A FAUNAL SURVEY OF EZELL'S CAVE
HAYS COUNTY, TEXAS

THESIS

Presented to the Graduate Council of
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MASTER OF SCIENCE

By

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INTRODUCTION

Past studies in Ezell's Cave have dealt primarily with a general description of the cave (Uhlenhuth, 1921 and Russell, 1976), the history (Davis, 1971a), and short-term faunal collections (Eigenmann, 1900; Uhlenhuth, 1921; Mohr, 1948a; Mitchell and Reddell, 1971; Reddell, 1965, 1966, 1967, 1970a, 1970b, and 1970c; and others). From these studies a large number of organisms from the cave were discovered and described. No study has been made over a continuous period of time to ascertain the details of the populations residing in the cave.

The present study was designed to gather basic information available about Ezell's Cave and to form a data base upon which other future studies can be made. Detailed baseline knowledge of the cave as a self contained ecosystem will be very helpful in the design, evaluation, and comprehension of future studies.

This study of Ezell's Cave was conducted from 1 January 1978, to 31 March 1979. The objectives of the study were: 1) to summarize all important literature concerning Ezell's Cave, 2) to supply additional descriptive information about the cave during the study period, 3) to prepare an annotated checklist of organisms found, and 4) to determine the

distribution and relative numbers of each kind of organism in the various parts of the cave during the study period.

HISTORY

Ezell's Cave was discovered by Greenberry B. Ezell about 1870, on land owned by J. H. Bishop (Davis, 1971a). In 1893, Ezell purchased the cave and .688 hectare of surrounding land for $78.70. He put a small boat in the first lake room of the cave and operated the cave commercially for several years.

The occurrence of the Texas Blind Salamander (*Eurycea rathbuni*) and several other cave adapted organisms from the newly drilled U.S. Fish Hatchery well (1895) drew the attention of many zoologists all across the nation to the San Marcos, Texas area. C. H. Eigenmann (1900) visited Ezell's Cave in 1899 searching for these organisms. He noted "steps" placed to assist entry into the cave had been destroyed by boys rolling rocks into the cave. These rocks also closed one entrance to the first lake room which required his assistant to take a side passage to reach the lake room. Eigenmann reported the following nine species in the first chamber: *Helicina orbiculata* Say, *Paravitrea petrophila* (Bland), *Gastrocopta contracta* (Say), *Helicodiscus eigenmanni* Pilsbry, *Brackenridgia cavernarum* Ulrich, *Gaucelmus augustinus* Keyserling, *Pseudosinella violenta* Folsom, *Texoreddellia texensis* (Ulrich), and *ceuthophilus secretus* Scudder.

Edward Uhlenhuth (1921) spent twelve days during August and September of 1916 describing Ezell's cave and in search of blind salamanders. He reported finding *Palaemonetes antrorum* (Benedict) and *Eurycea (Typholomolge) rathbuni*. He captured two catfishes "by means of hooks." Uhlenhuth was told by Mr. S. N. Stanfield, a Texas Normal School Teacher, "The first two blind salamanders ever seen were found in Ezell's Cave in 1893 in a small boat which had sunk in the lake."

Truman T. Saltonstall bought Ezell's Cave and .635 hectare of land in 1929, for $800. He visited the cave regularly in the belief that the cave air would help a lung condition he acquired during World War I (Davis, 1971a).

Charles E. Mohr and Kenneth N. Dearolf visited Ezell's Cave for several days during 1938, in search of blind salamanders (Mohr, 1948a). Prior to entering the cave he had been told by C. S. Smith of Southwest Texas State Teachers College that the salamanders had not been seen in the cave for over a year.

C. E. Mohr was the first to report visiting the second lake room. All previous collections were made between the entrance and first lake room. Mohr noted the following nine organisms during his visits: cave crickets (probably *Ceuthophilus secretus* and/or *Ceuthophilus cunicularis*), daddy-long-legs (probably *Leiobunum townsendi*), scorpions (probably *Vaejovis reddelli*), cave frogs (probably *Syrrhophus marnocki*), flatworms, *Cirolanides texensis* Benedict, *Palamonetes antrorum*

Benedict, *Stygobromus flagellatus* (Benedict), and *Eurycea rathbuni* (Stejneger). The flatworm was described shortly afterward as *Spalloplana mohri* (Hyman, 1938).

Davis (1971a) reported that the presence of the Texas blind salamander and the urban location caused a great increase of visitation in Ezell's Cave between 1930 and 1950. Vandalism and over-collecting resulted. At one time a Swiss dealer sold Texas blind salamanders commercially. The Texas Herpetological Society became concerned with the apparent decreasing number of salamanders in Ezell's Cave and the Society was granted an easement to protect the cave and regulate admission, in 1955. William K. Davis of Southwest Texas State College was appointed trustee. A brick wall topped with cyclone fencing was constructed around the entrance of the cave. The fencing prevented the resident bat population from entering but did not stop the vandals. The fence top was replaced with a .3 by .3 meter grid of 1.27 cm structural steel. The local vandals cut through the steel bars and beat holes in the brick wall. The owner and police did little to stem the illegal flow of visitors. The trustee fought a losing battle with the vandals for five years before "throwing in the towel."

T. J. Mostyn, the owner of a local commercial cave, purchased Evell's Cave and .303 hectare of land for $5,000 in 1962. He effectively sealed the entrance with cement and a solid sheet of steel after determinig the cave could not

be operated commercially and in fear of liability suits from accidents. The cave, land, and an additional street lot were put up for sale at $6,000.

The Texas Herpetological Society contacted the Nature Conservancy concerning the possibility of purchasing Ezell's Cave. The Conservancy agreed to advance the money if it could be proven that at least one Texas blind salamander could be found in the cave. A local businessman, Norman Elder, bought the property and cave before the Society could act. Elder planned to fill the cave entrance and build a house over it. W. H. Davis received permission from the owner to search for a salamander. A salamander was found in 1967, and soon afterward the property was sold to the Nature Conservancy for $7,430. The entrance cover was removed by the Southwest Texas State University Tri-Beta Society. The Southwest Texas State University Speleological Society protected the cave until a caretaker was found. Since the Nature Conservancy required a caretaker to live on the property, the remaining half of the land-tract and the house were purchased for $3,200 on January 28, 1968.

The resident bat population mentioned by Davis (1971a) was prevented from entering the cave by the fencing put over the entrance in 1955 and they have failed to return since the entrance was cleared in 1967. The bats originally roosted above the first lake room (Russell, 1976) and the bat guano was considered important in the cave energy cycle. Guano was transported to Ezell's Cave on several occasions in an

attempt to restore the presumed energy cycle. A group of students from Texas Tech University led by Tony Mollhagen and Dede Armentrout captured and banded 200 bats near New Braunfels. The bats were released in an unsuccessful attempt to recolonize Ezell's Cave on April 11, 1970.

Robert Mitchell and James Reddell compiled a species list of Ezell's Cave gathered from the literature and personal collections over a period of years (Mitchell and Reddell, 1971). They compiled a list of 36 species and included the following 23 species in addition to past records: *Stenostomum tenuicauda* von Graff, *Vaejovis* sp., *Tyrannochthonius* sp., *Cicurina varians* Gertsch and Mulaik, *Cicurina* sp., *Tegenaria pagana* Koch, *Microcyclops varicans rubellus* Lilljeborg, *Monodella texensis* Maguire, *Metroponorthus pruinosus* (Brandt), *Scolopendra viridis* Say, *Speodesmus echinourus* Loomis, *Cambala speobia* (Chamberlin), *Ceuthophilus secretus* Scudder, *Ceuthophilus cunicularis* Hubbell, *Ceuthophilus* sp., *Triatoma* sp., *Pseudoseopsis hellmani*, Mockford and Gurney, *Psyllipsocus ramburii* Selys-Longchamps, *Belonuchus* sp. near *moquinus* Casey, *Plethodon glutinosus albagula* Grobman, *Bufo valliceps* Wiegmann, *Hylactophryne augusti latrans* (Cope), and *Syrrhophus marnocki* Cope.

To protect the large variety of cave adapted organisms, Ezell's Cave was designated a National Landmark by the National Park Service in 1972. The Nature Conservancy has closed the cave to the public in the hope that without human disturbance the fauna will recover from past destruction.

STUDY AREA

General Property Description

Ezell's Cave is located in typical Texas hill country at a latitude of 29° 52" and longitude of 97° 78". The .451 hectare of property and cave are located within the western city limits of San Marcos in Hays County, Texas. The surface property lies in a middle class residential area. Development of the property is limited to the caretaker's house and a fence surrounding the cave entrance. Area soils are thin, stone and outcroppings of Edwards limestone are abundant. The vegetation of the area can best be described as an oak-juniper association. A floral list of the property compiled by Susan Guy is included in Appendix 1. Vertebrate fauna noted on the property during 1978 are listed in Appendix 2.

San Marcos has an average yearly temperature of 19.94° C. The average yearly rainfall is 86 centimeters. The relative humidity averages 73%. Prevailing wind direction is from the southwest in the summer and northwest in the winter (Williams, 1968). Summers are moderately hot, and winters are relatively mild. Meteorological data for the surface during the study period is recorded in Appendix 3.

Area Geography and Geology

The study area is on the edge of the Balcones Escarpment, between the Edwards Plateau and the lower Coastal Plain physiogeographical areas that extend from near Brackettville through San Antonio to Kyle. The Escarpment marks the Balcones Fault Zone and is composed of a series of parallel faults generally downthrown to the east. Ezell's Cave is on the edge of the San Marcos Springs Fault characterized by a displacement of 91.44 meters (Decook, 1963).

The Edwards Aquifer (Edwards Underground Reservoir) is a major feature of the area. The aquifer extends under all or parts of Kinney, Uvalde, Medina, Bexar, Comal, and Hays Counties (Figure 1). The aquifer is roughly 282 kilometers long, 8-64 kilometers wide, 122-152 meters thick, and is generally found 150 meters underground (Puente, 1976). The Edwards Aquifer is only 1.6 kilometers wide in the San Marcos area. Water enters the aquifer by streams and porous limestone in the Edwards Plateau. The San Marcos Springs is the major natural outlet in Hays County. The flow at San Marcos Springs tends to increase during rain periods and decrease during drought in the recharge area. The three major hydrogeologic areas of the Edwards Aquifer include the Uvalde Pool, the San Antonio Pool, and the San Marcos Pool. The three areas may be connected when pezometric levels are high and separated during drought periods (Longley, 1978). Direct access to the San Marcos Pool may be gained through Ezell's Cave.

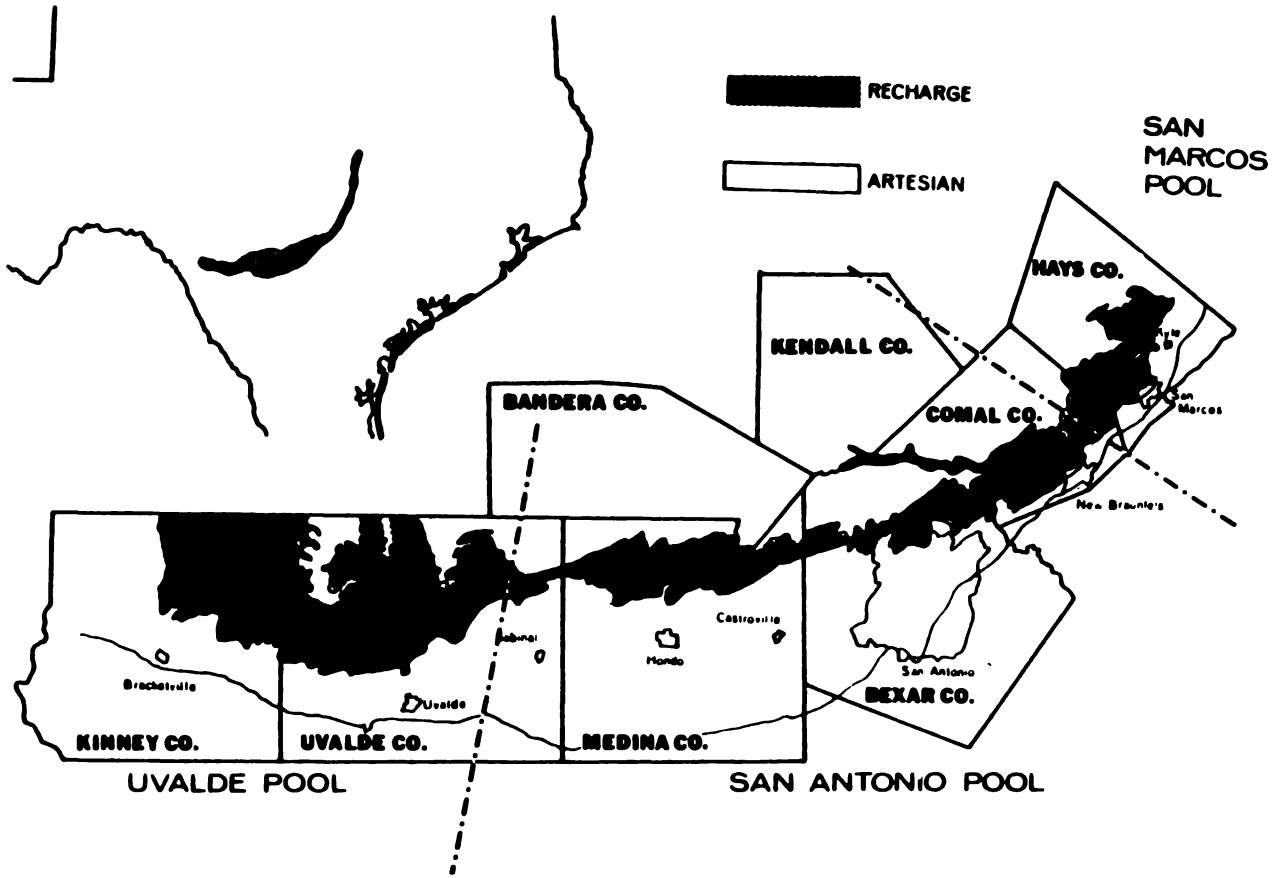

Figure 1. Map of Edwards Aquifer

Cave Formation

Ezell's Cave was formed by a collapse of the overburden into the void below the water level (Russell, 1976). The cone of collapse is 51.8 meters wide at the water level and continues to expand under the water. The initial collapse followed the dissolution of a chamber about 10 meters wide in the limestone. Broken rocks resulting from the collapse were dissolved rapidly as were rocks in contact with moving ground water at the cone base. The room continued to enlarge through slow settling of the ground as rocks around the base of the debris cone dissolved. Solution was greatest near the north end of the cave resulting in larger rooms. The slump blocks dip to the north. Rocks from the entrance and roof fell into the crack created by the decending floor and separated the cave into an upper chamber and a lower chamber by the water.

The cave is formed completely in Edwards limestone of lower Cretaceous age. Edwards limestone is hard, dense, fine grained, and ranges in color from gray to white. Chert nodules and fossils of *Monopleura*, *Reguienia*, and *Toucasia* are characteristic of Edwards limestone. Calcite crystals are common throughout the cave.

Cave Description

The entrance of Ezell's Cave lies at the southern end of a slit in the surface rocks 304 meters north of Purgatory Creek. The crack extends 18.89 meters in a north-north-west

to south-south-east direction (Figure 3). The relationship of the cave to the surface is illustrated in Figure 2. The entrance is 204.2 meters above sea level. Live oak (*Quercus virginiana*), Texas persimmon (*Diospyros texana*), mountain laurel (*Sophora secundiflora*), mesquite (*Prosopis glandulosa*), and hackberry (*Celtis laevigata*) are abundant in the immediate area. The cave opening is a narrow rectangle 0.60 by 2.59 meters at the base of a meter depression.

Entry to the cave is aided by a metal ladder placed immediately below the entrance. A large amount of leaf litter is present directly below the entrance and the area is well lit from the surface. The entrance crack slants steeply downward for 7.9 meters before dropping into the upper chamber which is 15.2 meters long and 3.1 meters wide. A second metal ladder lies against the nearly vertical, west wall. The floor is covered with rocks separating the upper chamber from the lake room below. The dimly lit upper chamber has a large amount of leaf litter and wood fragments present. A narrow crawlway leads from the north end of the upper chamber. No light is present in the cave beyond the crawlway entrance. The crawlway winds around breakdown (fallen rock) 12.1 meters to the first lake room.

The first lake room measures 30.5 meters long and 6 meters in width at the widest point. The ceiling and floor slant steeply into the water. Ulrich (1902) reported the water table to be 175.2 meters above sea level. The aquifer

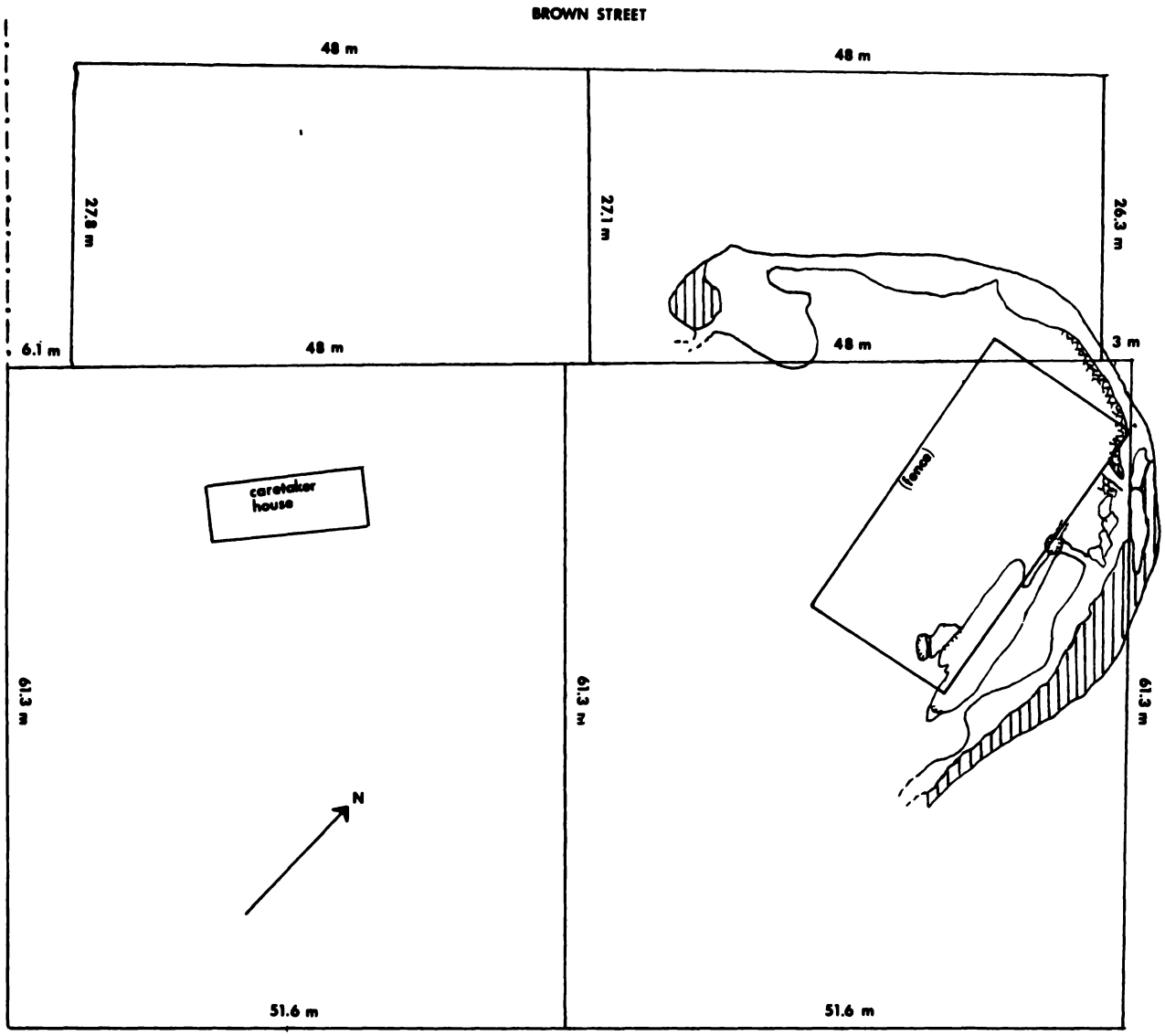

Figure 2. Position of Ezell's Cave under preserve property

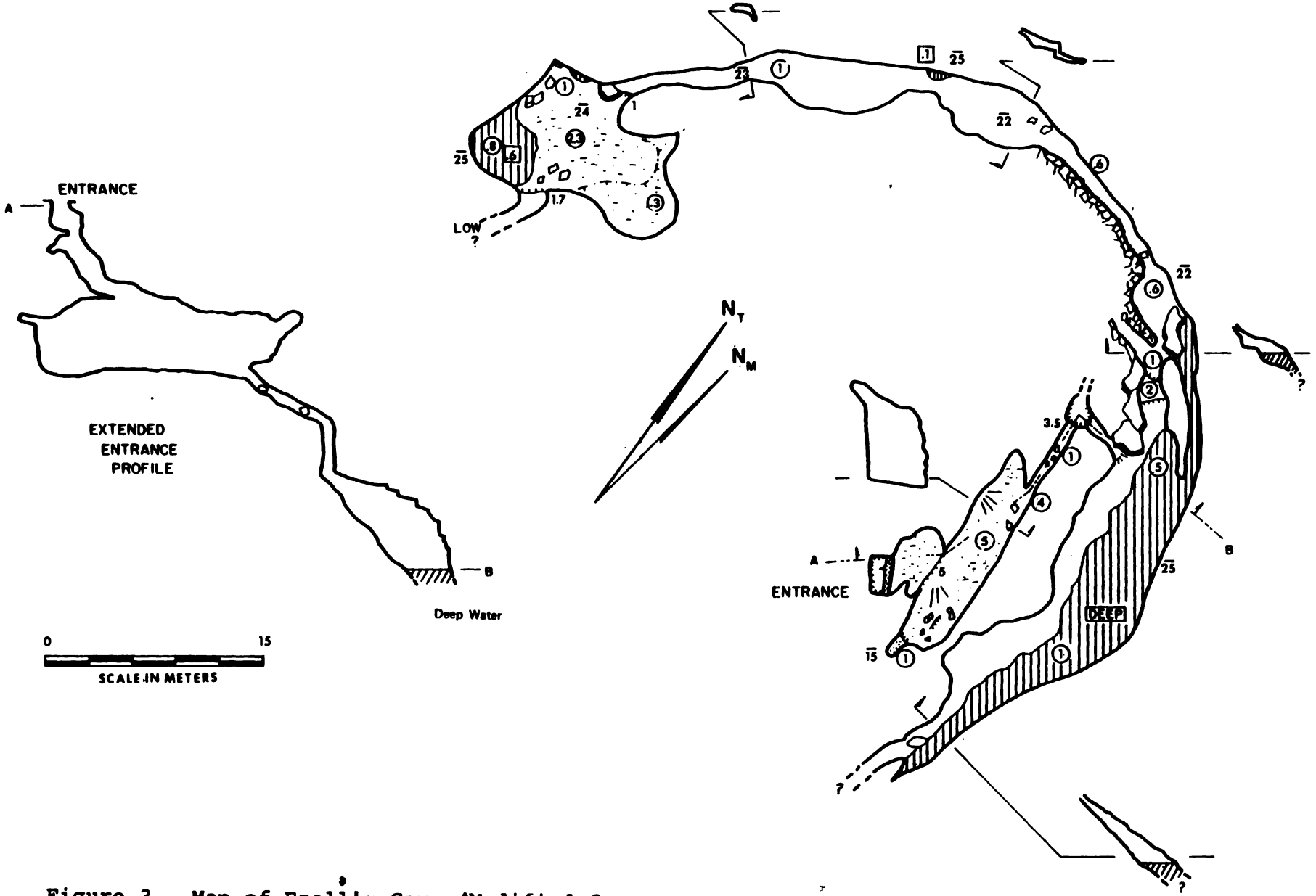

Figure 3. Map of Ezell's Cave (Modified from Russell, 1976)

water is very clear and appears bluish in color. The water temperature is a constant 21.5 C all year. "Cave ice" is common on the surface and is caused by the high concentration of calcium carbonate which percipitates out on the slow moving water. Divers have descended to depths of 21.3 meters before turning back (Russell, 1976).

The lake room is a large room separated into four smaller rooms by fallen rock. The smaller rooms are connected by small crawlways. A passage extends from the south end of the lake room for roughly 12.1 meters before narrowing abruptly. Another passage extends from the north end of the first lake room. The north passage curves westward around the cone of collapse for 50.6 meters and terminates in a second lake room. This passage is quite dusty.

The second lake room is 7.4 meters long and 13.2 meters wide. Water normally covers one-fourth the chamber, but the entire floor is flooded during periods of high water. All rocks on the floor are covered by a thin layer of mud. The second lake room and crawlway are inaccessible during high water periods.

STUDY METHODS AND MATERIALS

The cave was divided into six sections for the fifteen month study. Sections were numbered I through VI. Section I extended from the entrance to the first large chamber. The first large chamber was designated Section II. Section III was the crawlway stretching between the first large chamber and the first lake room. Section IV included the entire first lake room. The passage extending north between the first lake room and the second lake room was Section V. The second lake room was Section VI. Four terrestrial stations were located in each section and assigned a number 1 to 4. Two aquatic stations were assigned in Section IV and one in Section VI. Stations will be referred to as Station I-1, Station I-2, Station I-3, Station I-4, Station II-1, . . .etc. to Station VI-4. Station IV-Aq-1 is the first aquatic station in Section IV. The sections and stations are illustrated in Figure 4.

Each section was visited twice each month. Terrestrial stations 1 and 3 were baited one visit, and stations 2 and 4 were baited the following visit. Baited terrestrial stations were alternated each visit in an effort to minimize creating abnormally large populations of organisms in localized areas. Each terrestrial station was baited with peanut butter, beef liver, blue cheese, and banana. Approximately 1.5 cubic

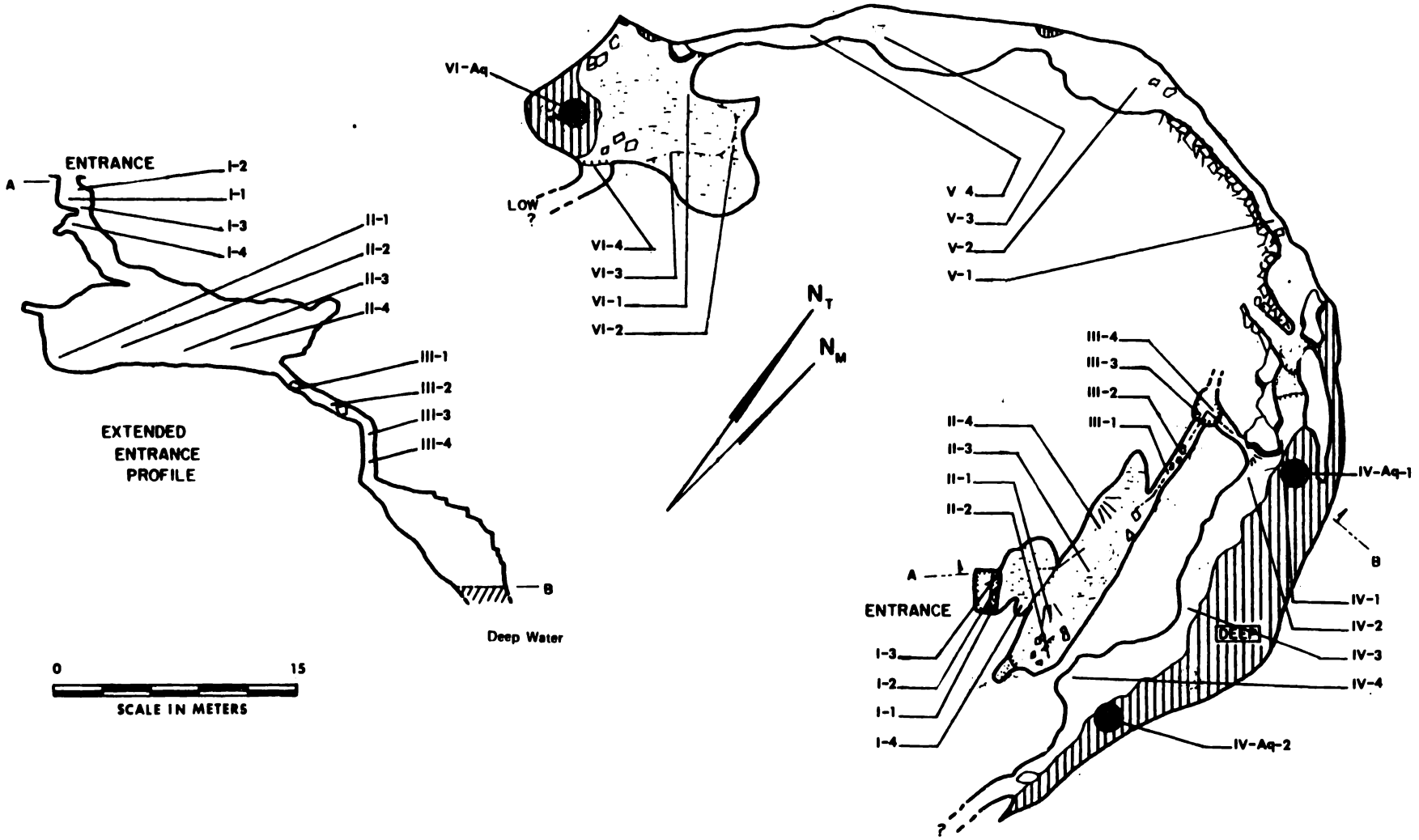

Figure 4. Station in Ezell's Cave (modified from Russell, 1976)

centimeters of each bait was placed under rocks and separated at least 30 cm.

Each aquatic station had a net and jar trap. The net consisted of a circle of nylon mosquito netting one meter in diameter. The netting was held extended by a heavy gauge, galvanized wire circle. Four nylon strings attached along the wire circle allowed the net to be drawn from the water horizontally. Bait consisted of 2 cm^3 of frozen catfish tied to the net center.

Jar traps were constructed from 473 m. pickle jars and resembled common minnow traps. The mouth of each jar was fitted with an inverted funnel of window screen. The funnel aperture was 2 cm in diameter. Bait consisted of 2 cm^3 of frozen catfish placed in each jar. Nets and jar traps were attached to shore by nylon strings. Aquatic stations were baited every visit (twice a month).

Plankton samples were taken irregularly. The plankton net on a 5 meter line was thrown 10 to 15 times at station IV-Aq-1.

Stations were checked starting at noon the day following placement of baits. The number of the various organisms associated with each bait was recorded. Organisms in the area not associated with baits were also recorded. Baits were removed immediately following checks.

The organisms in Section II along the ladder and wall were recorded at each bimonthly visit. The number of each

species noted within one meter each side the second ladder were recorded when descending into Section II. The number of each species was recorded within two meters of the floor along the west wall in Section II.

Descriptive information was gathered about each station. Distances from the entrances, chamber dimensions, and floor angles were taken from Figure 3 and on-site measurements. Light was noted as present or absent at each station. Soil samples were analyzed for percent organic matter and pH (Milford, 1976). Relative humidity was recorded twice a month at each section using a Model SAC sling psychrometer. Temperature was recorded at the same time from the dry bulb on the psychrometer. Surface temperatures and rainfall were gathered from records at KCNY Radio Station in San Marcos. Fluctuation in the case water level was noted on a two meter enamel plated depth gauge placed in Section IV.

Analysis of waters from Ezell's Cave and the artesian well on the Southwest Texas State University campus were made to determine if similarities or differences exist. Chemical analysis of the water in Ezell's Cave was made in the month of July and October of 1978, and in January, May, and July of 1979. Chemical parameters measured were dissolved oxygen, phenolphthalein and methyl orange alkalinity, pH, free carbon dioxide, Kjeldahl nitrogen, nitrate nitrogen, nitrite nitrogen, ortho and total phsophorous, sulfate, chloride, and iron magnesium-calcium metals. These analyses were made according to procedures outlined in Standard Methods for the

Determination of Water and Waste Water (1971). Water samples were sent to Southwestern Laboratories in Houston, Texas to determine the presence of pesticides or chlorinated hydrocarbons.

The collection of organisms was limited and for identification purposes only. Sample specimens were identified by specialists. Similar specimens observed in the cave were arbitrarily considered to be the same species. This method possibly resulted in occasional field identification error but was necessary to prevent disturbance of the delicate balance of cave life caused by overcollection.

Specimens collected were preserved in 70 percent ethyl alcohol (ETOH). Flatworms were placed in 5 percent nitric acid for one minute prior to the transfer to ETOH.

RESULTS AND DISCUSSION

Biological Data

A total of 98 different organisms have been identified from Ezell's Cave. These specimens represented 5 phyla, 12 classes, 40 orders, 73 families, 90 genera, and 76 species. Some specimens were not identified to species because they were unidentifiable females, immature specimens, improperly preserved, or an authority could not be contacted to identify them.

Information was gathered for each organism recorded from Ezell's Cave. Data listed for each specimen includes: 1) taxonomic classification, 2) common name, 3) degree of habitation (troglobite, troglophile, trogloxene, or accidental as defined by Moore and Sullivan, 1978), 4) substrate (aquatic or terrestrial), 5) description, 6) range, 7) distribution in cave, and 8) notes (observations, bait preference, and other information). The descriptions are meant only to give a general idea of the appearance and geographical distribution of each organism.

Phylum Platyhelminthes

Class Turbellaria

Order Catenulida

Family Stenostomidae

Stenostomum tenuicauda von Graff

Common name: Flatworm

Habitation: Troglophile

Substrate: Aquatic

Description: *Stenostomum tenuicauda* has a slender threadlike body. The worm usually consists of a chain of two or more zooids, each ranging from 0.3 to 2.5 mm in length (Ward and Whipple, 1963).

Range: The worm is a cosmopolitan species (Ward and Whipple, 1963). Ezell's Cave is the type locality.

Distribution in cave: *Stenostomum tenuicauda* was not taken during this study. Bassett Maguire collected a specimen at Station IV-Aq-1 (Reddell, 1965).

Note: It is quite possible the specimen Maguire collected was washed into the Edwards Aquifer from the surface following a heavy rain.

Order Tricladida

Family Bipaliidae

Bipalium kewense Moseley

Common name: Flatworm

Habitation: Trogloxene

Substrate: Terrestrial

Description: Specimens collected are 30 to 42 mm long and 2 to 3 mm wide. The head is expanded with dark pigment at the neck. The body is an olive color with three narrow and two broad black stripes. Many eyes are located along the lateral margins (Hyman, 1951).

Range: The species is cosmopolitan in distribution (Hyman, 1951).

Distribution in Cave: *Bipalium kewense* was observed six times during the study. One or two specimens were noted for September, October, and December, 1978, and January and February, 1979. All sightings were in the area of Station II-1.

Notes: *Bipalium kewense* feeds primarily on earthworms. The species was found under rocks baited with cheese and banana (Appendix 7). Several specimens were observed away from baits. The genus has not been previously recorded from Ezell's Cave.

Family Kenkiidae

Sphalloplana mohri Hyman

Common name: Flatworm

Habitation: Troglobite

Substrate: Aquatic

Description: This multipharyngeal flatworm is the largest of the genus and ranges in size from 20 to 30 mm (Kenk, 1977). The body width is about one-fourth to one-third the length. The anterior end of the white flatworm is truncate, while the posterior is rounded. The pharyngeal pouch is visible. An adhesive organ lccated in the center of the frontal margin aids movement.

Range: *Sphalloplana mohri* has been verified only from the artesian well on the campus of Southwest Texas State

University and Ezell's Cave in Hays County, Texas. Ezell's Cave is the type locality.

Distribution in cave: Specimens occurred at all three aquatic stations (Appendix 8). An average of 3 to 4 flatworms were seen per visit at Station VI-Aq. The maximum number seen on a check of the cave was thirteen.

Notes: The flatworms are capable of crawling rapidly along the pool bottom and are often seen drifting on the surface of the water. Mitchell (1974) speculated that *Spalloplana zeschi* feeds on injured or moribund amphipods and other arthropods which have fallen into the water. It is probable *Sphalloplana mohri* feeds in a similar manner. The flatworm was attracted to aquatic nets and easily captured in aquatic jar traps baited with fish. The species appears quite hardy. When a jar trap was recovered after a two week interval almost all the isopods (*Cirolanides texensis*) were dead, but three flatworms were alive and well. Turbid waters in the cave following heavy rains did not affect the success of capturing flatworms.

Phylum Mollusca

Class Gastropoda

Order Archaeogastropoda

Family Helicinidae

Helicina orbiculata (Say)

Common name: Snail

Habitation: Trogloxene

Description: The round shell ranges from 5 to 8.5 mm long and is white to buff in color (Burch, 1962).

Range: *Helicina orbiculata* is widespread in Georgia, Florida, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, and Oklahoma (Burch, 1962). In Texas, the snail has been reported from caves in Coryell, Hays, and Medina Counties (Reddell, 1965).

Distribution in cave: The snail is abundant on the surface preserve and also was found in small numbers in Sections I and II throughout the study period (Appendix 8). Empty shells were common on the floor of Section II.

Notes: The snails were attracted to liver, cheese, and banana baits (Appendix 7).

Order Stylommatophora

Family Achatinidae

Rumina decollata (Linnaeus)

Common name: Snail

Habitation: Accidental

Substrate: Terrestrial

Description: The snail ranges in size from 25 to 45 mm (Burch, 1962). The anterior whorls of the elongate shell are typically broken off.

Range: *Rumina decollata* was introduced into the southern United States and now occurs from North Carolina to Florida, and west to Texas (Burch, 1962). This species has been found in caves of Travis and Hays Counties in Texas (Reddell, 1965).

Distribution in cave: The shell of one specimen was found in Section I on December 27, 1977.

Notes: The species has not been previously reported from Ezell's Cave.

Family Bulimulidae

Rabdotus sp.

Common name: Snail

Habitation: Accidental

Substrate: Terrestrial

Description: The single specimen collected was 6 mm long and 3.5 mm wide. The buff colored shell tapered sharply dorsally and ventrally.

Range: The snail is a member of a South American family that has spread to the southern United States (Burch, 1962).

Distribution in cave: The shell of one specimen was found in Section VI.

Notes: The specimen was probably washed into the cave, by way of the aquifer, following a heavy rain. The genus was not noted from Ezell's Cave in past literature.

Family Endodontidae

Helicodiscus eigenmanni Pilsbry

Common name: Snail

Habitation: Troglobite

Substrate: Terrestrial

Description: The round, flat shell averages 3.5 to 4.8 mm in width and is olive-brown in color (Burch, 1962).
Range: The snail occurs in South Dakota, Texas, New Mexico, and Arizona (Burch, 1962). Specimens have been found in Texas caves in Bexar, Comal, Coryell, Edwards, Hays, Kerr, Kendall, Medina, San Saba, Travis, Uvalde, and Williamson Counties (Reddell, 1965).
Distribution in cave: *Helicodiscus eigenmanni* was found in Sections I through III but was most common in Section II (Appendix 8). The snail was present throughout the study period.
Notes: *Helicodiscus eigenmanni* was first collected by C. H. Eigenmann from Ezell's Cave in 1899. Ezell's Cave is the type locality. The snail was attracted to all baits but appeared to prefer peanut butter (Appendix 7).

Family Limacidae

Deroceras laeve Muller

Common name: Slug
Habitation: Trogloxene
Substrate: Terrestrial
Description: *Deroceras laeve* is 15 to 30 mm long. The slug is yellowish in color but sometimes appears gray (Burch, 1962). The mantle is located near the middle of the body.
Range: The species was introduced from Europe and has spread throughout the United States.
Distribution in cave: The slug was found on three occasions

in Section I and once in Section II. The species was present in June, 1978, and in January and February of 1979.
Notes: One specimen was found associated with peanut butter, cheese, and banana baits. *Deroceras laeve* was not recorded in the literature from Ezell's Cave.

Family Pupillidae

Gastrocopta contracta (Say)

Common name: Snail
Habitation: Accidental
Substrate: Terrestrial
Description: The shell is white or bluish white in color and measures 2.2 to 2.5 mm long (Burch, 1962).
Range: The snail ranges from Maine to Florida and west into Mexico (Burch, 1962).
Notes: *Gastrocopta contracta* founded by Eigenmann (1900) was not taken during this study. This species was not collected on the surface property.

Family Oleacinidae

Euglandina singleyana (Binney)

Common name: Snail
Habitation: Accidental
Substrate: Terrestrial
Description: The thin, fusiform shell is 40 to 52 mm long and glossy-tan or brown in color (Burch, 1962).

Range: The snail occurs in Texas (Burch, 1962).
Distribution in cave: *Euglandina singleyana* was found once during March, 1978, and again in August, 1978. Both specimens occurred in Section II.
Notes: One specimen was found associated with the banana bait. The snail is common on the surface property.

Paravitrea petrophila (Bland)

Common name: Snail
Habitation: Accidental
Substrate: Terrestrial
Description: The slightly flattened shell is glossy white and ranges from 5.7 to 7.0 mm in diameter (Burch, 1962).
Range: The primary range of the species is in Kentucky, Tennessee, and Arkansas (Burch, 1962).
Notes: One shell of *Paravitrea petrophila* was found at Station I-2 and another at Station IV-3. No living specimens were collected. The snail is occasionally found on the surface property.

Phylum Annelida

Class Oligochaeta

Unidentified material

Common name: Earthworm
Habitation: Trogloxene?
Substrate: Terrestrial
Description: The unidentifiable, immature specimens ranged

in size from 30 to 40 mm. The worms were brown in color. Distribution in cave: The species was found in Sections I and II (Appendix 8). Two specimens were observed during December, 1978, 4 during January, and 2 during March, 1979. Notes: The species was attracted to all baits (Appendix 7). Liver was the preferred bait. Earthworms have not been previously recorded from Ezell's Cave.

Phylum Arthropoda

Class Archnida

Order Scorpionida

Family Vaejovidae

Vaejovis reddelli Gertsch and Soleglad

Common name: Scorpion

Habitation: Troglophile

Substrate: Terrestrial

Description: Members of the family Vaejovidae have a sternum with parallel or subparallel lateral margins that are broader than long (Levi and Levi, 1968). A deep median groove is present, and the middle lamellae of the pectines are frequently subcircular and beaklike. There are 3 lateral eyes. No tibial spur or cubaculear tooth are present although there may be a slight tubercle. Adults of *Vaejovis reddelli* are black and average approximately 60 mm in length.

Range: *Vaejovis* sp. has been recorded from caves in Bandera, Bexar, Burnet, Edwards, Hays, Kimble, Real, Travis, Uvalde, Val Verde, and Williamson Counties in Texas (Reddell, 1965).

Distribution in cave: *Vaejovis* has been observed during checks at Sections I through V of the cave (Appendix 8). The species was most abundant in Sections I and II. Two specimens not recorded during a bait check, were found in Sections VI. The maximum number of scorpions noted on any one visit was 8 in March, 1978.

Notes: *Vaejovis reddelli* was found commonly clinging to walls and under rocks. The scorpions were often observed on the pool bottom in Section IV. Seven drowned specimens were found during one visit to the cave. Specimens of this species were found under rocks associated with all bait types (Appendix 7). The scorpions were probably feeding on other invertebrates attracted to the baits. Specimens were observed feeding on cave crickets.

Order Chelonethida

Family Chernetidae

Hesperochernes unicolor (Banks)

Common name: Pseudoscorpion

Habitation: Accidental or Trogloxene

Substrate: Terrestrial

Description: The organism is eyeless, but has no other significant troglobitic modifications.

Range: The species was originally described from specimens near Austin, Travis County, Texas.

Distribution in cave: One specimen was found at Station II-2 in June, and another occurred at Station I-1 in August, 1978.

Note: Both specimens were found in the soil and under rocks associated with banana as bait. The species had not been collected in Ezell's Cave prior to this study.

Family Chthoniidae

Tyrannochthonius sp.

Common name: Psuedoscorpion

Habitation: Accidental

Substrate: Terrestrial

Description: The tailess organism has no cave adapted features. A small nymph or female was collected, but classification to species was not possible. The genus has a wide distribution. Many subtropical epigean forms are found in the South. Seventy percent of the species occurred in caves. The genus has been found in caves in Edwards, Hays, and Travis Counties in Texas (Reddell, 1965).

Distribution in cave: One specimen was found at Section II-4 on January 16, 1979.

Notes: No species of the genus *Tyrannochthonius* have been described from Texas. The specimen was found in the dirt under a rock baited with cheese.

Order Opiliones

Family Phalangiidae

Leiobunum townsendi Weeds

Common name: Harvestman or Grand-daddy-longlegs

Habitation: Trogloxene

Substrate: Terrestrial

Description: The oval-shaped body is 5.5 mm long and 4 mm wide. The body is light in color ventrally and dark brown dorsally. The long, slender legs are dark brown with white bars adjacent to each joint.

Range: The species is abundant throughout the southwest. The harvestman has been found in Bexar, Brewster, and Uvalde Counties in Texas (Reddell, 1965).

Distribution in cave: *Leiobunum townsendi* was found almost exclusively in Section I. The species was very numerous from March through September (Appendix 8).

Notes: Specimens were found aggregated in large masses on the roof in dark corners of Section I. The species left the cave at night to feed. Early instars of the family Phalangiidae were noted in Section I from December to March. Adults of *Leiobunum townsendi* were not attracted to any baits. The species was not reported in past literature from Ezell's Cave.

Family Phalangodidae

Texella sp.

Common name: Harvestman

Habitation: Accidental or Troglexene

Substrate: Terrestrial

Description: This specimen possesses a small orange body with thin, short legs. Eyes are present. No troglobitic modifications are present.

Distribution in cave: One male specimen was found under a rock at Station III-3 on August 15, 1978.
Note: The harvestman was found associated with cheese bait.

Texella mulaiki Goodnight and Goodnight

Common name: Harvestman
Habitation: Troglobite
Substrate: Terrestrial
Description: *Texella mulaiki* has an oval body 2.6 mm long and 1.2 mm wide. The blind spider is a light yellow-brown color (Goodnight and Goodnight, 1967).
Range: The species has been found in caves in Comal, Hays, Travis, and Williamson Counties, Texas. Ezell's Cave is the type locality for this species (Reddell, 1965).
Distribution in cave: *Texella mulaiki* was taken in Sections III, V, and VI. The blind harvestman was most abundant in Section VI (Appendix 8). Seven specimens were found during the study.
Notes: The species was first collected by D. Mulaik on April 15, 1939. During this study specimens were found under rocks associated with peanut butter, liver, and cheese. Most sightings were under rocks baited with cheese (Appendix 7).

Order Araneae

Family Gnaphosidae

Gnaphosa fontinalis Keyserling

Common name: Spider

Habitation: Accidental

Substrate: Terrestrial

Description: The species is 6 to 7 mm long. The posterior lateral eyes are only slightly larger than the posterior median eyes. The posterior eye row is strongly recurved and are wider than the anterior eyes (Comstock, 1948). The lower margin of the cheliceral furrow is armed with a broad keel or lobe. The specimen is dark brown to black in color with a furry abdomen.

Range: *Gnaphosa* has been found in the entrance of caves in Hardeman and Hays Counties, Texas (Reddell, 1965).

Distribution in cave: One specimen was taken at Station I-3 in October of 1978, and two more were found at Station II-1 in March, 1979.

Notes: The spiders were found under rocks associated with peanut butter and cheese baits (Appendix 7). *Gnaphosa fontinalis* is a new species recorded for Ezell's Cave.

Family Agelenidae

Cicurina sp.

Common name: Spider

Habitation: Troglobite

Substrate: Terrestrial

Description: The white spider is blind and ranges from 2 to 5 mm in length.

Range: Approximately 18 undescribed species of *Cicurina* have been noted in caves in Bandera, Bell, Bexar, Comal, Coryell, Edwards, Hays, Kerr, Kimble, Medina, Menard, Real, San Saba, Sutton, Travis, Uvalde, Val Verde, Wheeler, and Williamson Counties in Texas (Reddell, 1965).
Distribution in cave: *Cicurina* sp. was found in the total darkness of Sections III through VI. The spider was most abundant in Sections III and IV (Appendix 8).
Notes: All specimens sent for identification were immature or females. The specific status of *Cicurina* specimens from Ezell's Cave remain undetermined. The specimens were attracted to all bait types (Appendix 7).

Cicurina varians Gertsch and Mulaik

Common name: Spider
Habitation: Troglophile
Substrate: Terrestrial
Description: Members of this species are 5 to 7 mm long. This spider has a brown thorax and legs with the abdomen slightly lighter in color. The anterior median eyes are well developed. The height of the clypeus is about equal to the anterior laterial eye diameter (Comstock, 1948).
Range: *Cicurina varians* is the most common spider found in Texas caves. The spider has been taken from caves in Bandera, Bell, Bexar, Brewster, Burnet, Childress, Comal, Coryell, Crockett, Edwards, Hardemann, Hays, Kendall, Kerr, Kimbel, King, Kinney, Lampasas, Llano, Mason, Medina, Menard,

Real, San Saba, Schleicher, Sutton, Terrell, Travis, Uvalde, Val Verde, Wheeler, and Williamson Counties (Reddell, 1965).
Distribution in cave: The spider was common under rocks in Section I and II (Appendix 8).
Notes: The species was noted at all bait types (Appendix 7). The spider was probably feeding on collembolans and other invertebrates attracted to the baits.

Tegenaria pagana Koch
Common name: Spider
Habitation: Troglophile
Substrate: Terrestrial
Description: Specimens of this spider averaged 11 mm in length. The posterior eye row is slightly procurved. The posterior median eyes are slightly smaller than the posterior lateral eyes (Kaston, 1953). The tan body has darker spots on the abdomen with bars on the legs. The spider constructs a sheet-like web.
Distribution in cave: The spider occurred in webs on walls and the roof in Sections I through IV, but was most abundant in Sections I and II (Appendix 8). The species was present all year.
Notes: Specimens were present in the entrance even during very cold weather, but the species was inactive during these periods. The spider was not effectively attracted to baits (Appendix 7).

Family Theridiidae

Achaearanea porteri (Banks)

Common name: Spider

Habitation: Troglophile

Substrate: Terrestrial

Description: *Achaearanea porteri* is a small black spider ranging from 2 to 3 mm in length.

Range: The species is common throughout the United States and Mexico. Specimens have been reported from caves in Bell, Blanco, Burnet, Childress, Comal, Culberson, Edwards, Hardeman, Hays, Irion, Kerr, Kimble, Lampasas, Llano, Mason, Medina, Menard, Pecos, Randall, Real, San Saba, Schleicher, Stonewall, Sutton, Terrell, Travis, Uvalde, Val Verde, Wheeler, and Williamson Counties, Texas (Reddell, 1965).

Distribution in cave: One specimen was found at Station I-3 on August 15, 1978. The specimen was on a web in a crack.

Note: The species has been reported hinging on walls throughout many caves (Reddell, 1965). The specimen was not attracted to any bait. The spider has not been previously reported in Ezell's Cave.

Achaearenea tepidariorum (Koch)

Common name: Spider

Habitation: Accidental?

Substrate: Terrestrial

Description: This spider has a body length of 6 to 7 mm

and a round abdomen. The species is brown in color with darker bars near the leg joints.

Destribution in cave: Only one specimen was found in Section I on December 29, 1977. The spider was found in a web on breakdown.

Family Nesticidae

Eidmannella sp.

Common name: Spider

Habitation: Troglobite

Substrate: Terrestrial

Description: The length of the body is 3 mm. The thorax and legs are white and the adbomen is yellowish.

Distribution in cave: One immature, female specimen of *Eidmannella* sp. was taken at Station IV-2 on October 21, 1978.

Notes: The specimen was collected under a rock associated with banana as bait. The troglobite has not been reported from Ezell's Cave in past literature.

Gaucelmus augustinus Keyserling

Common name: Spider

Habitation: Troglophile

Substrate: Terrestrial

Description: The male cephalothorax is 2.1 mm long. The femur is 8.2 mm, and the tibia is 7 mm long. The color of the cephalothorax, legs, and sternum is a pale reddish-

yellow, whereas, the abdomen varies from white to black and has two pale spots (Ulrich, 1902). Eight eyes are present. A distinct comb of setae is present on the fourth tarsal segment of the legs. The web is composed of strands radiating in all directions with no apparent regularity (Comstock, 1948).

Range: *Gaucelmus augustinus* is common in caves in Bandera, Bell, Comal, Hays, Kimble, Real, Travis, Uvalde, and Williamson Counties of Texas (Reddell, 1965).

Distribution in cave: The species was found in Section I through IV throughout the study. The species was by far more abundant in the twilight area of Section II (Appendix 8).

Notes: The spider is often seen hanging to the strandlike webs on walls, cracks, and breakdown. The young are white and hatch in August (Reddell, 1965). The species was not attracted to baited stations (Appendix 7). The spiders were observed feeding on millipedes and cave crickets captured in webs.

Family Argiopidae

Argiope aurantia Lucas

Common name: Spider

Habitation: Accidental

Substrate: Terrestrial

Description: This large "garden spider" averages 25 mm in length. The cephalothorax is flat and abdomen is oval. The black abdomen has a broad yellow pattern laterally. The legs

are long and black or have yellow bars. Distinctive webs are often .8 mm in diameter (Comstock, 1948).

Rnage: The orb weaver has been found at the entrance of caves in Coryell, Hays, and Williamson Counties in Texas (Reddell, 1965).

Distribution in cave: One specimen was found in Section I during August, 1978. No previous record for this spider has been recorded from Ezell's Cave.

Family Linyphiidae

Eperigone maculata (Banks)

Common name: Spider

Habitation: Accidental

Substrate: Terrestrial

Description: The tiny spider ranges from 1.0 to 1.5 mm in size. Irridescent eyespots are present. The body is light tan with a dark cloudy pattern on the abdomen. The web is small.

Range: *Eperigone maculata* has been taken from caves in Edwards, Hays, Lampasas, and Val Verde Counties of Texas (Reddell, 1965).

Distribution in cave: Four specimens were found at Station I-1 during June and December, 1978.

Notes: The species was found under rocks associated with peanut butter and banana baits (Appendix 7). *Eperigone maculata* has not been found in Ezell's Cave before.

Meioneta sp.

Common name: Spider

Habitation: Troglophile

Substrate: Terrestrial

Description: The small dark spider is 1 to 3 mm long. No lateral spines are present on the tibiae, and claws are absent on the female palps. The cymbium is usually angulate (Kaston, 1953).

Range: The spider has been found in caves in Bexar, Burnet, Childress, Comal, Coryell, Culberson, Edwards, Hardeman, Hays, Irion, Kendall, Kinney, Lampasas, Mason, Medina, San Saba, Schleicher, Sutton, Terrell, Travis, Uvalde, and Williamson Counties in Texas. A large population is present in nearby McCarty Lane Cave (Reddell, 1965).

Distribution in cave: Three specimens were found in Section I during January, 1978 and March, 1979.

Notes: Specimens were found hanging on webs on cracks. Only one specimen was found under a rock associated with a liver bait. This is a new species recorded for Ezell's Cave.

Class Crustacea

Order Anostraca

Family Streptocephalidae

Streptocephalus sp.

Common name: Fairy shrimp

Habitation: Accidental

Substrate: Aquatic

Description: The family is distinguished from other anostracans by the complex cheliform terminal segment of the male second antenna (Ward and Whipple, 1963). *Streptocephalus* is the only genus in the family. All specimens examined were immature and ranged in size from 1 to 3 mm.

Distribution in cave: The genus was observed mostly in the shallow waters of Section VI-Aq. Approximately fifty specimens were found during September, 1978. Several hundred were noted in November, 1978. Four specimens occurred in a plankton sample from IV-Aq-1 in November.

Notes: The fairy shrimp were probably washed into the Edwards Aquifer from surface waters following heavy rains of 12.80 cm during the two weeks prior to the September 16 observation, and 13.00 cm prior to the November 12 observation (Appendix 3). The fairy shrimp did not appear to be concentrated near baited areas. Streptocephalus has not been previously recorded from Ezell's Cave.

Order Diplostraca

Family Leptestheriidae

Leptestheria compleximanus (Packard)

Common name: Clam Shrimp

Habitation: Accidental

Substrate: Aquatic

Description: The family is distinguished from other

diplostracans by a conspicuous spine at the anteroventral extremity of the rostrum (Ward and Whipple, 1963). All specimens examined were immature and ranged from 1 to 2 mm in length.

Range: The species has been reported from Kansas, California, Colorado, Texas, Utah, and Mexico (Ward and Whipple, 1963).

Distribution in cave: Two specimens were collected with a plankton net at Station IV-Aq-1 in November, 1978.

Notes: The clan shrimp were probably washed into the aquifer following heavy rains two weeks prior to collection of the specimens on November 12, 1978.

Leptestheria compleximanus has not been taken from Ezell's Cave in the past.

Order Eucopepoda

Family Cyclopidae

Metacyclops gracilis (Lilljeborg)

Common name: Copepod

Habitation: Troglophile?

Substrate: Aquatic

Description: *Metacyclops gracilis* is slightly larger than *Tropocyclops prasinus mexicanus* and has longer caudal rami. The species is similar to *Metacyclops medocinus*, a common Central and South American species, but there are many differences in the first antennae and fourth and fifth legs (Yeatman, Personal Communication).

Range: The copepod is a typical Eurasian species, but it

has been reported from South America. This is the first North American record for the species.

Distribution in cave: A large number of copepods were captured with a plankton net at Station IV-Aq-1 in September, 1978. About 250 of the 743 specimens were mailed to Dr. Harry Yeatman for identification. Three specimens were identified as *Metacyclops gracilis*.

Notes: The large number of copepods occurred abruptly after a heavy rain. It is quite possible that the species was washed into the aquifer.

Microcyclops varicans rubellus Lilljeborg

Common name: Copepod

Habitation: Troglophile

Substrate: Aquatic

Description: *Microcyclops varicans rubellus* is distinguished from other copepods by the inner of the two middle terminal caudal setae being noticeably longer than the outer median setae and at least as long as the abdominal segments and the caudal ramus combined. The copepod ranges in size from 0.51 to 0.96 mm (Ward and Whipple, 1963).

Range: The species is widely distributed in North America. The copepod is common in debris and weeds near the shore in ponds and streams (Ward and Whipple, 1963).

Distribution in cave: Dr. Bassett Maguire collected this species from a "deep lake" in Ezell's Cave. The "deep lake" is undoubtedly Station IV-Aq-1.

Notes: The copepods were possibly washed into the aquifer from the surface. *Microcyclops varicans rubellus* was not collected during this study.

Tropocyclops prasinus mexicanus Kiefer

Common name: Copepod

Habitation: Troglophile

Substrate: Aquatic

Description: The inner, terminal spine on the inner end segment of the fourth leg is more than twice as long as the segment. The dorsal, caudal seta is more than twice the length of the outermost terminal caudal seta. The species ranges in length from 0.50 to 0.90 mm (Ward and Whipple, 1963).

Range: The copepod is common in Central and North America (Yeatman, Personal Communication).

Distribution in cave: *Tropocyclops prasinus mexicanus* was taken at Station IV-Aq-1 during September, 1978. Over 700 specimens were collected with a plankton net. Many immature specimens were present.

Notes: A large number of copepods occurred suddenly following a heavy rain. The epigean species was probably washed into the aquifer from surface waters. Several species of copepods encountered have been tentatively classified as troglophilic because many similar copepods can live quite well in the dark zone of caves. This classification may be misleading. Since no specimens were collected prior to the

the heavy rain and their numbers diminished rapidly following the rain. This species has not previously been reported from Ezell's Cave.

Order Thermosbenacea

Family Monodellidae

Monodella texana Maguire

Common name: Thermosbenacean

Habitation: Troglobite

Substrate: Aquatic

Description: The slender, subcylindrical animal averaged 1.8 mm in length. The crustacean is colorless and eyeless. A short carapace covers the head and first two thoracic segments (Karnei, 1978). Faint green blood corpuscles have been observed in living specimens by Maguire (1964).

Range: *Monodella texana* has been collected from Ezell's Cave (type locality) and the artesian well in San Marcos (Karnei, 1978). Specimens have been collected from two locations in Bexar County, Texas.

Distribution in cave: Only one specimen was collected at Station IV-Aq-1 during this study. The organism was collected with a plankton net on July 2, 1978. Specimens in past collections of Ezell's Cave were probably taken at Station Iv-Aq-1. Access to deep water is best in this area. The species seems to be present in very small numbers considering the amount of seining necessary to capture a few specimens.

Notes: *Monodella texana* is one of two species of the order Thermosbenacea found in the Western Hemisphere. The other species has been recently found in Cuba. All other Thermosbenaceans are found in caves and springs in the Mediterranean area. *Monodella texana* is the only inland species. The species was first collected by Maguire.

Order Amphipoda

Family Gammaridae

Stygobromus flagellatus (Benedict)

Common name: Amphipod

Habitation: Troglobite

Substrate: Aquatic

Description: The third uropod has one short ramus. The telson has apical spines and is 50 percent longer than wide. Adult males average 10 mm, whereas, females average 13 mm in length. The palms of the gnathopod propods are oblique. The bases of preopods 5 through 7 narrow distally. The isopod is white (Holsinger and Longley, In Press).

Range: The amphipod has been collected at the artesian well, San Marcos Springs, Ezell's Cave, and Rattlesnake Cave in San Marcos. Karnei (1978) reports specimens from three locations in Bexar County, Texas.

Distribution in cave: *Stygobromus flagellatus* was found at all three aquatic stations. The amphipod was found five times more frequently at Station VI-Aq as at the other two aquatic stations (Appendix 8).

Notes: Only one of the ten amphipod species Holsinger and Longley (In Press) found in the nearby artesian well was discovered in Ezell's Cave. This is probably because of different feeding and habitat requirements of each species. *Stygobromus flagellatus* was captured only in jar traps baited with fish. The species was first collected by Benedict in 1896, from the artesian well.

Order Isopoda

Family Armadillididae

Armadillidium vulgare (Latreille)

Common name: Pillbug or sowbug

Habitation: Trogloxene

Substrate: Terrestrial

Description: The gray to brown isopod is capable of rolling into a ball. The uropods extend only to the edge of the posterior carapace margin. The pleotelson is trapezoidal with rounded posterior corners. The broad, flat exopod extends to the posterior edge of the carapace (Schultz, 1965). Specimens ranged from 2 to 9 mm in length.

Range: *Armadillidium vulgare* has been found in caves of Bell, Burnet, Travis, and Williamson Counties (Shultz, 1965).

Distribution in cave: The isopod was found throughout the study period in Sections I and II. The species was present in greatest numbers from June through November in Section I (Appendix 8).

Notes: *Armadillidium vulgare* was the most abundant isopod in Ezell's Cave. The pillbugs were found with equal frequency at all bait types (Appendix 7). It is possible the isopods were merely taking cover under bait rocks rather than being attracted to the bait. This pillbug was not noted in past literature from Ezell's Cave.

Family Cirolandies

Cirolandies texensis Benedict

Common name: Isopod

Habitation: Troglobite

Substrate: Aquatic

Description: The white isopod averages 16.5 mm long and 6.5 mm wide (Ulrich, 1902). The body is oblong or elliptical with a depth of about one-half the breadth. All body segments have ventroposterior pleura which appear as scale-like projections. The dorsal surface is smooth and eyes are absent. The isopods possess mandibles capable of biting careless handlers.

Range: The isopod is widespread in the Edwards Plateau of Texas and is found in Bexar, Edwards, Hays, Kerr, Real, Schleicher, Uvalde, and Val Verde Counties (Reddell, 1965).

Distribution in cave: *Cirolandies texensis* was captured at all three aquatic stations (Appendix 8). Roughly three times as many isopods were captured at Station IV-Aq-1 as at the other two stations. The isopod does not seem to tolerate muddy water. Specimens in a jar of muddy water slowed and

became inactive. Waters in the cave were noticably turbid following heavy rains on April 3 (10.08 cm), September 16 (8.48 cm), November 12 (11.93 cm), and January 3 (10.00 cm). The number of isopods decreased sharply during these periods (Appendix 8).

Note: *Cirolanides texensis* was attracted to baits in the aquatic nets, and large numbers were captured in jar traps baited with fish.

Family Porcellionidae

Metoponorthus pruinosus (Brandt)

Common name: Pillbug or sowbug

Habitation: Troglophile

Substrate: Terrestrial

Description: These isopods are not capable of rolling into a ball. The abdominal segments are abruptly narrower than those of the thorax. The anterior segments appear rounded from a posterior view. The first flagellar segment is always longer than the second. The color of the pillbug is an iridescent reddish-purple when alive and reddish-brown in alcohol (Shultz, 1965).

Range: Shultz (1965) noted *Metoponorthus pruinosus* was the most widespread isopod in Texas caves. The pillbug was reported from caves in Bell, Childress, Hays, Pecos, Stonewall, Travis, Uvalde, Val Verde, and Williamson Counties.

Distribution in Cave: The isopod was not found during this study in Ezell's Cave. The specimens reported by Shultz

(1965) were probably captured in Sections I or II.

Notes: James Reddell collected gravid females from Ezell's Cave on January 30, 1965.

Porcellio laevis Latreille

Common name: Sowbug or Pillbug

Habitation: Accidental

Substrate: Terrestrial

Discription: The isopod is not capable of rolling into a ball. The adbominal segments are the same width as the thorax. The posterior angle of the anterior thoracie segments is slightly to notably extended. The first segment of the flagellum is longer than the second. The dorsal surface of the body is smooth. The pillbug is slate gray in color and with a small amount of yellow (Shultz, 1965).

Range: *Porcellio laevis* has been recorded in caves from Bell, Childress, Wheeler, and Williamson Counties in Texas (Shultz, 1965).

Distribution in cave: The species was found in Section I and II (Appendix 8). The isopod was most abundant in Section II, but it occurred throughout the study period in small numbers.

Note: *Porcellio laevis* has not been previously reported in past literature from Ezell's Cave.

Family Trichoniscidae

Brackenridgia (Protrichoniscus) cavernarum Ulrich

Common name: Pillbug or sowbug

Habitation: Troglobite

Substrate: Terrestrial

Description: The species ranged from 2 to 6 mm in length. The body is slightly arched. The posterior margin of the head is straight. Eyes and antennulae are absent. The antennae are one-half the body length. The isopods are white and often appear to have a dark longitudinal stripe located along the median dorsal surface. The dark band is caused by the contents of the alimentary tract (Ulrich, 1902).

Range: This species has been found in caves in Bexar, Comal, Hays, Kendall, Kinney, Terrell, and Val Verde Counties in Texas (Reddell, 1965).

Distribution in cave: Specimens were found in Sections II through VI. This species was the most widely distributed isopod in the cave (Appendix 8). Only 46 specimens were counted in Section II during the study period, while approximately 250 specimens were observed in each of the other sections. The species was very abundant in Sections V and VI.

Notes: Ezell's Cave is the type locality of *Brackenridgia cavernarum*. The isopod was first collected by Eigenmann in 1899 and was later described by Ulrich in 1902. The specimens occurring in Section II were possibly attracted from deeper within the cave during the summer and fall months by heavy deposits of cave cricket guano (or maybe

the fungi and bacteria associated with the guano). Some bait residue remained under rocks despite baits being removed promptly following checks/ The bait residue may have held these isopods and Collembola (*Pseudosinella violenta*) in the area). The numbers seemed to increase at each station.

Order Decapoda

Family Palaemonidae

Palaemonetes (*Alaocaris*) *antrorum* Benedict

Common name: Shrimp

Habitation: Troglobite

Substrate: Aquatic

Description: The body of this white shrimp averages 17 mm in length. The antennal length is 26 to 27 mm. The rostrum is short and bears approximately 12 dorsal notches. The telson narrows distally. The posterior telson margin has two large spines inside a smaller pair. Two small spines are usually between the larger spines (Ulrich, 1902).

Range: *Palaemonestes antrorum* has been found in Bexar and Hays Counties in Texas (Karnei, 1978).

Distribution in cave: Shrimp were found at all three aquatic stations (Appendix 8). An average of 3.1 shrimp were seen per visit at Station IV-Aq-1, and 3.4 were observed per visit at Station VI-Aq. Only 1.0 shrimp was seen per visit at Station IV-Aq-2. The maximum number of shrimp observed in Ezell's Cave was 18 on March 2, 1978.

Notes: These shrimp were never captured in jar traps. The decapods were readily attracted to aquatic nets baited with fish. A shrimp was noted eating a dead scorpion on one occasion (or perhaps bacteria associated with the dead scorpion).

Palaemonetes holthuisi Strenth

Common name: Shrimp

Habitation: Troglobite

Substrate: Aquatic

Description: The rostrum is high, laterally compressed and short, and bears 4 to 8 teeth. The posterior margin of the telson is expanded, with 6 to 10 small spines. An enlarged pair of spines occur inside of the outermost smaller pair. The eyes are reduced and bullet shaped in appearance. The carapace, including the rostrum, of this white shrimp is 8 mm in length (Strenth, 1976).

Range: Ezell's Cave is the type locality, and only place where *Palaemonetes holthuisi* has been found.

Distribution in cave: One female specimen with eggs was taken in a plankton net at Station IV-Aq-1 on September 22, 1978.

Notes: The shrimp was described by Strenth in 1976. Examination of the meager collection of shrimp during the study indicated *Palaemonetes holthuisi* was much less abundant than *Palaemonetes antrorum*.

Class Diplopoda

Order Chordeumida

Family Lysiopetalidae

Abacion sp.

Common name: Millipede

Habitation: Accidental

Substrate: Terrestrial

Description: Specimens averaged 24 mm in length. Body segments are very short (.8 to .9 mm). The legs are approximately 1 mm long. The body is a rich dark brown color. All specimens sent to W. Shear for determination were immature or female and thus unidentifiable to species.

Range: *Abacion texense* Loomis has been reported from caves in Burnet, Edwards, Kendall, Real, San Saba, Travis, and Uvalde Counties in Texas. *Abacion* sp. has been found in caves in Comal, Kerr, Lampasas, Uvalde, and Williamson Counties (Reddell, 1965).

Distribution in cave: This *Abacion* sp. was found in Sections I and II (Appendix 8). The genus was most common in Section I during the fall months.

Notes: It is difficult to identify immature and female specimens to species. *Abacion texense* is the most common species of *Abacion* in Texas. The undetermined *Abacion* was attracted to all bait types with no clear preference evident. The millipede had not been previously reported from Ezell's Cave.

Order Polydesmida

Family Eurymerodesmidae

Eurymerodesmus sp.

Common name: Millipede

Habitation: Accidental

Substrate: Terrestrial

Description: The average length for this species is 18 mm. Body segments are 1.5 to 2.0 mm long. The specimens are light brown.

Range: The genus has been taken from caves of Bexar, Hays, Kerr, Medina, Terrell, Travis, Uvalde, Val Verde, and Williamson Counties in Texas (Reddell, 1965).

Distribution in cave: One specimen was collected at Station IV-3 on December 6, 1978.

Notes: One specimen was collected under a rock baited with peanut butter. *Eurymerodesmus* sp. has not been found in Ezell's Cave before. Little work has been done on the genus.

Family Polydesmidae

Speodesmus echinourus Loomis

Common name: Millipede

Habitation: Troglobite

Substrate: Terrestrial

Description: Specimens range from 7 to 18 mm in length. The long oarlike legs allow the millipede rapid movement. The body is white with a dark longitudinal mid-dorsal line.

Range: Reddell (1965) reported the occurrance of *Speodesmus echinourus* in Bandera, Comal, Edwards, Hays, Kendall, Kerr, Menard, Real, Travis, and Uvalde Counties of Texas.
Distribution in cave: *Speodesmus* sp. was commonly found in Sections II through VI (Appendix 8). The millipede was most abundant in Section III.
Notes: *Speodesmus echinourus* has been found in past collections from Ezell's Cave. Immature and female specimens collected during the recent study were identified as *Speodesmus* sp. The millipede was attracted to all baits but preferred peanut butter (Appendix 7). The millipede appeared to be sensitive to light and would leave the area during checks to avoid the headlamp beam.

Family Strongylosomidae

Oxidus gracilis (Koch)

Common name: Millipede
Habitation: Trogloxene
Substrate: Terrestrial
Description: The millipede averages 20 mm in length and are a rich, dark brown color. The oval body segments are 1.5 to 2.0 mm long. Legs average 1.5 mm in length.
Range: *Oxidus gracilis* is distributed over much of tropical and semi-tropical areas of the world. The species is abundant in Mexico. The millipede has been reported from caves of Bell, Bexar, Hays , Kendall, Kimble, Travis, and Williamson Counties in Texas (Reddell, 1965).

Distribution in cave: The millipede was common in Sections I and II with greatest abundance in Section II (Appendix 8). Specimens were also noted in Sections III, V, and VI.
Notes: Caves protect the millipedes from light, desiccation, and temperature extremes. The millipedes prefer the high humidity in caves and derive food from the soil. They eat decaying vegetable matter, fungi, animal matter, and excrement. They rarely move except at night (Reddell, 1965). The specimens in Ezell's Cave were attracted to all baits but occurred in largest numbers on banana and peanut butter (Appendix 7). The species is not noted in past literature from Ezell's Cave.

Order Spirobolida

Family Atopetholidae

Unidentified material

Common name: Millipede
Habitation: Accidental
Substrate: Terrestrial
Description: Specimens average 23 mm in length and 2 to 3 mm in width. The body segments are smooth and continuous in appearance. The legs average 1 mm in length. The body is round in cross section. Specimens are dark brown in color.
Range: Unidentified members of the family Atopetholidae have been found in Hays and Uvalde Counties of Texas (Reddell, 1965).
Distribution in cave: Two specimens were found at Station

III-1, and 1 was found at Station I-2. The millipedes occurred in November and December of 1978.

Notes: Two specimens were associated with banana baits, while one was associated with peanut butter.

Order Cambalida

Family Cambalidae

Cambala speobia (Chamberlin)

Common name: Millipede

Habitation: Troglobite

Substrate: Terrestrial

Description: *Cambala speobia* has no conspicuous cave modifications. Adult males are necessary for specific determination. The flesh colored millipede has a maximum length 33 mm and a width of 1.9 mm. Ocelli are reduced. The body is composed of 37 to 50 segments. Six crests are found on each segment beginning with segments 5 (Causey, 1964).

Range: *Cambala speobia* is the most widespread troglobite in Texas. The millipede has been found in caves of Bandera, Bell, Bexar, Burnet, Comal, Coryell, Edwards, Hays, Irion, Kendall, Kerr, Kimble, Kinney, Lampasas, Medina, Menard, Real, San Saba, Schleicher, Sutton, Terrell, Travis, Uvalde, Val Verde, and Williamson Counties (Reddell, 1965).

Distribution in cave: *Cambala* sp. was found in Sections II through VI. The millipede was most abundant in Section III (Appendix 8). Only one specimen was found in Sections II and V.

Notes: *Cambala speobia* has been recorded from Ezell's Cave (Reddell, 1965). Material collected during this study was identified as *Cambala* sp. The species is typically found in silt, on walls, under organic debris, and rocks in the twilight zone and silt, on walls, under organic debris, and rocks in the twilight zone and total darkness of the cave. *Cambala* sp. curled when exposed to light. The millipede was attracted to all four baits but seemed to prefer liver and banana (Appendix 7).

Class Chilopoda

Unidentified material

Common name: Centipede

Habitation: Accidental

Substrate: Terrestrial

Description: The long, slender body of this yellowish centipede is about 1 mm wide and 27 mm long.

Distribution in cave: One specimen was found at Station I-2 in September and the other at Station I-3 in November of 1978.

Note: One centipede was found under a rock baited with cheese.

Order Scolopendromorpha

Family Scolopendridae

Scolopendra viridis Say

Common name: Centipede

Habitation: Trogloxene or Accidental

Substrate: Terrestrial

Description: The species can often reach 130 mm in length. Specimens captured in Ezell's Cave averaged 10 mm long and were a uniform dark brown color.

Range: The species is widely distributed from the southern United States to Brazil (Levi and Levi, 1968). Reddell (1970a), reported the species from Ezell's Cave in Hays County, Texas.

Distribution in cave: The occurrence of *Scolopendra viridis* as reported by Reddell (1970a) was probably in Sections I or II. Eleven centipedes found during the study were probably *Scolopendra viridis*, but the species was not verified. Most specimens were found in Section I during April, May, June, and November of 1978. One specimen was found in Section II during February, 1979.

Notes: The ecological status of this species is poorly known. The specimens in the recent study were associated with all baits. Four centipedes were attracted by peanut butter, 3 by cheese, 3 by banana, and 1 by liver baits.

Class Insecta

Order Collembola

Family Entomobryidae

Pseudosinella violenta (Folsom)

Common name: Elongate-bodied Springtail

Habitation: Troglophile

Substrate: Terrestrial

Description: These minute, wingless insects range in length from 1 to 2 mm. The furcula, situated on the fourth and fifth abdominal segments, enables the white springtail to jump. Antennae are short, and eyes are absent. The mesonotum is not greatly enlarged. A dense, scaley covering allows the species to live in rather dry soils (Maynard, 1951).

Range: This collembolan is present in almost every Texas cave. The species has been reported from Bandera, Bell, Bexar, Burnet, Comal, Coryell, Crockett, Edwards, Hays, Kendall, Kimble, King, Kinney, Mason, Medina, Menard, Real, San Saba, Schleicher, Sutton, Terrell, Travis, Uvalde, Val Verde, Wheeler, and Williamson Counties (Reddell, 1966 and 1970b).

Distribution in cave: *Pseudosinella violenta* was the most common organism found in Ezell's Cave. The springtail occurred in all parts of the cave, but it was most abundant in Sections II through Vi (Appendix 8).

Notes: Collembola are present in leaf litter, soil, or under rocks throughout the cave. They are an important food source for spiders and other arthropods in the cave. Specimens were collected with a paintbrush dipped in alcohol. This species was attracted in large numbers to all bait types (Appendix 7).

Tomoceras flavescens (Tulberg)

Common name: Elongate-bodied Springtail

Habitation: Trogloxene

Substrate: Terrestrial

Description: This species is a slate gray color with a body length of 2 to 3 mm. Antennae are short. The unguis has 2 to 4 inner teeth. The body is covered with dense scales. Simple setae are present (Maynard, 1951).

Range: *Tomoceras flavescens* has been taken from caves in Bexar, Hays and Travis Counties, Texas (Reddell, 1966).

Distribution in cave: The species was present in Section I (Appendix 8). Numbers were greatest in April and May. One specimen was found in Section II during April, 1978. *Tomoceras flavescens* is a new species record for Ezell's Cave.

Family Sminthuridae

Arrhopalites sp.

Common name: Globular Springtail

Habitation: Troglophile

Substrate: Terrestrial?

Description: The body is oval and globular in shape. The species is 1 mm or less in length and white in color. Ocelli are reduced and the fourth antennal segment is subdivided. Tenent hairs are absent. Both edges of the mucrones are similar. Conical pegs are present above and below the dentes. Abdominal segments 5 and 6 are separated by a constriction. Females have anal appendages (Maynard, 1961).

Range: The genus has been found in caves in Hays and Kendall Counties of Texas (Reddell, 1966).

Distribution in cave: A total of 16 Collembola were taken during the study period at Station IV-Aq-1. All specimens were collected from the pool surface with a plankton net. Nine specimens were taken on September 22, 1978. Four other specimens were found on October 2, 1978, and 3 were found on October 15, 1978.

Notes: The specimens sent for identification appeared to be intermediate between *Arhopalites clarus* and *Arrhopalites hirtus*. The genus has not been previously recorded from Ezell's Cave.

Dicyrtoma (Ptenothrix) marmorata (Packard)

Common name: Globular Springtail

Habitation: Trogloxene?

Substrate: Terrestrial

Description: The oval body averages 2.5 mm in length. Eyes are present. The ungues have no pseudonychia. The body is dark purple or brownish purple, and the legs are banded (Maynard, 1951).

Range: *Dicyrotoma marmorata* occurs in Maine, Massachusetts, Maryland, Illinois, Texas, Iowa, North Carolina, and in Ontario and Manitoba, Canada (Maynard, 1951).

Distribution in cave: Six specimens were found during the study period. Four specimens were found in Section I, 1 in Section II, and 1 in Section IV. The specimens were found in December, 1978, and January and February, 1979, respectively.

Notes: *Dicyrtoma marmorata* was found under rocks baited with liver, cheese, and banana. The species was not mentioned in the past literature of Ezell's Cave.

Order Thysanura

Family Nicoletiidae

Texoreddellia texensis (Ulrich)

Common name: Silverfish

Habitation: Troglobite

Substrate: Terrestrial

Description: The body of the white silverfish from 10 to 25 mm in length. The antennae and caudal appendages are longer than the body (Ulrich, 1902).

Distribution in cave: *Texoreddellia texensis* was abundant in the total darkness of Section III through VI (Appendix 8). The species was slightly more abundant in Section V. One specimen was found in Section II.

Notes: The species was first collected by C. H. Eigenmann in 1899, and was described by Carl Ulrich in 1902. The fragile silverfish were captured best with forceps to avoid damage to the antennae and caudal appendages. Specimens were observed struggling or dead on the pool surface on several occasions during this study. The species was attracted to all bait types (Appendix 7). Slight preference to banana bait was indicated.

Order Blattodea

Family Blattellidae

Unidentified Material

Common name: Cockroach

Habitation: Undetermined

Substrate: Terrestrial

Description: The specimen examined is a small nymph. The gold colored roach appears different from *Arenivaga tonkawa* and *Parcoblatta fulvescens*. The eyes have a few large facets that do not seem to fill the lens area, i.e. somewhat reduced. The face is narrow (Fisk, Personal Communication).

Distribution in cave: Five specimens were found. Four specimens were found in Section II during January, August, and September. One specimen was noted at Station III-3 in August, 1978.

Notes: The roach was attracted to peanut butter baits on two occasions.

Parcoblatta fulvescens (Saussure and Zehntner)

Common name: Cockroach

Habitation: Trogloxene or Accidental

Substrate: Terrestrial

Description: The winged adult is 10.8 to 16.5 mm long and is uniform brown in color. Nymphs are wingless and darker than adults in color. The male tegmina is a little broader than the pronotum. All cercal segments are simple (Hefer, 1953).

Range: The species occurs from Long Island, New York to the Florida Keys, Texas, Kansas, and Iowa (Hefer, 1953). The roach is common in Texas.

Distribution in cave: *Parcoblatta fulvescens* was found in Section I, II, and III but was most common in Section II (Appendix 8).

Notes: The species is common in wooded areas. *Parcoblatta* was attracted to peanut butter, cheese, and banana baits. The roach has not been found in Ezell's Cave before.

Family Polyphagidae

Arenivaga tonkawa Hebard

Common name: Cockroach

Habitation: Trogloxene

Substrate: Terrestrial

Description: The winged adults average 22 mm long and are mottled brown in color. Nymphs resemble isopods in shape and range from 4 to 20 mm in length. The nymphs are a rich brown color.

Range: *Arenivaga tonkawa* has been found in caves in Bexar, Brewster, Childress, Coryell, Edwards, Kerr, Kinney, Medina, Real, Terrell, Travis, and Uvalde Counties in Texas (Reddell, 1966).

Distribution in cave: The species was found in Section I, II, and IV (Appendix 8). The roach was most abundant in Section I.

Notes: *Arenivaga tonkawa* is a sandy, desert species. Females

and young are apterous and burrow in dirt and sand (Fisk, Personal Communication). Specimens were attracted to peanut butter and banana baits (Appendix 7). The species has not previously been recorded from Ezell's Cave.

Order Orthoptera

Family Rhaphidophoridae

Ceuthophilus (Geotettis) Cunicularis Hubbell

Common name: Cave Cricket

Habitation: Trogloxene

Substrate: Terrestrial

Description: Specimens ranged from 3 to 16 mm in length. The cave cricket is wingless. An unbroken brown bar is present on the dorsal posterior margin of each thoracic and abdominal segment. Hind femora and tibiae are long. Antennae are slender and longer than the body.

Range: The species is the most abundant and best known cave cricket in Texas. Reddell (1966) reported specimens from Bell, Bexar, Blanco, Burnet, Comal, Coryell, Edwards, Hays, Kendall, Kerr, Kinney, Lampasas, Mason, Medina, Real, San Saba, Terrell, Travis, Uvalde, Val Verde, and Williamson Counties, Texas.

Distribution in cave: *Ceuthophilus cunicularis* was found in all sections throughout the study period. The cave cricket was most abundant in Section II and III (Appendix 8).

Notes: The species was attracted to all baits (Appendix 7). Specimens were commonly observed under rocks.

Ceuthophilus (Ceuthophilus) secretus Scudder

Common name: Cave Cricket

Habitation: Trogloxene

Substrate: Terrestrial

Description: Adults of the species are 18 to 26 mm long. The cave cricket is wingless. A brown bar on the posterior margin of each dorsal thoracic and abdominal segment is deeply divided. A bar pattern is present on the elongate femora. Antennae are slender and longer than the body.

Range: *Ceuthophilus secretus* is common in caves in Bell, Bexar, Blanco, Burnet, Comal, Coryell, Edwards, Hays, Kendall, Lampasas, Mason, Medina, Menard, Real, San Saba, Terrell, Travis, Uvalde, Val Verde, and Williamson Counties of Texas (Reddell, 1966). Ezell's Cave is the type locality for the species (Hubbell, Personal Communication).

Distribution in cave: The species was found in all sections of the cave but was most common in Sections I, II, and III. Large numbers of crickets were present from June through September, 1978 (Appendix 8). The numbers decreased sharply during the cooler months and increased again in the spring.

Notes: The crickets dispersed from the cave at night to feed. Specimens were occasionally noted on the water in Section IV. Cave crickets play an important role in the food chain of Ezell's Cave. In addition to being fed upon by various predator groups, such as spiders, scorpions, and other arthropods, large amoungs of circket guano is deposited on the floor of Section II. A green mold, *Mucor racemosus*,

grew on the guano. Food was therefore furnished directly and indirectly by the cricket to collembolans, isopods, thysanurans, and other small organisms.

Family Gryllidae

Gryllus assimilis (Fabricius)

Common name: Field Cricket

Habitation: Accidental

Substrate: Terrestrial

Description: The black cricket is dorsally flattened. The species is 14 to 30 mm long. Wings are present (Helfer, 1953).

Range: The species is widespread in surface habitats of Texas, but has been noted in only one cave in Culberson County (Reddell, 1966).

Distribution in cave: One specimen was found at Station I-2 on September 4, 1978.

Notes: *Gryllus assimilis* was common in fields, pastures, lawns, roadsides, and woods. The species was common on the surface property. The specimen was collected under a rock associated with peanut butter bait. The species has not been collected in Ezell's Cave before.

Family Tettigoniidae

Fediodectes stevensonii (Thomas)

Common name: Round-headed Katydid

Habitation: Accidental

Substrate: Terrestrial

Description: *Pediodectes stevensonii* resembles a large cave cricket. The body length is 30 mm excluding the slightly upcurved ovipositor. The labrum and clypeus are white. The hind femur is long (Helfer, 1953).

Range: The species occurs from South Dakota and Colorado to New Mexico.

Distribution in cave: One specimen was taken at Station I-4 on December 5, 1978.

Notes: The species was common on the surface property. The katydid was not associated with any baits. *Pediodectes stevensonii* has not been found in Ezell's Cave before.

Order Dermaptera

Family Labiduridae

Unidentified Material

Common name: Long-horned Earwig

Habitation: Trogloxene?

Substrate: Terrestrial

Description: The second tarsal segment is cylindrical and does not protrude distally beneath the third segment. Antennal segments four through six combined are not longer than the first segment (Borror and White, 1970). The specimens range in size from 5 to 18 mm. The body of the larger specimens is a uniform dark brown. The light legs have several brown bars.

Range: Earwigs have been found in one cave in Val Verde

county, Texas (Reddell, 1966).

Distribution in cave: Earwigs were found in Sections I and II (Appendix 8). Most specimens were observed between June and October, 1978.

Notes: Thirty small (5 mm) specimens were found under one rock in Section II during September. The family has not been noted in past literature from Ezell's Cave.

Order Psocoptera

Family Amphientomidae

Pseudoseopsis hellmani Mockford and Gurney

Common name: Psocid

Habitation: Troglophile

Substrate: Terrestrial

Range: The species has been found only in Hays and Travis Counties of Texas. *Pseudoseopsis hellmani* is the only species of the family Amphientomidae in the United States. Ezell's Cave is the type locality.

Distribution in cave: Specimens were found under rocks at the entrance by Edward Mockford in 1953 (Mockford and Gurney, 1956).

Notes: The species was not found during this study.

Family Psyllipsocidae

Psyllipsocus ramburi Selys-Longchamps

Common name: Psyllipsocid

Habitation: Troglophile

Substrate: Terrestrial

Description: The tiny specimens are white in color. The head profile is short and vertical. The wings and body lack scales (Borror and White, 1970).

Range: The psyllipsocid is widespread throughout caves of the world, especially Mexico. The species has been found in caves in Burnet, Edwards, Hays, Lampasas, Llano, Travis, Uvalde, and Williamson Counties of Texas (Reddell, 1966).

Distribution in cave: *Psyllipsocus ramburi* was found in Sections I through IV. The species was most abundant in Section I (Appendix 8).

Notes: The species was present in dark, damp places under rocks and in the soil. Specimens were found under rocks and associated with all bait types. No bait preference was apparent.

Order Hemiptera

Family Coreidae

Leptoglossus clypealis (Heid.)

Common name: Leaf-footed Bug

Habitation: Accidental

Substrate: Terrestrial

Description: The body is 18 mm long. The head is narrow and shorter than the pronotum. The hind tibiae are flattened and leaflike.

Distribution in cave: The bug was found once in Section I, and once in Section VI, during June and December 1978, respectively.

Family Reduviidae

Triatoma gerstaeckeri (Stol)

Common name: Assassin Bug

Habitation: Trogloxene

Substrate: Terrestrial

Description: The body is oval with an elongate head. A short, curved beak fits into a groove on the prosternum. The edges of the abdomen extend laterally beyond the wings. The slate colored bug averages 25 mm in length.

Range: The bug is common in the dry, dusty entrances of Texas caves. Reddell (1966) noted the species in caves in Bexar, Comal, Coryell, Edwards, Hays, Lampasas, Medina, Travis, Uvalde, and Williamson Counties.

Distribution in cave: The species was most abundant on the roof in Section I during June, July, and August, 1978 (Appendix 8). Two specimens were found in Section II.

Notes: *Triatoma gerstaeckeri* occurred during June, July, and August. The assassin bug is predaceous and must have a blood meal from a vertebrate host. There is no previous literature account for the species from Ezell's Cave.

Order Coleoptera

Family Dytiscidae

Haidoporus texensis Young and Longley

Common name: Predaceous Diving Beetle

Habitation: Troglobite

Substrate: Aquatic

Description: The elongate body is slightly flattened, white in color, and ranges from 3.4 to 3.7 mm in length. Minute nonfunctional eyes are present. Setae are found on the legs (Young and Longley, 1975).

Range: The species had been previously taken only from the artesian well on the campus of Southwest texas State University in Hays County, Texas.

Distribution in cave: One specimen was taken in a jar trap baited with fish at Station IV-Aq-2 on April 14, 1978.

Notes: *Haidoporus texensis* is the only cave adapted water beetle in North America. In January, 1979, a specimen in the office of Glenn Longley (Southwest Texas State University) was noted moving about a dead cave shrimp (*Palaemonetes antrorum*). The beetle was apparently feeding on the shrimp or associated bacteria.

Family Staphylinidae

Belonuchus sp. near *moquinus* Casey

Common name: Rove Beetle

Habitation: Troglophile

Substrate: Terrestrial

Description: The elongate body is slender and averages 16 mm in length. Wings are short, and the posterior abdominal segments are exposed. The head and thorax are dark brown. The wings and abdomen are dark tan.

Range: The common rove beetle has a wide distribution and

probably occurs in most Texas caves. Specimens have been found in caves in Bandera, Bell, Bexar, Burnet, Childress, Comal, Coryell, Culberson, Edwards, Hays, Irion, Kendall, Kerr, Kimble, King, Kinney, Lampasas, Mason, Medina, San Saba, Schleicher, Sutton, Travis, Uvalde, Val Verde, Wheeler, and Williamson Counties of Texas (Reddell, 1966).

Distribution in cave: *Belonuchus* sp. was found in all sections of the cave but was most numerous in Section II (Appendix 8).

Notes: A specimen of the genus *Belonuchus* was reported from Ezell's Cave by Reddell (1966). The specimen resembled *Belonuchus moquinus* Casey, but positive identification could not be determined. Specimens collected during this study were identified simply as *Belonuchus* sp. Specimens were attracted to all baits but appeared to prefer liver and cheese (Appendix 7).

Orus (leucorus) rubens Casey

Common name: Troglophile

Substrate: Terrestrial

Description: The slender body is elongate and averages 3 mm in length. Wings are short, and the posterior abdominal segments are exposed. The species is a uniform dark brown color.

Range: The species has been found in caves in Burnet, Edwards, Hays, Lampasas, Real, San Saba, Schleicher, Travis, and Val Verde Counties of Texas (Reddell, 1966).

Distribution in cave: A total of 5 specimens were found in Sections II, III, and IV. One member of the species was found in Section III during April, 1978. One specimen was found in Section II during February, 1979. Other specimens were observed in Section IV during October and November, 1978, and March of 1979.

Notes: *Orus rubens* was attracted to all baits (Appendix 7). The species has not been previously reported from Ezell's Cave.

Family Pselaphidae

Batrisodes (Babnormodes) Schneiderensis Park

Common name: Short-winged Mold Beetle

Habitation: Troglophile

Substrate: Terrestrial

Description: The type female was described by Park (1960). The shiny red-brown species is 2.1 mm in length. Flavous pubescence is subprostrate. The eye contains 22 ocular facets. The inconspicuous tibial spur is short and tapered. The simple clubbed antennae are 7 segmented.

Range: The species previously had been found only in Schneider Ranch Cave and Pfeiffer Crawlway Cave in Kendall County, Texas (Reddell, 1966).

Distribution in cave: A total of 7 specimens were found in Sections IV, V, and VI from October, 1978, to January, 1979 (Appendix 8).

Notes: The species was described from one female found in Schneider Ranch Cave (Park, 1960). Many female and several male specimens were later found in Pfeiffer Crawlway Cave (Reddell, 1966). The specimens from Ezell's Cave were found associated with peanut butter and banana baits (Appendix 7). Ezell's Cave is a new county and cave record for *Batrisodes schneiderensis*.

Family Catopidae

Ptomaphagus (Adelops) cavernicola cavernicola Schwarz

Common name: Small Carrion Beetle

Habitation: Troglophile

Substrate: Terrestrial

Description: The elongate, oval body is 1.4 to 1.7 mm wide and 3 to 4 mm long. The body is brown with a blackish head. Large eyes are present (Peck, 1973).

Range: *Ptomaphagus cavernicola* occurs from northeastern Mexico to the Ozarks of Arkansas and southeast to Florida. Specimens have been taken from 55 caves and 1 epigean site (Peck, 1973). The species has been found in caves in Burnet, Comal, Coryell, Edwards, Kerr, Schleicher, Travis, Uvalde, Val Verde, and Williamson Counties in Texas (Reddell, 1966).

Distribution in cave: This species was taken on three occasions. Two specimens were found during February at Stations III-4 and V-2. One specimen was found at Station IV-4 during March of 1978.

Notes: Reddell (1966) reported *Ptomaphagus cavernicola* as the

only troglophilic catopid in Texas. The species was usually found on dung or decaying animal or plant remains. Two specimens were found under rocks baited with liver, and one was under a rock baited with banana (Appendix 7). The occurrence of *Ptomaphagus cavernicola* in Ezell's Cave represents a new cave and county record.

Family Curculionidae

Hypera postica (Gyll.)

Common name: Alfalfa Weevil

Habitation: Accidental

Substrate: Terrestrial

Description: The oval body is a rich brown color and is 3 to 5 mm in length. A well developed snout is present.

Range: The species is abundant in the western United States (Jaques, 1951). The beetle is common in Texas.

Distribution in cave: One specimen was found at Station I-3 in April, 1978.

Notes: The species is a common plant feeder and is often found associated with alfalfa and clover. The specimen was found under a rock baited with cheese. *Hypera postica* was not noted in the literature of Ezell's Cave.

Order Lepidoptera

Unidentified Material

Common name: Moth

Habitation: Accidental?

Substrate: Terrestrial

Description: The two specimens of moth collected are 8 and 16 mm in length. Both are white.

Distribution in cave: One specimen was found on the water near Station IV-3 in January, 1978. The other moth was collected on the west wall in Section II during March.

Notes: The 2 specimens deteriorated rapidly from improper preservation and prevented further identification. Moths have not been recorded from Ezell's Cave.

Order Diptera

Family Culicidae

Culex pipiens Linnaeus

Common name: Mosquito

Habitation: Trogloxene?

Substrate: Terrestrial

Description: The body averages 6 mm in length. Wings are long with scales along veins and wing margins. The distal part of the wing has an unforked vein between two forked veins. A long proboscis is present. Males have plumose antennae, and females have only a few short hairs on the antennae (Borror and White, 1970).

Range: The mosquito is widespread and common in Texas.

Distribution in cave: The species was found in Sections I and II. The mosquito was found from June through November, 1978 (Appendix 8).

Notes: Specimens were too poorly preserved for subspecific

identification. *Culex pipens* was not noted in past literature of Ezell's Cave.

Family Phoridae

Megaselia sp.

Common name: Humpbacked fly

Habitation: Terrestrial

Description: The small, dark colored fly is humpbacked. Strong veins are present in the costal wing area. The remaining veins are weaker and oblique. The hind femora are flattened (Borror and White, 1970). Specimens average 2 mm in length.

Distribution in cave: The species was found in all sections of the cave throughout the study. Specimens were most abundant in Sections III (Appendix 8).

Notes: The genus is commonly attracted to decaying vegetation and fungi. *Megaselia* sp. was attracted to all bait types but showed a definite preference to liver (Appendix 7). This species of fly has not been previously reported from Ezell's Cave.

Family Tachinidae

Elfia sp.

Common name: Fly

Habitation: Accidental

Substrate: Terrestrial

Description: The R-5 cell of the wing is narrowed or

distally closed. The postscutellum is well developed. The hypopleura has bristles, but the arista is bare (Borror and White, 1970).

Range: The species is very common in Texas.

Distribution in cave: One specimen was found at Section I-3 in March of 1978.

Note: The genus has not been reported from Ezell's Cave.

Order Siphonaptera

Family Pulicidae

Ctenocephalides felis (Bouche')

Common name: Common Flea

Habitation: Accidental

Substrate: Terrestrial

Description: The wingless body is laterally flattened and approximately 2 mm long. Well developed palps and sucking mouth-parts are present. The flea is a rich brown color. Seven or 8 sharp black genal teeth are present. The forehead is low and sloping (Hubbard, 1947).

Range: The species is widespread in Texas.

Distribution in cave: One specimen was found in Section IV on February 16, 1978.

Notes: The specimen could have been introduced accidentally during a previous visit. The species has not been found in Ezell's Cave before.

Order Hymenoptera

Family Formicidae

Camponotus sansabeanus (Buckley)

Common name: Ant

Habitation: Accidental

Substrate: Terrestrial

Description: The specimen collected is 9 mm long. The thorax and abdomen are red and the head is dark. The abdomen has a small circlet of hairs around the poison gland opening (Brues, Melander, and Carpenter, 1954).

Range: The species is cosmopolitan in distribution.

Distribution in cave: One specimen was found at Station I-2 in October, 1978.

Notes: The ant was found under a rock associated with peanut butter bait. The species has not been recorded from Ezell's Cave in the past.

Labidus (Eciton) coecus (Latreille)

Common name: Ant

Habitation: Trogloxene

Substrate: Terrestrial

Description: The ant ranges from 4 to 6 mm in length. The body is red. The mandibles are black. The frontal carinae are very close, almost vertical, and do not cover all the antennal insertions. The abdominal pedicel has 1 or 2 segments. The male genitalia are retractable (Brues, Melander, and Carpenter, 1954).

Range: The species has been found in caves in Coryell and Hays Counties in Texas (Reddell, 1966).

Distribution in cave: *Labidus coecus* was most abundant in Sections I and II (Appendix 8). Two specimens were found in Section III. Ants were present in Section I in large numbers during July and August but were absent in colder months. Specimens were observed throughout the study period in Section II.

Notes: The species was attracted to all baits but appeared to prefer cheese (Appendix 7). The specimens of *Labidus coecus* represent a new species record for Ezell's Cave.

Hypoponera opacior (Forel)

Common name: Ant

Habitation: Trogloxene

Substrate: Terrestrial

Description: The body averages 2 mm in length and is black in color.

Distribution in cave: *Hypoponera opacior* was found in Sections I and II (Appendix 8). The species was not observed during the first half of the study period.

Notes: The species was attracted to all bait types but appeared to prefer peanut butter and cheese (Appendix 7). *Hypoponera opacior* was not observed in past studies of Ezell's Cave.

Phylum Chordata

Class Osteichthyes

Order Perciformes

Family Centrarchidae

Lepomis gulosus (Cuvier)

Common name: Warmouth Sunfish

Habitation: Accidental

Substrate: Aquatic

Description: Members of the genus *Lepomis* lack a distinct dorsal fin notch and have 3 spines in the short anal fin. The species has a median patch of teeth on the tongue. A dark spot is found at the base of the soft dorsal fin. *Lepomis gulosus* is brass to olive-green in color and has lines on the opercula and cheek radiating posteriad from the eye. The species averages 250 mm in length (Douglas, 1974).

Range: Warmouth sunfish are found from southern Minnesota and the Great Lakes region south to Texas and Florida (Douglas, 1974).

Distribution in cave: One 28 mm specimen was captured at Station IV-Aq-1 on December 21, 1978. An unidentified fish resembling a sunfish was photographed by W. K. Davis at Station IV-Aq-1 in November, 1976. A small fish (possibly *Gambusia affinis*) was observed in Section VI on November 12, 1978.

Notes: The stomach of the captured specimen was shriveled, and the individual may have been starving. Small fish are

probably washed into the aquifer regularly following heavy rains. All fish observed were epigean. *Lepomis gulosus* has not been recorded in the literature on Ezell's Cave.

Order Cypriniformes

Family Ictaluridae

Ictalurus sp.

Common name: Catfish

Habitation: Accidental

Substrate: Aquatic

Description: The body is elongate and scaleless. The head is large and flat. Whisker-like barbels are present on maxillary, nasal, and chin areas. Dorsal and pectoral fins have stout spines.

Range: The genus is found statewide and is common in local creeks, ponds, and lakes.

Distribution in cave: Uhlenhuth captured two specimens in 1916, from Section IV-Aq.

Notes: The specimens must have been relatively large as they were reportedly captured with hooks. The catfish could have been washed into the aquifer by heavy rains. Reddell (Personal Communication) reported catfish were placed in the "wishing well" of nearby Wonder Cave. The wishing well connects to the aquifer, and it is conceivable that the catfish swam to Ezell's Cave.

Class Amphibia

Order Urodela

Family Plethodontidae

Eurycea (Typhlomolge) rathbuni (Stejneger)

Common name: Texas Blind Salamander

Habitation: Troglobite

Substrate: Aquatic

Description: *Eurycea rathbuni* is the most highly cave adapted salamander. The white salamander has pink gills, a flattened snout, degenerate eyes, and long thin legs incapable of body support out of water. The tail is laterally flattened (Stejneger, 1896), Specimen observed in Ezell's Cave averaged 96.5 mm in length.

Range: The species occurs only in the San Marcos Pool of the Edwards Aquifer. Specimens have been taken from Johnson's Well, Primer's Fissure "Well", Ezell's Cave, Wonder Cave, the artesian well, San Marcos Springs, and Rattlesnake Cave in Hays County, Texas (Longley, 1978).

Distribution in cave: *Eurycea rathbuni* was found at all aquatic stations (Appendix 8). The salamander was frequently observed in the unbaited water under IV-3. The species was sighted on 32 occasions during the study. Twenty-one sightings were made during official checks of the cave. Salamanders were not common. One was seen every 7 or 8 visits to the cave. *Eurycea rathbuni* was most frequently seen at Station IV-Aq-2.

Notes: Salamanders were usually observed motionless on the

pool bottom. Individuals would take a few unhurried steps and lie immobile again. When alarmed, they swam alligator style in a wave-like motion with appendages by their sides. Salamanders often moved away after my arrival at Station IV-Aq when apparently sensing vibrations of the ground. The smallest *Eurycea rathbuni* recorded from Ezell's Cave was 38 mm long. Smaller specimens are found frequently at the artesian well on the Southwest Texas University campus. Small salamanders were probably not observed in the cave because of their size and lack of movement. Large salamanders were frequently seen on nets baited with fish. The fish bait attracted cave shrimp (*Palaemonetes*) which in turn attracted *Eurycea rathbuni*. Young salamanders apparently feed largely on copepods (Longley, Personal Communication). The baiting technique did not concentrate copepods or other small arthropods, and hence, no small salamanders were observed on the nets. No salamanders were captured in aquatic jar traps. While *Eurycea rathbuni* will eat almost any small organism it can catch, it seems to prefer shrimp (*Palaemonetes*). A salamander was observed making contact with an isopod (*Cirolanides texensis*) and a flatworm (*Spalloplana mohri*) while slowly pursuing a shrimp around an aquatic net. No interest was shown in the isopod or flatworm. *Eurycea rathbuni* was probably found as infrequently in the past as they are at the present. Uhlenhuth searched for 12 days in 1916 and found only 1 salamander. Bat guano was considered an important source of every input into Ezell's Cave (Davis, 1971). The placement

of a cover over the entrance in 1955, prevented bats from entering the cave. The presense of bat guano in the cave waters may have served to concentrate cave shrimp (and salamanders) but probably had little affect on the salamander population in the aquifer.

Plethodon glutinosus albagula Grobman

Common name: White-throated Slimey Salamander

Habitation: Troglophile

Substrate: Terrestrial

Description: The elongate body is black with small white spots. The throat and chin are white. The salamander is 130 to 152 mm long (Conant, 1975).

Range: The salamander is widespread in central Texas caves. Specimens have been recorded from caves in Bandera, Bexar, Comal, Hays, Kendall, Kerr, Mason, Real, San Saba, Travis, and Williamson Counties in Texas (Reddell, 1967).

Distribution in cave: The species was found in Section II (Appendix 8). Specimens were noted in the winter and spring months but were absent in the summer and fall months.

Notes: *Plethodon glutinosus* was observed most often under rocks along the ladder wall in Section II. Of the 13 specimens recorded during the study period, one was associated with liver bait, and one was found near banana bait.

Order Anura

Family Bufonidae

Bufo valliceps Weigmann

Common name: Gulf Coast Toad

Habitation: Trogloxene

Substrate: Terrestrial

Description: The large, olive-brown toad is 50 to 100 mm long. A broad, dark lateral stripe is bordered above by a light stripe. A light middorsal stripe is present. Cranial crests are well developed (Conant, 1975).

Range: *Bufo valliceps* is distributed in Louisiana and the southern half of Texas (Conant, 1975). Specimens have been recorded from caves in Bexar, Comal, Hays, Kendall, Kerr, Mason, Real, Travis, Uvalde, Val Verde, and Williamson Counties of Texas (Reddell, 1967).

Distribution in cave: The species was found in Sections I and II. Specimens were most abundant in Section II during the spring and summer months (Appendix 8).

Notes: The toads apparently fell into the cave by accident. Toads were attracted to baits.

Family Leptodactylidae

Hylactophrlyne augusti latrans (Cope)

Common name: Barking Frog

Habitation: Trogloxene

Substrate: Terrestrial

Description: This toadlike frog is 64 to 76 mm long. Warts are absent. A dorsolateral body fold and well developed toe pads are present. A ventral disc is on the venter. The

species is green to brown in color (Conant, 1975). The frog has a distinctive call, sounding remarkably like the bark of a dog.

Range: The barking frog is found in the Edwards Plateau of Texas. The species has been recorded from caves in Bexar, Comal, Edwards, Hays, Kendall, Real, Uvalde, and Williamson Counties of Texas (Reddell, 1967).

Distribution in cave: The species was reported from Ezell's Cave by Reddell (1967). The frog was probably found in Sections I and/or II of the cave.

Note: *Hylactophryne augusti* was not found in Ezell's Cave during this study.

Syrrhophus marnocki Cope

Common name: Cliff Frog

Habitation: Trogloxene

Substrate: Terrestrial

Description: This smooth skinned frog ranges from 19 to 38 mm in length. The frog is pale green with random dark markings. The head is large in proportion to the body (Conant, 1975).

Range: The species is common in many caves of the Edwards Plateau. *Syrrhophus marnocki* has been found in caves in Bandera, Bell, Comal, Edwards, Hays, Kendall, Kerr, Medina, Real, Pecos, Travis, Uvalde, Val Verde, and Williamson Counties of Texas (Reddell, 1967).

Distribution in cave: The cliff frog was found in Section I

through III and was most common in Section II. The species was present throughout the study period (Appendix 8).
Notes: *Syrrhophus marnocki* was regularly observed in cracks and crevices along the west wall of Section II.

Family Ranidae

Rana catesbeiana Shaw

Common name: Bullfrog
Habitation: Accidental
Substrate: Terrestrial
Description: *Rana catesbiana* is the largest frog occurring in the United States and ranges from 90 to 150 mm in length. The fourth hind toe extends well beyond the webbing. No dorsolateral ridges are present on the body. The frog has a dark mottled pattern ventrally, and the dorsal coloration is highly variable (Conant, 1975).
Distribution in cave: Two specimens were found in cracks along the west wall of Section II during the study. One specimen was observed in June, 1978, and the other in February, 1979.
Notes: The bullfrogs probably fell into the cave by accident. *Rana catesbeians* has not been found in Ezell's Cave before.

Rana pipiens Schreber

Common name: Leopard Frog
Habitation: Trogloxene
Substrate: Terrestrial
Description: Two to 3 irregular rows of dark, round spots

are present on the brown to green body. Specimens range in length from 51 to 89 mm. Conspicuous dorsolateral ridges are present. A light spot occurs on the tympanum (Conant, 1975).
Range: The species has been found in caves in Bell, Bexar, Burnet, Comal, Kendall, Mason, Medina, San Saba, Travis, Uvalde, and Williamson Counties of Texas (Appendix 8).
Notes: A single individual was observed in Section II throughout the 15 months study. The species was not recorded in the literature of Ezell's Cave.

Family Microhylidae

Gastrophryne olivacea (Hallowell)

Common name: Great Plains Narrow-mouth Toad
Habitation: Trogloxene
Substrate: Terrestrial
Description: This gray, tan, or green toad ranges from 22 to 38 mm in length. The small head is relatively pointed. The ventral aspect is plain with dark coloration under the chin. The skin is smooth (Conant, 1975).
Range: *Gastrophryne olivacea* is found from Kansas south to Mexico (Conant, 1975). The species has been discovered in caves in Brewster, Comal, Crocket, Hays, Kinny, King, Medina, San Saba, and Val Verde Counties of Texas (Reddell, 1967).
Distribution in cave: The species was noted on two occasions along the west wall in Section II. One specimen was observed in February, 1978, and the other in January, 1979.

Note: Great Plains Narrow-mouth Toads have not been found in Ezell's Cave prior to this study.

Class Reptilia

Order Squamata

Family Colubridae

Tantilla gracilis Baird and Girard

Common name: Flat-headed Snake

Habitation: Accidental

Substrate: Terrestrial

Description: The rear fanged snake is 180 to 200 mm long. The body is brown dorsally with a slightly darker head. The belly is a salmon pink color. Scales are smooth and the anal plate is divided (Conant, 1975).

Range: The flat-headed snake is found in parts of Kansas, Oklahoma, Missouri, Arkansas, and Louisiana. The snake is found in eastern, central, and southern Texas (Conant, 1975). The species has been found in caves in Hays and Val Verde Counties of Texas (Reddell, 1967).

Distribution in cave: One dead specimen was found at Station IV-1 on September 16, 1978.

Notes: *Tantilla gracilis* feeds on centipedes and insect larve (Conant, 1975). The one specimen found during the study was possibly carried into the cave by a person or wild animal. It is unlikely the snake would have crawled so far back in the dark zone. The species has not been found in Ezell's Cave before.

Class Mammalia

Order Chiroptera

Family Vespertillionidae or Molossidae

Probably *Myotis velifer* (Allen) or *Tadarida braziliensis* (Saussure)

Common name: Cave Bat or Brazilian Freetail Bat

Habitation: Trogloxene

Substrate: Terrestrial

Description: *Myotis velifer* is the largest *Myotis* in Texas and averages 90 mm in total length. The tail does not extend past the hairless interfemoral membrane. Thirty-eight teeth are present. Ears are small. The bat is mottled yellow-brown in color (Davis, 1974).

Tadarida braziliensis averages 95 mm in total length. The tail extends well beyond the interfemoral membrane. Thirty or 32 teeth are present. Ears are broad. The bat is dull brown to slate in color.

Range: Both species are abundant in the San Marcos area. The cave bat is found in central and west Texas (Davis, 1974) and has been reported from caves in Armstrong, Bexar, Blanco, Burnet, Childress, Comal, Cottle, Crockett, Edwards, Hardeman, Hays, Kendall, Kerr, Kimble, King, Kinny, Llano, Mason, Medina, Presidio, San Saba, Stonewall, Sutton, Travis, Uvalde, Val Verde, Wheeler, and Williamson Counties (Reddell, 1967). The brazilian freetail bat is distributed in all but the eastern edge of Texas and has been found in caves in

Bandera, Blanco, Brewster, Burnet, Comal, Cottle, Crockett, Edwards, Hardeman, Hays, Kendall, Kerr, Kimble, King, Kinny, Llano, Mason, Median, Presidio, San Saba, Stonewall, Sutton, Travis, Uvalde, and Val Verde Counties of Texas (Reddell, 1967). Several freetail bat colonies number in the millions of individuals.

Distribution in cave: Floyd Potter (Personal Communication) observed 1,000 bats roosting on the roof of Section II prior to the sealing of the entrance in 1955. Russell, (1976) noted bats once roosted above the lake room (Section IV-Aq) before the cave entrance was closed. Very black dirt, possibly guano, is under the thin mud layer in Section VI.

Notes: No bats have returned to Ezell's Cave since the entrance cover was removed in 1967. *Myotis velifer* and *Tadarida braziliensis* are the only two common bats in the area. Potter (Personal Communication) reported bat guano in Section II was 250 to 300 mm thick and the walls were slimy with "bat oils". Guano is not apparent in Section II at present and could have been covered or mixed with dirt, debris, and rocks fallen from the entrance. No guano or dark soil is obvious in Section IV. The introduction or removal of guano should have some effect on populations of aquatic organism in the Edwards Aquifer. The guano in the waters of Ezell's Cave probably did concentrate aquatic organisms in the area to a food source or possibly even increased the carrying capacity in this one small area. Terrestrial fauna probably suffered greatest from the removal

of the bat population. With less organic input, populations certainly declined. Guanophiles and organisms dependent on them must have been reduced and some possibly became absent in Ezell's Cave.

Order Rodentia

Family Cricetidae

Peromyscus pectoralis Osgood

Common name: White-ankled Mouse

Habitation: Trogloxene

Substrate: Terrestrial

Description: The mouse averages 187 mm in total length. The indistinctly bicolored tail averages 95 mm long and has a slight tuft. The species is brown dorsally and white ventrally. The mouse has white ankles and large ears (Davis, 1974).

Range: *Peromyscus pectoralis* is found on the Edwards Plateau and in west Texas (Davis, 1974). The species has been noted in caves in Burnet and Hays Counties of Texas (Reddell, 1967).

Distribution in cave: The species has been captured in Sections I, II, and III. The presense of mice was indicated throughout the study period.

Notes: Evidence of bait removal by mice was indicated by mouse scat, diggings, tracks, and gnawing on or near the baits. It was sometimes difficult to be positive if mice were responsible for bait removal. Appendix 9 lists sections where baits were removed. A "M" placed after the

number of baits removed indicates mice are suspect. Trapping efforts for *Peromyscus pectoralis* were halted when mice were found dead in the Sherman Live Traps. Despite checks every 24 hours, the mice appeared to die from exposure.

Family Sciuridae

Spermophilus variegatus (Erxleben)

Common name: Rock Squirrel

Habitation: Accidental

Substrate: Terrestrial

Description: The large squirrel averages 468 mm in length. The head and upper back are black and hindparts are brownish-gray. The hair on the tail is long and scraggly (Davis, 1974).

Range: The species is found on the Edwards Plateau and in west Texas (Davis, 1974).

Distribution in cave: One rock squirrel was seen in Section I during March, 1979. A skull was found near Station III-1.

Notes: *Spermophilus variegatus* is frequently observed on the surface property. The species is not noted from Ezell's Cave in past literature.

Order Carnivora

Family Mustelidae

Mephitis mephitis (Schreber)

Common name: Striped Skunk

Habitation: Accidental

Substrate: Terrestrial

Description: The striped skunk is a stout bodied animal with a total length of 680 mm. The body is solid black with two broad dorsolateral white stripes joining on the head. The legs are short and have long claws. Two large scent glands are located by the anus (Davis, 1974).

Range: *Mephitis mephitis* is found statewide in Texas (Davis, 1974).

Distribution in cave: One skull was found in Section I.

Note: The species is present on the surface property, but it is not numerous.

Family Procyonidae

Procyon lotor (Linnaeus)

Common name: Raccoon

Habitation: Accidental

Substrate: Terrestrial

Description: Raccoons have large, heavy bodies and weigh from 4 to 13 kg. Specimens average 880 mm in length. The facial pattern resembles a black mask outlined with white. The tail has alternating black and light rings. The body is a grizzled brown color. The legs are relatively long (Davis, 1974).

Range: *Procyon lotor* has statewide distribution. The species has been recorded from caves in Bell, Bexar, Blanco, Burnet, Comal, Edwards, Hays, Kendall, Kerr, Lampasas, Mason, Medina, San Saba, Sutton, Travis, Val Verde, and Williamson

Counties of Texas (Reddell, 1967).

Distribution in cave: Raccoon tracks were found in Section I during January, February, and March of 1979. A skull was also found in Section I.

Notes: Raccoons are frequent inhabitants of caves.

Several organisms not found in Ezell's Cave have been taken from the nearby U.S. Fish Hatchery Well (artesian well) on the Southwest Texas State University campus. Waters in the cave and well are derived from the San Marcos Pool of the Edwards Aquifer. Organisms collected from the artesian well probably will also be found in the cave waters with closer observation. Inappropriate collecting methods probably prevented capture of these, and other, organisms during this study.

Troglobitic fauna taken from the artesian well include an undescribed leech, an undescribed ostracod, *Lirceolus smithii* (isopod), *Stygobromus russelli* (amphipod), *Texiweckelia samacos* (amphipod), *Texiweckelia insolita* (amphipod), *Texiweckelia texensis* (amphipod), *Allotexiweckelia hirsuta* (amphipod), *Parabogidiella americana* (amphipod), *Parabogidiella* sp. (amphipod), *Artesia subterranea* (amphipod), and *Seborgia relicta* (amphipod). Other fauna found in the well waters include *Cypridopsis vidua obesa* (ostracod), *Hyalella azteca* (amphipod), several unidentified spiders, and *Chironomus* sp. (midge).

Chemical Data

The following paragraphs describe the results from the chemical analyses made on the water within the cave and the water from the artesian well on the campus at Southwest Texas State University (Appendix 4). Soils are discussed in the last two paragraphs.

The temperature of the water in Ezell's Cave varied from a low of 21°C to a high of 22°C with a yearly average of 21.4°C. Similiar data from the well indicated a range of 21.8°C to a high of 22.7°C with a yearly average of 22.2°C. These differences in temperature are insignificant.

The dissolved oxygen in Ezell's Cave ranged from 4.42 mg/l to 4.96 mg/l with an average of 4.70 mg/l. The available oxygen in the well was only slightly higher with a range of 4.60 mg/l to 5.84 mg/l. The well had an average of 5.43 mg/l during the study. The oxygen available for the aquatic life is neither limiting in time or quantity.

Phenolphthalein alkalinity was consistantly zero throughout the study in both the well and cave. In the cave methyl orange alkalinity ranged from 236 mg $CaCO_3$/l to 257 mg $CaCO_3$/l with a yearly average of 249 mg $CaCO_3$/l. The well ranged from 222 mg $CaCO_3$/l to 256 mg $CaCO_3$/l with a yearly average of 240 mg $CaCO_3$/l. These differences in alkalinity are not significant, and they are consistent with water generally available in this area of Texas.

The pH increased in both the well and cave from a low of 6.9 in July of 1978, to 7.4 in July of 1979. If this rise in pH over the course of this study is not within the possibility of experimental error then the slow rise in pH could be important in future studies.

With a slowly increasing pH one would expect a similar decrease in free carbon dioxide. Free carbon dioxide in the well and cave decreased in a similiar manner from a high of 52 mg CO_2/l in July of 1978 to a low of 19 mg CO_2/l in July of 1979.

Because Ezell's Cave lies under an area of San Marcos replete with septic systems, the possibility of surface contamination from overlying sewage systems was examined by making three different kinds of nitrogen analyses. Nitrates varied from a low of 2.5 mg NO_3-N/l to a high of 4.4 mg NO3-N/l with an average of 3.36 mg NO_3-N/l in the cave. The natural unpolluted waters of the world average 0.3 mg NO_3-N/l. This would indicate some surface leakage is occurring since the nitrate content from the well averaged only 1.88 mg NO_3-N/l. This slight elevation in nitrate nitrogen is not considered especially significant, and it is still considerably below the recommended level of 45.0 mg NO_3-N/l for human consumption. Nitrite nitrogen in the cave averaged .024 mg NO_2-N/l and .022 mg NO_2-N/l in the well. Very minute quantities of nitrite nitrogen are found in unpolluted waters, and the quantities in the cave and well indicated some bacterial denitrification. Organic

nitrogen, as measured by the Kjeldahl method, averaged 0.013 mg N/l in the cave and 0.168 mg N/l in the well. These quantities are well below the acceptable standards of 1 mg N/l for unpolluted waters.

Phosphorous was measured as total phosphorous and as ortho phosphorous. The amounts found in the cave and well were the same in each analysis, and the variation in these parameters showed a gradual increase from 10 mg P/l beginning in July of 1978 to 50 mg P/l in January of 1979. The concentrations returned to lo mg P/l by the end of the study. These concentrations are characteristic when compared to the rainfall pattern. The study began with the water level in the cave decreasing. The water level rose with the late fall rains. An influx of surface water enhanced the phosphorous content and the biological activity of the cave. Phosphorous is generally considered a basic nutrient. With the water level becoming stable in the later part of the study the phosphorous level returned to normal levels.

The Sulfate analysis showed no significant changes throughout the study. The cave averaged 31.4 mg/l and the well averaged 25.6 mg/l. Neither of these quantities are significant levels.

The chloride content of the cave and well water were almost constant with a variation of less than 2 mg/l with the rains in January of 1979. At that time the variation

was roughly 6 mg/l between the two. This amount may be attributed to surface runoff and is low.

The metals magnesium and iron remained relatively consistent throughout the study with magnesium averaging 16.2 mg/l and iron averaging .016 mg/l. The concentration of magnesium is similar to the concentrations of magnesium commonly found in subsurface waters of this area. The iron content was slightly high in relation to surface waters but was considered to be of no major importance. Calcium averaged 109 mg/l in the cave and 89 mg/l in the well. This would lead one to believe that the cave water was "harder" than the water from the well. Frequently throughout this study "cave ice" was found floating on the surface of the water. Evaporation of the very still water within the cave produced minute crystals of calcium carbonate on the water's surface. For cave ice to form at least the surface layer of water must be super saturated. In any case, these levels of calcium indicated moderately hard water and were not in themselves important.

The chlorinated hydrocarbons and pesticides were not detected. If present they are below 0.02 and 0.05 parts per billion respectively.

From the analyses there was no indication of a decrease in water quality in the aquatic environment of Ezell's Cave. Based on water analysis, the water in Ezell's Cave is probably from the same pool as that of the well on the campus at Southwest Texas State University.

Organic matter in the soil of Ezell's Cave was found to be highest at the entrance and first chamber (Appendix 5). Cave cricket guano and leaf litter are abundant in these areas. The organic matter ranged from 5.49 to 6.55 percent in soils of Stations I-1, I-2, and I-4. The organic content was only 2.89 percent at Station I-3 because of thin, rocky soils. Organic matter in Section II was 3.31 percent at Station II-1, 4.88 percent at Station II-2, and 6.62 percent at Stations II-3 and II-4. Concentrations were higher at the last two stations, perhaps because they were positioned directly under areas where large numbers of cave crickets congregate on the ceiling during winter months. The percent organic matter declined sharply in Section III and ranged from 1.56 to 1.85 percent. Little organic matter entered from outside the cave into Section III or deeper in the cave. Organic matter at Station IV-1 and IV-2 were 1.42 and 1.35 percent respectively. The percentage increased at Station IV-3 and IV-4 to 2.43 and 3.38 percent, respectively. The increase resulted from soils sifting through the breakdown from Section I. Soils of Sections V and VI were not analysed because of high waters at the end of the study.

The pH of soils in Section I was 7.7 at Station I-1, 7.83 at Station I-2, 7.75 at Station I-3, and 7.5 at Station I-4 (Appendix 6). The pH of Stations II-1 through III-4 was 7.5, 7.85, 8.0, and 8.0 respectively. The pH of the soils in Section IV was 8.1 at Station IV-1, 8.15 at

Station IV-2, 7.94 at Station IV-3, and 7.6 at Station IV-4. The pH of soils at Stations IV-3 and IV-4 was similar to those in Section I. The soils were slightly more alkaline than the waters of Ezell's Cave.

Physical Data

The water level in Ezell's Cave fluctuated with rainfall during the study period (Figure 5). The water level slowly receded 25 cm from January to July, 1978. Rainfall was widespread during this period. The level rose 13 cm following 8.5 cm of rain within two days during early August. The water level fell off 11 cm until 9.7 cm of heavy rain fell during a three day period in September. The water level rose 28 cm immediately and slowly receded 18 cm by late October. Over 11.9 cm of rain fell on November 6, and the cave water level correspondingly rose 24 cm. Rain fell on 17 days in January, 1979. The water level rose over the measure stick and continued to rise through March. Small rains scattered over a month appeared not to affect the water level of Ezell's Cave to any extent. Heavy rains of 8 cm or more during a short period of time increased the height of the water level abruptly. The water was usually turbid and contained epigean organisms following these abrupt heavy rains.

The temperature and relative humidity fluctuated near the entrance and stabilized toward the rear of the cave (Appendix 6). The temperatures in Section I varied from

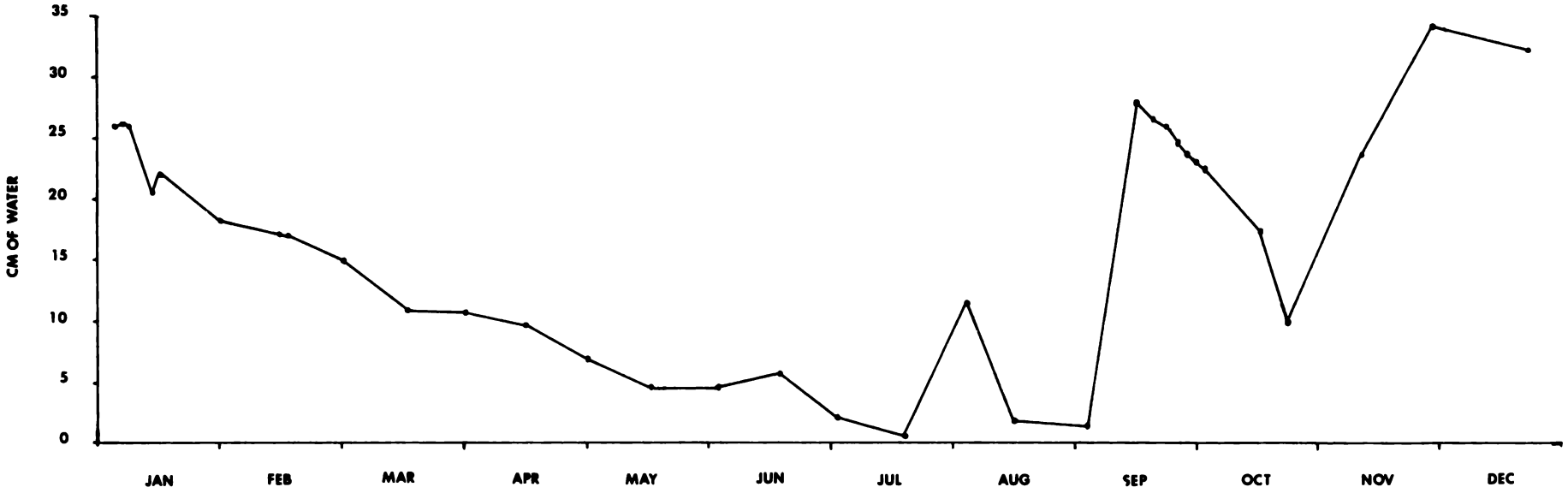

Figure 5. Fluctuations in cave water level of Ezell's Cave

3.3 to 32.2°C and averaged 20°C. The relative humidity ranged from 34 to 98 percent in Section I and averaged 70.9 percent. In Section II temperatures ranged from 12.2 to 24.9°C and averaged 19.0°C. The relative humidity varied from 85 to 96 percent and averaged 86.6 percent in Section II. The temperatures in Section III ranged from a low of 16.6°C to a high of 23.8°C and averaged 22.3°C. The relative humidity fluctuated between 86 and 95 percent in Section III. The relative humidity in Sections III, IV, V, and VI averaged 90.9 percent. The temperatures in Section IV varied from 21.6 to 23.3°C and averaged 21.9°C. In Section IV relative humidity ranged from 86 to 95 percent. The temperatures in Section V and VI averaged 23.1°C. The relative humidity in Sections V and VI is high and ranges from 88 to 93 and 90 to 94 percent respectively.

SUMMARY

A total of 39 species were recorded from Ezell's Cave in previous literature. An additional 59 species including 1 turbellarian, 4 gastropods, 1 oligochaete, 6 crustaceans, 4 diplopods, 1 chilopod, 10 arachnids, 23 insects, 1 osteichthys, 3 amphibians, 1 reptile, and 4 mammals were noted from January, 1978 to March, 1979.

The 98 organisms reported from Ezell's Cave were composed of 34 accidentals, 25 trogloxenes, 22 troglophiles, 16 troglobites, and 1 orach of unknown status.

Species numbers were greatest in Sections I and II with 46 and 47 different species noted during the 15 month study Respectively. Most entrance species were accidentals or trogloxenes. Species richness declined with increased distance from the entrance to a low of 14 species in Section VI. Troglophiles and troglobites predominated in the rear areas of the cave. Twelve species were recorded at Station IV-Aq-1 and 6 each at Station IV-Aq-1 accounted for the increased number of species taken there as opposed to the other two aquatic stations. Large numbers of epigean organisms occurred in the cave waters following heavy rains.

The number of species in the cave did not vary greatly from month to month. Numbers appeared slightly greater during fall months.

No clear bait preference was shown. Thirty-four to 40 species were attracted to each bait type. Certain species showed definite bait preference while most did not. Many species showed no attraction to bait while others appeared to be feeding on smaller organisms attracted to the baits.

Analysis of waters from Ezell's Cave and the artesian well on the Southwest Texas State University campus showed little significant difference with respect to temperature, dissolved oxygen, phenolphthalein and methyl alkalinity, pH, nitrate nitrogen, nitrite nitrogen, Kjeldahl nitrogen, phosphorous, sulfate, chloride, and magnesium-iron-calcium metals. No pesticides or chlorinated hydrocarbons were noted. Organisms found in the well will probably be found in Ezell's Cave during future studies.

Organic matter in the soil was found to be high in the entrance and first chamber. Cave cricket guano, leaves, and other organic matter from the surface contribute to the organic input of these two areas. The organic content was low in the crawlway between the first chamber and the first "lake room" and in the north end of the first "lake room." Percent of organic soil has evidently sifted through the breakdown from the first chamber. The pH of the soils was slightly alkaline.

Light rains dispersed over the month had little effect on the water level in Ezell's Cave. Heavy rains brought the water level up abruptly. The cave water level fell slowly

from January to July, 1978. The water level rose in response to heavy rains in September and continued to rise until the study terminated in March, 1979.

Temperature and relative humidity fluctuated greatly near the entrance and stabilized toward the rear of the cave.

This study has expanded the known ranges of several species. Further research on this and other caves will give a better understanding of cave organisms.

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APPENDICES

Appendix 1. Plants recorded on the surface preserve around Ezell's Cave during 1977

Amaryllidaceae	
Zephyranthes brazosensis	-Brazos Rainlily
Anacardiaceae	
Rhus aromatica	-Fragrant Sumac
Phus toxicodendron	-Poison Oak
Asclepiadaceae	
Cynanchum barbigerum	-Bearded Swallowwart
Matelea reticulata	-Milkvine
Berberidaceae	
Berberis trifoliolata	-Agarito
Bromeliaceae	
Tillandsia recurvata	-Small Ballmoss
Tillandsia usneoides	-Spanishmoss
Cactaceae	
Opuntia lindheimeria	-Texas Prickleypear
Campanulaceae	
Triodanis biflora	-Small Venuslookingglass
Triodanis coloradoensis	-Colorado Venuslookingglass
Triodanis leptocarpa	-Slimpod Venuslookingglass
Commelinaceae	
Commelina communis	-Common Dayflower
Commelinantia anomala	-False Dayflower
Tradescantia gigantia	-Giant Spiderwart
Tradescantia occidentalis	-Prairie Spiderwart
Compositae	
Cirsium texanum	-Thistle
Engelmannia pinnatifida	-Engelmann Daisy
Evax multicaulis	-Manystem Evax
Gaillardia pulchella	-Rosering Gaillardia
Helianthus annuus	-Common Sunflower
Hymenopappus scabiosaeus	-Flattop Whoollywhite
Crassulaceae	
Sedum nuttallianum	-Yellow Stonecrop
Curciferae	
Draba platycarpa	-Broadpod Draba
Lepidium densiflorum	-Prairie Pepperweed
Strepthanthus platycarpus	-Broadpod Twistflower
Ebenaceae	
Diospyros texana	-Texas Persimmon
Euphorbiaceae	
Acalypha glandulosa	-Copperleaf
Acalypha monostachya	-Copperleaf
Bernardia myricaefolia	-Brush Myrtlecroton
Croton lindheimerianus	-Croton
Croton monanthogynus	-One-seed Croton

Appendix 1. Continued

Fagaceae	
Quercus virginiana	-Live Oak
Geraniaceae	
Geranium carolinanum	-Carolina Geranium
Gramineae	
Aristida purpurea	-Threeawn
Bromus unioloides	-Rescuegrass
Cenchrus incertus	-Coast Sandbur
Cynodon dactylon	-Bermudagrass
Hordeum pussillum	-Barley
Limnodea arkansana	-Ozarkgrass
Melica nitens	-Threeflower Melic
Sorghum halepense	-Johnsongrass
Stipa leucotricha	-Texas Wintergrass
Hydrophyllaceae	
Hemophila phacelioides	-Hemophila
Phacelia congesta	-Phacelia
Labiateae	
Lamium amplexicaule	-Henbit Deadnettle
Prunella vulgaris	-Common Selfheal
Leguminosea	
Acacia angustissima	-Fern Acacia
Eysenhardtia texana	-Texas Kidneywood
Lupinus subcarnosus	-Texas Bluebonnet
Medicago hispida	-Burclover
Melilotus indicus	-Annual Yellow Sweetclover
Parkinsonia aculeata	-Retama
Sophora affinis	-Texas Sophora
Cicia Leavenworthii	-Leavenworth Vetch
Liliaceae	
Allium canadense	-Onion
Smilax bona-nox	-Saw Greenbriar
Yucca arkansana	-Arkansas Yucca
Loranthaceae	
Phoradendron serotinum	-Christmas Mistletoe
Malavaceae	
Wissadula holosericea	-Wissadula
Meliaceae	
Melia azedarach	-Chinaberry
Menispermaceae	
Cocculus carolinus	-Carolina Snailseed
Moraceae	
Morus microphylla	-Texas Mulberry
Oleaceae	
Forestiera pubescens	-Forestiera
Ligustrum ovata	-Ligustrum
Menodora heterophyla	-Low Menodora
Onagraceae	
Oenothera speciosa	-Evening Primrose
Oenothera triloba	-Stemless Evening Primrose
Gaura parviflora	-Gaura

Appendix 1. Continued

Oxalidaceae	
Oxalis dillenii	-Wood Sorrel
Papaveraceae	
Argemone albiflora	-White Pricklepoppy
Pinaceae	
Juniperus ashei	-Ashe Juniper
Plantaginaceae	
Plantago rhodosperma	-Redseed Plantain
Ranunculaceae	
Anemone heterophylla	-Anemone
Clematis drummondii	-Texas Virgins Bower
Delphinium virescens	-Larkspur
Rhamnaceae	
Columbrina texensis	-Texas Colubrina
Condalia spathulata	-Knifeleaf Condalia
Posaceae	
Prunus persica	-Peach
Rubus trivialis	-Dewberry
Rubiaceae	
Galium virgatum	-Southwest Bedstraw
Galium aparine	-Catchweed Bedstraw
Rutaceae	
Ptelea trifoliata	-Hoptree
Sapindaceae	
Ungnadia speciosa	-Mexican Buckeye
Solanaceae	
Nicotiana longiflora	-Longflower Tobacco
Solanum triquetrum	-Texas Nightshade
Ulmaceae	
Celtis lavaegata	-Hackberry
Umbelliferae	
Chaerophyllum tainturieri	-Hairyfruit Chervil
Torilis japonica	-Torilis
Urticaceae	
Parietaria pennsylvanica	-Pennsylvania Pellitory
Verbenaceae	
Lantana camara	-Lantana
Phyla incisa	-Sawtooth Frogfruit
Verbena canescens	-Verbena
Verbena bipinnatifida	-Verbena
Verbena halei	-Slender Verbena
Vitaceae	
Parthenocissus heptaphylla	-Sevenleaf Creeper
Vitis mustangensis	-Mustang Grape

Appendix 2. Vertebrate fauna observed on the surface preserve near Ezell's Cave from January, 1978 to March, 1979

Amphibians and Reptiles	
Syrrhophus marnocki	-Cliff Frog
Bufo valliceps	-Gulf Coast Toad
Anolis carolinensis	-Green Anole
Sceloporus olivaceus	-Texas Spiny Lizard
Urosaurus ornatus	-Tree Lizard
Eumeces tetragrammus brevilineatus	-Short-lined Skink
Scincella lateralis	-Ground Skink
Gerrhonotus liocephalus infernalis	-Texas Alligator Lizard
Opheodrys aestivus	-Rough Green Snake
Tantilla gracilis	-Flat-headed Snake
Micrurus fulvius tenere	-Texas Coral Snake
Crotalus atrox	-Western Diamondback Rattlesnake

Birds	
Cathartes aura	-Turkey Vulture
Ictinia mississippiensis	-Mississippi Kite
Falco sparverius	-Sparrow Hawk
Colinus virginianus	-Bobwhite
Bubulcus ibis	-Cattle Egret
Ardea herodias	-Great Blue Heron
Butorides virescens	-Green Heron
Zenaidura macroura	-Mourning Dove
Scardafella inca	-Inca Dove
Coccyzus americanus	-Yellow-billed Cuckoo
Geococcyx californianus	-Roadrunner
Caprimulgus vociferus	-Whip-poor-will
Chordeiles minor	-Common Nighthawk
Chaetura pelagica	-Chimney Swift
Archilochus colubris	-Ruby-throated Hummingbird
Archilochus alexandri	-Black-chinned Hummingbird
Colaptes auratus	-Yellow-shafted Flicker
Muscivora forfic	-Scissor-tailed Flycatcher
Progne subis	-Purple Martin
Cyanocitta cristata	-Blue Jay
Parus bicolor	-Tufted Titmouse
Thryomanes bewickii	-Bewick's Wren
Mimus polyglottos	-Mockingbird
Turdus migratorius	-Robin
Regulus calendula	-Ruby-crowned Kinglet

Appendix 2 Continued

Sturnus vulgaris	-Starling
Vireo griseus	-White-eyed Vireo
Vermivora ruficapilla	-Nashville Warbler
Wilsonia pusilla	-Wilson's Warbler
Cassidix mexicanus	-Boat-tailed Grackle
Molothrus ater	-Brown-headed Cowbird
Icterus galbula	-Baltimore Oriole
Piranga rubra	-Summer Tanager
Richmondena cardinalis	-Cardinal
Passerina ciris	-Painted Bunting
Carpodacus mexicanus	-House Finch
Pipila erythrophthalmus	-Rufous-sided Towhee
Spizella pusilla	-Field Sparrow

Mammals

Didelphis virginiana	-Oppossum
Order Chiroptera	-Bat
Dasypus novemcinctus	-Nine-banded Armadillo
Sylvilagus floridanus	-Eastern Cottontail
Peromyscus pectoralis	-White-ankled Mouse
Sciurus niger	-Fox Squirrel
Spermophilus variegatus	-Rock Squirrel
Procyon lotor	-Raccoon
Odocoileus virginianus	-White-tailed Deer

Appendix 3. Climatic data taken bimonthly for the San Marcos area from January, 1978 to March, 1979 (R = average rainfall during the two prior weeks, B = barometric pressure and TA = average temperature, on the day of check, MI = minimum temperature, and MX = temperature on the day of check.

Date	R	B	TA	MI	MX
J-78	----	29.31	16.1	6.6	24.4
	1.06	29.44	7.2	-4.4	9.9
F-78	1.37	29.56	3.8	2.7	6.1
	4.74	29.41	7.7	2.7	10.5
M-78	.86	29.16	16.1	7.7	12.7
	2.03	29.72	12.2	6.1	24.9
A-78	.58	29.55	17.7	8.8	23.3
	2.89	29.37	19.4	6.6	23.3
M-78	.15	29.00	24.9	19.4	25.5
	3.86	28.97	28.3	16.1	33.8
J-78	5.30	29.40	29.4	22.2	33.3
	7.87	29.30	24.9	21.6	32.7
J-78	.00	29.27	31.6	24.4	38.8
	.33	29.23	30.5	21.6	36.1
A-78	8.48	29.32	31.1	23.8	35.5
	1.04	29.35	28.8	23.3	33.3
S-78	12.80	29.23	28.3	23.3	33.8
	.58	29.36	28.8	19.9	34.9
0-78	.17	29.57	17.2	4.4	23.3
	.66	29.32	24.4	14.9	31.1
N-78	13.00	29.48	20.5	13.8	23.3
	.81	29.34	19.9	8.3	31.1
D-78	8.94	29.14	10.5	1.6	22.2
	.86	29.49	9.4	3.8	24.9
J-79	5.35	29.91	-1.1	9.9	2.2
	10.10	29.54	11.1	4.9	7.7
F-79	2.13	29.40	5.5	2.7	7.2
	4.74	29.62	2.2	.5	26.1
M-79	3.32	29.12	17.2	4.4	23.8
	.99	29.63	11.1	9.9	21.1

Appendix 4. Physical and chemical parameters of waters in Ezell's Cave and the Artesian Well on the Southwest Texas State University Campus.

Date	Jul. 6, 1978		Oct. 21, 1978		Jan. 12, 1979		May 5, 1979		Jul. 4, 1979	
Parameter	Cave	Well	Cave	Well	Cave	Well	Cave	Well	Cave	Well
Temperature (°C)	21.7	21.8	21.6	21.8	21.0	22.3	21.0	22.6	22.0	22.7
Dissolved oxygen (mg DO/l)	4.79	5.19	4.96	5.73	4.51	4.60	4.42	5.75	4.86	5.84
Alkalinity (mg $CaCO_3$/l										
Phenolphthalein	0	0	0	0	0	0	0	0	0	0
Methyl orange	257	256	250	248	236	222	252	232	250	242
Hydrogen ion activity (pH)	6.9	6.9	6.9	6.8	7.0	7.0	7.0	7.0	7.4	7.4
Free carbon dioxide (mg C02/l)	52	52	52	65	42	40	46	42	19	19
Nitrogen										
Nitrate (mg NO_3-N/l)	3.0	1.8	2.5	2.0	3.8	1.9	4.4	1.8	3.1	1.9
Nitrite (mg NO_2-N/l)	0.02	0.02	0.02	0.02	0.04	0.03	0.02	0.02	0.02	0.02
Kjeldahl (mg NH_3-N/l)	0.2	0.1	0.10	0.11	0.14	0.12	0	0.21	0.22	0.30
Phosphorous (ug P/l)										
Ortho	10	10	40	30	50	50	30	10	10	10
Total	10	10	40	30	50	50	30	10	10	10
Sulfate (mg SO_4/l)	32	25	30	25	35	26	28	25	32	27
Chloride (mg Cl/l)	7.3	6.0	8.0	6.2	18.5	12.2	5.7	4.4	5.5	4.2
Metals										
Ca (mg Ca/l) dissolved	100	99	105	90	110	83	100	80	100	91
total	101	99	110	90	115	83	115	82	105	91
Mg (mg Mg/l) dissolved	15	15	15	15	17	19	14	16	18	16
total	15	15	15	15	18	19	18	16	18	16
Fe (mg Fe/l) dissolved	0.01	0.02	0.20	0.30	0.20	0.40	0.00	0.20	0.00	0.00
total	0.01	0.02	0.20	0.30	0.20	0.40	0.00	0.20	0.10	0.30
Chlorinated Hydrocarbons (ppb)										
(None detected)	<0.02		<0.02		<0.02				<0.02	
Pesticides (ppb)										
(None detected)							<0.05			

Appendix 5. Physical data of stations in Ezell's Cave (DE = distance from entrance in meters, H = heigth of chamber, W = width of chamber, Lg = length of chamber, FA = floor angle, L = light present (+) or absent (-), SpH = soil pH, SOM = percent organic matter of soil.

Station	DE	H	W	Lg	FA	L	SpH	SOM
I-1	2.13	1.01	1.01	2.80	10	+	7.70	5.49
I-2	2.13	3.65	1.82	2.80	15	+	7.83	6.55
I-3	2.13	1.70	2.28	2.80	7	+	7.75	2.89
I-4	3.96	.76	3.55	4.57	10	+	7.50	5.53
II-1	17.67	3.95	3.04	15.24	0	+	7.45	3.31
II-2	14.93	3.95	3.10	15.24	25	+	7.80	4.88
II-3	16.45	3.95	3.10	15.24	0	+	7.70	6.62
II-4	19.81	3.95	3.10	15.23	0	+	7.52	6.62
III-1	24.38	.58	1.16	2.74	45	-	7.50	1.63
III-2	26.82	.96	.96	3.65	35	-	7.85	1.85
III-3	29.87	.68	1.82	3.52	20	-	8.00	1.56
III-4	31.69	1.21	1.26	3.52	30	-	8.00	1.70
IV-1	38.70	1.37	1.82	30.48	5	-	8.10	1.42
IV-2	35.35	2.63	6.00	30.48	5	-	8.15	1.35
IV-3	44.50	1.00	2.00	5.00	25	-	7.94	2.43
IV-4	57.60	2.00	2.00	3.00	30	-	7.60	3.38
V-1	53.03	1.50	1.51	40.00	5	-	----	----
V-2	65.22	1.00	3.24	5.88	0	-	----	----
V-3	80.46	2.00	1.00	10.29	5	-	----	----
V-4	85.90	1.00	1.00	3.00	0	-	----	----
VI-1	94.48	1.00	13.23	7.35	5	-	----	----
VI-2	99.36	1.00	13.23	7.35	0	-	----	----
VI-3	99.36	1.00	13.23	7.35	0	-	----	----
VI-4	103.02	.50	13.23	7.35	15	-	----	----

Appendix 6. Bimonthly readings of temperature and relative humidity in each section of Ezell's Cave from January, 1978 to March, 1979 (T = temperature in degrees centigrade, H = percent relative humidity)

Date	Surface T	Surface H	I T	I H	II T	II H	III T	III H	IV T	IV H	V T	V H	VI T	VI H
J-78	20.5	62	19.4	85	20.5	86	22.7	86	22.7	86	23.3	90	23.8	90
	8.8	75	12.7	82	16.6	89	22.2	91	21.1	90	22.7	92	23.3	92
F-78	5.5	93	13.3	91	16.6	90	22.2	91	21.1	90	22.2	93	23.3	93
	11.1	70	13.8	86	18.3	85	21.6	90	21.1	90	22.7	88	23.3	90
M-78	19.4	76	18.8	87	19.9	90	21.6	95	22.2	86	22.7	90	23.3	90
	19.4	55	18.3	75	19.9	89	21.6	90	21.1	90	23.3	90	23.3	90
A-78	28.3	50	19.4	90	20.5	90	22.7	90	22.7	89	22.7	93	23.3	90
	23.3	64	20.5	85	20.5	90	22.7	89	21.1	90	23.3	90	22.7	93
M-78	26.1	72	21.6	86	21.6	90	22.7	90	22.7	90	23.3	90	23.8	93
	27.7	75	21.6	90	21.6	93	22.2	93	22.7	91	23.3	90	23.3	93
J-78	25.5	77	22.7	90	22.2	94	22.7	93	23.3	90	23.3	90	23.3	94
	26.1	83	22.7	89	22.2	90	22.7	90	22.7	90	23.3	93	23.3	90
J-78	26.1	87	24.9	88	23.3	99	23.8	89	23.3	90	23.8	90	23.3	90
	32.2	59	22.7	90	25.5	90	22.7	93	22.7	93	23.3	90	23.3	90
A-78	30.5	82	24.9	90	25.5	93	23.3	93	23.3	90	23.3	90	23.3	90
	32.2	59	24.4	90	23.3	90	23.3	90	22.7	93	-	-	-	-
S-78	31.1	64	-	-	25.5	93	22.7	93	22.7	93	23.3	90	23.3	90
	29.4	71	23.3	90	25.5	90	23.3	90	22.7	93	23.8	90	23.3	93
O-78	29.4	80	21.1	77	21.6	90	22.2	90	22.7	90	23.3	90	22.7	93
	24.9	32	22.7	90	25.5	93	23.3	90	22.7	90	23.3	90	23.3	90
N-78	22.2	48	20.5	81	21.1	90	22.7	92	22.2	93	23.3	90	23.3	90
	20.5	81	20.5	80	21.6	86	21.6	90	22.7	90	23.8	88	23.3	90
D-78	11.6	90	14.9	93	18.8	91	22.2	93	21.6	90	22.7	90	23.3	90
	11.1	54	17.2	82	18.3	90	22.2	93	21.6	90	22.7	90	22.7	93
J-79	4.9	53	12.7	95	15.5	93	21.6	93	20.5	90	-	-	-	-
	15.5	73	15.5	93	17.2	96	21.6	90	19.0	93	-	-	-	-
F-79	8.8	98	13.8	57	16.6	95	21.6	91	19.9	95	-	-	-	-
	3.3	60	12.2	92	16.6	90	21.6	94	20.5	90	-	-	-	-
M-79	18.3	95	18.3	95	19.4	95	21.6	95	20.5	92	-	-	-	-
	11.6	88	16.1	95	18.3	90	21.5	90	20.5	95	-	-	-	-

Appendix 7. Numbers of each species found at various baits from January, 1978 to March, 1979.

Species	Not by Baits	Peanut Butter	Liver	Cheese	Banana
Bipalium sp.	2			3	1
Helicina orbiculata	7		1	2	1
Rumina decollata	1				
Rabdotus sp.	1				
Helicodiscus eigenmanni	5	49	15	19	9
Deroceras laeve	1	1		1	1
Gastrocopta contracta	Not found during this study				
Euglandina singleyana	1				1
Paravitrea petrophila					2
Class Oligochaeta	1	2	3	1	1
Armadillidium vulgare	310	185	216	178	224
Metoponorthus pruinosus	Not found during this study				
Porcellio laevis	5	5	9	9	1
Brackenridgia cavernarum		348	280	341	341
Abcion sp.		4	5	4	7
Eurymerodesmus sp.		1			
Speodesmus echinourus	43	35	13	16	10
Oxidus gracilis	18	7	2	1	9
Family Atopetholidae		1			2
Cambala speobia	45	35	73	38	71
Class Chilopoda	2				
Scolopendra viridis	Not verified during this study				

Appendix 7. Continued

Species	Not by Baits	Peanut Butter	Liver	Cheese	Banana
Vaejovis reddelli	30	4	7	2	12
Hesperochernes unicolor					2
Tyrannochthonius sp.				1	
Cicurina sp.	6	7	2	7	6
Cicurina varians	2	4	2	5	5
Tegenaria pagana	587	1	1	2	1
Argiope aurantia	1				
Gnaphosa fontinalis		1		2	
Eperigone maculata	1				2
Meioneta sp.	2		1		
Eidmannella sp.					1
Gaucelmus augustinius	838		2		
Achaearanea porteri	1				
Achaearanea tepidatiorum	1				
Leiobunum townsendi	7401				
Texella mulaiki	1	1	1	4	
Texella sp.				1	
Texoreddellia texensis	39	64	61	54	88
Pseudosinella violenta	435	2233	2568	2297	2797
Tomoceras flavescens	1	31	25	21	24
Arrhopalites sp.	18				
Dicyrtoma marmorata			2	3	1
Leptoglossus clypealis	2				

Appendix 7. Continued

Species	Not by Baits	Peanut Butter	Liver	Cheese	Banana
Triatoma gerstaeckeri	23		2		
Arenivaga tonkawa	2	1			1
Family Blattellidae	1	2	1		
Parcoblatta fulvescens		3		3	3
Ceuthophilus cunicularis	206	48	50	31	57
Ceuthophilus secretus	16,910	19	22	8	24
Gryllus assimilis		1			
Pediodectes stevensonii	1				
Pseudoseopsis hellmani	Not found during this study				
Psyllipsocus ramburri	6	17	21	27	15
Order Lepidoptera	2				
Family Labiduridae	8	4	2	2	3
Camponotus sansabeanus		1			
Labidus coecus	424	80	23	215	68
Hypoponera opacior	22	82	2	52	8
Ctenocephalides felis	1				
Culex pipens	86				
Megaselia sp.	11	15	245	53	16
Elfia sp.	1				
Ptomaphagus cavernicola			2		1
Hypera postica				1	
Batrisodes schneiderensis	1	2			4
Belonuches sp.	2	5	13	13	4

Appendix 7. Continued

Species	Not by Baits	Peanut Butter	Liver	Cheese	Banana
Orus rubens		2	1	1	2
Plethodon glutinosus	13		1		1
Bufo valliceps	35				
Hylactophryne augusti	Not found during this study				
Syrrhophus marnocki	25				
Rana catesbeiana	2				
Rana pipiens	22				
Gastrophryne olivacea	2				
Tantilla gracilis	1				
Order Chiroptera	Not found during this study				
Peromyscus pectoralis	Difficult to distinguish				
Spermophilus variegatus	2				
Mephitis mephitis	1				
Procyon lotor	3				

Appendix 8. Number of organisms found at each terrestrial section and aquatic station in Exell's Cave from January, 1978 to March, 1979 (NC = station not checked).

Section I

Species	Month (1978 - 1979)														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Helicina orbiculata	1		1			1		4	1	1					
Rumina decollata												1			
Helicodiscus eigenmanni				3	1	3		5	1		1	3			1
Deroceras laeve						1							1		
Class Oligochaeta													2		
Armadillidium vulgare				1	22	170	395	85	87	78	107	15		11	57
Porcellio laevis											1				1
Abacion sp.			1					6	1	3	3	1			
Speodesmus sp.								1							
Oxidus gracilis				2				2			1			1	
Family Atopetholidae												1			
Class Chilopoda				3	3	2			1		3				
Vaejovis reddelli	1	1	1		1	4			2	1	1	1		3	2
Hesperochernes unicolor				1											
Cicurina varians		1				1		1	2		1		1		
Tegenaria pagana		3	4	2	14	12	1	10	27	32	99	61	34	31	29
Argiope aurantia								1							
Gnaphosa fontinalis										1					
Eperigone maculata						2						2			
Meioneta sp.	2														1
Gaucelmus augustinus				2	3	2	1	9	6	6	8	1	1	2	4
Achaearanea porteri								1							
Achaearanea tepidariorum													1		
Leiobunum townsendi	3				118	240	1530	3975	1487	30	12	1	2		1
Pseudosinella violenta	1	2		17	17	107	21	50	45	58	21	23		9	
Tomoceras flavescens				27	21	8		1	5	2	4	2		4	27
Dicyrtoma marmorata												4			
Leptoglossus Clypealis						1									
Triatoma gerstaeckeri						6	12	4		1					

Appendix 8. Continued

Section I

Species	Month (1978 - 1979)														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Parcoblatta fulvescens										1					
Arenivaga tonkawa		1					2			1		1			
Ceuthophilus cunicularis	6	4	2	13	1			1			2	4	3		5
Ceuthophilus secretus		2	1	13	47	612	1682	4035	792	64					
Gryllus assimilis									1						
Pediodectes stevensonii												1			
Psyllipsocus ramburi				22	24	5		6	1		8		1	1	
Family Labiduridae						1	1	3	3	1					
Camponotus sansabeanus										1					
Labidus coecus						1	276	106	13	30		2			3
Hypoponera opacior									35	65					
Culex pipiens						11		1	20	33	4				
Megaselia sp.	1		16	1	13	2		4	2	14		1			14
Elfia sp.					1										
Hypera postica				1											
Belonuchus sp.	1		1		1		1	1		2	1				
Bufo valliceps						3	1	3	1						
Syrrhophus marnocki			1			1									1
Spermophilus variegatus															1
Procyon lotor												1	1		1

Appendix 8. Continued

Section II

Species	Month (1978 - 1979)														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Bipalium kewense									1	2	1	2			
Helicina orbiculata		1												1	
Helicodiscus eigenmanni			5	4	2	5	1	2	2	6	3	8	11	8	16
Deroceras laeve														1	
Euglandina singleyana			1					1							
Class Oligochaeta												2	2	2	
Armadillidium vulgare		4	2	12	3	5	3	10	1	3	23	11	1		4
Porcellio laevis	1		1	7			3			1	5	1	3	1	1
Brackenridgia cavernarum					2	3	9	6	9	2	8	5	1	1	1
Abacion sp.				1					1					1	
Speodesmus sp.				1	1			2	1		5	2	1	3	3
Oxidus gracilis	2	1			3			6	1		1	2	2	5	4
Cambala sp.		1													
Class Chilopoda														1	
Vaejovis reddelli	2	3	2	1	2	1		1	4	3	1		1	2	4
Hesperochernes unicolor						1									
Tyrannochthonius sp.													1		
Circurina varians						1	2	2	1		1		2	1	1
Tegenaria pagana			4	4	5	4	1	1	5	21	26	34	43	33	34
Gnaphosa fontinalis															2
Gaucelmus augustinus	40	63	38	41	42	45	28	27	40	48	65	67	74	78	80
Leiobunum townsendi	1		1												
Texoreddellia texensis						1									
Pseudosinella violenta	171	34	37	82	75	40	62	347	675	230	122	66	60	57	18
Tomoceras flavescens				1											
Dicyrtoma marmorata														1	
Triatoma gerstaeckeri										1	1				
Family Blattellidae	1							2	1						

Appendix 8. Continued

Section II

Species	Month (1978 - 1979)														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Parcoblatta fulvescens	2	1	1	1						4	1				
Arenivaga tonkawa			1						1						
Ceuthophilus cunicularis	15	6		5	16	6	15	3	7	14	17	24	14	13	16
Ceuthophilus secretus		15	8	7	8	410	815	5501	1024	17	11		1	1	
Psyllipsocus ramburi				4	2	1	1		7					1	
Family Labiduridae	1								30						
Order Lepidoptera					1										
Labidus coecus	2	300	9	13	13	3	5	3	1			24	1		3
Hypoponera opacior									1	2	41	1		6	11
Culex pipiens										17					
Megaselia sp.	8	2		3	37	3	3		7	4	2	1			3
Belonuchus sp.		1	2	3	2		2		1	2	1				
Orus rubens														1	
Plethodon glutinosus	1	3	5	1	1							1	2		1
Bufo valliceps				2	1	5	4	7	5	1	1				1
Syrrhophus marnocki	1	1	5	2	1	1		1	1	3	1	1			3
Rana catesbeiana						1								1	
Rana pipens	1	1	1	1		1	1	1		1	1	1	1	1	1
Castrophryne olivacea		1											1		

Appendix 8. Continued

Section III

Species	Month (1978 - 1979														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Holicodiscus eigenmanni				1			2		1		1	1			
Armadillidium vulgare										1					
Brackenridgia cavernarum	1	8	12	10	8	14	23	21	17	17	18	31	32	25	11
Speodesmus sp.	8	14	4	8	2	2		2	1	1	3		3	2	2
Oxidus gracilis		1			1										
Family Atopetholidae											2				
Cambala sp.	8	19	4	14	16	17	23	24	21	15	17	10	11	32	14
Vaejovis reddelli	1									1		1		2	
Cicurina sp.							3	3			2	1	2	2	
Tegenaria pagana										1		2	3	3	3
Gaucelmus augustinus		1				3	1	1		4	2	5	2	2	3
Texella sp.								1							
Texella mulaiki				1											
Texoreddellia texensis	2	3	11	2	2	3	5	2		3	6	8	11	8	11
Pseudosinella violenta	170	130	91	106	85	153	92	185	292	217	187	175	283	172	282
Family Blattellidae								1							
Parcoblatta fulvescens		1			2										
Ceuthophilus cunicularis		5			1	5	3	5		3	10	11	19	19	20
Ceuthophilus secretus	8	7	8	2	1	23	149	348	88	13	9				
Psyllipsocus ramburi													2		
Labidus coecus	2														
Megaselia sp.	6	1		4	22	14	2	9	21	16	6	5	3		5
Ptomaphagus cavernicola		1													
Belonuchus sp.				1			1								
Orus rubens				1											
Syrrhophus marnocki														1	

Appendix 8. Continued

Section IV

Species	Month (1978 - 1979														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Brackenridgia cavernarum		8	14	15	16	7	8	26	35	35	28	13	24	19	20
Eurymerodesmus sp.												1			
Speodesmus sp.			2	3	1		3	1	1	1	3		1		
Cambala sp.				2				3	1	1		1			1
Vaejovis reddelli													1	1	2
Circurina sp.	1						1			2	1		4		2
Tegenaria pagana								1			1				
Eidmannella sp.										1					
Gaucelmus augustinus							1								1
Texoreddellia texensis	8	4	5	3	5	3	3	4	3	5	4	4	6	7	10
Pseudosinella violenta	5	40	64	153	167	78	45	286	153	121	141	134	149	124	94
Dicyrtoma marmorata													1		
Arenivaga fulvescens				1											
Ceuthophilus cunicularis	4	2		5	2	3			1	7	6	7	3	4	15
Ceuthophilus secretus		4	2	1		1	5	4		4					
Psyllipsocus ramburi				1											1
Order Lepidoptera	1														
Ctenocephalides felis		1													
Megaselia sp.		1		2	10	1		2	2	6	1				1
Ptomaphagus cavernicola			1												
Batrisodes schneiderensis													1		
Belonuchus sp.				1					1		1				
Orus rubens										1	1				1
Tantilla gracilis									1						
Megaselia sp.	1	5		2	4	2	4		3	1	1	1	NC	NC	NC
Batrisodes schneiderensis										1	1	1	NC	NC	NC
Belonuchus sp.	1			1		2							NC	NC	NC

Appendix 8. Continued

Section V

Species	Month (1978 - 1979)														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Brackenridgia cavernarum	1	10	20	27	3	30	33	30	32	36	55	38	NC	NC	NC
Speodesmus sp.				1			2		1	3			NC	NC	NC
Oxidus gracilis			1										NC	NC	NC
Cambala sp.										1			NC	NC	NC
Vaejovis reddelli												1	NC	NC	NC
Cicurina sp.				1						1			NC	NC	NC
Texella mulaiki						1							NC	NC	NC
Texoreddellia texensis	9	5	7	9	1	4	6	3	2	13	14	14	NC	NC	NC
Pseudosinella violenta	20	11	61	120	76	139	194	235	331	96	190	91	NC	NC	NC
Ceuthophilus cunicularis	2	1	3	2	2		1				1	5	NC	NC	NC
Ceuthophilus secretus			1	1									NC	NC	NC
Megaselia sp.		4		4	1	6	3		2	1	2	2	NC	NC	NC
Ptomaphagus cavernicola		1											NC	NC	NC
Batrisodes schneiderensis											2	1	NC	NC	NC
Belonuchus sp.				1	2	1		2					NC	NC	NC

Section VI

Rabdotus sp.					1										
Brackenridgia cavernarum	2	5	11	25	31	40	38	41	32	53	68	86	NC	NC	NC
Speodesmus sp.	1	1	1	2	4	1	1	3	5		2	1	NC	NC	NC
Oxidus gracilis										1			NC	NC	NC
Cambala sp.						1	2	2					NC	NC	NC
Cicurina sp.									2				NC	NC	NC
Texella mulaiki					2		1			2			NC	NC	NC
Texoreddellia texensis	7	9	7	9	6	5	6		4	3	6	4	NC	NC	NC
Pseudosinella violenta	19	14	45	124	167	329	202	154	274	261	175	183	NC	NC	NC
Leptoglossus clypealis												1	NC	NC	NC
Ceuthophilus cunicularis			1	1		2	2		2		5	1	NC	NC	NC
Ceuthophilus secretus		1											NC	NC	NC

Appendix 8. Continued

Species	Month (1978 - 1979														
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR
Station IV-Aq-1															
Sphalloplana mohri	3	4	3	3	2	5	2	1	2	2	2	4	8	5	6
Streptocephalus sp.											4				
Leptestheria compleximanus											2				
Metacyclops gracilis									3						
Tropocyclops prasinus									700						
Cirolanides texensis	7	k83	111	115	60	248	180	44	150	130	144	23	12	62	109
Monodella texana							1								
Stygobromus flagellatus			3	2	1										
Palaemonetes sp.	5	10	12	5	12	8	6	14	5	5	3	4		1	3
Arrhopalites sp.									9	7					
Lepomis gulosus												1			
Eurycea rathbuni	1				2	1				1					
Station IV-Aq-2															
Sphalloplana mohri		3		2	3	5	1	5	1	2	2	5	1		3
Cirolanides texensis	7	66	92	54	22	46	46	19	43	34	30	6	12	24	19
Stygobromus flagellatus		1	1	1			1				1	1	1		
Palaemonetes sp.	7	3	5	1		2	1	2		4	1	2	3		
Haidoporus texensis				1											
Eurycea rathbuni	2						1	3	2						
Station IV-Aq															
Sphalloplana mohri	3	7	10	8	6	8	11	1	6	9	5	5	NC	NC	NC
Streptocephalus sp.									50		200		NC	NC	NC
Cirolanides texensis	17	38	42	53	47	124	56	1	41	130	15	3	NC	NC	NC
Stygobromus flagellatus			12	5	4	3	3	1		1	1		NC	NC	NC
Palaemonetes sp.	22	9	12	2	7	3	5	6	4	11	7	2	NC	NC	NC
Eurycea rathbuni	1		1				1				1		NC	NC	NC

Appendix 9. Number of baits missing from each terrestrial section in Ezell's Cave from January, 1978 to March, 1979 (M = mice are suspected of bait removal, RS = rock squirrels are suspected of bait removal, and R = raccoons are suspected of bait removal).

Date	Sections I	II	III	IV	V	VI
Jan-78	3M	1M				
Feb-78	4M	2M	1M			
Mar-78	3M, IRS	1M	2M			
Apr-78	3M	2M	2M			
May-78	2M	3M	2M			
Jun-78	3M	4M	2M	3M		
Jul-78	2M	2M	3M	4M		
Aug-78	1M		2M	3M		
Sep-78	1M	1M	3M	4M		
Oct-78		1M		1M		
Nov-78						
Dec-78	2M	1M				
Jan-79	1M, 3R	2M				
Feb-79	1M, 2R	2M				
Mar-79	1M, 2R	3M	2M			