

NEW FAUNAL AND FUNGAL RECORDS FROM CAVES IN GEORGIA, USA

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Records for 173 cavernicolous invertebrate species of Platyhelminthes, Nematoda, Nemertea, Annelida, Mollusca, and Arthropoda from 47 caves in Georgia are presented. The checklist includes eight species of cave-dwelling cellular slime molds and endosymbiotic trichomycete fungi associated with cave millipedes and isopods.

The cave fauna of Georgia has attracted less attention than that of neighboring Alabama and Tennessee, yet Georgia contains many unique cave systems. Limestone caves are found in two geological regions of the state, the Coastal Plain, and the Appalachian Plateau and Valley. Over five hundred caves in Georgia are known, but biological information has been reported for less than 15%.

Culver *et al.* (1999) reviewed the distributions of cavernicoles in the United States. Their records of obligate cave dwellers in Georgia were significantly less than records for adjacent counties of Alabama and Tennessee. Holsinger and Peck (1971) reviewed the cave faunal records of Georgia and included their own collection records in an annotated checklist. Since that publication, new records and species descriptions have been published. As indicated by Gosz (1999), the longer the sampling effort in a biodiversity survey, the more likely rare or seasonal species will be collected. The objective of our paper is to update the cave faunal and fungal records in Georgia by reporting recently collected material and reviewing relevant literature published after Holsinger and Peck (1971).

MATERIALS AND METHODS

Specimens were collected opportunistically by hand, baiting, and processing detritus in Berlese funnels. Baits included canned cat food, chicken liver, dung, rotten apples, and cheese. Trichomycete fungal hosts were collected alive and processed using the techniques of Lichtwardt (1986). Cellular slime molds were cultured at Shepherd College using the techniques of Landolt *et al.* (1992)

The ecological classification after species names of cavernicolous organisms refers to levels of cave specificity, as defined by Barr (1963) with modifications to include edaphobites and symbiotes. The notations are (TB) troglobites, (TP) troglaphiles, (TX) troglonexes, (AC) accidentals, (ED) edaphobites, (SY) symbiotes, and (unknown). Dates are given for those species collected during field surveys. Some species were not collected repeatedly at the same site although they often were present. Therefore, collection dates do not represent the seasonal presence of those animals.

Unless otherwise noted, specimens have been deposited in the Clemson University Arthropod Collection. Other collections where specimens were deposited are abbreviated with the following four letter codes, which are listed after the species name: AMNH-American Museum of Natural History; CAAS-California Academy of Science; CARL-Carleton University (Canada); CARN-Carnegie Museum of Natural History; DEIC-Deutsches Entomologisches Institut (Germany); FSCA-Florida State Collection of Arthropods; GASO-Georgia Southern University Collection; JCKK-James Cokendolpher Personal Collection; LANH-Los Angeles County Museum of Natural History; LSUC-Louisiana State University Collection; MAXP-Max Planck Institute (Germany); NCRL-Natural Resources Canada Laurentian Forestry Centre (Canada); OHIO-Ohio State University; OLDM-Old Dominion University; SMIT-Smithsonian Institute; SYDH-Hampden-Sydney College; UGAM-University of Georgia Natural History Museum; UMAA-University of Michigan at Ann Arbor; UMON-University of Montana; USNT-United States National Tick Collection; UTEN-University of Tennessee; VMNH-Virginia Museum of Natural History; WITT-Wittenberg University.

The annotated list of species is organized phylogenetically by phylum and class following Holsinger and Peck (1971). The cellular slime molds and symbiotic trichomycete fungi are listed first because they do not fall into an animal phylogeny. Orders and all other taxonomic categories are organized alphabetically. The investigated caves are listed alphabetically by county. Those caves that were not surveyed in this study but are referenced in the literature and included for the updated faunal list are noted with an asterisk (*). Approximate cave locations are indicated in figure 1.

Investigated Georgia caves include; Bartow Co.-Anthonys Cave, Busch Cave, Chert Chasm, Kingston Saltpeter Cave, Ladds Lime Cave, Yarborough Cave; Chattooga Co.-Blowing Springs Cave*, Parkers Cave*; Dade Co.-Boxcan Cave*, Byers Cave*, Case Cavern*, Cemetery Pit, Deans Pit, Goat Cave, Howards Waterfall Cave, Hurricane Cave, Johnsons Crook Cave, Morrison Cave*, Morrison Springs Cave*, Newsome Gap Cave, Quarry Cave, Rising Fawn Cave*, Rock

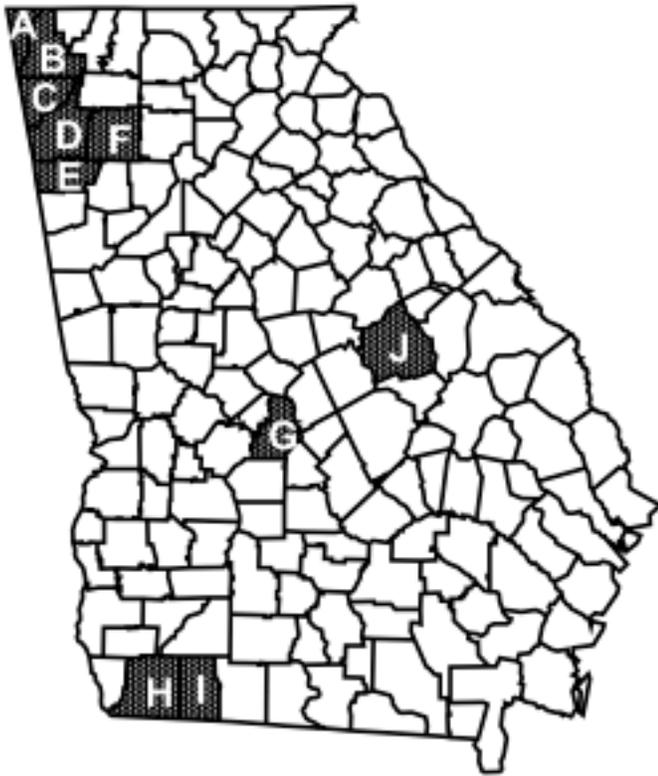


Figure 1. Distribution of Georgia caves investigated.
A= Dade County (19 caves), B= Walker County (14 caves), C= Chattooga County (2 caves), D= Floyd County (1 cave), E= Polk County (1 cave), F= Bartow County (6 caves), G= Houston County (1 cave), H= Decatur County (1 cave), I= Grady County (1 cave), J= Washington County (1 cave).

Shelter Pit, Rustys Cave, Sittons Cave, Twin Snakes Cave* (Limestone Caverns), Upper Valley Cave; Decatur Co.-Climax Cave; Floyd Co.-Cave Springs Cave*; Grady Co.-Maloyo Waterfall Cave; Houston Co.-Limerock Cave*; Polk Co.-White River Cave*; Walker Co.-Anderson Spring Cave, Bible Springs Cave*, Cave Springs Cave*, Chickamagua Cave Spring Cave*, Ellissons Cave, Fricks Cave, Harrisburg Caves*, Hickman Gulf Cave*, Horseshoe Cave, Mt. Cove Farm Cave*, Nash Waterfall Pit, Pettijohns Cave, Spooky Cave, Rocky Cave; Washington Co.-Tennille Lime Sinks.

ANNOTATED LIST

Division Myxomycota

Class Acrasiomycetes

Order Dictyosteliales

Family Dictyosteliaceae

Dictyostelium giganteum Singh, *D. mucoroides* Brefeld, *D. purpureum* Olive, and *D. sphaerocephalum* (Oud) (unknown)

Dade Co.: Sittons Cave, 22 October 1999.

Comments: Four cellular slime molds were cultured from a soil sample collected in Sittons Cave. Cellular slime molds are considered primarily leaf-

litter organisms, but several species have been reported from caves in West Virginia (Landolt *et. al* 1992). All records are presented under one heading because the collections were made at the same time in the same location.

Dictyostelium aureo-stipes Cavender, Raper and Norberg and *Polysphondylium violaceum* Brefeld (unknown)

Dade Co.: Sittons Cave, 22 October 1999, Rustys Cave, 30 January 2000.

Comments: These two slime molds were cultured from soils in both caves. These species are common surface and cave dwelling slime molds.

Division Zygomycota

Class Trichomycetes

Trichomycetes are endosymbiotic gut fungi associated with arthropods. Trichomycetes are believed to have an obligate association with their hosts and cannot grow, metabolize, or reproduce in environments outside their host (Lichtwardt 1986). Trichomycetes have not been reported in previous cave faunal lists, but probably are found in cavernicolous amphipods, crayfish, isopods, and millipedes.

Order Ecrinales

Family Ecrinaceae

Enterobryus oxidi Lichtwardt (SY)

Dade Co.: Howards Waterfall Cave

Comments: This fungus was found in the hindgut of *Oxidus gracilis* (Koch), a common troglolithic millipede in Howards Waterfall Cave. *Enterobryus oxidi* is the only trichomycete known to associate with *O. gracilis* (Lichtwardt 1986).

Enterobryus spp. (SY)

Bartow Co.: Kingston Saltpeter Cave; Dade Co.: Sittons Cave, Johnsons Crook Cave, Howards Waterfall Cave, Hurricane Cave; Walker Co.: Horseshoe Cave, Fricks Cave, Pettijohns Cave.

Comments: Several unidentified *Enterobryus* spp. were removed from the hindguts of the cavernicolous millipedes *Cambala annulata*, *C. hubrichti*, *C. ochra*, *Pseudotremia eburnea*, and *Scoterpes austrinus*, and the troglolithic isopod *Caecidotea richardsonae*. These records probably represent several new species of trichomycetes and, except for the *Caecidotea*, are new host-genus records.

Phylum Platyhelminthes

Class Turbellaria

Order Tricladida

Family Kenkiidae

Sphalloplana spp. (TB)

Dade Co.: Hurricane Cave, 10 December 1998; Walker Co.: Anderson Spring Cave, 1 January 1999.

Comments: These collections might represent undescribed species. Only *S. georgiana* Hyman was known previously in Georgia (Kenk 1976; Carpenter 1970).

Phylum Nematoda

Class Adenophorea

Order Mermithida

Family Mermithidae

Unidentified genus and species (SY)

Dade Co.: Howards Waterfall Cave, 26 December 1998.

Comments: Immature mermithids can not be identified. These endoparasitic nematodes were collected in Howards Waterfall Cave. The host organism was a troglolithic millipede, *Pseudotremia eburnea*.

Class Rhabditae

Order Oxyurida

Family Thelastomatidae

Unidentified genus and species (SY)

Walker Co.: Fricks Cave, 11 December 1998.

Comments: These nematodes were found in the guts of cave millipedes, *Cambala hubrichti*. Unlike mermithids, thelastomatids are not always destructive to their hosts.

Phylum Nemertea

Class Enopla

Order Hoplonemertea

Family Tetrastemmatidae

Prostoma cf. graecense (Bohmig) (unknown) SMIT

Dade Co.: Howards Waterfall Cave, 10 December 1998.

Comments: Nemerteans are usually overlooked by aquatic biologists. These

worms have not been reported in cave streams and this specimen might represent an undescribed species. According to Pennak (1978), several undescribed species of *Prostoma* have been collected in the continental USA.

Phylum Annelida

Class Clitellata

Order Branchiobdellida

Family Branchiobdellidae

Undetermined genus and species (SY)

Dade Co.: Howards Waterfall Cave, 10 December 1998; Hurricane Cave, 10 December 1998; Washington Co.: Tennille Lime Sinks, 24 May 2000.

Comments: These symbionts were found on the exoskeleton of cave-dwelling crayfish and were reported by Reeves and Reynolds (1999). Several species of branchiobdellids can be found on a single host (Hobbs *et al.* 1967).

Undetermined material

Decatur Co.: Climax Cave.

Comments: Several undetermined species of Branchiobdellida were reported by Holt (1973).

Order Oligochaeta

Earthworms and other annelids are only sometimes collected during cave surveys; however, several species are troglomorphic or troglotic (Peck 1998; Reynolds 1996).

Family Lumbricidae

Aporrectodea sp. (TP)

Walker Co.: Spooky Cave, 19 March 1999.

Comments: This immature worm was reported by Reeves and Reynolds (1999).

Aporrectodea trapezoides Duges (TP)

Dade Co.: Howards Waterfall Cave, 29 January 1999; Walker Co.: Horseshoe Cave, 16 August 1998 and 19 May 1999.

Comments: An immature and albino adult earthworm was reported by Reeves and Reynolds (1999) in Horseshoe Cave.

Bimastos tumidus (Eisen) (TP)

Bartow Co.: Kingston Saltpeter Cave, 2 June 1999.

Comments: This endemic earthworm was reported by Reeves and Reynolds (1999)

Dendrodrilus rubidus (Savigny) (TP)

Dade Co.: Howards Waterfall Cave, 10 December 1998, Hurricane Cave, 10 December 1998; Decatur Co.: Climax Cave, 6 March 1999; Walker Co.: Goat Cave, 19 May 1999, Horseshoe Cave, 16 August 1998.

Comments: This earthworm was reported by Reeves and Reynolds (1999). *Dendrodrilus rubidus* is preadapted to cave life (Gates 1959).

Lumbricus rubellus Hoffmeister (ED)

Bartow Co.: Anthonys Cave, 20 May 1999; Dade Co.: Howards Waterfall Cave, 10 January 1999; Walker Co.: Horseshoe Cave, 19 May 1999.

Comments: This earthworm was reported by Reeves and Reynolds (1999).

Family Megascolecidae

Amyntas minimus (Horst) (ED)

Dade Co.: Howards Waterfall Cave, 29 January 1999.

Comments: This megascolecid earthworm was reported by Reeves and Reynolds (1999). It is an exotic Asian earthworm (Reynolds 1978).

Family Naididae

Arcteonais lomondi (Martin) (TP)

Bartow Co.: Anthonys Cave, 20 May 1999.

Comments: This aquatic oligochaete was collected in a drip pool with mammal feces.

Phylum Mollusca

Class Gastropoda

Order Stylommatophora

Family Polygyridae

Mesodon sp. (unknown) OHIO

Walker Co.: Anderson Springs Cave, 9 May 1999.

Comments: Immature snails were collected in a boulder pile. Some *Mesodon* species inhabit dark overhung and rocky habitats like caves (Hubricht 1985).

Triodopsis or *Mesodon* sp. (unknown) OHIO

Bartow Co.: Busch Cave, 2 June 1999.

Comments: Juvenile specimens were collected in organic debris near an entrance.

Family Zonitidae

Glyphyalinia cryptomphala (Clapp) (TP) OHIO

Dade Co.: Upper Valley Cave, 10 May 1999.

Comments: This small snail was crawling on the roof of the cave in the dark zone.

Glyphyalinia praecox (Baker) (unknown) OHIO

Bartow Co.: Anthonys Cave, 20 May 1999.

Comments: This small snail was collected in the dark zone of the cave.

Glyphyalinia rhoadsi (Pilsbry) (unknown) OHIO

Washington Co.: Tennille Lime Sinks, 24 May 2000.

Comments: Five snails were collected in a dry area with decaying woody debris.

Glyphyalinia sculptilis (Bland) (TX) OHIO

Bartow Co.: Busch Cave, 2 June 1999; Walker Co.: Rocky Cave, 19 March 1999, Spooky Cave, 19 March 1999.

Comments: This snail was collected in debris piles near the cave entrances.

Hawaiiia miniuscula (Binney) (TP) OHIO

Dade Co.: Howards Waterfall Cave.

Comments: This snail was collected in organic debris. *Hawaiiia miniuscula* was the most common cave snail reported in Mexican caves (Reddell 1981) and is thus a probable troglophile.

Ventridens gularis (Say) (TP) OHIO

Walker Co.: Horseshoe Cave, 19 May 1999.

Comments: This snail was collected on the roof of the cave.

Ventridens sp. (unknown) OHIO

Walker Co.: Horseshoe Cave, 16 August 1998.

Comments: This record potentially represents an undescribed species, but an adult of *Ventridens gularis* was also collected in the cave.

Zonitoides arboreus (Say) (unknown) OHIO

Decatur Co.: Climax Cave, 6 March 1999; Grady Co.: Maloys Waterfall Cave, 5 March 1999.

Comments: This species is widely distributed in Georgia (Hubricht 1964, 1985).

Phylum Arthropoda

Class Crustacea

Order Amphipoda

Family Gammaridae

Crangonyx antennatus Packard (TB) OLDMD

Dade Co.: Cemetery Pit, 10 March 1999, Rustys Cave, 17 December 1998, 1 February 2000, Spooky Cave, 19 March 1999, Upper Valley Cave, 10 March 1999; Walker Co.: Anderson Springs Cave, 9 May 1999.

Comments: This amphipod was repeatedly collected in Georgia's caves.

Stygobromus ackeriyi Holsinger (TB) OLDMD

Bartow Co.: Chert Chasm, 1 April 1999; Floyd Co.: Cave Springs Cave; Polk Co.: White River Cave.

Comments: Holsinger (1978) described and presented the Georgia records of this species, except for our collections in Chert Chasm.

Stygobromus dicksoni Holsinger (TB)

Chattooga Co.: Blowing Springs Cave; Dade Co.: Byers Cave, Cemetery Pit, 10 March 1999, Howards Waterfall Cave, Rustys Cave; Walker Co.: Pettijohns Cave.

Comments: Holsinger (1978) described and presented the Georgia records of this species. We made an additional collection in Cemetery Pit.

Stygobromus grandis Holsinger (TB)

Chattooga Co.: Parker Cave.

Comments: Holsinger (1978) described and presented the Georgia records of this species.

Stygobromus minutus Holsinger (TB)

Walker Co.: Pettijohns Cave.

Comments: Holsinger (1978) described and presented the Georgia records of this species.

Order Cladocera

Family Daphnidae

Daphnia sp. (unknown)

Bartow Co.: Anthonys Cave, 20 May 1999

Comments: This daphnid was collected in drip pools with mammal dung.

Order Copepoda

Family Canthocamptidae

Attheyella illinoisensis (Forbes) (unknown)

Washington Co.: Tennille Lime Sinks, 24 May 2000.

Comments: This copepod was collected in the cave silt.
Attheyella nordenskioldi (Lilljeborg) (AC)
 Dade Co.: Howards Waterfall Cave, 12 February 1999; Walker Co.: Horseshoe Cave, 19 May 1999.

Comments: This copepod probably entered the caves during rainstorms and represents accidental cave fauna.

Elaphoidella bidens (Schmeil) (unknown)
 Washington Co.: Tennille Lime Sinks, 24 May 2000.

Comments: This copepod was collected in the cave silt.

Family Cyclopidae

Acanthocyclops robustus (Fischer) (TP)
 Bartow Co.: Anthonys Cave, 20 June 1999.

Comments: This copepod was collected in drip pools with mammal dung.

Eucyclops conrowae Reid (unknown)
 Washington Co.: Tennille Lime Sinks, 24 May 2000.
 Comments: This copepod was collected in the cave silt.

Eucyclops elegans (Herrick) (TP)
 Bartow Co.: Anthonys Cave, 20 June 1999.

Comments: This copepod was collected in drip pools with mammal dung.

Macrocyclus albidus (Jurine) (TP)
 Bartow Co.: Anthonys Cave, 20 June 1999.

Comments: This copepod was collected in drip pools with mammal dung.

Order Decapoda

Family Astacidae

Cambarus bartonii (Fabricius) (TP)
 Dade Co.: Twin Snakes Cave.
 Comments: Hobbs (1981) reported this cave crayfish record.

Cambarus striatus Hay (TP) WITT
 Chattooga Co.: Blowing Springs Cave; Walker Co.: Bible Springs Cave, Horseshoe Cave, August 1998.
 Comments: Holsinger and Peck (1971) reported some of these records as *Cambarus* sp. and they were later identified by Hobbs *et al.* (1977).

Cambarus tenebrosus Hay (TP) WITT
 Dade Co.: Howards Waterfall Cave, 10 December 1998, Hurricane Cave, 10 December 1998.
 Comments: This crayfish is common in the streams and pools of these caves.

Order Isopoda

Family Asellidae

Caecidotea spp. (TB)
 Comments: Records for several species were presented by Buhmann (1996) in an unpublished report to the State Department of Natural Resources.

Family Oniscidae

Cylisticus convexus (DeGreer) (TX) SYDH
 Bartow Co.: Anthonys Cave, 21 May 1999; Dade Co.: Howards Waterfall Cave, 10 December 1998, 5 January 1999, 29 January 1999; Walker Co.: Horseshoe Cave, 16 August 1998.
 Comments: This imported European isopod was collected near cave entrances or elsewhere in the caves after rains.

Family Trichoniscidae

Miktoniscus spp. (TB)
 Bartow Co.: Anthonys Cave, 20 May 1999; Dade Co.: Howards Waterfall Cave, 10 December 1998, 6 August 1998, Sittons Cave, 6 August 1998; Walker Co.: Horseshoe Cave, 16 August 1998, Spooky Cave, 19 March 1999.

Comments: These trogloniscids were found on the mud flats of Anthonys, Horseshoe, and Sittons caves and along the drip pools of Howards Waterfall Cave. Shear (pers. comm. 1999) believes that they might represent an undescribed species.

Order Ostracoda

Family Candoniidae

Pseudocandona sp. (unknown)
 Dade Co.: Rustys Cave, 1 February 2000.
 Comments: Two ostracods were collected in the cave stream.

Family Cypridopsidae

Potamocypris cf. *fulva* (unknown)
 Walker Co.: Horseshoe Cave, 19 May 1999.
 Comments: This ostracod was collected in a plankton net.

Family Entocytheridae

Uncinocythere warreni Hobbs and Walton (SY)

Decatur Co.: Climax Cave.

Comments: Entocytherids are symbionts of trogloniscid decapods. These ostracods were reported to live on *Cambarus cryptodytes* by Hobbs *et al.* (1977).

Class Arachnida

Order Acarina

Family Acaridae

Troglocoptes sp. (TB) UMAA
 Walker Co.: Fricks Cave, 11 December 1998.

Comments: This undescribed trogloniscid mite lives in *Myotis grisescens* guano.

Family Argasidae

Carios kelleyi (Cooley and Kohls) (SY) USNT
 Decatur Co.: Climax Cave, 6 March 1999.

Comments: A fully engorged nymphal bat tick was collected in guano piles. The host bat is likely *Myotis austroriparius*. Unlike the hard ticks (Ixodidae), this species feeds on its host only intermittently and breeds in caves.

Family Ixodidae

Dermacentor variabilis (Say) (SY) USNT
 Dade Co.: Howards Waterfall Cave, 26 December 1998.

Comments: An adult tick was collected under a wooden plank in the cave, probably having dropped from a small mammal.

Ixodes cookei Packard (SY) USNT

Walker Co.: Rocky Cave, 19 March 1999.

Comments: This is a common eastern tick that feeds on marmots, beavers, porcupines, cows, humans, and owls (Gregson 1982).

Family Laelapidae

Laelaspis sp. (TP) OHIO
 Walker Co.: Pettijohns Cave, 15 July 1995; Dade Co.: Case Cave, 26 August 1995
 Comments: Only female mites were collected.

Family Macrochelidae

Macrocheles sp. (TP) UMAA, OHIO
 Walker Co.: Fricks Cave, 16 September 1995, 11 December 1998.
 Comments: This mite was common in guano of *Myotis grisescens*.

Family Trombiculidae

Euschoengastia pipistrelli Brennan (SY) GASO
 Dade Co.: Howards Waterfall Cave, 10 December 1998; Walker Co.: Fricks Cave, 11 December 1998.
 Comments: This species of chigger was ectoparasitic on *Pipistrellus subflavus*, living in the ears and on the face.

Leptotrombidium myotis (Ewing) (SY) GASO

Bartow Co.: Anthonys Cave, 20 May 1999.

Comments: This chigger was found feeding in the ear of *Pipistrellus subflavus*.

Family Veigaidae

Veigaia sp. (unknown) OHIO
 Walker Co.: Nash Waterfall Pit, 5 August 1995.

Comments: The single specimen collected did not appear to be troglomorphic.

Undetermined genus and species (unknown)

Walker Co.: Horseshoe Cave, 12 October 1998.

Comments: Two female mites were collected in cave debris.

Order Araneae

Family Agelenidae

Calyptaria cavicola (Banks) (TP)
 Dade Co.: Rustys Cave, 18 October 1998 and 17 December 1998.

Comments: On 18 October 1998, a pair of these trogloniscid spiders was collected while they mated.

Family Antrodiaetidae

Antrodiaetus unicolor (Hentz) (TP) SMIT

Dade Co.: Howards Waterfall Cave, 29 January 1999; Walker Co.: Fricks Cave, 11 December 1998.

Comments: Small populations of this trap door spider were found near the guano slopes deep in Fricks Cave. All age classes were present, which indicated a viable breeding population. A single spider was found in Howards Waterfall Cave.

Family Clubionidae*Elaver exceptus* (L. Koch) (TP) AMNH

Dade Co.: Upper Valley Cave, 10 March 1999.

Comments: This spider was collected in the rubble piles near the entrance pit.

Family Leptonetidae*Appaleptoneta fiskei* (Gertsch) (TB)

Walker Co.: Pettijohns Cave, Harrisburg Cave.

Comments: Gertsch (1974) reported these records.

Appaleptoneta georgia (Gertsch) (TB)

Dade Co.: Byers Cave.

Comments: Gertsch (1974) reported this record.

Family Linyphiidae*Anthrobia* sp. (TP/TB) AMNH

Bartow Co.: Kingston Saltpeter Cave, 2 June 1999.

Comments: This unidentifiable, pale, eyeless spider might represent a new species. No males were collected, which precludes a definitive species identification. Only one species, *A. mammothia* Tellkamp, has been described and it is known from Mammoth Cave, Kentucky (Roth 1993).*Erigone maculata* (Banks) (TP) AMNH

Bartow Co.: Busch Cave, 2 June 1999; Decatur Co.: Climax Cave, 6 March 1999; Grady Co.: Maloys Waterfall Cave, 5 March 1999.

Comments: This linyphiid lives in bat guano and under loose rocks.

Family Lycosidae*Pirata insularis* Emerton (unknown) SMIT

Grady Co.: Maloys Waterfall Cave, 5 March 1999.

Comments: A pair of these wolf spiders was collected in the cave.

Family Hypochilidae*Hypochilus thorelli* Marx (TX/AC)

Dade Co.: Boxcan Cave, Sittons Cave, 3 November 1998.

Comments: Forester *et al.* (1987) noted the Boxcan Cave record. These spiders were frequently found in the entrances of Sittons Cave.**Family Nesticidae***Eidmannella pallida* (Emerton) (TP)

Dade Co.: Howards Waterfall Cave, 21 December 1998; Decatur Co.: Climax Cave, 6 March 1999.

Comments: This species of nesticid is common in the Nearctic region, Hawaii, and Europe (Gertsch 1984).

Gaucelmus augustinus Keyserling (TP)

Decatur Co.: Climax Cave, 6 March 1999; Houston Co.: Limerock Cave; Washington Co.: Tennille Lime Sinks 24 May 2000.

Comments: Gertsch (1984) noted the Limerock Cave record. *Gaucelmus augustinus* occurs frequently in coastal plain caves from South Carolina to Mexico (Reeves 1999).*Nesticus georgia* Gertsch (TB)

Dade Co.: Sittons Cave, Case Caverns, unnamed cave near Trenton.

Comments: Gertsch (1984) presented these records. We observed individuals of *N. georgia* up to 600 m from the entrance. Females with egg sacs were in Sittons Cave on 7 and 16 August 1998 (Reeves 1999).**Family Pholcidae***Pholcus* spp. (TX/TP) SMIT

Bartow Co.: Ladds Lime Cave, 31 July 1998; Dade Co.: Hurricane Cave, 10 December 1998, Sittons Cave, 14 January 1998, 7 August 1998, 16 August 1998; Walker Co.: Fricks Cave, 11 December 1998, Spooky Cave, 19 March 1999.

Comments: These records represent several undescribed species of *Pholcus*. Individuals were collected near the entrances to the caves in complete darkness. *Pholcus* spp. webs were built on the ceilings of the caves. The species at Ladds Lime Caves had egg sacs on 31 July 1998.**Family Tengellidae***Liocranoides gertschi* Platnick (TP) AMNH

Dade Co.: Byers Cave 18 June 1967, Hurricane Cave, 10 December 1998, Sittons Cave, January 1998; Walker Co.: Horseshoe Cave, 19 May 1999.

Comments: This recently described species of *Liocranoides* was misidentified as *Liocranoides unicolor* by Holsinger and Peck (1971). *Liocranoides gertschi* was reported from both Byers and Hurricane Cave by Platnick (1999).**Family Tetragnathidae***Meta ovalis* (Gertsch) (TP)

Dade Co.: Goat Cave, 19 May 1999, Howards Waterfall Cave, 10 December 1998, 27 December 1998, Sittons Cave, 7 August 1998; Walker Co.: Fricks Cave, 11 December 1998, Spooky Cave, 19 March 1999.

Comments: This species is common in cave entrances. The egg sac of a female in Howards Waterfall Cave had 105 eggs when collected on 10 December 1998, and mating was observed here on 10 and 27 December 1998. Adult spiders fed on millipedes and carabid beetles in this cave.

Family Theridiidae*Achaearanea tepidariorum* (Koch) (TP/TX)

Bartow Co.: Ladds Lime Cave, 31 July 1998; Dade Co.: Sittons Cave, 28 July 1998.

Comments: This common cellar spider is an occasional troglophile and was collected near entrances. It has been reported in Alabama and Tennessee caves (Holsinger & Peck 1971).

Achaearanea sp. (TP)

Bartow Co.: Anthonys Cave, 20 May 1999.

Comments: An immature spider was collected from a web within the cave.

Family Theridiosomatidae*Theridiosoma gemmosum* (L. Koch) (TX/AC)

Walker Co.: Horseshoe Cave, 16 August 1998.

Comments: This spider was found in the entrance of Horseshoe Cave.

Order Opiliones**Family Phalangodidae***Bishopella laciniosa* (Crosby and Bishop) (TP)

Bartow Co.: Busch Cave, 2 June 1999; Dade Co.: Hurricane Cave, 10 December 1998, Howards Waterfall Cave, 10 December 1998, 26 December 1998; Walker Co.: Anderson Spring Cave, 1 January 1999.

Comments: Opiliones are opportunistic feeders and *B. laciniosa* probably feeds on most available organic material.*Bishopella* sp. (TB) JCKK

Dade Co.: Howards Waterfall Cave, 10 December 1998.

Comments: A potentially troglitic specimen was collected on the cave roof. This species remains unidentified but is not *B. laciniosa*.*Bishopella* sp. (TP) JCKK

Bartow Co.: Anthonys Cave, 20 May 1999.

Comments: A single immature specimen was collected.

Crosbyella spinturnix (Crosby and Bishop) (TP) JCKK

Grady Co.: Maloys Waterfall Cave, 5 March 1999.

Comments: This species has been reported in other caves of south Georgia (Holsinger & Peck 1971).

Family Sabaconidae*Sabacon* sp. (TP) JCKK

Walker Co.: Goat Cave, 19 May 1999.

Comments: An immature specimen was collected. This was probably an immature specimen of *Sabacon cavicolens* (Packard).**Family Sclerosomatidae***Leiobunum* sp. (TX) JCKK

Bartow Co.: Anthonys Cave, 20 May 1999.

Comments: An immature specimen was collected.

Order Pseudoscorpiones**Family Chernetidae***Hesperochnes mirabilis* (Banks) (TP) FSCA

Chattooga Co.: Parkers Cave; Dade Co.: Johnsons Crook Cave, Howards Waterfall Cave, Morrison Cave, and Morrison Spring Cave; Floyd Co.: Cave Springs Cave, Walker Co.: Fricks Cave, Hickman Gulf Cave, and Mt. Cove Farm Cave.

Comments: This species, reported by Muchmore (1994), was previously identified as *Pseudozaona* sp. in Holsinger and Peck (1971).**Family Chthoniidae***Apochthonius minor* Muchmore (TB) FSCA

Chattooga Co.: Parkers Cave; Dade Co.: Morrison Cave.

Comments: This species, described by Muchmore (1976), was reported as *Apochthonius* sp. in Holsinger and Peck (1971).*Chthonius paludis* (Chamberlin) (TP) FSCA

Walker Co.: Horseshoe Cave, 16 December 1998.

Comments: This species was collected in organic debris near a vertical entrance. *Chthonius paludis* is also found in epigeal leaf litter outside caves.*Chthonius virginicus* (Chamberlin) (TP) FSCA

Dade Co.: Howards Waterfall Cave, 10 December 1998.

Comments: This species was collected in accumulated organic debris along a stream corridor.

Class Symphyla

Order Symphyla

Family Scutigereleididae

Scutigereilla sp. (ED)

Dade Co.: Sittons Cave, 7 August 1998.

Comments: Symphyla are common soil inhabitants that have been largely ignored taxonomically for years (Allen 1992).

Class Diplopoda

Order Chordeumida

Family Cleidogonidae

Pseudotremia aeacus Shear (TB)

Dade Co.: Hurricane Cave.

Comments: Shear (1972) described this species from Hurricane Cave.

Pseudotremia eburnea Loomis (TB) VNHM

Dade Co. Case Cavern, Cemetery Pit, 10 May 1999, Howards Waterfall Cave, 10 December 1998, 18 December 1998, 29 December 1998, 5 January 1999, Hurricane Cave, 10 December 1998, Upper Valley Cave, 10 May 1999; Walker Co.: Spooky Cave, 19 March 1999.

Comments: This species, reported in Case Cavern by Peck (1989), is a widely distributed troglolithic millipede (Hoffman 1999).

Family Trichopetalidae

Scoterpes austrinus Loomis (TB) VNHM

Bartow Co.: Busch Cave, 2 June 1999; Dade Co. Cemetery Pit, 10 May 1999, Sittons Cave, 30 September 1997, 14 January 1998, 22 May 1998, 30 July 1998, 7 August 1998, 16 August 1998, Upper Valley Cave, 10 May 1999; Walker Co.: Anderson Spring Cave, 1 January 1999, Goat Cave, 19 May 1999, Horseshoe Cave, 7 August 1998, 16 August 1998, 30 May 1998, Spooky Cave, 19 March 1999.

Comments: Holsinger and Peck (1971) could not determine the species they collected from Sittons Cave because they had immature specimens. Later collections of adult males allowed species determination. The genus *Scoterpes* is in need of taxonomic revision, and these collections might represent several species. Specimens in Sittons and Horseshoe Caves were collected on chicken liver.

Scoterpes sp. (TB) VMNH

Dade Co.: Howards Waterfall Cave, 26 December 1998.

Comments: Immature specimens were collected but could not be identified.

Order Julida

Family Blaniulidae

Blaniulus guttulus (Bosc) (ED) VNHM

Dade Co.: Howards Waterfall Cave, 10 December 1998.

Comments: *Blaniulus guttulus* is an exotic European species.

Order Polydesmida

Family Paradoxomatidae

Oxidus gracilis (Koch) (TP) VNHM

Bartow Co.: Ladds Lime Cave, 31 July 1998; Dade Co.: Howards Waterfall Cave, 10 December 1998, 26 December 1998; Decatur Co.: Climax Cave, 6 March 1999; Grady Co.: Maloys Waterfall Cave, 5 March 1999; Washington Co.: Tennille Lime Sinks, 24 May 2000.

Comments: *Oxidus gracilis* is a common introduced millipede.

Order Spirostreptida

Family Cambalidae

Cambala annulata (Say) (TX/AC) VNHM

Bartow Co.: Anthonys Cave, 20 May 1999; Dade Co.: Rustys Cave, 18 December 1998, Hurricane Cave, 10 December 1998.

Comments: This species was found near the entrance of the caves.

Cambala hubrichti Hoffman (TP) VNHM

Walker Co.: Fricks Cave, 11 December 1998, Spooky Cave, 19 March 1999. Comments: In Fricks Cave this millipede fed on bat guano.

Cambala ochra Chamberlin (TP) VNHM

Bartow Co.: Chert Chasm, 1 April 1999; Walker Co.: Horseshoe Cave, 14 January 1998, 30 July 1998, 7 August 1998, Rocky Cave, 19 March 1999.

Comments: This species, collected on carrion in the dark zone, cannibalized injured specimens in the laboratory.

Class Insecta

Order Coleoptera

Family Cantharidae

Cantharis spp. (TX)

Chattooga Co.: Parkers Cave; Dade Co.: Quarry Cave; Walker Co.: Harrisburg Cave, Horseshoe Cave, Mt. Cove Farm Cave, and Pettijohns Cave.

Comments: According to Peck (1975), the above records understate the commonness of cantharid larvae. He believes these records may represent multiple species and that *Cantharis* spp. potentially are significant predators in caves. With the exception of our collections from Quarry and Horseshoe caves, Peck (1975) reported the records.

Family Carabidae

Atronus pubescens (Dejean) (TP) CAAS

Dade Co.: Upper Valley Cave, 10 May 1999; Decatur Co.: Climax Cave, 6 March 1999.

Comments: This beetle lives in Appalachian caves and epigeal habitats.

Anillinus sp. (TP/TB/ED) CARN

Dade Co.: Hurricane Cave, 10 December 1998.

Comments: An eyeless specimen was collected under stones near the upper cave entrance.

Bembidion lacunarium Zimmerman (TP) CAAS

Dade Co.: Howards Waterfall Cave, 26 Dec 1998, Upper Valley Cave, 10 May 1999.

Comments: Specimens were collected in rocky debris around drip pools and in organic debris.

Harpalus pennsylvanicus (DeGeer) (AC) CAAS

Bartow Co.: Busch Cave, 2 June 1999.

Comments: A specimen was collected near a bird nest at the bottom of one of the vertical entrances to Busch Cave.

Paratachys sp. (TP) CAAS

Grady Co.: Maloys Waterfall Cave, 5 March 1999.

Comments: Because this genus is in need of revision, the species could not be determined from the adults collected.

Platynus parmarginatus Hamilton (AC) CARN

Walker Co.: Spooky Cave, 19 March 1999.

Comments: This beetle is a common surface species frequently found along streams.

Pseudanopthalmus digitus Valentine (TB) CARN

Dade Co.: Cemetery Pit, 10 May 1999.

Comments: A female was collected in the debris and rocks below the entrance pit. The specimen was under the same rock as a congener, *P. fulleri*.

Pseudanopthalmus fastigatus Barr (TB)

Walker Co.: Horseshoe Cave.

Comments: Barr (1981) described this species and provided the record.

Pseudanopthalmus fulleri Valentine (TB) CARN

Dade Co.: Cemetery Pit, 10 May 1999, Upper Valley Cave, 10 May 1999.

Comments: This beetle was collected in the mud and organic debris at the base of the entrance pits of both caves.

Pseudanopthalmus georgiae Barr (TB)

Chattooga Co.: Blowing Spring Cave; Walker Co.: Mt. Cove Farm Cave, Pettijohns Cave.

Comments: Barr (1981) described this species and provided the records.

Pterostichus relictus (Newman) (TX/TP) CAAS

Dade Co.: Upper Valley Cave, 10 May 1999.

Comments: A single beetle was collected in the debris piles of Upper Valley Cave.

Sphaeroderus stenostomus Weber (TX) CAAS

Dade Co.: Howards Waterfall Cave, 10 December 1998.

Comments: A specimen was collected in the web of *Meta ovalis*.

Family Histeridae

Margarinotus egreius (Casey) (TX/AC)

Walker Co.: Spooky Cave, 19 March 1999.

Comments: This beetle is usually associated with carrion.

Family Leiodidae

Catops gratiosus Blanchard (TP) CARL

Dade Co.: Johnsons Crook Cave, December 1998, Newsome Gap Cave, 29 May 1998; Walker Co.: Horseshoe Cave, 21 June 1998.

Comments: This common cave species has been found throughout the Southeast (Holsinger & Peck 1971).

Nemadus horni Hatch (TP) CARL

Dade Co.: Newsome Gap Cave, 29 May 1998. Johnsons Crook Cave, December 1998; Decatur Co.: Climax Cave, 6 March 1999; Walker Co. Rocky Cave, 19 March 1999.

Comments: The species has been reported in caves of Alabama (Peck 1995).

Ptomaphagus cavernicola Schwarz (TP) CARL

Decatur Co.: Climax Cave, 6 March 1999; Grady Co.: Maloys Waterfall Cave, 6 March 1999.

Comments: *Ptomaphagus cavernicola* is a common troglomorphic leiodid near the coast. *Ptomaphagus cavernicola* was collected in Florida by Peck (1973).

Ptomaphagus fiskei Peck (TB)

Dade Co.: Anderson Spring Cave, 1 January 1999; Walker Co.: Bible Spring Cave, Mountain Cove Farm Cave, Pettijohns Cave, Rocky Cave, 19 March 1999.

Comments: With the exception of the Anderson Spring Cave and Rocky Cave records, these records were reported by Peck (1973), who determined that the species is limited to the east and west flanks of Pigeon Mountain.

Ptomaphagus whiteselli Barr (TB)

Dade Co. Cemetery Pit, 10 May 1999, Case Cavern, Hurricane Cave, 10 December 1998, Rustys Cave, 18 December 1998, and Twin Snakes Cave.

Comments: Peck (1973) reported the Case Cavern and Twin Snakes Cave records. These beetles are attracted to carrion and cheese baits.

Family Scarabaeidae*Trox aequalis* Say (TP)

Walker Co.: Fricks Cave, 11 December 1998.

Comments: This scarab beetle apparently lives in guano of *Myotis grisescens* in Fricks Cave.

Family Staphylinidae*Atheta annexa* Casey (TP) NRCL

Bartow Co.: Yarbrough Cave, 12 June 1967; Dade Co.: Morrison Cave, 13 July 1967; Decatur Co.: Climax Cave, 6 March 1999; Grady Co.: Maloys Waterfall Cave, 5 March 1999; Walker Co.: Chickamagua Cave Spring Cave, 10 June 1967, Horseshoe Cave, 21 June 1967, Mt. Cove Cave, 20 June 1967.

Comments: This staphylinid beetle was collected in bat guano from Maloys Waterfall Cave and Climax Cave. Klimaszewski and Peck (1986) published the additional records.

Atheta lucifuga Klimaszewski and Peck (TP)

Walker Co.: Mt. Cove Cave, 11-20 June 1967.

Comments: Klimaszewski and Peck (1986) published this record.

Atheta trogliphila Klimaszewski and Peck (TP)

Dade Co.: Howard (sic) Waterfall, 30 July 1965, Byers Cave, 18 June 1967; Walker Co.: Mt. Cove Cave, 11 June 1967.

Comments: Klimaszewski and Peck (1986) published these records.

Batriasymmodes sp. (TP) LSUC

Dade Co.: Howards Waterfall Cave, 26 December 1998.

Comments: A female was collected in organic debris. *Batriasymmodes* has previously been reported as a Pselaphidae. Newton and Thayer (1995) provided evidence to move the family Pselaphidae to the Omaliinae group of the Staphylinidae.

Lesteva pallipes (LeConte) (TP) NRCL

Bartow Co.: Chert Chasm; Dade Co.: Hurricane Cave, 10 December 1998; Walker Co. Rocky Cave, 19 March 1999.

Comments: An adult was taken in the stream passages of Hurricane Cave on cat food.

Philonthus sp. (TP) NRCL

Grady Co.: Maloys Waterfall Cave, 5 March 1999.

Comments: This beetle was collected in bat guano.

Sepedophilus littoreus (Linnaeus) (TP) NRCL

Dade Co.: Horseshoe Cave, 16 August 1998.

Comments: *Sepedophilus littoreus* was collected on chicken liver.

Xenota spp. (TP)

Dade Co.: Deans Pit, January 1998, Johnsons Crook Cave, 20 March 1998; Walker Co. Horseshoe Cave, January 1998, Pettijohns Cave, 7 August 1998.

Comments: Adults of *Xenota* spp. were collected on chicken liver. Immature stages were collected in Horseshoe Cave. The specimens could not be identified to species, but they represent at least three species. One species was found in Johnsons Crook Cave and another in Pettijohns Cave. The remain-

ing records appear to represent a third species.

Order Collembola**Family Entomobryidae***Lepidocyrtus* sp. (TP)

Bartow Co.: Kingston Saltpeter Cave, 2 June 1999

Comments: This collembolan was collected in a drip pool.

Pseudosinella georgia Christiansen and Bellinger (TP) UTEN

Walker Co.: Fricks Cave, 11 December 1998.

Comments: This species was collected in fresh bat guano after processing it in a Berlese funnel.

Pseudosinella pecki Christiansen and Bellinger (TB)

Decatur, Randolph, and Stewart counties: Cave localities unreported.

Comments: Christiansen and Bellinger (1980) described this troglotic species but did not indicate the caves in which it was collected.

Pseudosinella sp. (TB/TP) UTEN

Dade Co.: Howards Waterfall Cave, 10 December 1998, 26, December 1998.

Comments: This species does not key out to the previously reported *P. hirsuta* (Holsinger & Peck 1971), and could not be identified.

Family Neelidae*Neelus murinus* Folsom (TP) UTEN

Dade Co.: Howards Waterfall Cave, 26 December 1998.

Comments: *Neelus murinus* was a common springtail in the organic debris.

Family Onychiuridae*Tullbergia iowensis* Mills (TP) UTEN

Dade Co.: Howards Waterfall Cave, 10 December 1998.

Comments: *Tullbergia iowensis* was a common collembolan in organic debris.

Family Sminthuridae*Arrhopalites pygmaeus* (Wankel) (TP)

Bartow Co.: Kingston Saltpeter Cave, 2 June 1999.

Comments: This collembolan was collected on the surface of a drip pool.

Family Tomoceridae*Tomocerus dubius* Christiansen (TP)

Bartow Co.: Kingston Saltpeter Cave, 2 June 1999.

Comments: This collembolan was collected on the surface of a drip pool.

Order Diptera**Family Campodeidae***Litocampa* spp. (TB)

Walker Co.: Anderson Spring Cave, 1 January 1998, Fricks Cave, 11 December 1998, Spooky Cave, 19 March 1999.

Comments: Two undescribed species of *Litocampa* were collected in Walker County on cheese bait and a dead mouse.

Order Diptera**Family Calliphoridae***Calliphora vicina* (Robineau-Desvoidy) (TX)

Dade Co.: Deans Pit, 15 May 1998, Howards Waterfall Cave, 16 December 1998; Walker Co.: Horseshoe Cave, 15 May 1998, 7 August 1998.

Comments: This calliphorid was collected on chicken liver in twilight and total darkness. Similar records exist from Illinois (Peck & Lewis 1977) and Alabama (Reeves, unpublished data).

Calliphora vomitoria (Linnaeus) (TX)

Dade Co.: Howards Waterfall Cave, 16 December 1998.

Comments: An adult was collected near chicken liver.

Family Cecidomyiidae*Bremia* sp. (unknown) SMIT

Dade Co.: Sittons Cave, 7 August 1998.

Comments: This record represents a pale, long-legged specimen. The genus is in need of revision and specimens could not be identified to species level.

Family Chironomidae*Chironomus decorus* group (TX/AC) FSCA

Washington Co.: Tennille Lime Sinks, 24 May 2000.

Comments: This fly was attracted to headlamps while in the dark area of the cave.

Procladius bellus (Loew) (TX) FSCA

Bartow Co.: Busch Cave, 2 June 1999.

Comments: This fly rests in the cave during the day.

Tanytarsus nr. *recurvatus* Brundin (TX) FSCA

Bartow Co.: Busch Cave, 2 June 1999.

Comments: This fly rests in the cave during the day.

Family Culicidae

Comments: Several species of Culicidae overwinter in caves (Makiya & Taguchi 1982).

Anopheles punctipennis (Say) (TX)

Dade Co.: Hurricane Cave, 10 December 1998, Howards Waterfall Cave, 10 December 1998; Walker Co.: Horseshoe Cave, 7 November 1998, Fricks Cave, 11 December 1998.

Culex territans Walker (TX)

Walker Co.: Horseshoe Cave, 7 November 1998.

Family Dolichopodidae

Liancalus genualis Loew (TX) UMON

Bartow Co.: Yarborough Cave, 7 September 1998.

Comments: Adults of *L. genualis* were seen on the roof and walls of the cave, probably avoiding the hot summer days outside.

Neurigonella sombria (Harmston and Knowlton) (unknown) UMON

Dade Co.: Upper Valley Cave, 10 May 1999.

Comments: This pale dolichopodid was collected on the roof in the dark zone.

Family Heleomyzidae

Aecothea specus (Aldrich) (TX)

Bartow Co.: Busch Cave, 2 June 1999, Kingston Saltpeter Cave, 2 June 1999; Dade Co.: Sittons Cave, 1 October 1998.

Comments: This fly was common in Georgias caves.

Amoebalaria defessa (Osten-Sacken) (TX)

Bartow Co.: Busch Cave, 2 June 1999, Kingston Saltpeter Cave, 2 June 1999; Dade Co.: Cemetery Pit, 10 May 1999, Hurricane Cave, Howards Waterfall Cave, Rustys Cave, Sittons Cave, Upper Valley Cave, 10 May 1999; Walker Co.: Anderson Spring Cave, Ellisons Cave, 25 July 1995, Horseshoe Cave.

Comments: This fly was common in Georgia's caves.

Family Muscidae

Muscina prolapsa (Harris) (TX) OXFO

Dade Co.: Sittons Cave, 1 October 1998; Walker Co.: Horseshoe Cave, 16 August 1998.

Comments: This species has not been recorded from caves, but Holsinger and Peck (1971) reported an unidentified muscid in Yarborough Cave. *Muscina prolapsa* was always collected in total darkness.

Family Mycetophilidae

Rymosa sp. (TX/TP)

Dade Co.: Sittons Cave, 30 September 1997.

Comments: Specimens of this undetermined species were collected hanging on the webs of *Meta ovalis* near a cave entrance.

Family Phoridae

Megaselia cavernicola (Brues) (TP) LANH

Dade Co.: Howards Waterfall Cave, Johnsons Crook Cave, Newsome Gap Cave; Walker Co.: Anderson Spring Cave, Pettijohns Cave, Horseshoe Cave. Comments: *Megaselia cavernicola* larvae were collected on chicken liver, human dung, and Brie cheese.

Megaselia spelunciphila Disney (TP) LANH

Dade Co.: Deans Pit, 22 March 1998, Rock Shelter Pit, 22 March 1998; Walker Co.: Horseshoe Cave.

Comments: This species is associated with caves in Georgia and South Carolina. Reeves and Disney (1999) recently described *Megaselia spelunciphila*.

Puliciphora virginensis Malloch (TP) LANH

Walker Co.: Horseshoe Cave, 16 August 1998.

Comments: This wingless phorid was associated with fungal hyphae and carrion.

Family Psychodidae

Psychoda pussilla Tonnoir (TP) MAXP

Walker Co.: Horseshoe Cave, 14 January 1998.

Comments: Larvae were collected on chicken liver and reared in the laboratory.

Psychoda reevesi Quate (TP) SMIT

Dade Co.: Newsome Gap Cave.

Comments: This species was collected on human dung and was recently described by Quate (2000).

Family Sciaridae

Bradysia forficulata (Bezzi) (unknown) DEIC

Dade Co.: Newsome Gap Cave, 29 May 1998.

Comments: A single female was collected from organic debris. Several species of *Bradysia* are troglaphiles in Mexico (Reddell 1981), but the status of Nearctic species is not fully known.

Corynoptera sp. (unknown) DEIC

Dade Co.: Upper Valley Cave, 10 May 1999. Walker Co.: Horseshoe Cave, 30 May 1998.

Comments: Female *Corynoptera* were collected from organic debris.

Lycoriella sp. (TP) DEIC

Bartow Co.: Anthonys Cave, 20 May 1999. Dade Co.: Deans Pit, 22 March 1998, Newsome Gap Cave, 29 May 1998; Walker Co.: Pettijohns Cave, 3 August 1998, Horseshoe Cave, 30 May 1998, 30 September 1998.

Comments: These records represent an undescribed cavernicolous species.

Family Simuliidae

Prosimulium saltus Stone and Jamback (TX)

Dade Co.: Newsome Gap Cave, March-April 1998.

Comments: Larvae and pupae were recorded from this cave (Reeves & Paysen 1999).

Simulium parnassum Malloch (TX)

Dade Co.: Newsome Gap Cave, March-June 1998.

Comments: Larvae and pupae were recorded from this cave (Reeves & Paysen 1999).

Family Sphaeroceridae

Leptocera caenosa (Aldrich) (TP)

Dade Co.: Newsome Gap Cave, 29 May 1998; Walker Co.: Pettijohns Cave, 3 August 1998.

Comments: This fly was common in caves on carrion, cheese, and dung.

Spelobia tenebrarum (Aldrich) (TB)

Chattooga Co.: Blowing Springs Cave; Dade Co. Howards Waterfall Cave, Rising Fawn Cave, Johnsons Crook Cave; Walker Co.: Mt. Cove Farm Cave, Pettijohns Cave, Bible Spring Cave.

Comments: Marshall and Peck (1984, 1985) reported these records. They assume *S. tenebrarum* is a troglotic species because of its reduced eyes, cave-restricted range, and lack of active flight.

Family Syrphidae

Copestylum vesicularium (Curran) (TX) SMIT

Grady Co.: Maloys Waterfall Cave, 6 March 1999.

Comments: Adults probably overwinter in the cave.

Family Tipulidae

Dolichopeza tridenticulata Alexander (TX) CARN

Dade Co.: Sittons Cave, 7 August 1998.

Comments: This species of crane fly was found only during the late summer.

Dolichopeza walleyi (Alexander) (TX) CARN

Bartow Co.: Anthonys Cave, 20 May 1999.

Comments: This crane fly hangs from the roof of the cave during the day.

Tipula abdominalis (Say) (TX)

Walker Co.: Ellisons Cave, 29 July 1995.

Comments: A larva was collected near the "Historic Entrance".

Family Trichoceridae

Trichocera fattigiana Alexander (TX) CARN

Dade Co.: Hurricane Cave, 10 December 1998, Howards Waterfall Cave, 10 December 1998; Walker Co.: Anderson Spring Cave, 1 January 1999.

Comments: This winter crane fly was common near the entrances of caves.

Trichocera sp. (TX) CARN

Dade Co.: Howards Waterfall Cave, 16 December 1998; Walker Co.: Horseshoe Cave, 14 February 1998.

Comments: In Horseshoe Cave, a female was entangled in a carrion trap. Species identification was not possible due to the gender.

Order Hemiptera

Family Cicadidae

Magiccada sp. (ED)

Walker Co.: Horseshoe Cave, March 1998.

Comments: This periodic cicada is a true edaphic species, but some immatures become trapped in caves prior to emergence.

Family Veliidae

Microvelia americana (Uhler) (AC) SMIT

Dade Co.: Howards Waterfall Cave, 10 December 1998.

Comments: An individual was collected in a cave pool.

Order Hymenoptera

Family Braconidae

Aspilota spp. (TP)

Dade Co.: Sittons Cave, 1 October 1998, Deans Pit, 22 March 1998, Rock Shelter Pit, 22 March 1998, Upper Valley Cave, 10 May 1999.

Comments: These braconids were parasitoids of immature phorids. Braconids emerged individually from phorid puparia (Reeves & Disney 1999). Adults were observed on cave walls, carrion, and cheese.

Family Formicidae

Myrmecina americana Emery (TX)

Dade Co.: Newsome Gap Cave, 29 May 1998.

Comments: This ant was foraging in the dark zone.

Order Lepidoptera

Family Noctuidae

Scoliopteryx libatrix (Linnaeus) (TX)

Dade Co.: Johnsons Crook Cave, 20 December 1998, Howards Waterfall, 10 December 1998, Newsome Gap Cave, 29 May 1998; Walker Co.: Horseshoe Cave.

Comments: *Scoliopteryx libatrix* uses caves as hibernacula and has a worldwide distribution (Peck & Lewis 1977).

Order Odonata

Family Cordulegastridae

Cordulegaster sp. (TX)

Washington Co.: Tennille Lime Sinks, 24 May 2000.

Comments: These sand dwelling odonates were common in the Tennille Lime Sinks stream.

Family Gomphidae

Progomphus obscurus (Rambur) (TX)

Washington Co.: Tennille Lime Sinks, 24 May 2000.

Comments: These sand dwelling odonates were common in the Tennille Lime Sinks stream.

Order Psocoptera

Family Liposcelididae

Liposcelis decolor Pearman (TP)

Bartow Co.: Kingston Saltpeter Cave, 2 June 1999; Walker Co.: Ellisons Cave, 29 July 1995.

Comments: *Liposcelis decolor* was collected in bat guano and in debris.

Order Siphonaptera

Family Ctenophthalmidae

Ctenophthalmus pseudagyrtis Baker (SY) GASO

Walker Co.: Pettijohns Cave

Comments: Two adult *Ctenophthalmus pseudagyrtis* were collected in the cave. These fleas usually feed on small mammals.

Order Trichoptera

Family Hydropsychidae

Diplectrona marianae Reeves (TX)

Dade Co. Newsome Gap Cave, March-April 1998, 29 May 1998.

Comments: Adults and larvae of this species were collected from a cave stream and surrounding passages (Reeves & Paysen 1999).

DISCUSSION

Updated local checklists are essential for protecting cave organisms. Holsinger and Peck (1971) presented an annotated checklist of cave fauna in Georgia, but many caves and microhabitats were omitted. Our work indicates further research is needed in caves where undescribed or unidentifiable species were collected. These species include most of the nematodes and fungi, which are seldom-reported in checklists. Future research into the life history and taxonomy of cavernicolous fungi and worms could reveal undetected troglobitic species.

The majority of the species found in Georgia's caves were not unique to the state and can be found in caves of Alabama, Florida, North Carolina, South Carolina, and Tennessee. The

five zoogeographic patterns presented by Holsinger and Peck (1971) can be partially supported by our data. Their first pattern, which states that some troglobitic species are common in the southern Appalachians, was supported. However, this statement is ambiguous and further sampling and taxonomic revisions will probably indicate that the true ranges of these troglobites are restricted by geologic or historic factors. Our data support the hypothesis that many aquatic species inhabit the phreatic zone and, thus, enter connected phreatic cave systems. For example the amphipod *Crangonyx antennatus* was collected in different drainage basins and was reported to be in caves throughout the southern Appalachians (Holsinger & Peck 1971).

Their second pattern, which stated that some species are limited to the plateau caves, was also supported by our additional records. For example the millipede *Pseudotremia eburnea* was found in the caves of Lookout Mountain and Pigeon Mountain but it was not collected in any of the valley caves of Walker or Bartow Counties. Another troglobitic millipede *Scoterpes austrinus* shared some of its distribution range with *Pseudotremia eburnea*, but *Scoterpes austrinus* was also collected in the valley caves of Bartow County.

Their third zoogeographic pattern, which states that some species are limited to karst subunits, was supported by our data. This pattern was an extension of the second pattern, but further limits karst regions within the plateaus and valleys. An example of this pattern was demonstrated by the records of both *Ptomaphagus* beetle species, which were restricted to Lookout Valley and the flanks of Pigeon Mountain.

Their fourth and fifth patterns were problematic. It stated that two species, *Pseudanophthalmus fulleri* and *Apochthonius minor*, were found in both the plateau and valleys. Extensive collections have not been made of either species, and we do not have evidence to refute this pattern. The apparent pattern could be an artifact of small sample sizes. The same problem exists for their fifth pattern, which states that only two species of *Stygobromus* are known exclusively from the Appalachian Valley. There is no evidence this was untrue, but extensive samples in the phreatic region have not been made.

There are three major limitations in understanding the zoogeography of troglobitic and troglophilic species in Georgia. First, the general life histories and habitat requirements of almost all cavernicoles are unknown. Ecological factors influence the distribution of all species, and research is needed to determine what factors are important for cavernicoles. The second limitation in understanding Georgia's cave fauna is the lack of information on the fauna of Coastal Plain caves. Some coastal regions of the state are biologically unsurveyed. Finally the dwindling taxonomic community makes identification of some cavernicoles impossible.

ACKNOWLEDGEMENTS

We thank Anheuser-Busch, Georgia Department of Natural Resources, Sandersville Railroad Company, Southeastern

Cave Conservancy, United States Forest Service, and private landowners for allowing us to collect specimens in their caves.

Fieldwork associated with this project was assisted by P.H. Adler, P. Aughey, B. Aulenbach, L. Barid, C.E. Beard, L. Blair, K. Buhlmann, D. Cousineau, A. Cressler, E.T. Davis, I. Dillon, S. Dublois, W. Gibbons, J. Greene, P. Kelly, J. Kintz, F. Lane, N. Holcomb, D. Lasky, T. Moltz, A. Padgett, E.S. Paysen, B.C. Postlewaite, B. Putnam, B. Reeves, B.A. Reeves, M.A. Reeves, M.H. Reeves, W.C. Reeves, A.D. Smith, M.J. Schwallier, P. Spivey, J. Storbakken, T. Tuberville, and J. Wallace.

Identifications of many specimens could not have been made without the assistance of numerous taxonomists. We are grateful for the determinations and helpful comments of the following specialists: P.H. Adler, Simuliidae; J.S. Ashe, Staphylinidae; R. Baptista, Pholcidae; T.C. Barr, Carabidae; C.E. Beard, Trichomycetes; E. Bernard, Collembola; B.V. Brown, Phoridae; K. A. Buhlmann, unpublished mite records; B.A. Caldwell, Chironomidae; C. Carlton, beetles; J. Cokendolpher, Opiliones; F. Coyle, spiders; D.A. Crossley, mites; R. Davidson, Carabidae; R.H.L. Disney, Phoridae; L. Durden, fleas, mites, and ticks; R.J. Gagne, Cecidomyiidae; M.C. Hedin, Nesticidae; H.H. Hobbs, Crayfish; R. Hoffman, millipedes and centipedes; J.R. Holsinger, amphipods; G. Hormiga, Linyphiidae; H. Howden, Scarabidae; D.J. Hunt, nematodes; R.L. Hurley, Dolichopodidae; R.D. Kathman, Aeolosomatida and Oligochaeta; D. Kavanaugh, Carabidae; J. Klimaszewski, Staphylinidae; O. Kulkoyluoglu, Ostracoda; G. Knue, ants; J. Landolt, slime molds; S. Laplante, Histeridae; R.W. Lichtwardt, Trichomycetes; P.M. Marsh, Braconidae; S. Marshall, Sphaeroceridae; F. Menzel, Sciaridae; W.B. Muchmore, pseudoscorpiones; B. O'Connor, mites; E.S. Payson, Simuliidae; L.M. Page, aquatic isopods; D. Paulson, Odonata; S.B. Peck, Leioididae; N. Platnick, spiders; D. Polhemus, Heteroptera; A. Pont, Muscidae; L.W. Quate, Psychodidae; J. Reid, Copepoda; J.W. Reynolds, Oligochaeta; B. Robinson, Trichoptera; E. Ruppert, Nemertea nomenclature; M. J. Sharkey, Braconidae; W. Shear, centipedes, isopods, millipedes, and spiders; F.C. Thompson, Syrphidae; R. Wagner, Psychodidae; C. Watson, Chironomidae, Oligochaeta, and Nemertea, G.T. Watters, snails; and C. Young, Trichoceridae and Tipulidae.

Will Reeves' fieldwork was partially supported by P. H. Adler and an E.W. King Grant. A portion of the funding for this study was derived from the sale of Georgia's nongame wildlife license plates. This is Technical Contribution Number 4567 of the South Carolina Agriculture and Forestry Research System.

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