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# Annotated Checklist of the Macroscopic Troglobites of Virginia With Notes on Their Geographic Distribution[1]

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ABSTRACT—Extensive field work in recent years has facilitated the publication of a checklist of Virginia's troglobitic species. A large number of pertinent range extensions remain to be worked out, however, and in addition, several new species probably remain to be discovered. Forty-one troglobitic species are presently recognized from Virginia, including planarians (2), amphipods (4), isopods (3), millipeds (9), collembolans (4), beetles (10), pseudoscorpions (4), and spiders (5). At least fifteen more species are known but have yet to be described in the literature.

The isolation of certain species in caves and genetic changes within cave-dwelling animal populations are believed to be causative factors in troglobitic speciation. Many present-day cave species have probably evolved from surface forms already partially adapted for a subterranean existence. Certain cavernicolous groups like the anophthalmid beetles, pseudotremid millipeds, and cave pseudoscorpions are restricted to very small geographic areas and in some cases, only one cave system. Other cavernicolous groups like linyphiid spiders and various species of collembola are not restricted to isolated areas, but their range extends over a wide geographic region. With the exception of spiders and collembolans, aquatic troglobites seem to be more widely dispersed than terrestrial troglobites. The limestone region of Virginia which was remote from Pleistocene glaciation contains more than three times as many troglobitic species as the limestone area in Pennsylvania which was close to Pleistocene glaciation.

The first attempt to present a systematic checklist of all the known macroscopic troglobites of the United States was by Nicholas (1960a). Previous to this, Nicholas had published preliminary lists of troglobites for the states of Missouri (1960b) and Pennsylvania (1960c). One year later, Warren (1961) published a checklist of the obligative cavernicoles of Florida. Recently, the need was felt for a similar treatment of this subject in Virginia, and the author began to compile data for such a presentation. The extensive collecting carried on by T. C. Barr, Jr. in 1958 and more recently by members of the Biological Survey of Virginia Caves has provided considerable information on range extension relative to many of the little-known troglobitic species of this state. Unfortunately, most of the undescribed material obtained during this period remains to be worked out and could not be included in the formal list. In addition to the concentrated collecting efforts mentioned above, earlier workers had already added appreciably to the knowledge of Virginia cave fauna prior to 1950.

Both Nicholas (1960a) and Warren (1961) used the term obligative cavernicole in reference to those animals which are more or less completely adapted to the hypogean environment, thus permanent cave dwellers. Warren considered the two terms obligative cavernicole and troglobite to be synonymous.

[1]Contribution Number Eight from the Biological Survey of Virginia Caves, a research project of the National Speleological Society.

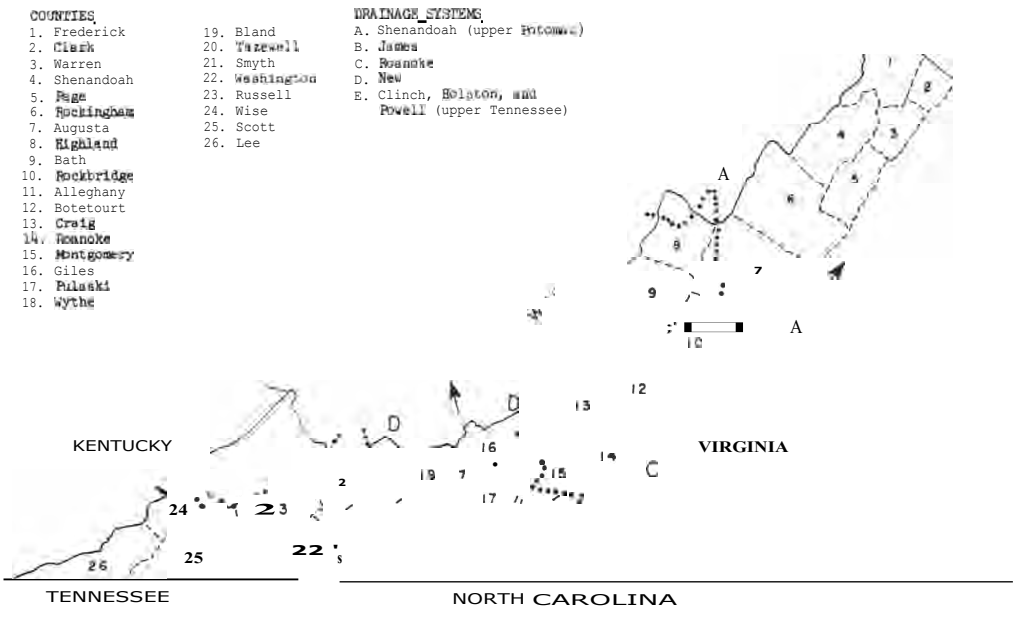


Figure I
Map of the caverniferous limestone areas in the Appalachian region of Virginia. Dots indicate boundaries of major drainage basins; arrows indicate general direction of flow in drainage basins.

The author has adopted the term troglobite, and finds the following definition convenient: members of a species which exist only in the cavern environment and complete their life cycles in absolute darkness (troglobites are never found on the surface unless they are washed out of a cave by flooding). Through modification and regressive evolution these organisms usually possess characteristic features such as loss of sight (their eyes being rudimentary or lost), slender bodies, loss of toleration to such stimuli as light and heat, longer appendages, and some or complete loss of integumentary pigmentation.

As would be expected, strict limitation of species to this definition has lead to the exclusion from the checklist of several cavernicoles which, because of their almost complete modification to subterranean life, might otherwise have been included.[2] Three examples immediately come to mind: Nesticus pallidus Emerton, Tomocerus bidentatus Folsom, and Phalangodes flavescens (Cope). All three forms, when found in caves, undoubtedly complete their life cycles there. The occurrence, however, of these same species in epigean surroundings provided the necessary criterion for their exclusion.

The greatest shortcoming to presenting a checklist at this time was the impossibility of including many of the recently acquired but as yet undescribed troglobites that are known to exist. In many instances, whole complexes remain to be studied and worked out. In other cases further collecting is needed before definite ranges can be accurately plotted, The author has personally collected at least five and possibly six new forms which remain to be described. In addition, ten or more other new forms, collected by other workers in earlier times, are also in need of description. Several groups need a modern review

2Because of its reported existence in a grave, Pseudosinella argen[illegible] Folsom might be an exception to this rule. The author, however, feels that a grave (while possibly endogeic) could in most instances be regarded as possessing all of the factors that ordinarily constitute a hypogean habitat. It might also be added that all other records for this species are strictly from caves.

before meaningful names and data can be published. The present situation, while regretable, is not surprising considering the tedious task and enormous amount of time required to complete some of these necessary jobs. In view of this, the author feels justified at this time to mention some of the undescribed forms and give the reader an idea of their present status.

Blind, unpigmented snails (fam. Bithyniidae) have been obtained from five cave streams and three springs in Virginia. Seven of these forms have been tentatively assigned to the genus Fontigens. The other one is an undescribed species of the genus Lartetia, a relict form collected only from travertine pools in Skyline Caverns, near Front Royal, Warren County. Fontigens is known from the following localities: Witheros Cave, Bath County; Paint Bank Spring, Craig County; Ogdens Cave and Ogdens Spring, Frederick County; Tawneys Cave, Giles County; George Hinkin Spring, Shenandoah County; and Skyline Caverns, Warren County. All specimens have been deposited with J. P. E. Morrison, United States National Museum.

As a result of work by Causey (1960) many of the problems regarding the taxonomy and geographic distribution of the zygonopid millipeds have been clarified. Another problem, similar to the one which once plagued the zygonopids, remains to be resolved for the genus Pseudotremia. Major problems concern the variation and speciation of this group, especially in the southwestern portion of the state. In addition, a totally new species of pseudotremid was recently obtained in Porters Cave, Bath County, and will be described by N. B. Causey in the near future.

Two new species of isopods of completely different families have been discovered since 1958. One, a cirolonid, was collected from Madison Cave, Augusta County by T. C. Barr, Jr. and possibly belongs to the otherwise European genus, Sphaeromides. In 1960 the author collected a new species of asellid isopod from three caves in southwestern Virginia. With subsequent collecting, Asellus sp. is now known from five localities, all within the upper Tennessee River drainage system. Specific locations for this species are Crouses and Unthanks Caves, Lee County; Rock House and Seven Springs Caves, Russell County; and Parsons Cave, Wise County. H. R. Steeves, III, (pers. comm.) now has a description of this isopod in press. Several undetermined and possibly new species of terrestrial isopods (fam. Trichoniscidae) have been collected from Lowmoor Quarry Cave, Alleghany County and Bucks Hill Cave, Rockbridge County.

Many additional specimens of troglobitic amphipods, some of which may be new forms, have been discovered since the informative work of Hubricht (1943). When further work has been accomplished, new range extensions can undoubtedly be mapped. All amphipod material is at present in the care of the author.

A great deal of important work on the troglobitic trechines (essentially of the genus Pseudanophthalmus) has been accomplished in recent years by T. C. Barr, Jr. Many new species have been obtained in west central and southwestern Virginia, and a monographic treatment on this interesting group of cavernicoles is expected in the near future.

Little has been reported regarding the range or habits of the troglobitic pesudoscorpions. Malcolm and Chamberlain (1961) have recently described two new species from caves in southwestern Virginia, but owing to the secretive nature and comparative rarity of these organisms, few specimens have ever been obtained. To date, however, every cave (with one possible exception) in which pseudoscorpions were collected have yielded what will probably turn out to be discrete new species. These include *Apochthonius* sp. and Pseudozaona sp. from Cave Run Pit Cave, Bath County; Mundochthonius sp. from Helsleys Cave, Shenandoah County; a form similar to the European genus *Pseudoblothrus* from Maddens Cave, Shenandoah County; and Kleptochthonius (Chamberlinochthonius) sp. from Porters Cave, Bath County.

Continued field work will doubtlessly add considerable knowledge to the ranges of many of the known troglobites of the state. It also stands to reason that a few more new species will be uncovered from time to time. This is especially true of the organisms with-

in the groups that consist of pseudoscorpions, pseudotremid millipeds, and carabid and pselaphid beetles. In order to keep pace with the inevitable addition of pertinent data, the author plans to publish supplementary checklist as warranted.

### GEOGRAPHIC DISTRIBUTION

It is beyond the scope of this paper to make more than a few brief comments relative to the many problems regarding the distribution of troglobitic species in the Appalachians of Virginia. Intense speciation, which is so characteristic of cavernicolous groups like the trechine beetles, pseudotremid millipeds, and cave pseudoscorpions, is undoubtedly a dramatic result of geographic isolation in caves. Of the eight presently recognized species of the carabid genus Pseudanophthalmus from Virginia, one is known from a single cave while the remaining seven are restricted to but a few caves closely related to each other by their geographic proximity. Four of these anophthalmid species are represented by subspecies (see checklist), and with the exception of P. *hubbardi* limicola, P. p. *potomaca,* and P. p. pusio, each subspecies is known from only one cave. In Clover Hollow and Tawneys Caves, Giles County, P. gracilis and P. punctatus are sympatric, but each species occupies its own niche within the cave habitat.

Three of the six described troglobitic species of the milliped genus Pseudotremia are, to date, known only from their type locality. The other three species, while not restricted to one cave, are however, found only in caves that exist in continuous or contiguous beds of limestone within a relatively small area. Three species of the completely troglobitic genus Zygonopus have been described from Virginia, but all three fail to demonstrate the high degree of endemism that is so characteristic of the cave species belonging to the genus Pseudotremia. In Virginia species ranges seem roughly to follow drainage basin outlines. Close scrutiny, however, reveals that this is not a general rule, especially in the neighboring state of West Virginia. The tendency to overlap into an adjacent drainage basin is noted in Augusta County, Virginia, where the range of Zygonopus *weyeriensis* extends into the upper Potomac drainage and comes to within approximately ten miles of the range of Zygonopus whitei. A similar situation is found in Pendleton County, West Virginia, where the range of Z. weyeriensis also extends into the upper Potomac drainage basin and comes to within approximately five miles of the range of Z. whitei. Comparable situations are also noted in Roanoke County, Virginia, and Greenbrier County, West Virginia.

Information regarding cave pseudoscorpions is rare, but of the four recognized species each has so far been collected from only a single cave. In contrast, other cavernicolous groups like spiders (linyphiids and several nesticids) and collembolans (three species of the family Entomobryidae) contain extremely vagile species which, in several cases, are distributed in caves throughout the limestone areas of the entire southeastern United States. If isolation is a definitive factor here, then it has not yet shown itself in any appreciable amount of speciation. This seemingly unusual situation might be explained if consideration is given to the distribution pattern of ancestors, to the length of time that these species have actually been isolated within a cave, and to their susceptibility to genetic drift. If it is assumed that isolation has occurred in fairly recent times, then it might also be assumed that divergence has not had enough time to advance to the point where phenotypic differences can be properly recognized.

In some respects, aquatic troglobites present different zoogeographic distribution problems than do terrestrial troglobites, and must be studied from a slightly different viewpoint. As Barr (1960a) has pointed out, the dispersal of aquatic troglobites by underground routes is probably more easily facilitated than terrestrial troglobites since subterranean watercourses are probably less readily closed by silting, erosion, and flowstone deposition than drier courses. This hypothesis may well account for the wide range of the cave isopod, Asellus pricei, which occurs in caves in the Susquehanna River drainage system in Pennsylvania southwestward to the James River drainage system in Virginia and possibly as far south as

the New River drainage basin. None of the divides separating these drainage systems are more than a few miles wide and all consist of limestone strata. If, as Piper (1932) has observed, surface and subterranean erosion can proceed at different rates then it might be predicted that there are one or more underground waterway connections between these aforementioned basins. If these hypothetical connections exist, they could greatly favor gene exchange between populations living in caves situated along basin headwaters. It should be pointed out, however, that a totally different species of Asellus exists in caves located along the upper Tennessee River drainage in southwestern Virginia, and, according to H. R. Steeves, III (pers. comm.), this undescribed species is more closely related morphologically to certain Tennessee and Kentucky forms that it is to the pricei group in northern and west central Virginia.

Cavernicolous amphipods, with the exception of the widely distributed troglophile, Gammarus minus Say, seem to be restricted to specific drainage systems. Stygobromus spinosus appears to be the most isolated of these species and is know so far from only two locations in the upper Potomac drainage basin in the Shenandoah Valley.

In comparison, aquatic cave planarians present so many range anomalies that an explanation for their dispersal by the usual means, i.e., intra-drainage or inter-drainage, is impossible at the present time. Sphalloplana virginiana is restricted to only one cave in Rockbridge County, while Phagocata subterranea is widely but sparsely distributed over an area covering the states of Indiana, Pennsylvania, and Virginia.

It is interesting to compare the number of troglobitic species of the Paleozoic limestone terrane in Virginia to those in the glaciated or glacial-affected areas of Pennsylvania. Twelve true cave forms have been discovered in Pennsylvania in contrast to forty-one which have been described from Virginia. It is perhaps significant, that of these twelve species, all are aquatic organisms except for one milliped and two spiders. Five of the species found in Pennsylvania caves are also found in Virginia caves and three of these are aquatic. Doubtless the inundation of caves by glacial floodwaters and the correspondingly lower temperatures must have had a devastating effect on many of the cave forms which were living in Pennsylvania caves during the Pleistocene. It is conceivable, however, that many of the aquatic troglobites of that period were able to escape extinction by virtue of the fact that they would not have been vulnerable to drowning or drastically affected by the supposed temperature drop of underground water. Hazelton and Glennie (1953) indicated that the European cave amphipod, Niphargus, might have escaped annihilation during the Pleistocene glaciation of the British Isles if the ground water below the ice remained at a temperature above 4°C. (39°F.). An alternate theory might assume that all troglobites in Pennsylvania were exterminated by one or more of the lethal effects of glaciation, and that most of the aquatic forms present in Pennsylvania today have migrated there through subterranean watercourses from unglaciated areas since the late Pleistocene. Still a third hypothesis might argue that all troglobitic forms present in Pennsylvania have evolved since glacial recession. The third postulate, however, fails to account for the comparatively large number of aquatic species in contrast to the relatively small number of terrestrial ones. If the latter hypothesis is accepted, then it must be assumed that any of the same species living in Virginia (e.g., Asellus pricei or Phagocata *subterranea*) have also evolved in the interval of 10,000 to 15,000 years since the last glacial period. That troglobitic evolution could have taken place in this comparatively short period of time is not necessarily ruled out, if one takes into consideration the fact that many ancestors of currently existing troglobites were probably already preadapted for cavern dwelling and that small isolated populations might be very prone to the accidental fixing of mutations.

One of the most tantalizing zoogeographic problems yet encountered involves two relict troglobitic species only recently discovered in the Shenandoah Valley. As already pointed out, a troglobitic snail, Lartetila sp., known in this country only from Skyline Caverns,

has its closest affinities with a European cave form found in several caves in the Rhine River Valley. Similarly, a cirolanid isopod from Madison Cave seems to be much closer related to a European species, Stiieromides raymondi Dollfus (known only from a single cave in France), than to a previously known North American species, Cirolanides texensis Benedict, known from several caves in Texas. Such phenomena are probably the result of several complex, interrelated factors and are almost certain to have zoological as well as geological implications. It is not uncommon to find like genera on both sides of the Atlantic, but, to find two such closely related forms as those indicated above, in remotely isolated caves, separated by an insurmountable geological barrier, is unique.

## CHECKLIST

In the following checklist, specific cave localities have been listed as part of the range of a species in Virginia. Where the troglobite has no record outside of the state, specific localities are cited under the General Range category. Cave location data have been made consistent with information in the files of the Virginia Cave Survey. Caves listed as specific localities but not consistent with records of the Virginia Cave Survey are noted with an asterisk. Where caves have been known by more than one name the currently accepted one is listed first with the former name in parentheses.

The author is grateful to the following for their aid in identifying specimens and their helpful comments regarding the taxa included: Dr. Thomas C. Barr, Jr., Carabidae; Dr. Nell B. Causey, Chordeumida; Dr. Kenneth A. Christiansen and Dr. David L. Wray, Collembola; Dr. Willis J. Gertsch, Araneae; Dr. Libbie H. Hyman, Turbellaria; Dr. David R. Malcolm and Dr. William B. Muchmore. Chelonethida; Mr. Harrison R. Stevens, III, Asellidae. The author is also indebted to Dr. Horton H. Hobbs, Jr., Brother G. Nicholas, F. S. C., and Mr. John E. Cooper for their helpful suggestions in the preparation of the manuscript. The latter is an investigator in the Biological Survey of Virginia Caves, and has contributed to the field work upon which this report is based. Mr. Lyle G. Conrad has also assisted in field work.

## PLATYHELMINTHES

### TURBELLARIA

### TRICLADIDA

Kenkiidae

Sphalloplana virginiana Hyman

Sphalloplana virginiana Hyman, 1945. Am. Midl. Nat., 34:477.
Type locality—Showalters Cave, 1 mile south of Lexington, Rockbridge, Co., Virginia.
General range—Known only from type locality.
Comments—Small population observed in small, muddy-bottomed pool several hundred feet from entrance. Cave is subject to flooding and type pool dries up during summer months. Habitat also with a wealth of organic matter and contains other organisms, including isopods, collembolans, and salamander larvae.

Planariidae

Phagocata subterranea Hyman

Phagocata subterranea Hyman, 1937. Trans. Am. Microscop. Soc., 56:474.
Type locality—Donaldsons Cave, 4 miles east of Mitchell, Lawrence Co., Indiana.
General range—Caves of Lawrence and Monroe Cos., Indiana; Goss Cave, Mifflin Co., Pennsylvania (L. H. Hyman, pers. comm.) ; and Russell Co., Virginia.
Virginia localities—Known only from Rock House (Banners Corner) Cave, Russell County.
Comments—In Rock House Cave a large population lives in several rimstone pools which are highly contaminated with septic tank leakage from above. The population exists in close association with annelid worms, isopods, and salamanders.

## ARTHROPODA

### CRUSTACEA

#### AMPHIPODA

Gammaridae

Crangonyx antennatus Packard

Crangonyx antennatus Packard, 1881. Am. Nat., 15:880.
Type locality—Nickajack Cave, Shellmound, Marion Co., Tennessee.
General range—Caves in Alabama, Tennessee, and Virginia.
Virginia localities—Known only from Cudjos Cave, Lee Co.
Comments—Collected from a stream in Cudjos Cave (Hubricht, 1943).

Stygobromus mackini Hubricht

Stygobromus mackini Hubricht, 1943. Am. Midl. Nat., 29:695.
Type locality—Sikes Cave,* 4.5 miles north of Lebanon, Russell Co., Virginia.
General range—Indian Cave, Grainger Co., Tennessee; and caves in Russell and Tazewell Cos., Virginia.
Virginia localities—Type locality and Chimney Rock (Chimney) Cave, Tazewell Co.

Stygobromus spinosus (Hubricht and Mackin)

Cragonyx spinosus Hubricht and Mackin, 1940. Am. Midl. Nat., 23:203
Stygobromus spinosus (Hubricht and Mackin) Hubricht, 1943. Am. Midl. Nat., 29:697.
Type locality—A spring near Hawksbill Mountain, Skyline Drive, Madison Co., Virginia.
General range—Type locality and Luray Caverns, Page Co.
Comments—Hubricht (1943) reported 100 female specimens from drip pools in Luray Caverns.

Synpleonia *pizzinii* Shoemaker

Synpleonia pizzinii Shoemaker, 1938. Proc. Biol. Soc. Wash., 51:137.
Type locality—Wetzel's Spring, Grover Archbold Park, just west of Georgetown, Washington D. C.
General range—Springs in Washington, D. C. and southern Pennsylvania, and caves and springs in northern Virginia.
Virginia localities—Spring, Fairfax Co.; Massanutten Caverns, Rockingham Co.; Skyline Caverns, Warren Co.
Comments—Collected from cave streams and pools and from springs.

#### ISOPODA

Asellidae

Asellus pricei (Levi)

Caecidotea pricei Levi, 1949. Notulae Nat., no. 220:2.
Asellus pricei (Levi) Mackin, 1959. In Ward and Whipple's Fresh Water Biology: 876.
Type locality—Refton Cave, Lancaster Co., Pennsylvania.
General range—Caves in Pennsylvania and northern and west central Virginia.
Virginia localities—Barterbrook Springs Cave, Augusta Co.; Ogdens Cave, Frederick Co.; Will Mauck Cave, Page Co.; Billy Williams, Showalters, Tolleys Caves and Graham Spring, Rockbridge Co.; Endless and Massanutten (spring in front of cave) Caverns, Rockingham Co. This species has also been reported from Better Forgotten and Butler Caves, Bath Co.; Eagle Rock Cave No. 2, Botetourt Co.; and Tawneys Cave, Giles Co., but these records are unconfirmed at the present time.
Comments—Usually found in small numbers in quiet pools but sometimes under rocks in streams. This species has been observed to feed on dead frogs and toads. Asellids (but not A. pricei) have been found to eat cave planarians in Rock House Cave, Russell Co. It should be noted that on several occasions in the past this species was erroneously determined as Caecidotea stygia Packard in Virginia as well as in Pennsylvania.

Trichoniscidae

*Caucasonethis* henroti (Vandel)

Amerigoniscus henroti Vandel, 1950. Arch. Zool. exp. Gen., 87:191.
Caucasonethis henroti (Vandel) Vandel, 1953. Pacific Sc., 7:175.
Type locality—Gilleys Cave, Pennington Gap, Lee Co., Virginia.
General range—Known only from type locality.
Comments—According to T. C. Barr, Jr. (pers. comm.) , this species lives on wet, rotting wood near the entrance to Gilleys Cave.

*Miktoniscus* racovitzai Vandel

Miktoniscus racovitzai Vandel, 1950. Arch. Zool. exp. Gen., 87:197.
Type locality—Luray Caverns, Luray, Page Co., Virginia.
General range—Known only from type locality.

DIPLOPODA

CHORDEUMIDA

Conotylidae

Zygonopus packardi Causey

Zygonopus packardi Causey, 1960. J. New York Entomol. Soc., 68:77.
Type locality—Pattons Cave, Monroe Co., West Virginia.
General range—Caves in Bland, Botetourt, Giles, and Roanoke Cos., Virginia; and Greenbrier, Mercer, and Monroe Cos., West Virginia.
Virginia localities—Hamilton and Newberry-Bane Caves, Bland Co.; Perry Saltpeter Cave, Botetourt Co.; Clover Hollow, Starnes, Straleys, and Tawneys Caves and Giant Caverns, Giles Co., Dixie Caverns, Roanoke Co.
Comments—Usually found in small numbers around decaying wood and leaf litter, or on moist clay banks. Collected from wet stalactites in Dixie Caverns.

Zygonopus weyeriensis Causey

Zygonopus whitei Ryder, 1881 (in part) . Proc. U. S. Nat. Mus., 3:527.
Zygonopus weyeriensis Causey, 1960. J. New York Entomol. Soc., 68:75.
Type locality—Grand Caverns (Weyers Cave) , near Grottoes, Augusta Co., Virginia.
General range—Caves in Augusta, Bath, and Rockbridge Co., Virginia; and Greenbrier, Pendleton, and Pocahontas Cos., West Virginia.
Virginia localities—Type locality and Madison Cave, Augusta Co.; Boundless, Butler, Porters, and Starr Chapel Caves, Bath Co.; Billy Williams Cave, Rockbridge Co.
Comments—Habits are similar to Zygonopus packardi (discussed above) .

Zygonopus whitei, Ryder

Zygonopus whitei Ryder, 1881. Proc. U. S. Nat. Mus., 3:527.
Type locality—Luray Caverns, Luray, Page Co., Virginia.
General range—Caves in Augusta, Page, Rockingham, and Shenandoah Cos., Virginia; and Pendleton Co., West Virginia.
Virginia localities—Glade Cave, Augusta Co.; type locality and Ruffners Cave, Page Co.; Endless Caverns and Stephens Cave, Rockingham Co.; Maddens Cave and Shenandoah Caverns, Shenandoah Co.
Comments—Habits are similar to other zygonopids. Specimens of this species were collected under raccoon feces in Glade Cave and on rocks barely submerged in a stream in Endless Caverns.

Cleidogonidae

Pseudotremia cavernarum Cope

Pseudotremia cavernarum Cope, 1869. Proc. Am. Philos. Soc., 11:179.
Type locality—Erharts Cave, 5 miles east of Christiansburg, Montgomery Co., Virginia.
General range—Known only from type locality.
Comments—In most instances, troglobitic pseudotremids are found crawling on damp clay

or mud banks. In Erharts Cave, P. *cavernarum* is very abundant on rotting wood at the bottom of the entrance slope (T. C. Barr, Jr., pers. comm.).
In Porters Cave, Bath Co., two specimens *(Pseudotremia* sp.) were collected from the decaying carcass of a turtle.

*Pseudotremia hobbsi* Hoffman

Pseudotremia hobbsi Hoffman, 1950. J. Wash. Acad. Sci., 40:90.
Type locality—Chestnut Ridge Cave,* 2.5 miles northwest of Clifton Forge, Alleghany Co., Virginia.
General range—Caves in the upper James River drainage system in Alleghany and Bath Cos., Virginia, and McClungs Cave, Greenbrier Co., West Virginia.
Virginia localities—Hoffman (1950) reports this species from 11 caves in Alleghany and Bath Cos., but unfortunately, these records are not presently available. One additional record is known—Second Dam Cave, Alleghany Co.

*Pseudotremia nodosa* Loomis

Pseudotremia nodosa Loomis, 1939. Bull. Mus. Comp. Zool., 86:175.
Type locality—English Cave, near Harrowgate, Claiborne Co., Tennessee.
General range—Caves in Claiborne and Anderson Cos., Tennessee, and Lee Co., Virginia.
Virginia localities—Crouses Cave and possibly Gilleys and Jones (Ewing) Saltpeter Caves, Lee Co. Note: A larger series of material is needed before accurate determinations can be made on the pseudotremids of Lee Co.

*Pseudotremia sublevis* Loomis

Pseudotremia sublevis Loomis, 1944. Psyche, 51:67.
Type locality—Tawneys Cave, near Newport, Giles Co., Virginia.
General range—Type locality, Big Stony,* Clover Hollow, and Spruce Run Caves, Giles Co., Virginia.
Virginia localities—There is a good possibility that this species has been collected in caves other than those listed under general range, but data on these locations are not presently available.
Comments—Cope (1869) reported *Pseudotremia cavernarum* from Big Stony and Spruce Run Caves, Giles Co., in addition to Erharts Cave, Montgomery Co. Hoffman (1958) explored these Giles County caves for millipeds and reached the conclusion that they were inhabited by *Pseudotremia sublevis* and not P. *cavernarum* as originally reported by Cope. As a result, the type locality and range of P. *cavernarum* was restricted to Erhart's Cave (see checklist, above).

*Pseudotremia tuberculata* Loomis

Pseudotremia tuberculata Loomis, 1938. Bull. Mus. Comp. Zool., 86:171.
Type locality—Cassel (Cassel Farm) Cave, Burkes Garden, Tazewell Co., Virginia.
General range—Known only from type locality.
Comments—Abundant on raccoon feces in type locality.

*Pseudotremia valga* Loomis

Pseudotremia valga Loomis, 1943. Bull. Mus. Comp. Zool., 92:377.
Type locality—Cudjos (King Solomons) Cave, Cumberland Gap, Lee Co., Virginia.
General range—Known only from type locality.
Virginia localities—See note on P. *nodosa.*

INSECTA

COLLEMBOLA

• Entomobryidae

*Pseudosinella argentea* Folsom

*Pseudosinella argentea* Folsom
Pseudosinella argentea Folsom, 1902. Psyche. 9:366.
Type locality—A grave in Washington, D. C.

General range—Caves in Arkansas, Georgia, Kentucky, Missouri, Tennessee, Virginia, and a grave in Washington, D. C.
Virginia localities—Known only from Madison Cave, Augusta Co.

Pseudosinella orba Christiansen

Pseudosinella orba Christiansen, 1960. Psyche. 67:20.
Type locality—Morrill Cave, Sullivan Co., Tennessee.
General range—Single localities in Tennessee and Virginia.
Virginia localities—Known only from Hamilton Cave, Bland Co.

Sinella hoffmani Wray

Sinella hoffmani Wray, 1952. Bull. Broklyn Entomol. Soc., 47:95.
Type locality—Lowmoor Quarry Cave, near Clifton Forge, Alleghany Co., Virginia.
General range—Caves in Bath, Botetourt, Rockbridge, and Tazewell Cos., Virginia; and Monroe, Pendleton, and Pocahontas Cos., West Virginia.
Virginia localities—Type locality, Alleghany Co.; Boundless, Breathing, Butler, Crossroads, Porters, Starr Chapel, and Witheros Caves, Bath Co.; Perry Saltpeter Cave, Botetourt Co.; Buck Hill and Doll House Caves, Rockbridge Co.; Stonleys (Divides) Cave, Tazewell Co.
Comments—This species is sometimes very plentiful on decaying organic debris and occasionally on moist clay banks. Several specimens were collected from the surface of a small pool in Lowmoor Quarry and Stonleys Caves.

Sminthuridae

Arrhopalites ferrugineus (Packard)
Smynthurus ferrugineus (Packard), 1888. Mem. Nat. Acad. Sci., 4:67.
Arrhopalites ferrugineus (Packard) Christiansen, 1960. Am. Midl. Nat., 64:40.
Type locality—Endless Caverns (New Market Cave) , 4 miles south of New Market, Rockingham Co., Virginia.
General range—Type locality and Grand Caverns, Augusta Co., Virginia.

COLEOPTERA

Carabidae

*Aphanotrechus* virginicus Barr

Aphanotrechus virginicus Barr, 1960. Coleopterists' Bull., 14:65.
Type locality—Hugh Young Cave, 0.5 mile southeast of Maiden Spring, Tazewell Co., Virginia.
General range—Known only from type locality.
Comments—This form is known from a single female collected on a rock above the cave stream (Barr, 1960b) .

Pseudanophthalmus gracilis Valentine

Pseudanophthalmus gracilis Valentine, 1932. J. Elisha Mitchell Sci. Soc., 47:253.
Type locality—Tawneys Cave, near Newport, Giles Co., Virginia.
General range—Type locality and Clover Hollow Cave, Giles Co., Virginia.
Comments—The anophthalmids are usually found near cave streams or pools and frequently under rocks or organic material.

Pseudanophthalmus hirsutus hirsutus Valentine

Pseudanophthalmus hirsutus hirsutus Valentine, 1932. J. Elisha Mitchell Sci. Soc., 47:252.
Type locality—Cudjos (King Solomons) Cave, Cumberland Gap, Lee Co., Virginia.
General range—Known only from type locality.

Pseudanophthalmus hirsutus delicatus Valentine

Pseudanophthalmus hirsutus delicatus Valentine, 1932. J. Elisha Mitchell Sci Soc., 47:270.
Type locality—Gilleys Cave, Pennington Gap, Lee Co., Virginia.
General range—Known only from type locality.

*Pseudanophthalmus hubbardi hubbardi* (Barber)

Anophthalmus hubbardi Barber, 1928. J. Wash. Acad. Sci., 18:196.
Pseudanophthalmus hubbardi (Barber) Jeannel, 1928. L'Abeille, 35:130.
Pseudanophthalmus hubbardi hubbardi (Barber) Jeannel, 1931. Arch. Zool. ex. Gen., 71:450.
Type locality—Luray Caverns, Luray, Page Co., Virginia.
General range—Known only from type locality.

*Pseudanophthalmus hubbardi avernus* Valentine

Pseudanophthalmus hubbardi avernus Valentine, 1945. Trans. Conn. Acad. Arts and Sci., 36:648.
Type locality—Endless Caverns, 4 miles south of New Market, Rockingham Co., Virginia.
General range—Known only from type locality.

*Pseudanophthalmus hubbardi limicola* Jeannel

Pseudanophthalmus hubbardi limicola Jeannel, 1931. Arch. Zool. exp. Gen., 71:450.
Type locality—Maddens Cave, 1.5 miles northwest of New Market Station, Shenandoah Co., Virginia.
General range—Type locality, Shenandoah Caverns and Shenandoah Wild Cave, Shenandoah Co., Virginia.

*Pseudanophthalmus hubbardi parvicollis* Jeannel

Pseudanophthalmus hubbardi parvicollis Jeannel, 1931. Arch. Zool. exp. Gen., 71:450.
Type locality—Battlefield Crystal Cave, 2 miles northeast of Strasburg, Shenandoah Co., Virginia.
General range—Known only from type locality.

*Pseudanophthalmus hubrichti* Valentine

Pseudanophthalmus hubrichti Valentine, 1948. Geol. Surv. Alabama, Mus. Pap. no. 27:13.
Type locality—Dougherty's Cave, 3 miles northwest of Lebanon, Russell Co., Virginia.
General range—Type locality and Rock House (Banners Corner) Cave, Russell Co., Virginia.

*Pseudanophtahnus petrunkevitchi* Valentine, 1945.

Pseudanophthalmus petrunkevitchi Valentine, 1945. Trans. Conn. Acad. Arts and Sci., 36:652.
Type locality—Skyline Caverns, 2 miles southwest of Front Royal, Warren Co., Virginia.
General range—Type locality and Woods Cave, Page Co., Virginia.

*Pseudanophthalmus potomaca potomaca* (Valentine)

Pseudanophthalmus potomaca Valentine, 1932. J. Elisha Mitchell Sci. Soc., 47:262.
Pseudanophthalmus hubbardi potomaca Valentine, 1945. Trans. Conn. Acad. Arts and Sci., 36:651.
Pseudanophthalmus potomaca potomaca (Valentine) Jeannel, 1949. Notes Biospeol, fasc. 4. Publ. Mus. Nat. Hist. Paris, no. 12:63.
Type locality—Kenny Simmons Cave, Pendleton Co., West Virginia.
General range—Single localities in Virginia and West Virginia.
Virginia localities—Known only from Van Devanters Cave, Highland Co.

*Pseudanophthalmus punctatus* Valentine

Pseudanophthalmus pusio var. punctatus Valentine, 1931. J. Elisha Mitchell Sci. Soc., 46:250.
Pseudanophthalmus punctatus Valentine, 1932. J. Elisha Mitchell Sci. Soc., 47:266.
Type locality—Tawneys Cave, near Newport, Giles Co., Virginia.
General range—Type locality, Clover Hollow and Spruce Run Caves, Giles Co., Virginia.

Pseudanophthalmus pusio pusio (Horn)

Pseudanophthalmus pusio Horn, 1868. Trans. Am. Entomol. Soc., 2:124.
Pseudanophthalmus pusio pusio (Horn) Valentine, 1932. J. Elisha Mitchell Sci. Soc., 47:268.
Type locality—Erharts Cave, 5 miles east of Christiansburg, Montgomery Co., Virginia.
General range—Type locality, Agnew and Thorn Hill Caves, Montgomery Co., Virginia.

Pseudanophthalmus pusio bathycola Valentine

Pseudanophthalmus pusio bathycola Valentine, 1932. J. Elish Mitchell Sci. Soc., 47:268.
Type locality—Aunt Nellies Cave, 3 miles southeast of Blacksburg, Montgomery Co., Virginia.
General range—Known only from type locality.

Pselaphidae

Arianops (Arispeleops) jeanneli Park
Arianops (Arispeleops) jeanneli Park, 1956. J. Tenn. Acad. Sci., 31:85.
Type locality—Gilleys Cave, Pennington Gap, Lee Co., Virginia.
General range—Known only from type locality.
Comments—Cavernicolous pselaphids are usually found in damp areas near organic material, close to cave entrances. Only one specimen of this species is known.

ARACHNIDA

CHELONETHIDA

Chthoniidae

Apochthonius coecus (Packard)

Chthonius coecus Packard, 1884. Am. Nat., 18:203.
Apochthonius coecus (Packard) Chamberlin and Malcolm, 1960. Am. Midl. Nat., 64:111.
Type locality—Grand Caverns (Weyers Cave) , near Grottoes, Augusta Co., Virginia.
General range—Known only from type locality.

Kleptochthonius (Chamberlinochthonius) gertschi Malcolm and Chamberlin

Kleptochthonius (Chamberlinochthonius) gertschi Malcomb and Chamberlin, 1961. Am. Mus. Novitates, no. 2063:17.
Type locality—Gilleys Cave, Pennington Gap, Lee Co., Virginia.
General range—Known only from type locality.

Kleptochthonius (Chamberlinochthonius) lutzi Malcolm and Chamberlin

Kleptochthonius (Chamberlinochthonius) lutzi Malcolm and Chamberlin, 1961. Am. Mus. Novitates, no. 2063:19.
Type locality—Cudjos Cave, Cumberland Gap, Lee Co., Virginia.
General range—Known only from type locality.

Syarinidae

Chitrella cavicola (Packard)
Obisium cavicola Packard, 1884. Am. Nat., 18:201.
Chitrella cavicola (Packard) Chamberlin and Malcolm, 1960. Am. Midl. Nat., 64:113.
Type locality—Endless Caverns (New Market Cave) , 4 miles south of New Market, Rockingham Co., Virginia.
General range—Known only from type locality.

ARANEAE

Linyphiidae

Bathyphantes weyeri (Emerton)

Linyphia weyeri Emerton, 1875. Am. Nat., 9:279.
Bathyphantes weyeri (Emerton) Barr, 1960. Am. Midl. Nat., 64:5.
Type locality—Grand caverns (Weyers Cave) , near Grottoes, Augusta Co., Virginia.
General range—Virginia and Pennsylvania west to Kentucky and Wisconsin.
Virginia localities—Known only from type locality.

Phanetta subterranea (Emerton)

Linyphia subterranea Emerton, 1875. Am. Nat., 9:279.
Phanetta subterranea (Emerton) Keyserling, 1886. Spinnen Amerikas, Theridiidae, 2:125.
Type locality—Wyandotte Caverns, Crawford Co., Indiana.
General range—Virginia and Pennsylvania west to Indiana and southeast to Alabama.
Virginia localities—Lowmoor Quarry Cave, Alleghany Co.; Fountain and Madison Caves, Augusta, Ca.; Boundless, Breathing, Cave Run Pit, Clarks, and Starr Chapel Caves, Bath Co.; Hamilton Cave, Bland Co.; Perry Saltpeter Cave, Botetourt Co.; Ogdens Cave, Frederick Co. Clover Hollow, Starnes, Straleys, and Tawney's Caves, Giles Co. Olingers Cave, Lee Co.; Luray Caverns, Page Co.; Massanutten Caverns and Stephens Cave, Rockingham Co.; Jessie Cave, Russell Co. Grigsby Cave, Scott Co.
Comments—Usually found in or under rotting vegetable matter, decaying animal feces and sometimes on damp clay banks. This species is quite often found to live in close association with collembolans on which it may be predacious.

Porrhomma *cavernicolum* (Keyserling) new combination[3]

Willibaldia cavernicola Keyserling, 1886. Spinnen Amerikas, Theridiidae, 2:123.
Linyphia incerta Emerton, 1875. Am. Nat., 9:280.
Porrhomma emertoni (Emerton) Roewer, 1942. Katalog der Araneae, 1:603.
Troglohypantes cavernicola (Keyserling) Bonnet, 1959. Bibligraphia Araneorum, 2 (5) :4721.
Type locality—Reynolds Cave, Barren Co., Kentucky.
General range—Virginia west to Missouri and southwest to Arkansas.
Virginia localities—Glade and Madison Caves, Augusta Co.; Clarks, Crossroads, Porters, and Witheros Caves, Bath Co.; Clover Hollow Cave, Giles Co.; Unthanks Cave, Lee Co.; Luray Caverns and Ruffners Cave, Page Co.; Buck Hill Cave, Rockbridge Co.
Comments—The habits for this species seems to be approximately the same as for Phanetta subterranea.

Nesticidae

Nesticus carteri Emerton

Nesticus carteri Emerton, 1875. Am. Nat., 9:279.
Type locality—Mammoth Cave, Edmonson Co., Kentucky.
General range—Caves in Kentucky, Tennessee, and Virginia.
Virginia localities—Cudjos Cave, Lee Co.; Buck Hill and Doll House Caves, Rockbridge Co.

Nesticus tennesseensis (Petrunkevitch)

Ivesia tennesseensis Petrunkevitch, 1925. Ann. Entomol. Soc. Am., 18:321.
Nesticus tennesseensis (Petrunkevitch) Jackson, 1944. Bull. Nat. Speleol. Soc., 6:57.
Type locality—Indian Cave, 5 miles northwest of New Market, Jefferson Co., Tennessee.
General range—Caves of Kentucky, Tennessee, Virginia, and West Virginia.
Virginia localities—Rumbolds Cave, Alleghany Co.; Fish Hatchery and Walkthrough Caves. Craig Co. Giant Caverns, Glenlyn,* and Starnes Caves, Giles Co.; Burton (Burtons Indian) Cave, Russell Co.

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3New combination recommended by W. J. Gertsch, Curator of Arachnida, American Museum of Natural History.

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