

BIOLOGY OF THE CHIQUIBUL CAVE SYSTEM, BELIZE AND GUATEMALA

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The Chiquibul Cave System is the longest and largest known network of caves in Central America. Most biological collections and observations in the system were conducted in 1986 in the Cebada Cave segment. Other collections were made in 1984 and 1988. At least 70 invertebrate species are known from the system. Many species await study, and of these, two aquatic and five terrestrial species are apparent troglobites. A zonation survey in the entrance of Cebada Cave showed typical forest litter species in all areas. The fauna of the deep zones of the system included only troglaphiles and troglobites. Troglobites were rare and present only in the area farthest from the entrance.

The Chiquibul Cave System is located in a remote and little known area of west-central Belize on the southern Vaca Plateau (see location map on page 68), with its downstream end extending into Guatemala. Primarily comprised of four hydrologically-linked caves (see Miller, Figure 15, this issue), the system formed by the sinking of the Chiquibul River into its present and former subterranean conduits. Its resurgence is in Guatemala. Over 55 km of passages in the system have been surveyed, including the largest known passages and cave room in the Western Hemisphere (Miller, 1989).

The cave fauna of Belize and Guatemala has been poorly studied, with few systematic surveys having been conducted. Most collections have been sporadic and associated with general exploration and mapping expeditions. The only general discussion of the fauna is that of Reddell (1981). Recent work in other parts of Belize has been conducted by William R. Elliott and Stewart B. Peck. The present study of the Chiquibul Cave System is the first comprehensive biological study conducted in Belize. The only other biospeleological studies of the area are the description of a new species of troglobitic crab found by Tom Miller during a 1984 reconnaissance of the Chiquibul area (Hobbs, 1986), and the description of a new species of troglobitic shrimp found by Don Coons in the Chiquibul System's Actun Tunkul segment in 1986 (Hobbs & Hobbs, 1995).

Three expeditions explored the Chiquibul System, making few biological collections in 1984, most in 1986, and additional collections in 1988. This report compiles those data, identifying the discovered species and their habitats.

DESCRIPTION OF THE CHIQUIBUL CAVE SYSTEM

Each year, about 2.5 m of rain falls on the noncarbonate rocks of Belize's Maya Mountains and flows west toward the

karstic Vaca Plateau. The resultant Chiquibul River goes underground about 1 km before reaching the Chiquibul System's Kabal Cave Group, which consists of a series of large, former stream passages that occasionally transmit flood overflows and intersect the underground Chiquibul River in one passage for about 150 m. The upper end of Kabal holds ponded floodwaters with large, washed-in rotting trees and organic debris. Downstream the system holds less water and organic material because fewer collapses intersect the cave. Passages in the cave are generally 10-60 m wide and 10-30 m high.

The downstream end of the Kabal Group is truncated by a valley which is a 1.2-km-stretch of collapsed passage that ends at the entrance of 12-km-long Actun Tunkul. Tunkul is also a former conduit for the Chiquibul River and is only seasonally flooded. With the exception of some short side passages, the cave is a large single passage averaging 40-50 m wide by 20 m high, enlarging in the Belize Chamber to more than 200 m in diameter. Approximately 1 km into the cave, a perennial stream enters from a side passage. In addition, minor seeps occur along the main passage walls. Most of the floor is a thick deposit of sand and silt laden with organic debris. The cave ends in a deep sump about 500 m from the upstream end of Cebada Cave.

The entrance to Cebada Cave is 1.5 km east of the Guatemalan border at the base of a deep collapsed sinkhole, like the other caves of the Chiquibul System. The cave contains the full flow of the underground Chiquibul River, which averages 2-4 m wide and 1-2 m deep, with a baseflow of about 2 m³/s. Annual stream rises greater than 20 m are not unusual, and large amounts of organic debris often enter the cave. The river is flanked by large banks of sand, silt, and some breakdown. Some pools amid the silt banks contain a dark red alga. Upstream, the cave extends south, then east for over 4 km to a

large collapse. The passage is similar to Actun Tunkul but has more side passages and the side passages tend to be longer. The Chiquibul River emerges from the breakdown, and a 2-4 m diameter upper level passage intersects the river 1.1 km upstream near Tunkul. Downstream from the Cebada entrance the river flows about 2.2 km and sumps just before reaching Guatemala. An overflow passage exits to the 500-m-diameter collapsed "Zactun" sinkhole just inside Guatemala, and a large, well-decorated passage intersects the main passage far above flood levels.

The resurgence segment of the cave system is Xibalba. The Chiquibul River enters the cave through breakdown near a collapse-formed "Middle Entrance," and flows down the 2.3-km-long main passage, which averages 70-100 m wide by 30-50 m high. The river discharges from breakdown into a surface river below Xibalba's 200-m-wide by 80-m-high main entrance. Two other significant passages also occur in the cave. One is a dry, upper level, 30-m-wide by 20-m-high passage that extends north from the main entrance for 750 m. The other begins at the Zactun sinkhole and extends as a series of lakes for nearly 3 km to the upstream end of the main passage.

ECOLOGICAL ZONES

The massive size of the Chiquibul entrances and passages, and the volume of floodwaters that flow through them somewhat blur the distinction between the entrance, twilight, and dark zones. Daylight can reach over 200 m into most Chiquibul caves, which are easily accessible by most epigean species. Floods carry ample organic material through the system, in addition to species such as catfish that are common in Cebada Cave.

Specimens were collected by hand throughout most of the cave system. In addition, pitfall traps were placed in five locations in the Cebada Cave entrance area (Figure 1). The pit openings were 2.5 cm in diameter and were covered with a caprock placed 2 cm above. A margarine-oats-sugar bait was placed on the bottom of the caprock.

The following discussion includes the location and general ecological conditions in the parts of the system that were studied. Brief notes are also provided on the fauna in each area.

ACTUN TUNKUL

The only collections in this cave have been of one species each of troglobitic shrimp and crab by Tom Miller and Don Coons. This section should contain a rich troglobitic fauna.

CEBADA CAVE ENTRANCE AREA

The entrance area was divided into three zones (A, B, C) based on available natural light (Figure 1). Bats and cliff swallows inhabited this part of the cave.

Zone A: This zone extended across the passage from the drip-line for about 20 m into the cave. It contained surface fauna and was modestly representative of that ecosystem. It

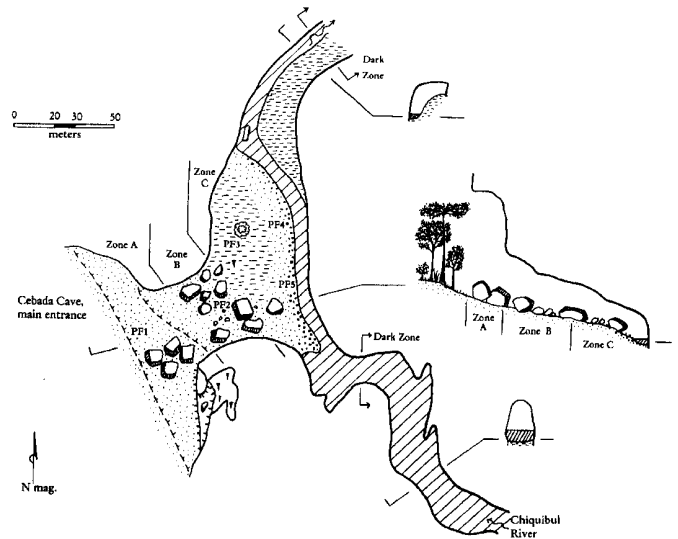


Figure 1. Biotic sampling zones and pitfall trap locations in the main entrance area of Cebada Cave (after Grundy & Whitwell, 1990).

was located under the cave's drip-line and was heavily vegetated due to several hours of daily direct sunlight. The substrate was mostly a dry loose sand. Pitfall trap no. 1 was placed in this zone. One beetle was found in this trap.

Zone B: This zone extended across the passage and into the cave for about 20 m. It had sparse vegetation, including some moss. It received no more than an hour of direct sunlight per day, and was markedly cooler than Zone A. Pitfall trap no. 2 was placed in an area of dry sand substrate. It was more successful than pitfall trap no. 1. The only troglobitic species found in this zone was the collembolan *Troglopedetes* ?n.sp.

Zone C: This zone extended from the stream to the left wall and was about 120 m long. It lacked vegetation. There was seldom direct sunlight and the temperature was near the cave's constant of 22°C. Three pitfall traps were placed in this zone. Pitfall trap no. 3 was placed on wet clay substrate. Pitfall trap no. 4 was placed on dry sand substrate. Pitfall trap no. 5 was placed on wet gravel/cobble with some sand substrate about 2 m from and 0.5 m above the baseflow of the Chiquibul River. This zone contained some surface species but also included the troglobitic isopod *Troglophiloscia* sp. cf. *belizensis* and the collembolan *Troglopedetes* ?n.sp. Trogloniles included spiders of the subfamily Araneinae and the isopod *Sphaerarmadillo* sp. cf. *schwarzi*. The trogloniphilic rove beetle *Homaeotarsus* sp. was especially abundant near the stream. Isopods were found only on wet mud substrate.

UPSTREAM CEBADA CAVE

No differences in faunal variety or abundance occurred between this section and the downstream section (see below), except for the lack of the small carabid beetles found near the

downstream sump. No fauna was observed in the upper level passage, which heads toward Actun Tunkul. No collections were made in this section.

CATFISH PASSAGE

Located about 2 km upstream from the Cebada Cave entrance, this is the most extensive series of passages that feed into the Chiquibul River. The passage does not contain catfish, but is named for a catfish skeleton on a mud bank in the main passage near its entrance. An unidentified water treader collected from a clear, flowing, bedrock-floored pool was the only one seen in the Chiquibul System. Observed, but uncollected, fauna included crabs, amblypygids, and beetles. Terrestrial troglobites included the isopod *Troglophiloscia* sp. cf. *belizensis* and the collembolan *Troglopedetes* ?n.sp. Trogloniles included carabid beetles and the spiders *Metagonia* sp. and an undetermined species of the subfamily Araneinae.

DOWNSTREAM CEBADA CAVE

Small carabid beetles were found only near the downstream sump of Cebada Cave on a predominantly organic rich mud substrate. All other collected fauna (beetles, spiders, springtails, harvestmen, isopods, amblypygids, etc.) were found on sand-silt banks and well above stream level. Representatives of all observed fauna were collected, except for the large population of non-troglobitic catfish. All species found in this area are probably either trogloniles or troglobites. This was the only locality for the troglobitic entotroph of the family Campodeidae. Other troglobites included the isopod *Troglophiloscia* sp. cf. *belizensis*, the pseudoscorpion *Mexobisium goodnighti*, and the collembolan *Troglopedetes* ?n.sp.

ACTUN ZACTUN

A small collection by Olivia Whitwell was made in the twilight zone. It included only amblypygids and scutigermorph centipedes.

XIBALBA (MAIN STREAM PASSAGE)

Only one large spider, about 600 m from the resurgence entrance was collected in this section of the cave. Crickets, bats, and millipede exuviae were observed.

XIBALBA (RB SURVEY)

This is the high level, dry passage near the resurgence. Dry guano covers the floor of the passage's first 300 m to depths of over one meter. This area is often exposed to direct or near-direct sunlight. Invertebrates and guanophiles were not found on the guano, but bats and cliff swallows were observed above it. The passage was dry except for the damp collection site located in the final hundred meters of the passage. All species obtained in this area were trogloniles or troglobites. Crickets were observed throughout the passage. Hundreds of millipede exuviae occurred in the dry part of the passage. Although no

live millipedes were actually observed, they may go there to dry out their new exoskeletons. Troglonitic species include the pseudoscorpion *Mexobisium goodnighti* and undetermined pholcid spiders.

CAVE FAUNA

A minimum of 70 invertebrate species has been found in the Chiquibul Cave System and they are listed in the appendix to this report. Much of the fauna remains unidentified for lack of specialists in specific groups. The cave fauna, as in most large stream caves in Central America, is dominated by epigeal species washed into the cave or attracted to entrance areas by abundant food and shelter.

The aquatic cave fauna is poorly known with only three species recorded. Many small crustaceans probably occur and they may be of considerable interest. The aquatic species include an unidentified catfish of the genus *Rhamdia*, the troglonitic shrimp *Macrobrachium cationium* Hobbs and Hobbs (1995), and the troglonitic crab *Typhlopseudothelphusa acanthochela* Hobbs (1986). The fish and crab occur in all parts of the system. The shrimp is known from the Actun Tunkul section. The troglonitic catfish *R. laticauda typhla* Greenfield, Greenfield, and Woods (1983) occurs in other caves in Belize and could possibly be found in remote parts of the Chiquibul Cave System. All observed catfish in the system, however, appeared to have fully developed eyes and pigment.

The terrestrial cave fauna includes a large number of accidentals and troglonenes, most still unidentified. Few troglobites are known in the cave system but this number should increase with further study. Only four or five species show significant adaptations to the cave environment. The pseudoscorpion *Mexobisium goodnighti* Muchmore (1973) is a highly troglomorphic species known from several other Belize caves. The isopod *Troglophiloscia* sp. cf. *belizensis* is abundant in Cebada Cave. This species was described by Schultz (1984) from caves near Caves Branch and Augustine. An undescribed species of Collembola of the genus *Troglopedetes* was found in several areas of Cebada Cave. This genus is widespread in Middle America (Palacios-Vargas, Ojeda, and Christiansen, 1985). A single specimen of an apparently troglonitic species of the entotroph family Campodeidae was found in the Downstream Section of Cebada Cave. Finally from Xibalba, unidentified juveniles of the spider family Pholcidae were collected. These have reduced eyes and may be an undescribed troglonite. Of special interest is the presence in large numbers of the eyeless isopod *Sphaerarmadillo* sp. cf. *schwarzi*. This species is widespread from caves and leaf litter in Guatemala, Belize, and southern Mexico (Schultz, 1984).

DISCUSSION

The Chiquibul Cave System provides a wide variety of habitats available for colonization by invertebrates. These

habitats range from large vegetated entrance areas to remote subterranean areas characterized by comparatively lower energy levels and extensive deposits of speleothems.

The zonation survey in the entrance area of Cebada Cave shows no distinct demarcation of fauna. The minimal light and absence of vegetation allows a few of the less cave-adapted troglobites to survive. Accidentals and troglaphiles were found in all three zones.

Pitfall trap results in these zones closely reflect the observed fauna except that trap #1 in Zone A was notably unsuccessful. This is probably a direct result of the abundance of food, thus largely negating the attraction of the bait in the trap. The traps in Zones B and C were in areas with less food and therefore the bait was more attractive to more species.

The fauna of the deep zone parts of Cebada Cave (Downstream and the Catfish Passage) and Xibalba is dominated by troglaphiles and troglobites as would be expected in these areas of low energy input. The absence of more accidentals in these flood-prone areas is somewhat surprising, but may be a reflection of the time of collection (near the end of the dry season) and the inability of non-cave adapted species to survive in these areas.

Troglobitic crabs have been found on all types of substrate in Actun Tunkul, Cebada Cave, and Xibalba, but were often close to pools, rimstone dams, and seeps entering the main stream. None were observed feeding, but their slender pinchers are strong enough to snap onto cavers' fingers and get lifted into the air. One female crab bearing 48 young was collected. It is interesting to compare this with specimens of *Typhlopseudothelphusa mocinoi* Rioja from Chiapas. One specimen of this less cave-adapted species contained 57 young while another had 75 eggs (Hobbs, Hobbs & Daniel, 1977). Epigeic species typically produce many more young than this. Based on a 1984 observation in Tunkul, the crabs can grow up to 10-cm-diameter bodies with legs and pinchers of proportional size, although 3-cm-diameter bodies are far more typical.

The ubiquitous catfish of Cebada Cave range from 10-70 cm in length. They exhibit no features of adaptation to the cave environment. However, the younger fish are a medium dark brown to brown-gray color that fades to a pale white to gray as they get older. Dark coloring on the larger, apparently older, fish was found to be a coating of stream silt. No catfish were seen in Xibalba. Apparently the breakdown between Xibalba and Cebada is dense enough to prevent the catfish from swimming through. It would be interesting to study catfish from all parts of the system to see if any demonstrate reduction of eyes and pigment not readily apparent in the cave.

Despite the limitations of this study (lack of collections and intensive studies from other parts of the system) the results are valuable in demonstrating the patterns of colonization in the system. Other troglobitic groups present in Belize caves (schizomids, charontid amblypygids, ochyroceratid spiders, vachoniid pseudoscorpions, phalangodid harvestmen, and

cambalid millipedes) may well occur in the Chiquibul System. We urge that other studies of this type be conducted in other large cave systems in Belize.

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APPENDIX

The following is a complete list of fauna collected from the Chiquibul Cave System. Specimens of many groups were sent to specialists for identification but remain unstudied. Where possible the number of specimens is given. Records are separated by separate cave segments with the areas in the cave placed in parentheses.

PHYLUM NEMATOMORPHA

CLASS GORDIOIDA (gordion worms)

Undetermined material (parasite)

Record. BELIZE: Cebada Cave (Zone C).

Comment. One adult gordion worm was collected. The host is unknown.

PHYLUM MOLLUSCA

CLASS GASTROPODA (snails)

Undetermined material

Records. BELIZE: Cebada Cave (Zones A, B). GUATEMALA: Xibalba (RB Survey).

Comment. Dry shells of about six species are represented by the above records. This material probably washed into the cave and probably should not be considered part of the true cave fauna.

PHYLUM ARTHROPODA

CLASS ARACHNIDA

Order Amblypygida

Family Phrynidae

Paraphrynus sp. (troglophile)

Records. BELIZE: Cebada Cave (Downstream; Catfish Passage). GUATEMALA: Actun Zactun (Twilight Zone).

Comment. No specimens were collected from the Catfish Passage of Cebada Cave but are probably the same as in other parts of the system.

Order Pseudoscorpionida (pseudoscorpions)

Undetermined material

Record. BELIZE: Cebada Cave (3 km upstream of entrance).

Comment. One specimen from this locality awaits study.

Family Bochicidae

Mexobisium goodnighti Muchmore (troglomite)

Records. BELIZE: Cebada Cave (Downstream). GUATEMALA: Xibalba (RB Survey).

Comment. This collection included one male, 4 females, and one nymph from Cebada Cave and 1 female from Xibalba.

Order Araneae (spiders)

Family Agelenidae

Undetermined genus and species

Record. BELIZE: Cebada Cave (Zone A).

Comment. Two immature specimens of this family were collected.

Family Araneidae

Undetermined genus and species of the subfamily

Araneinae

Records. BELIZE: Cebada Cave (Catfish Passage; Zones A, B, C).

Comment. This material requires further study.

Micrathena sp. (accidental)

Record. BELIZE: Cebada Cave (Zone B).

Comment. A single male of this genus was collected.

Cupiennius sp. (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. A single immature specimen was collected.

Family Pholcidae

Undetermined genus and species (troglomite)

Record. GUATEMALA: Xibalba (RB Survey).

Comment. Only two immature specimens of this species with reduced eyes were obtained.

Metagonia sp. (troglophile)

Record. BELIZE: Cebada Cave (Catfish Passage).

Comment. Only single fragmented female was available for study.

Metagonia n.sp. (troglophile)

Record. BELIZE: Cebada Cave (Downstream).

Family Salticidae

Undetermined genus and species (accidental)

Record. BELIZE: Cebada Cave (Zone B).

Comment. One specimen of this family was collected.

Family Scytodidae

Scytodes sp. (?troglophile)

Record. BELIZE: Cebada Cave (Zone B).

Comment. A single female of this genus was collected.

Family Sicariidae

Loxosceles yucatanana Chamberlin and Ivie (troglophile)

Record. GUATEMALA: Xibalba (RB Survey)

Comments. One female was collected. This species is widespread throughout the Yucatán Peninsula and Belize.

Family Uloboridae

Philoponella sp. (?accidental)

Record. BELIZE: Cebada Cave (Zone B).

Comment. One female was collected.

Order Opiliona (harvestmen)

Family Sclerosomatidae

Geaya belizensis Goodnight and Goodnight (troglone)

Records. BELIZE: Cebada Cave (Catfish Passage; Zones B, C; and Pitfall Traps 2-5).

Comment. The following material was collected from each part of the cave: Catfish Passage (6 juveniles), Zone B (1 male, 2 females, 4 juveniles), Zone C (11 juveniles), Pitfall Trap 2 (14 juveniles), Pitfall Trap 3 (1 juvenile), Pitfall Trap 4 (3 juveniles), Pitfall Trap 5 (1 juvenile).

Order Acarida (mites and ticks)

Undetermined material

Record. BELIZE: Cebada Cave (Zone B).

Comment. One mite was collected.

Suborder Metastigmata (ticks)

Family Ixodidae

Amblyomma sp. (parasite)

Record. BELIZE: Cebada Cave (Zone C).

Comment. A single nymph was taken from a human host.

Ixodes (Ixodes) boliviensis Neumann (parasite)

Record. BELIZE: Cebada Cave (Zone C).

Comment. One female was taken from a human host. This species has been reported from man and a wide variety of wild and domesticated hosts.

Suborder Prostigmata (mites)

Family ?Trombidiidae

Undetermined genus and species

Record. GUATEMALA: Xibalba (RB Survey).

Comment. Four mites possibly belonging to this family were collected.

CLASS CRUSTACEA

Order Isopoda

Suborder Oniscoidea

Family Oniscidae

Records. BELIZE: Cebada Cave (Zone A, B).

Comment. One specimen of this epigeal species was found in each zone.

Family Philosciidae

Troglyphoscia sp. cf. *belizensis* Schultz

Records. BELIZE: Cebada Cave (Catfish Passage; Downstream; Zone C; Pitfall Trap 3).

Comment. This species was abundant throughout Cebada Cave. The following material was collected: Catfish Passage (1), Downstream (4), Zone C (3), Pitfall Trap 3 (7).

Family Sphaeroniscidae

Sphaerarmadillo sp. cf. *schwarzi* Richardson (troglophile)

Records. BELIZE: Cebada Cave (Downstream; Zones B, C; Pitfall Trap 3). GUATEMALA: Xibalba.

Comment. Specimens of this family are abundant in moister parts of the cave. The following material was collected: Downstream (4), Zone B (4), Zone C (2), Pitfall Trap 3 (5), Xibalba (1).

Order Decapoda

Family Palaemonidae (shrimp)

Macrobrachium cationium Hobbs and Hobbs (troglomite)

Record. BELIZE: Actun Tunkul.

Comment. This species is also known from Actun Chapat, Cayo District, Belize.

Family Pseudothelphusidae (crabs)

Typhlopseudothelphusa acanthochela Hobbs (troglomite)

Records. BELIZE: Cebada Cave (Downstream; Catfish Passage); Actun Tunkul.

Comment. This species is also known from Actun Chapat, Cayo District, Belize. One of three specimens from Cebada Cave carried 48 young. Specimens were seen but not collected from the Catfish Passage.

CLASS ENTOGNATHA

Order Collembola (springtails)

Family Entomobryidae

Troglopedetes n.sp. (troglomite)

Records. BELIZE: Cebada Cave (Catfish Passage; Downstream; Zones B, C; Pitfall Traps 2-5).

Comment. This undescribed species is widespread in caves throughout Belize. It was abundant in all parts of the cave.

Order Entotrophi (entotrophs)

Family Campodeidae

Undetermined genus and species (troglomite)

Record. Cebada Cave (Downstream).

Comment. This species appears to be highly troglomorphic. A single specimen was collected.

CLASS INSECTA (insects)

Undetermined material (larvae)

Records. BELIZE: Cebada Cave (Zone B; Pitfall Trap 2).

Comment. This material is under study.

Order Orthoptera

Undetermined material (accidental)

Record. GUATEMALA: Xibalba.

Comment. Only one specimen was collected.

Family Gryllidae (true crickets)

Undetermined genus and species (?troglophile)

Records. GUATEMALA: Xibalba (Middle Entrance; RB Survey).

Comment. Specimens from the Middle Entrance were taken from under bats.

Order Blattaria (roaches)

Undetermined material (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. One dead specimen was collected.

Order Hemiptera (true bugs)

Undetermined material (?accidental)

Records. BELIZE: Cebada Cave (Catfish Passage; Zone B).

Comment. A water treader from the Catfish Passage was taken from a clear, flowing, bedrock-floored pool.

Order Homoptera

Undetermined material (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. One specimen was collected.

Family Aphididae (aphids)

Undetermined genus and species (accidental)

Record. BELIZE: Cebada Cave (Zone B).

Comment. One specimen was collected.

Order Coleoptera (beetles)

Undetermined material

Records. BELIZE: Cebada Cave (Pitfall Trap 4; Catfish Passage).

Comment. Two or more species of undetermined beetles were collected. No specimens were obtained from the Catfish Passage. This material is presently under study.

Family Carabidae (ground beetles)

Undetermined genus and species (troglophile)

Records. BELIZE: Cebada Cave (Catfish Passage; Downstream). GUATEMALA: Xibalba.

Comment. In the downstream section these were present near the sump on an organically rich mud substrate.

Family Curculionidae (weevils)

Undetermined genus and species (accidental)

Record. Cebada Cave (Zone B).

Cossonus sp. (accidental)

Record. BELIZE: Cebada Cave (Zone C).

Pseudopentarthrum sp. (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Family Dryopidae (long-toed water beetles)

Helichus sp. (accidental)

Record. BELIZE: Cebada Cave (Zone B).

Family Elateridae (click beetles)

Agrypnus sp. (accidental)

Record. BELIZE: Cebada Cave (Zone B).

Horistonotus sp. (accidental)

Record. Cebada Cave (Zone C).

Family Endomychidae (handsome fungus beetles)

Anamorphus sp. (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Family Pselaphidae (mold beetles)

Scalenarthrus sp. (?accidental)

Record. BELIZE: Cebada Cave (Pitfall Trap 2).

Comment. Two specimens of this genus were collected.

Family Staphylinidae (rove beetles)

Homaotarsus sp. (troglophile)

Records. BELIZE: Cebada Cave (Zone C; Pitfall Traps 3, 5).

Comment. This species was extremely abundant with 34 specimens taken from pitfall trap no. 5.

Scopaeus sp. (?accidental)

Record. BELIZE: Cebada Cave (Zone B).

Comment. Only two specimens of this genus were found.

Stannoderus sp. (?accidental)

Record. BELIZE: Cebada Cave (Zone B).

Comment. A single specimen was collected.

Stenus sp. (?accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. A single specimen was collected.

Order Lepidoptera (moths)

Undetermined material

Records. BELIZE: Cebada Cave (Zones A, B, C).

Order Hymenoptera

Undetermined material

Records. BELIZE: Cebada Cave (Zones A, B).

Family Formicidae (ants)

Azteca sp. (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. Six specimens of this genus were collected.

Camponotus abdominalis (Fabricius) (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. One specimen of this species was collected.

Crematogaster sumichrasti Mayr (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. Six specimens of this species were collected.

Pachycondyla carinulata (Roger) (accidental)

Record. BELIZE: Cebada Cave (Zone B).

Comment. One specimen of this species was collected.

Paratrechina sp. (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. One specimen of this genus was collected.

Pheidole punctatissima Roger (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. One specimen of this species was collected.

Solenopsis geminata (Fabricius) (accidental)

Record. BELIZE: Cebada Cave (Zone C).

Comment. One specimen of this species was collected.

Wasmannia auropunctata (Roger) (accidental)

Record. BELIZE: Cebada Cave (Zone A).

Comment. Four specimens of this species were collected.

Order Diptera (flies)

Undetermined material

Records. BELIZE: Cebada Cave (Downstream; Entrance area; Zone B, C; Pitfall Traps 2, 3, 5).

Comment. Numerous species are represented in these collections. This material is all under study.

Family Sphaeroceridae (small dung flies)

Opalimosina n.sp. (?accidental)

Record. BELIZE: Cebada Cave (Zone A).

CLASS CHILOPODA (centipedes)

Order Scutigleromorpha

Undetermined material

Records. BELIZE: Cebada Cave (Downstream). GUATEMALA: Actun Zactun (Twilight Zone).

CLASS DIPLOPODA (millipedes)

Order Spirostreptida

Family Spirostreptidae

BIOLOGY OF THE CHIQUIBUL CAVE SYSTEM

Orthoporus sp. (troglophile)

Record. GUATEMALA: Xibalba (RB Survey).

Order Polydesmida

Family Pyrgodesmidae

Undetermined genus and species (troglophile)

Record. BELIZE: Cebada Cave (Downstream).

PHYLUM CHORDATA

CLASS TELEOSTOMI

Order Cypriniformes

Family Pimelodidae (catfish)

Rhamdia sp. (troglophile)

Records. BELIZE: Cebada Cave (Upstream; Downstream);
Actun Tunkul. GUATEMALA: Xibalba (Main Stream
Passage).

Comment. Catfish from the Chiquibul System show no obvi-
ous signs of cave adaptation.

Order Synbranchiformes

Family Synbranchidae

Undetermined genus and species

Record. BELIZE: Actun Tunkul.

Comment. Several eels were observed in this cave by Logan
McNatt (pers. comm., 1995).

CLASS AVES

Order Passeriformes

Family Hirundinidae

Undetermined genus and species

Records. BELIZE: Cebada Cave (Entrance Area).
GUATEMALA: Xibalba (Entrance Area).

Comment. No specimens were collected.

CLASS MAMMALIA

Order Chiroptera

Undetermined material

Records. BELIZE: Cebada Cave (Entrance Area).
GUATEMALA: Xibalba (Main Stream Passage; RB
Survey).

Comment. No specimens of bat were collected.