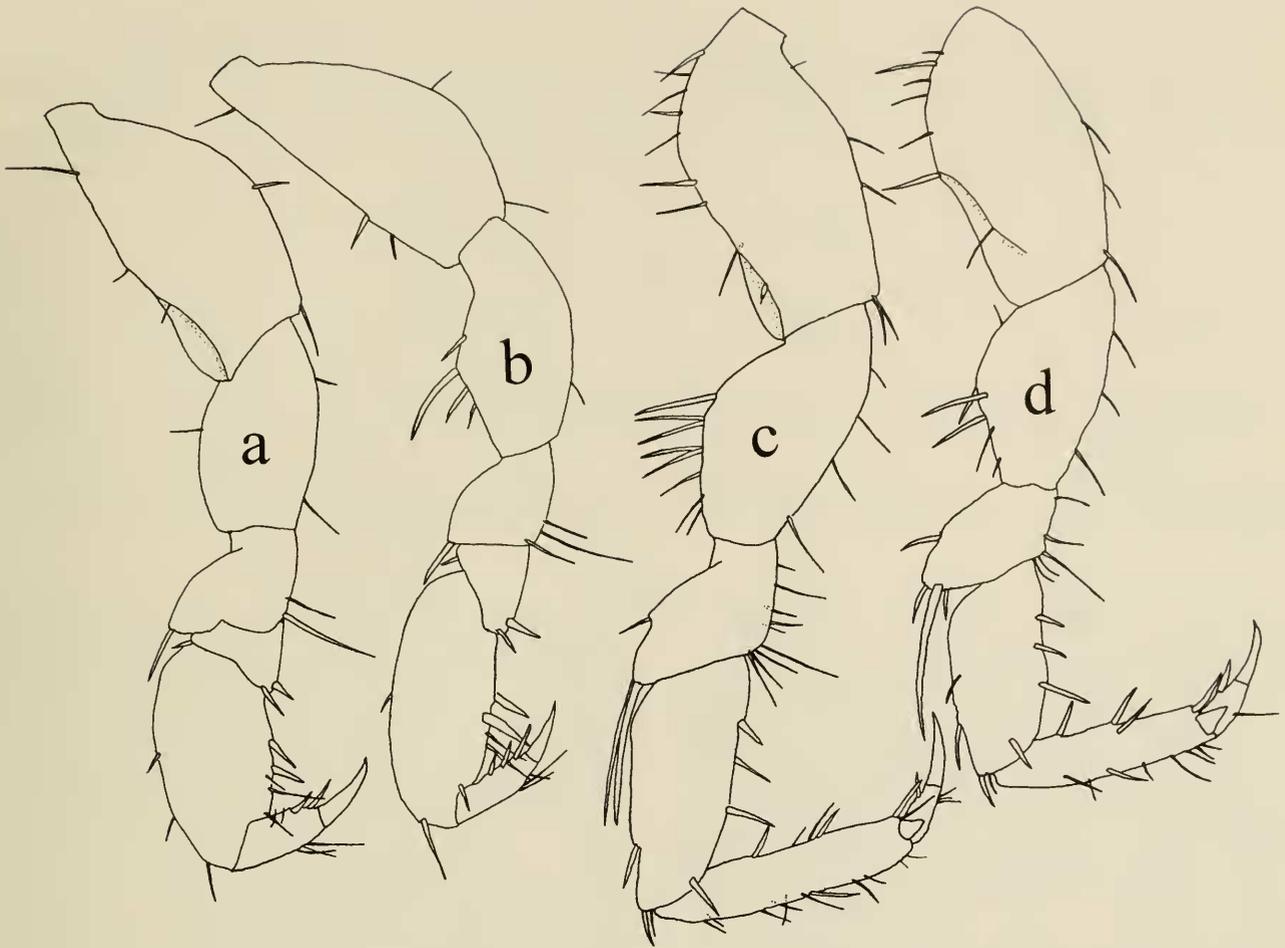


Fig. 2. *Caecidotea cumberlandensis*, 4.7 mm female paratype, Indian Cave, Lee Co., Virginia, (a, d); 5.5 mm male holotype, same locality, (b–c): (a) pereopod 1, (b) same, (c) pereopod 4, (d) same.

12 Aug 1999, 2 males, 2 females; Rich Mountain Blowhole Cave, W. Reeves, 25 Aug 1999, 2 males, 1 female; Virginia: Wythe Co., Early's Cave, D. A. Hubbard, Jr., 7 Jul 1997, 6 males, 4 females; Campbell Cave, D. A. Hubbard, Jr., 14 Sep 1998, 1 male, 1 female; Lone Ash Cave #2, D. A. Hubbard, Jr., 3 Nov 1997, 4 males, 13 females; Mockley Cave, D. A. Hubbard, Jr., 29 Mar 1999, 1 male, 1 female.

*Range*.—This species was incompletely described, but the endopod of the male second pleopod is so distinct in appearance (Steeves & Holsinger 1968) that a fairly certain identification can be made. Holsinger & Culver (1988) reported this species in Virginia from McMullin Cave, Smyth Co., and Groseclose Cave Number 1, Wythe Co. Other unpublished Virginia records identified and provided by J. R. Holsinger (in litt.) are Deep Spring and Bowles

Spring caves, Wythe Co., and Dolingers Cave, Washington Co.

*Caecidotea paurotirgonus* (Fleming, 1972b)

*Material examined*.—Louisiana: St. Mary Parish, holes dug in moist area at forest edge beside road, just outside entrance to parish park at Burn's Point, at end of state highway 317, coll. D.W.D., 23 Aug 1981, 1 male, 1 fragment, 9 females.

*Range*.—This groundwater species was previously known from a single male described by Fleming (1972b) from a ditch in southwestern Mississippi. The new locality is the first report of a subterranean asellid from Louisiana. Identification of *C. paurotirgonus* is obscured by Fleming's description. Based on a single 16.7 mm male, the description provided drawings of key

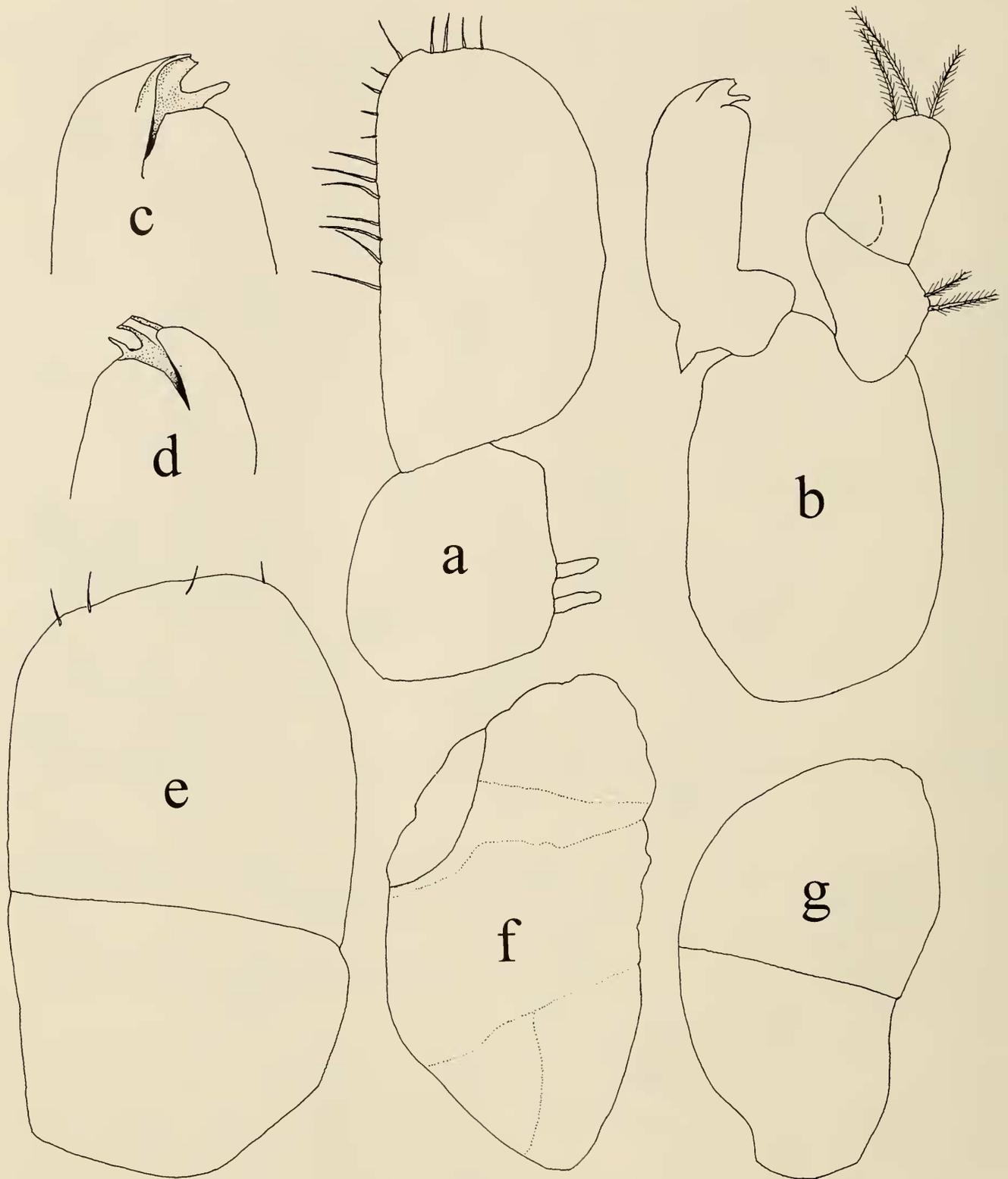


Fig. 3. *Caecidotea cumberlandensis*, 4.5 mm paratype male, Indian Cave, Lee Co., Virginia (a-c, e-g); 5.8 mm male, Cliff Cave, Lee Co., Virginia (d): (a) pleopod 1, (b) pleopod 2, (c) same, endopod tip, (d) same, (e) pleopod 3 exopod, (f) pleopod 4 exopod, (g) pleopod 5 exopod.

structures, but the quality of the drawings and the interpretation of the structures were both questionable. Modlin (1986) on the other hand provided a detailed description of *Caecidotea dauphina* based on a 7.5 mm male. Unfortunately, three of the four struc-

tures figured by Fleming for *C. paurotrigonus* bear a strong resemblance to that of *C. dauphina*: (1) pereopod 1 propods of very similar dimensions, margin in *C. dauphina* with basal spine, medial and distal processes, identical in *C. paurotrigonus* ex-

Table 1.—Comparison of selected structures of male *C. cumberlandensis*, *C. bicrenata* and *C. richardsonae* useful for separating the species.

	<i>C. cumberlandensis</i>	<i>C. bicrenata</i>	<i>C. richardsonae</i>
Pereopod 1 propod			
palmar margin processes	absent	present	absent
Pleopod 1			
distolateral lobe	absent	absent	present
Pleopod 2 exopod	3–5 setae	12–15 setae	12–15 setae
Pleopod 2 endopod			
lateral process	thin, tapered distally	cylindrical, not tapered	long digitiform
Proportion of uropod			
length to pleotelson	0.5× length	1.5–2.0× length	1.5–2.0× length

cept the spine is replaced by a process (as typical of more mature specimens); (2) pleopod 1 with essentially identical shapes, setation patterns and quantity of retinacula; (2) pleopod 2 endopod tips with short apical cannula directed mediad, and short, unremarkable knob-like lateral process. I suspect that *C. dauphina* represents a well described juvenile of the poorly described, but conspecific *C. paurotrigonus*. Unravelling this will require redescription of *C. paurotrigonus* and perhaps more male specimens for comparison from Mississippi and Alabama.

#### *Caecidotea barri* (Steeves, 1965)

*Material examined*.—Kentucky: Woodford Co., small spring 0.6 mile E. Clifton, in side valley above waterfall, elevation about 670 feet, Julian J. Lewis, Victor M. Lewis, James J. Lewis, 19 Feb 1995, 3 males, 4 females.

*Range*.—This species was previously known only from the type-locality, Clifton Cave, Woodford Co., Kentucky (Steeves 1965), which was bulldozed shut by highway workers. The new locality is across the valley from Clifton Cave.

#### *Caecidotea teresae* Lewis, 1982b

*Material examined*.—Indiana: Floyd Co., well on Grant Line Road, Julian J. Lewis, 26 Apr 1995, 1 male, 1 female.

*Range*. This species was apparently extirpated by termiticides at the two previously known localities on the campus of Indiana University Southeast, New Albany. The well from which the new specimens were taken is found in a pasture across Grant Line Road from the I.U.S. campus. According to the owner, the well was hand dug at the end of the 19th century and was 21 feet deep, with 8 feet in soil and the bottom 13 feet through New Albany Shale.

#### Acknowledgments

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### Literature Cited

- Eberly, W. R. 1966. A new troglobitic isopod (Asellidae) from southern Indiana.—*Proceedings of the Indiana Academy of Science* 75:286–288.
- Fleming, L. E. 1972a. The evolution of the eastern North American isopods of the genus *Asellus* (Crustacea: Asellidae).—*International Journal of Speleology* 4:221–256.
- . 1972b. Four new species of troglobitic asellids (Crustacea: Isopoda) from the United States.—*Proceedings of the Biological Society of Washington* 84:489–499.
- Holsinger, J. R. 1975. Descriptions of Virginia Caves.—*Virginia Division of Mineral Resources, Bulletin* 85, 450 pp.
- . 1978. Systematics of the subterranean amphipod genus *Stygobromus* (Crangonyctidae), Part II: Species of the eastern United States.—*Smithsonian Contributions to Zoology* 266:1–144.
- , & D. C. Culver. 1988. The invertebrate cave fauna of Virginia and a part of eastern Tennessee: Zoogeography and ecology.—*Brimleyana* 14:1–162.
- Lewis, J. J. 1982a. Systematics of the troglobitic *Caecidotea* (Crustacea: Isopoda: Asellidae) of the southern Interior Low Plateaus.—*Brimleyana* 8:65–74.
- . 1982b. A diagnosis of the Hobbsi Group, with descriptions of *Caecidotea teresae*, new species, and *C. macropoda* Chase and Blair (Crustacea: Isopoda: Asellidae).—*Proceedings of the Biological Society of Washington* 95:338–346.
- , & T. E. Bowman. 1977. *Caecidotea carolinensis*, n. sp., the first subterranean water slater from North Carolina (Crustacea: Isopoda: Asellidae).—*Proceedings of the Biological Society of Washington* 90:968–974.
- Modlin, R. F. 1986. *Caecidotea dauphina*, a new subterranean isopod from a barrier island in the northern Gulf of Mexico (Crustacea: Isopoda: Asellidae).—*Proceedings of the Biological Society of Washington* 99:316–322.
- Steeves, H. R., III. 1963. The troglobitic asellids of the United States: The *Stygius* Group.—*American Midland Naturalist* 69:470–481.
- . 1965. Two new species of troglobitic asellids from the United States.—*American Midland Naturalist* 73:81–84.
- , & J. R. Holsinger. 1968. Biology of three new species of troglobitic asellids from Tennessee.—*American Midland Naturalist* 80:75–83.