Baseline Troglobitic Survey and Inventory of Selected Sites;
Alachua County, Florida
May – June 2022

Prepared For:
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TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

Page No.

TABLE OF CONTENTS
(Continued)

LIST OF FIGURES AND TABLES

Photographs Page No.

TABLE OF CONTENTS
(Continued)

LIST OF FIGURES AND TABLES
(Continued)

Tables Page No.

ABBREVIATIONS

ACEPD – Alachua County Environmental Protection Department

DO – Dissolved Oxygen

°C – Degrees Centigrade

CFS – Cubic Feet Per Second

°F – Degrees Fahrenheit

FDEP – Florida Department of Environmental Protection

FWC – Florida Fish & Wildlife Conservation Commission

GPM – Gallons Per Minute

KES - Karst Environmental Services, Inc.

MGD – Millions of Gallons Per Day

OFS – Outstanding Florida Spring

RA – Relative Abundance

SAV – Submerged Aquatic Vegetation

SFC – Santa Fe College

SFR – Santa Fe River

SRWMD – Suwannee River Water Management District

TMDL – Total Maximum Daily Load

EXECUTIVE SUMMARY

The purpose of this study was to document the troglobitic inventory and habitat conditions within the spring, basin, and cave environments of selected spring and sink sites. Certified professional biologists and cave divers determined species presence and relative abundance within portions of the spring entrances surveyed. The focus of the surveys was on cave-adapted crustaceans including crayfish, amphipods, and isopods.

Spring sites included Boulware Spring, Glen Spring, Hornsby Spring, Poe Spring, and Trestle Spring. The sink sites included Backyard Sink, Bat Cave, Braddock Sink, Herzog Cave, Hornsby Sink, Jerome Sink, and Mill Creek Sink. Water quality samples and field readings were collected at each site. Water quality analysis included iron, magnesium, sodium, total nitrogen, total Kjedahl nitrogen, ammonia, nitrate plus nitrite, total phosphorus, orthophosphate, chloride, fluoride, sulfate, and total suspended solids. Field readings were collected for pH, specific conductance, dissolved oxygen, and temperature.

This project logged the first documented observation of a cave-adapted amphipod in the Hornsby Sink/Hornsby Spring cave system. Previous surveys completed at Hornsby Spring/Sink did not find cave adapted amphipods (Franz et. Al. 1994). Cave-adapted amphipods were also recorded for the first time at Backyard Sink and Braddock Sink. A survey completed at Mill Creek Sink in 1994 identified cave adapted amphipods, while surveys conducted for this project at the same site found no remaining cave adapted amphipods.

This project also completed a second survey at Herzog Cave (the first was in 1996), allowing for a comparison of conditions over a 26-year period. Herzog Cave appears to be in decent shape and supports what may be the best population of the Alachua Light-Fleeing Crayfish in the county. Additionally, this survey has documented three additional Pallid Cave Crayfish locations: Braddock Sink, Backyard Sink, and Bobika Sink.

Findings from this study are important in setting baseline conditions of troglobitic species that have previously never been surveyed. For sites that were previously surveyed, the locations had not been revisited in over 20 years. Troglobitic surveys should be completed at additional locations including but not limited to Gilchrist Blue Springs, River Sink, and River Rise since they were not included in this project.

INTRODUCTION

AUTHORIZATION

Karst Environmental Services, Inc. (KES) was contracted by the Alachua County Environmental Protection Department (ACEPD) to perform 'A baseline troglobitic survey and inventory of selected sites in Alachua County, Florida', as per Purchase Order No. 2022-00001796. The ACEPD authorization for the 2022 survey included identifying and obtaining access to suitable spring and sink sites and making faunal counts and species identification. This May through June 2022 survey established baseline information for future surveys at the sites visited.

PURPOSE

The purpose of this study was to document the troglobitic inventory and habitat conditions within the spring basin and cave environments of selected spring and sink sites. The focus was on cave-adapted crustaceans, including crayfish, amphipods and isopods. The spring sites included Boulware Spring, Glen Spring, Hornsby Spring, Poe Spring and Trestle Spring. The sink sites included Backyard Sink, Bat Cave, Braddock Sink, Herzog Cave, Hornsby Sink, Jerome Sink and Mill Creek Sink. A prior 2022 survey at Bobika Sink is also included with this report.

SCOPE OF WORK

Survey tasks included:

1. Making a direct visual count/estimate of troglobitic (especially cave-adapted crustaceans, i.e., crayfish, amphipods and isopods) and troglophilic fauna present within a given habitat or a selected portion of that habitat.

2. When and where possible, make a video and photo record at the site.

3. Where necessary, place and recover troglobitic fauna live traps.

4. Prepare a summary report that includes a narrative description and inventory counts for each site surveyed.

PERSONNEL

Primary KES personnel for this survey included Tom Morris, Biologist, and Peter Butt, Project Manager, with field support provided by Field Technicians Matt Hubner and Mark Long.

ACEPD Senior Planner Gregory Owen was part of the survey team during several of the site visit and assisted with obtaining access to many of the sites.

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Alachua Conservation Trust.
City of Gainesville Parks, Recreation and Cultural Affairs Department.
Alachua Office of Parks and Open Space.
Thomas Sawicky, Ph.D., Florida A&M University.

STUDY AREA

As per the Purchase Order authorization, study sites were targeted within Alachua County. The thirteen sites covered by this study were located primarily in the western half of the county, ranging from Boulware Spring in Gainesville westward to Braddock Sink, near the Gilchrist County line. Ten of the sites required the use of SCUBA equipment and three sites were accessed using snorkel equipment or wading. Eight of the sites had never been previously visited for the purposes of a formal troglobitic faunal survey.

All the sites surveyed for this study are environmentally sensitive, and most are location sensitive and special permission for access is required. All sites are either in private ownership or subject to public access control. Therefore, specific location identifiers such as map locations, Township/Range/Section, GPS coordinates, and other GIS-related data are not included in this report. Please contact the authors of this report or ACEPD for specific location and access information.

TARGET SPECIES

The following troglobitic species (or genera) were anticipated to be most likely encountered during this survey. Please refer to Photos 1 to 6 in the Appendix I Photographic Log for examples of these fauna. Table 1 summarizes the presence of target taxa in each of the sites surveyed.

Cave-adapted Crayfish:

1. Pallid Cave Crayfish; *Procambarus pallidus.*
2. Alachua Light-fleeing Cave Crayfish; *Procambarus lucifugus alachua.*
3. Northern Spider Cave Crayfish; *Troglocambarus maclanei.*

Cave-adapted Amphipods;

4. Hobbs' Cave Amphipod; *Crangonyx hobbsi.*
5. Florida Cave Amphipod; *Crangonyx grandimanus*.
6. Possible other *Crangonyx* sp.

Cave-adapted Isopods;

7. Hobbs' Cave Isopod; *Caecidotea hobbsi.*
8. Swimming Florida Cave Isopod; *Remasellus parvus.*
9. Possible other *Caecidotea* sp.

Baseline Troglobitic Survey and Inventory of Selected Sites; Alachua County, Florida, May – June 2022									
By Karst Environmental Services, Inc., for Alachua County Environmental Protection Department									
Table 1. List of study sites showing the observed presence or absence of target taxa during each survey.									
	Survey Date(s)	**Site Control**	**Troglobitic Taxa Observed**					**Other Fauna**	
Target Species:			*Procambarus*	*Troglo-*	*Procambarus*	Amphipods	Isopods	Surface	Fish
			pallidus	*cambarus*	*lucifugus*	*(Crangonyx sp.)*	*(Caecidotea +*	Form	Present?
Spring Name:				*maclanei*	*alachua*		*Remasellus sp.)*	Crayfish	
Boulware Spring	May 19 + 20, 2022	Muni. Gvmt.	N	N	N	N	N	**P**	Yes
Glen Spring	May 13 + 15, 2022	Private	N	N	N	N	N	**P**	No
Hornsby Spring	May 22, 2022	Private Park	**P**	N	N	**P**	**P**	N	No
Poe Spring	May 13 + 18, 2022	County Gvmt.	N	N	N	N	N	N	Yes
Trestle Spring	May 24, 2022	Private	N	N	N	N	N	N	No
Sink/Cave Name:									
Backyard Sink	June 2, 2022	Private	**P**	**P**	N	**P**	**P**	N	Yes
Bat Cave	May 6, 2022	NGO	N	N	**P**	**P**	N	N	No
Bobika Sink	February 23, 2022	Private	**P**	**P**	N	N	N	N	Yes
Braddock Sink	May 10, 2022	Private	**P**	N	N	**P**	**P**	N	No
Herzog Cave	May 25, 2022	NGO	**P**	N	**P**	**P**	N	N	No
Hornsby Sink	May 8, 2022	Private Park	**P**	N	N	**P**	N	N	No
Jerome Sink	May 12, 2022	Private	N	N	**P**	**P**	N	N	Yes
Mill Creek Sink	June 6, 2022	NGO	**P**	N	N	N	N	N	Yes
			P = Present/Observed						
			N = Not Observed						

Table 1. List of study sites showing the observed presence or absence of target taxa during each survey.

METHODS

VISUAL SURVEY PROTOCOLS: DIVING

Visual surveys are effective in caves as troglobitic animals typically do not hide and are easily spotted with dive lights. Divers using standard cave diving scuba kit typically followed a guideline that helped define the survey transects. Guidelines were already in place or were installed for the purposes of the surveys. The cave environment along the transects, including the floor, walls, ceiling and water column, were visually scanned using standard cave diving lights, and/or video lights. The visual surveys were usually done on the way into the cave. These were initial baseline surveys, and transects varied based on conditions at each site. Animal counts were recorded on plastic slates.

VISUAL SURVEY PROTOCOLS: SNORKELING

Conventional snorkeling gear was used at one site, Bat Cave, where shallow water with overhead air did not require SCUBA gear. Survey transects were terminated where water became too shallow, or a low ceiling prevented further travel. Guidelines were not needed here, and the survey was mostly focused on lake and passage floor habitats as well as the water column.

DIRECT COLLECTION PROTOCOLS

Crayfish specimens were captured in-cave by hand and placed in 50 ml capped vials. Experience has shown that these animals will survive in a vial until transferred to larger containers at the surface.

Amphipods and isopods were captured using a Sket bottle, which is a small plastic bottle designed for collecting small crustaceans, such as isopods and amphipods, underwater. The Sket bottle works by gentle suction that pulls the animals through a one-way valve into the bottle. Ideally, many animals can be collected with one bottle.

Specimens were later sorted and transferred from the vials or Sket bottle into small vials containing ethanol for preservation. All amphipods and isopods collected and preserved during this study have been transferred to Dr. Thomas Sawicki of Florida A&M University for further study, including DNA analysis.

TRAPPING PROTOCOLS

At two sites, Glen Spring and Boulware Spring, diving and snorkeling were not allowed or were not practicable due to shallow water. In addition to visual surveys made from above the water surface, traps were utilized to cover diurnal and nocturnal periods.

The traps used for crayfish were standard commercial wire mesh minnow/crayfish traps with inverted conical ends, each about 16 inches long with about a 9-inch diameter. Each trap was equipped with a retrieval line. Traps were baited with small, punctured cat food tins. Traps were placed as close as possible to the spring vents and were typically left in place for about 48 hours.

Traps for amphipods were homemade devices made from plastic water bottles. The top portion of the bottles was cut off, rotated, and inserted back into the cut bottle to form an inverted cone, creating a one-way opening in the same manner as the commercial minnow traps. Prior to

assembling the two bottle sections, the bait was inserted, along with a few small rocks for ballast. Spanish moss was used as bait for amphipods; experience has shown this to be an effective bait/attractant for both surface and subterranean forms, except for *Crangonyx grandimanus*, which is carnivorous (Thomas Sawicki, personal communication.)

PHOTOGRAPHY AND VIDEO

Photographs and video were typically taken using GoPro cameras, illuminated by video lights and/or cave diving lights. Photographs at Mill Creek Sink were taken with a Nikon D-800 DSLR camera and underwater strobes. Photographs and videos were not taken at all sites.

Additional photographs were generated from GoPro video screengrabs. Photographs are presented in Appendix I; Photographic Log, as part of this report. Video files of selected sites are available as part of a separate Video Database that accompanies this report. The Video Database is available only on portable drives due to the file sizes.

WATER QUALITY SAMPLING AND ANALYSIS

Water quality grab samples were collected by KES and ACEPD staff and hand delivered by ACEPD to AEL Environmental, Inc. of Gainesville, Florida for analysis. Laboratory analyses parameters included nitrate-nitrite as nitrogen, total Kjeldahl nitrogen, total nitrogen, ammonia, total phosphorus, ortho-phosphate, iron, sulfate, magnesium, sodium, fluoride, chloride and suspended solids. Additional field parameters including specific conductance, temperature, pH and dissolved oxygen were measured on site by ACEPD staff with a YSI Professional Plus Multiparameter meter. See Tables 2 and 3.

SITE VISIT ACCOUNTS AND SURVEY RESULTS; SPRINGS

BOULWARE SPRING

SITE DESCRIPTION

Boulware Spring is located in Gainesville Florida at 3300 SE 15th Street, in a city park. It is a historical site owned and maintained by the City of Gainesville, Department of Parks and Recreation. The park is open to public entry, but swimming and wading in the spring are not allowed.

Boulware Spring is a fourth magnitude spring that discharges into a brick-lined, shallow semicircular basin, approximately 430 square feet in area`. The water source is from a local, intermediate aquifer. From the spring basin, the discharge flows under a walkway into a larger concrete rectangular pool, approximately 70 feet long by 24 feet wide, and about five feet deep. Spring water then discharges from the large pool into a ravine, continuing as a stream to Paynes Prairie. The City of Gainesville estimates the overall discharge from the spring to be about 0.3 cubic feet per second (CFS), or about 194,000 gallons per day (GPD). On May 11, 2022, ACEPD measured a discharge of 0.44 CFS or about 284,000 GPD. There is a large building alongside the pool that was a former city public waterworks.

SITE SURVEY PARAMETERS

The survey of Boulware Spring pool was conducted between May 19 and 21, 2022, by Tom Morris. See Photos 7 and 8. On May 19, two commercial crayfish and two home-made amphipod traps were placed in the spring pool at 17:30. On May 21, the traps were recovered at 19:00.

The traps were placed in the spring pool opposite the spring vent, near two outflow pipes, in about three feet of water. The crayfish traps were baited with punctured cat food tins and the amphipod traps were baited with Spanish moss.

When visited for retrieval on May 21, one of the crayfish traps had been stolen, and one of the amphipod traps had been removed from the water. The remaining traps appeared to be undisturbed and were recovered.

FAUNAL COUNTS/ESTIMATES

No amphipods were present in the traps. In the remaining crayfish trap, there were four live and three dead crayfish, all identified as *Procambarus paeninsulanis*, the Peninsula Crayfish. See Photo 4. Three of the live crayfish were females, and one was a male. The females were released, but the male was retained for identification. This male was a Form One (sexually active form) which is preferable for identification. Twenty sailfin mollies (*Poecillia latipinna*) were also present in the trap and were released.

No crayfish or amphipods were observed during visual searches of the basin on either day. This is expected as crayfish are typically nocturnal and hide during the day.

FAUNA COLLECTED

The only specimen collected and taken from the site was the male *Procambarus paeninsulanis*.

OBSERVATIONS AND COMMENTS

Permission to access this site was obtained through the City of Gainesville, Parks, Recreation and Cultural Affairs Department.

When the traps were installed on May 19, 2022, the water level in the spring pool was about two feet above normal, but when the traps were retrieved on May 21, the water level in the pool was back down to normal. The cause of the high water was a turtle that had become lodged in the discharge pipe.

The Peninsula Crayfish ranges from the Choctawhatchee River basin in panhandle Florida eastward across north Florida and northward into southern Georgia. NatureServe ranks this species as G5S5; secure, common, widespread and abundant.

This crayfish inhabits ponds, ditches, wetlands, and streams. If water recedes these crayfish dig simple burrows down to the water table.

GLEN SPRING

SITE DESCRIPTION

Glen Spring is a fourth magnitude spring located behind the Gainesville Elks Lodge #990, at 2424 NW 23rd Boulevard, Gainesville, Florida. Glen Spring discharges from small, scattered vents in the bottom of a 360 square foot concrete walled head pool. The water source is from a local, surficial aquifer that lies to the north and is estimated to be about 300 acres in extent (Grossman, 2012). From the head pool, the water flows through two larger concrete rectangular pools formerly used for swimming. Spring water then discharges from the last swimming pool into Hogtown Creek via a short stream. Historical estimates of discharge range from 0.9 CFS down to 0.05 CFS. On May 11, 2022, ACEPD measured a discharge of 0.25 CFS or about 161,500 GPD.

The Elks Lodge buildings are located adjacent and along the northern side of the two swimming pools. The spring is not open to the public, and permission for access must be obtained through the local Lodge.

SITE SURVEY PARAMETERS

The survey of Glen Spring pool was conducted between May 13 and 15, 2022, by Tom Morris. See Photos 9 to 11. On May 13, two commercial crayfish and two home-made amphipod traps were placed in the head pool at 18:00. On May 15, the traps were recovered at 18:00.

The traps were placed in the head pool near the ledges where the main spring discharge occurs, in about eight feet of water. The crayfish traps were baited with punctured cat food tins and the amphipod traps were baited with Spanish moss.

FAUNAL COUNTS/ESTIMATES

No amphipods were present in either of the amphipod traps.

There were 15 live crayfish in one crayfish trap and seven live and five dead crayfish in the other trap. All were identified as Peninsula Crayfish (*Procambarus paeninsulanis*).

Morris estimated that there may have been as many as 100 crayfish present in the head pool. It is assumed they were all Peninsula Crayfish.

FAUNA COLLECTED

Twelve crayfish were collected to verify identification and make aquarium observations.

OBSERVATIONS AND COMMENTS

The water in the head pool was very clear. The bottom consisted of white sand. There was no vegetation present except a thin, slick algal film on the concrete walls of the head pool.

Morris revisited the spring on October 30, 2022, to take photographs. He estimated there were about 50 crayfish in the head pool.

The Peninsula Crayfish ranges from the Choctawhatchee River basin in panhandle Florida eastward across north Florida and northward into southern Georgia. NatureServe ranks this species as G5S5; Secure, common, widespread and abundant.

This crayfish inhabits ponds, ditches, wetlands, and streams. If water recedes these crayfish survive by digging simple burrows down to the water table.

HORNSBY SPRING

SITE DESCRIPTION

Hornsby Spring is located 1.6 miles north of the city of High Springs and approximately 0.6 miles from the left bank of the Santa Fe River (SFR), in Alachua County.

The Spring and its run to the SFR lies within Camp Kulaqua, a park that is privately owned and operated by the Florida Conference of Seventh-Day Adventists. Hornsby Spring is classed as a first magnitude spring, with discharges measurements recorded as high as 250 CFS (Scott, et.al., 2004). The Suwannee River Water Management District (SRWMD) reported a discharge measurement of 182 CFS on June 9, 2022. The spring itself is the recreational waterfront for the park. The run flows through a bottomland swamp towards the SFR. During normal to low water conditions, most of the water in the run goes underground at two swallets, which convey water underground to the SFR. Special permission from Camp Kulaqua is required for access to this site.

The water discharging here is clear but tends to be greenish or brownish in color. During flood conditions this spring may reverse flow and take in substantial amounts of river water.

The spring entrance area is about 35 feet deep. It has steep, irregular walls and ledges that open into a large main cave passage on its east side. There are other smaller openings into additional cave passages on its southeastern side. The complex entrance area is filled with a matrix of timbers, breakdown boulders and man-made debris. Considerable algal growth is present, along with numerous patches of colorless (whitish) bacteria.

The entrance opens into the main cave passage at a depth of 50 feet and is generally about 30 feet wide by 15 to 20 feet high, with a predominantly rock floor. The main passage is generally free of debris and runs southeast and then east for 1,400 feet to Hornsby Sink, where the cave can be accessed by divers. The cave continues more-or-less east beyond County Road 236. A 2005 dye trace study by KES showed that groundwater flowing through Mill Creek Sink, located about six miles to the SE, discharges at Hornsby Spring (Butt, et.al. 2006).

SITE SURVEY PARAMETERS

The survey of Hornsby Spring was conducted on May 22, 2022, by Tom Morris and Mark Long. See Photos 12 to 14. The survey was conducted using conventional SCUBA cave diving gear. The dive was conducted between 14:02 and 15:32. A visual scan for cave animals was performed at least 150 feet into the cave, reaching a maximum depth of 59 feet. A fiberglass tape was deployed into the main passage for 100 feet, at which point the cave floor drops off vertically. The visual search covered both sides of the tape out to the passage walls. At the end of the tape, a guideline was tied off, and a sweep was performed to about 50 feet beyond the drop-off, to approximately 60 feet deep. During the sweep, several alcoves along the walls were carefully searched. The bottoms of these alcoves were covered in a thick layer of organic silt.

FAUNAL COUNTS/ESTIMATES

During the survey Morris found one immature female Pallid Cave Crayfish (*Procambarus pallidus*) at the edge of the drop-off at a depth of 50 feet. Amphipods and isopods were observed in the silty alcoves during the sweep beyond the drop-off. In these alcoves, Morris counted at

least 30 amphipods and at least six isopods. Tubificid worms were also present in the alcove sediments.

No fish were observed within the basin or inside the cave. However, what appeared to be old catfish 'bites' were present in the silty bottom sediments of the alcoves, evidence that catfish are sometimes present in the cave.

FAUNA COLLECTED

Eleven cave-adapted amphipods and four cave-adapted isopods were collected.

OBSERVATIONS AND COMMENTS

These are the first records of amphipods and isopods at this site. The specimens have been preserved in ethanol and forwarded to Dr. Thomas Sawicki's lab at Florida A & M University in Tallahassee.

Scattered patches of colorless sulfur-oxidizing bacteria were observed in the basin and just inside the cave.

Dissolved oxygen (DO) measurements at the spring mouth are often below 1ppm, and patches of colorless sulfur-oxidizing bacteria are further evidence for low levels of DO in this cave.

Water temperature was 72°F.

The photos and video media data from the May 22, 2022 survey dive were corrupted and all images and video were lost. The photos included in this report and video were taken during a follow-up dive on November 20, 2022.

POE SPRING

SITE DESCRIPTION

Poe Springs is a second magnitude spring located three miles west of High Springs, on the left bank of the SFR, within Poe Springs County Park, in Alachua County. It is listed as an Outstanding Florida Spring (OFS) and has been developed as a recreation area.

The spring pool is about 100 feet in diameter and bordered on one side by a concrete retaining wall. Water discharges from several elongated vents at the bottom of a 20 feet deep conical depression on the south side of the pool. The discharge flows through a shallow 160 feet long and about 15 feet wide run to the SFR. The water is generally clear with a greenish tinge. The shallow parts of the pool and run have a sand, rock, or soft sediment bottom. The deeper parts of the pool have a sloping sand bottom with limestone exposed around the vents. The margins of the spring basin are largely natural, except for wide concrete steps for recreational access on the eastern side.

The spring discharge source is from the Floridan Aquifer. Estimates of the overall discharge from the spring range from 0 CFS to 93.1 CFS. The most recent discharge measurement was recorded by SRWMD as 48.8 CFS on December 7, 2021.

SITE SURVEY PARAMETERS

The survey of Poe Spring pool was conducted between May 13 and 18, 2022, by Tom Morris, supported by Peter Butt. See Photos 15 and 16. The survey was conducted using conventional SCUBA cave diving gear. This was a two-part survey consisting of a visual survey of the spring basin and vents, and trapping. On May 13, the visual survey was performed between 14:52 and 15:07, and two commercial crayfish and two home-made amphipod traps were placed in selected spring vents around 15:15. On May 18, the crayfish and amphipod traps were recovered from the spring vents at 15:30, with a fifteen-minute-long visual survey performed after that. During both visual surveys Morris searched into the vents with a bright dive light as far back as he could see.

The two crayfish traps and one amphipod trap were placed into two of the largest and deepest vents, in about seventeen feet of water. Another amphipod trap was placed into an isolated shallow vent on the south margin of the basin. The crayfish traps were baited with punctured cat food tins and the amphipod traps were baited with Spanish moss. When visited for retrieval on May 18, all the traps appeared to be undisturbed and were recovered.

FAUNAL COUNTS/ESTIMATES

There were no animals in any of the traps, except for a mosquitofish (*Gambusia holbrooki*) in one of the crayfish traps.

No troglobitic or surface form crayfish, amphipods or isopods were observed during the visual searches of the pool and vents.

FAUNA COLLECTED

No specimens were collected.

OBSERVATIONS AND COMMENTS

The basin and rock walls near the vents were covered in dense growths of filamentous algae.

There were scratch marks from turtles on the rock surfaces of several vents.

Video was recorded with a GoPro camera.

TRESTLE SPRING

SITE DESCRIPTION

Trestle Spring is located in Alachua County on the left bank of the Santa Fe River, approximately 680 feet southwest and downstream of the Highway 27 bridge. This spring is a single submerged vent below the normal river water line, and discharges directly into the river. It is estimated to be at least a third magnitude spring. While this spring has been known to Morris for a few years, there are no known references to this spring and its cave in the literature. The land on the bank above is private residential property. The authors have assigned the name Trestle Spring for the purposes of this report and for future reference.

The entrance to Trestle Spring is about six feet deep under normal river levels and is about four feet high by about three feet wide. Flow was estimated to be about five CFS during this visit. The cave passage varies in size but is never large and is often restrictive for divers, requiring the use of 'side-mount' equipment. The passage extends to the southeast and has been explored for about 250 feet. It is suspected that this cave conduit connects with a water-filled sinkhole approximately 1300 feet to the southeast.

The cave is littered with organic debris including leaves and small sticks that are swept in during reverse flow conditions. Fresh vegetation fragments provide evidence for an upstream karst window. Patches of bacteria were present in alcoves protected from flow.

SITE SURVEY PARAMETERS

The survey of Trestle Spring was conducted on May 24, 2022, by Tom Morris, supported by Peter Butt. See Photos 17 and 18. Access to the site was made by canoe from the public boat ramp on the north side of Highway 27. The survey was conducted using conventional side-mount SCUBA cave diving gear. This visit consisted of two separate dives. Water samples were collected on the first dive, at about ten feet into the cave and about six feet deep, at 15:20. A visual survey for cave animals was conducted on the second dive, between 15:26 and 16:07, from the cave entrance to the end of the existing guideline, approximately 250 feet into the cave. A maximum depth of 29 feet was reached, but the average depth of the dive was 17 feet. GoPro video was taken during the survey dive.

FAUNAL COUNTS/ESTIMATES

No crayfish, amphipods or isopods were observed during the visual search of the cave.

FAUNA COLLECTED

No fauna was collected.

OBSERVATIONS AND COMMENTS

No fish were observed in the cave. No catfish 'bites' were seen in the bottom sediments.

No tubificid worms were observed in the cave.

In September of 2019 Morris collected one mature female Pallid Cave Crayfish (*Procambarus pallidus*) from this site. No other animals were seen on that dive.

SITE VISIT ACCOUNTS AND SURVEY RESULTS; SINKS

BACKYARD SINK

SITE DESCRIPTION

Backyard Sink is located within a subdivision on private residential property. The sink lies about 1.5 miles northwest of the City of High Springs city center, about 2000 feet northeast of Highway 27, and about 2400 feet southeast of the nearest part of the Santa Fe River. The sink is the entrance into the Backyard Sink aquifer cave. This site is location sensitive and permission for access is required. Please contact the authors of this report for specific location and access information. This sink was not known to have a name, either locally or in the literature, so the authors have assigned the name Backyard Sink for the purposes of this report and for future reference.

During this visit, the ground water surface in the sink was about 15 feet below that of the surrounding land surface. The upper rim of the sink is approximately 75 feet in diameter. The north side slopes down to the water surface in the basin, which is about 15 feet in diameter. The east, south and west side of the sink have vertical limestone walls about 10 feet high. The sink is surrounded by mature hardwood trees.

Underwater, the bottom of the sink basin slopes to the south at about a 30-degree angle to around 20 feet deep just under the southern sink wall. The entrance into the cave is choked with a tangle of tree limbs, branches and lengths of PVC pipe. From there the floor ramps down to a depth of about fifty feet deep. Cave passage dimensions from this point are variable, but usually run about 15 to 20 feet wide and about ten feet high. The cave is known to be at least 900 feet long and ends in low silty restrictions at about 70 feet deep.

The bottom sediments in the cave are composed of soft dark silt and lighter colored flocculent bacteria and bacterial silt which is easily stirred up. What appeared to be very old soft pieces of wood are scattered along the passage floor. The limestone of the walls and ceiling has a rough, rotten texture and is soft and friable.

The water in most of the cave has a brownish tint and is hazy in some places. However, about 400 feet in there is a 30-foot-long stretch that has very clear water in the upper part of the passage. At about 500 feet into the cave, whisps of colorless bacteria occurred as stratified layers in the water column.

SITE SURVEY PARAMETERS

The survey of Backyard Sink Cave was conducted on June 2, 2022, by Tom Morris and Matt Hubner. See Photos 19 to 24. The visual survey was conducted using conventional SCUBA cave diving gear. The dive was conducted between 14:35 and 15:40 and reached 540 feet into the cave to a maximum depth of 63 feet. The visual search covered both sides of the existing cave guideline out to the passage walls. During the dive video was taken with a GoPro camera and specimens were collected.

FAUNAL COUNTS/ESTIMATES

Backyard Sink Cave was observed to harbor a substantial number of troglobitic fauna. Troglobitic isopods and amphipods were too numerous to count. Morris counted at least 22 Pallid Cave Crayfish (*Procambarus pallidus*). Several of these were very young. Four Spider Cave Crayfish (*Troglocambarus maclanei*) were observed, including two very small individuals, as well as one medium-sized and one normal-sized adult.

No fish were observed inside the cave. Mosquitofish (*Gambusia holbrooki*) were present in the basin down to a depth of about fourteen feet.

FAUNA COLLECTED

Thirteen cave-adapted isopods, seventeen cave-adapted amphipods and one female Spider Cave Crayfish were collected. The isopods and amphipods were preserved in ethanol and transferred to Thomas Sawicki. The crayfish was transferred alive to Paul Moler.

OBSERVATIONS AND COMMENTS

Based on prior observations, this cave may experience river water intrusion during flood level conditions on the SFR. The sink may also receive infrequent stormwater input from a retention basin immediately adjacent to the west. There was no detectable water movement in the cave during this or previous dives, and sediment patterns suggest this is the normal condition.

This is a remarkable troglobite site. It supports two species of cave crayfish as well as isopods and amphipods, which are present in uncommonly large numbers.

BAT CAVE

SITE DESCRIPTION

Bat Cave, also referred to as Newberry Bat Cave, is located about 4 miles north-northwest of the city of Newberry in western Alachua County. The site is owned by Santa Fe College (SFC) and has been developed and is operated as the Harvey Sharron Bat Cave preserve and educational site. Permission for visitation must be obtained from SFC.

Bat Cave was previously owned by a paper company during which time the cave had uncontrolled visitation, resulting in considerable vandalism and dumping. Ownership of the site was transferred to SFC in 1994, when the site was secured, and restoration begun. Since then, SFC has fenced off the over 3.3 acres that includes most of the underlying cave and its five entrances.

Surveys by members of the Florida Speleological Society have mapped at least 3770 feet of rooms and passage, with a surveyed depth of 49 feet below land surface. Bat Cave is largely located above the water table, except for water filled pools that vary in depth and extent with changes in groundwater levels.

SITE SURVEY PARAMETERS

The survey of Bat Cave was conducted on May 6, 2022. See Photos 25 to 30. Tom Morris conducted the survey and was supported by Pete Butt. SFC faculty members Greg Meade and Melanie Roberti and her daughter were present during the survey. The survey was conducted using conventional snorkeling gear. The survey was divided between two main flooded areas of the cave, with the main entrance room used as the base of operations and starting point. The water levels in these areas fluctuate and were at relatively high levels during this visit.

The first area surveyed was the flooded Lake Room pool immediately north of the dry main entrance room. The deepest water in the cave is always found in this pool, which usually contains water, even during periods of low ground water levels. This is the site of an existing staff gauge, installed by KES in 2003, which is in the deepest part of the lake. The visual search took place in a general east to west direction between 13:00 and 14:10 and covered the deep part of the pool and surrounding accessible shallow areas.

The second area surveyed was the passage leading from the southwest side of the main entrance room back to the Root Cellar area. The survey was completed between 14:15 and 14:45. This area was visually surveyed from west to east, with Morris terminating his survey just shy of the Root Cellar where the ceiling/water surface contact prevented further travel. This transect length was approximately 75 feet. The survey of the western flanks of the cave in this area was also limited by the ceiling/water surface contact that prevented further access.

No water samples were collected from Bat Cave for lab analyses, and no photos were taken during this visit. A follow-up visit was made on November 23, 2022 by KES and ACEPD staff to obtain photos and video, along with water parameter measurements in the Lake Room basin.

FAUNAL COUNTS/ESTIMATES

Cave adapted fauna in the Lake Room pool included amphipods in numbers too numerous to count. Twenty-nine Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*) were observed in the Lake Room area. Nine of these were found within the deeper part of the Lake Room pool, including two large adults and two small, immature crayfish. Twenty more intermediate sized crayfish were scattered around the margins of the pool. No isopods were observed.

Cave adapted fauna in the Root Cellar area, the second area surveyed, included at least 20 amphipods, and at least 22 Alachua Light-Fleeing Cave Crayfish, including 15 very small, immature crayfish, four sub-adult crayfish and three large, mature crayfish. No isopods were observed.

FAUNA COLLECTED

Seven amphipods were collected from both the Lake Room area and the Root Cellar area. These specimens were preserved in ethanol and transferred to Dr. Thomas Sawicki of Florida A&M University for further study, including DNA analysis.

OBSERVATIONS AND COMMENTS

One mid-size crayfish had a portion of a small unidentified millipede in its mouth parts. These same millipedes were observed on the dry floor of the main entrance room.

Upon completion of the Lake Room pool survey, Butt removed a MiniTroll water level recording system from its mount on the staff gauge, along with its buried cable and connection box. This staff gauge and recorder were part of a prior water level monitoring project that was operated by KES for CCDA Waters, LLC from December 1, 2003 until June 27, 2013. The staff gauge, which was surveyed-in professionally at considerable expense, was left in place.

Utilizing the staff gauge in the Lake Room basin, the water depth during this visit was measured at 39.9 feet of NGVD elevation. This compares to a high of 40.69 feet NGVD on November 10, 2004 (in the aftermath of that year's multiple hurricanes) and a low of 31.64 feet NGVD on April 17, 2012. During low water stands the only water in the cave is in the deepest part of the Lake Room pool. Paul Smith (personal communication), one of the original explorers of Bat Cave, has seen the Lake Room pool reduced to the size of a kitchen sink. Scattered skins of calcite raft were present on water surfaces in the cave.

Franz, et.al. (1994) recorded Hobbs' Cave Isopod (*Caecidotea hobbsi*) from this site, but no isopods were seen during this survey. Furthermore, Franz (1994) does not mention amphipods, which were common during this survey and have been observed previously by the authors. Amphipods collected here since Franz's 1994 publication have been identified as Hobbs' Cave Amphipod (*Crangonyx hobbsi*). Dr. Thomas Sawicki, a biologist at Florida A & M University in Tallahassee who is studying Florida troglobitic crustaceans, has genetic evidence showing that the amphipod specimens from Bat Cave have diverged from the main Florida population and may be a unique species (personal communication, Sept. 2022).

No fish were seen in the cave pools. Also, no bats were seen during a casual search of the ceiling in the entrance area and Lake Room during this survey. Bats were observed in the Lake Room during the November 23, 2022 follow-up visit.

BOBIKA SINK

SITE DESCRIPTION

Bobika Sink is located about 2.4 miles NNE of High Springs in Alachua County in a young pine plantation. The sinkhole is on private property owned by Bob and Erika Simons of Gainesville, Florida. Permission from the landowner is required for access. As this a sensitive site, please contact the authors of this report for specific location and access information.

The Bobika Sink cavern is entered through a six-feet diameter vertical shaft in the bottom of a steep-sided sinkhole, approximately 20 feet in diameter at the water surface. The vertical shaft opens into a large room about 30 feet in diameter. There is a debris cone located below the overhead entrance, composed of sand and rocky collapse material, the top of which is at about 50 feet deep. Other material that has fallen in from the surface is scattered about the cone and includes tree trunks and limbs, leaves, and organic silt.

SITE SURVEY PARAMETERS

The survey of Bobika Sink was conducted on the afternoon of February 23, 2022, by Tom Morris and Kenny Broad. Retired FWC biologist Paul Moler, landowners Bob and Erika Simons, and Mark Long provided surface support. The survey was conducted using conventional SCUBA cave diving gear. The visual search was oriented along the existing guideline, covering the cavern floor, walls, ceiling, debris cone and water column. Woody debris was also searched for isopods.

FAUNAL COUNTS/ESTIMATES

A total of six Pallid Cave Crayfish (*Procambarus pallidus*) were present in the cavern. Three of these were present on the debris cone and three more were observed farther towards the margins of the room, on dark organic silt. (Debris cones under overhead cave entrances are relatively food rich and are often a preferred habitat for certain troglobitic crayfish.)

Two Spider Cave Crayfish (*Troglocambarus maclanei*) were observed near each other towards the margin of the room, swimming in the water column several feet below the ceiling. One of the crayfish, a male, was of exceptional size, the largest ever observed by Moler and Morris.

No troglobitic amphipods or isopods were found in the cave.

Several Yellow Bullhead catfish (*Ameiurus natalis*) were observed in the cavern.

FAUNA COLLECTED

Two Spider Cave Crayfish, a male and a female were collected and placed into 50 ml capped plastic tubes. The female was released back into the cave and the male was retained by Paul Moler as a voucher specimen. Tissue will be preserved for genetic studies. One adult-sized male Pallid Cave Crayfish was also brought to the surface for identification and then released.

OBSERVATIONS AND COMMENTS

The water temperature in the cavern was 72°F measured on a dive computer.

BRADDOCK SINK

SITE DESCRIPTION

Braddock Sink is a karst window located in the extreme north-western portion of Alachua County about 1400 feet south of Poe Springs Road (County Road 340) and 1500 east of NW 298th Street (a county line road), and 3.5 miles west of the High Springs, Florida, city center. It is also about 3200 feet south-southwest of Poe Spring. Braddock Sink is in private ownership and is not open to the public. The sink is hidden in a stand of hardwood trees in an area of agricultural clearings. Permission from the landowner is required for access. As this a sensitive site, please contact the authors of this report for specific location and access information.

There are two small openings to groundwater at the bottom of Braddock Sink, separated by a narrow land bridge. The eastern opening provides diver access into the cave. A short, narrow shaft opens into the ceiling of a large entrance room, directly above a breakdown pile that slopes to the west to about 50 feet of depth. The entrance room is about 50 feet across, with a maximum depth of about 80 feet. A guideline runs through the entrance room and continues into the downstream main cave passage on the west side. The downstream passage has been explored and surveyed to an overland distance of about 1200 feet. There is no upstream passage large enough for divers.

SITE SURVEY PARAMETERS

The survey of Braddock Sink was conducted on May 10, 2022, by Tom Morris and Pete Butt. See Photos 31 and 32. Morris and Butt were guided by Elliot Dirr, a cave diver who has explored and mapped this cave. The dive was conducted between 17:45 and 18:31. The search for cave animals extended to about 300 feet into the cave and reached a maximum depth of 97 feet. The visual search covered the entrance room and both sides of the guideline out to the walls. During the dive, Butt took photos and video with a GoPro camera in the room near the sink entrance. Water in the cave was clear and the temperature was 71° F. Water samples were collected in Cubitainers at 48 feet deep in the Entrance Room, at about 18:00. The Cubitainers were decanted into sampling kit containers and delivered to ACEPD staff for later analysis. Water parameter field readings were not taken at this site.

FAUNAL COUNTS/ESTIMATES

During the survey dive Morris counted at least 30 Pallid Cave Crayfish (*Procambarus pallidus*) of all sizes in the entrance room area, including some very young individuals. Only one crayfish was found in the 250 feet of passage downstream of the entrance room.

One isopod was found on woody debris in the entrance room at about 50 feet deep. Two amphipods were also found in the entrance room at 50 and 80 feet.

No fish were observed in the sink and cave.

FAUNA COLLECTED

No fauna was collected.

OBSERVATIONS AND COMMENTS

This site is notable for its proximity to a stretch of the SFR that includes Poe Spring, Lily Spring and numerous smaller springs. It is located within the 50-foot elevation contour that delimits many of the springs and other karst features in this area. The relatively strong downstream flow to the west and north in this cave suggests that this cave has a hydrologic connection to some of these springs. Due to the small size of the cave a dye trace would probably be required to determine if this is the case.

HERZOG CAVE

SITE DESCRIPTION

Herzog Cave is located within the Herzog Cave Conservation Area. The area is owned by the Alachua Conservation Trust (ACT) and is leased by them to the Haile Plantation West Owners Association. Permission from ACT is required for access. This is a location sensitive site. Please contact the authors of this report or ACT for specific location and access information.

Herzog Cave is located southwest of Gainesville, about 2.5 miles west of Interstate 75, in western Alachua County, Florida. The area immediately surrounding the cave, about one acre, has been fenced, but the gate is off its hinges and lying on the ground. The vertical entrance to the cave is covered by a heavy-duty locked steel grate to protect the cave and to protect people from a potentially damaging fall.

The entrance to Herzog Cave is a circular opening about four feet in diameter at the land surface. The entrance chimney, or solution shaft, goes down about 13 feet where it opens into a large NW to SE oriented room, approximately 110 feet long, and up to 15 feet wide and 25 feet high. There is a sandy debris pile located under the entrance shaft, 33 feet below the land surface, which was seven feet underwater during the survey. From the debris pile, the cave extends for about 60 feet to the NW, where it reached a maximum below-the-water-surface depth of 29 feet, and to the SE for 50 feet, where shallower depths prevail. The NW part of the cave has a silty uncluttered bottom, while the bottom of the NE part of the cave is covered in breakdown boulders, some of which are large. The vertical distance from the land surface to the water surface was 26 feet, and the entire bottom of the cave was underwater.

The floor is composed of a dark organic silt with scattered acorns, a few leaves, and a few man-made objects.

SITE SURVEY PARAMETERS

The survey of Herzog Cave was conducted on May 25, 2022, by Tom Morris, supported by Peter Butt and Matt Hubner. See Photos 33 to 36. Retired FWC biologist Paul Moler was also present. After the site was rigged for vertical access Morris rappelled into the cave and then his equipment was lowered to him. The survey was conducted using conventional side mount SCUBA cave diving kit.

After kitting up, Morris began diving at 15:23, dividing the survey effort into several short dives, and calling out findings for each survey excursion to the team above. For survey purposes, the cave was divided into two sections: the longer, deeper northwest segment, and the shallower boulder strewn southeast segment. These excursions continued until Morris had covered all areas and habitats within the cave. Video was recorded with a GoPro camera. The visual survey ended at 16:24. Water samples were taken underneath the entrance at two feet below the surface at 16:05.

FAUNAL COUNTS/ESTIMATES

During the survey dive into the northwest section, Morris counted fifteen very large mature crayfish and one small immature crayfish. These were a mix of Pallid Cave Crayfish (*Procambarus pallidus*) and the Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*), with the latter species appearing to be most numerous. Cave adapted amphipods were present in numbers too numerous to count; Morris estimated there were at least fifty.

During the survey dive into the southeast portion of the cave, Morris counted ten to twelve large mature crayfish and three small immature crayfish. These were presumably a mix of Pallid Cave Crayfish and Alachua Light-Fleeing Cave Crayfish. Morris estimated over 30 amphipods were present in this section.

No fish were observed.

FAUNA COLLECTED

No specimens were collected from this site.

OBSERVATIONS AND COMMENTS

The water level in the cave was approximately ten feet deeper than when KES visited the site for troglobitic fauna surveys for the Florida Fish and Wildlife Conservation Commission (FWC) during March and May of 1996 (Morris and Butt, 1996).

Two gopher tortoise shells were partially buried in the cave floor sediments, and the skeletal remains of an armadillo was present on the floor near the end of the NW part of the cave. It is unknown how important these unlucky animals are to the food budget of the cave's animal community, but it may be prudent when fencing caves to allow access for small or mid-sized animals.

A review of the GoPro video suggests that the Light-fleeing Cave Crayfish outnumbered the Pallid Cave Crayfish during this survey, whereas the two May 1996 surveys found the Pallid Cave Crayfish to be most numerous. This conflicts with Paul Moler's trapping findings, which suggest that the Alachua Light-fleeing Crayfish may be the more common species. Crayfish numbers were significantly higher during this survey than in the May 1996 survey, when only four adult crayfish were observed.

Two Spider Cave Crayfish (*Troglocambarus maclanei*) were observed during the May 1996 KES survey, but none were seen during this survey.

One troglobitic isopod was found at this site during the May 1996 KES survey, but none were found during this survey.

No fish were seen in the cave.

No bats or cave crickets were seen during a scan of the walls and ceiling of the air-filled part of the cave.

HORNSBY SINK

SITE DESCRIPTION

Hornsby Sink is located 1.6 miles north of the city of High Springs, in Alachua County, and is a salient feature of the Hornsby Spring cave system. It is an upstream entrance into the cave passage of this historically first magnitude spring. The sink is within a private recreation park, Camp Kulaqua, which is privately owned and operated by the Florida Conference of Seventh-Day Adventists. Special permission from Camp Kulaqua is required for access to this site.

Hornsby Sink is a large water-filled depression approximately 120 feet in diameter surrounded by mature hardwood and cypress trees. It is offset to the north from the main cave passage, intersecting the cave approximately 1,400 feet upstream and east of Hornsby Spring. This sink has been used as an entry point for prior exploration. The main cave passage continues upstream from the sink to the east for about 900 feet where it splits into north and south passages. These passages continue east, beyond County Road 236.

Underwater, the southern side of the sink has vertical limestone walls that open to a wide arched ceiling over a steeply sloping floor on the sink's southwest side. Several very large tree trunks rest on the upper portion of the slope. The floor continues to slope even more steeply to the southwest for about 110 feet, to its intersection with the cave. The entrance is 40 feet wide and 20 feet high. The floor of the slope is composed of limestone breakdown boulders, sand and organic sediments. The intersection with the cave is in excess of 100 feet deep.

The water in the sink is clear but greenish in color, as is the water within the cave. The entire sinkhole basin was covered with duckweed during the survey.

SITE SURVEY PARAMETERS

The survey of Hornsby Sink was conducted on May 8, 2022, by Tom Morris, Pete Butt and Mark Long. The survey was conducted using conventional SCUBA cave diving gear. The dive was conducted between 14:05 and 15:10. A visual scan for cave animals was started at about 50 feet deep in the daylight zone of the basin, and was continued down the slope reaching a maximum depth of 102 feet. The dive team ran their own guideline, although older existing guideline remnants were observed lower on the slope. The visual search covered the slope's floor, walls and ceiling. Various alcoves at around 95 feet deep were also carefully searched.

FAUNAL COUNTS/ESTIMATES

During the survey dive Morris counted approximately 25 Pallid Cave Crayfish (*Procambarus pallidus*), most of them very large mature adults. The shallowest depth a crayfish was observed was at 65 feet deep in the twilight zone of the entrance cavern. Two crayfish were observed copulating mid-slope, in the missionary position. Morris found one cave-adapted amphipod in a small silty ceiling alcove at about 95 feet deep.

No fish were observed during the survey.

FAUNA COLLECTED

One male Pallid Cave Crayfish was collected.

OBSERVATIONS AND COMMENTS

This was the first documented observation of a cave-adapted amphipod in the Hornsby Sink/Hornsby Spring cave system. Water temperature was 72°F. Franz, et.al., (1994) only recorded the Pallid Cave Crayfish from this site.

JEROME SINK

SITE DESCRIPTION

Jerome Sink is located in western Alachua County about 330' east of US Hwy 27/41 and 3 miles north of the Hwy 27-41/SR 26 intersection in Newberry, Florida. Jerome Sink is in private ownership and has not been open to the public for about three decades. This has protected the site from the degradation common to so many sites with unfettered public access. The sink is hidden in a stand of hardwood trees in a region of widespread agricultural clearings. A large limestone quarry is active about one mile to the east. Permission from the landowner is required for access. Please contact the authors of this report for specific location and access information.

Jerome Sink is a spectacular cenote-like karst feature located west of Gainesville in the Newberry Sinkhole Plain. The walls of perhaps one-third of the sink drop almost 30 feet vertically to the water surface in the sinkhole lake. Much of the remainder of the sinkhole also has vertical walls, and access to the lake is by a series of steep slopes interrupted by vertical rocky sections on the west side of the sink. Remnants of solution pipes are common in the limestone walls and it appears this large sink, which is roughly 40 feet or so in diameter, may have formed, at least in part, by the coalescence of these pipes. The north sinkhole wall supports an impressive stand of liverworts.

The Jerome Sink pool covers the eastern third of the feature and is approximately 30 feet from shoreline to wall. The water is usually clear. The bottom slopes to the east at about a 25-degree angle to around 30 feet deep just under the cave roof. From there the floor drops in ramps and steps to a depth of fifty feet in the middle of the passage, which runs more-or-less east for about 200 feet. There are numerous breakdown boulders scattered along the floor and the cave varies from being quite roomy in places, up to 25 feet wide and 10 feet high, to less than four feet high. The floor falls off, sometimes steeply, on both sides of the main tunnel, reaching a depth of about 80 feet at one spot. The openings flanking the main tunnel are probably too small for divers.

The limestone of the walls, ceiling, and boulders has a rough texture and is soft and friable. Most horizontal surfaces and moderate slopes are covered with an organic or limestone silt which is easily stirred up. Towards the back of the cave, at 50 feet deep, there are remarkable rust-colored goethite formations. Goethite forms on a time scale of thousands of years and is extremely fragile.

SITE SURVEY PARAMETERS

The survey of Jerome Sink was conducted on May 12, 2022, by Tom Morris, supported by Peter Butt. See Photos 37 to 42. Retired FWC biologist Paul Moler was also present. The survey was conducted using conventional SCUBA cave diving gear. This visit consisted of three separate dives. The first dive was conducted between 14:36 and 15:21 to perform a visual scan for cave animals, all the way to the back of the cave, reaching a maximum depth of 59 feet. The second dive was made at 15:13 to collect water samples, just inside the cave, at a depth of 38 feet. The third dive was made between 15:55 and 16:15. A fiberglass tape was run out during this last dive to measure cave length, and animals were once again searched for. During the first and third dives video was taken with a GoPro camera and specimens were collected.

FAUNAL COUNTS/ESTIMATES

During the first dive, two Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*) were observed, along with three cave-adapted amphipods. Five mid-sized (about six inches long) yellow bullheads (*Ameiurus natalis*) and one white catfish (*Ameiurus catus*) of the same size were also observed.

During the third dive, one Alachua Light-Fleeing Cave Crayfish was observed, along with three cave-adapted amphipods. Two small (less than three inches long), yellow bullheads were also observed.

Spring chubs (*Pteronotropis harperi*, formerly *Notropis harperi*) were common in the basin in numbers too numerous to count. They occurred throughout the cave in lesser numbers, estimated at about two dozen or so individuals, as far back as 180 feet into the cave.

FAUNA COLLECTED

One cave-adapted amphipod was collected.

OBSERVATIONS AND COMMENTS

This survey, as well as a prior survey on September 15, 2020 by Morris, confirms the presence of cave adapted amphipods and the Alachua Light-Fleeing Cave Crayfish in Jerome Sink.

The presence of the white catfish was remarkable, as they are generally associated with spring caves near rivers.

Based on the observation of suspended particles in the water column, Morris detected a slight movement of water from the rear of the cave towards the entrance.

MILL CREEK SINK

SITE DESCRIPTION

Mill Creek Sink located on the north side of US Highway 441, about 100 feet from the roadway. The water surface in the sink is typically about 35 feet below the sinkhole rim. Mill Creek Sink and Swallet are owned by the National Speleological Society (NSS), and with the surrounding property, comprise the NSS' Mill Creek Sink Nature Preserve. The NSS has installed stairs to allow diver access from the east side. This a sensitive and potentially hazardous site, and permission from the NSS is required for access.

Mill Creek Sink and Swallet are the present-day endpoints of Mill Creek. Mill Creek and its northern tributary, the Townsend Branch, currently drain about 13 square miles northwest of the city of Alachua. The Mill Creek drainage was part of the ancient Alachua Stream System (Williams, et.al., 1977). This formerly integrated surface drainage system has been reduced to localized segments that end at swallets, including Mill, Lee, Split Rock, Big Otter and Burnetts Lake swallets. The Mill Creek Sink and Swallet is the most downstream and westernmost of these drainage features.

Mill Creek is an ephemeral surface stream with highly variable flow. It drains into a cypress swamp and thence into Mill Creek Swallet via an underground passage, about 200 feet long, and running at a depth of about 40 feet. This passage opens into the north side of Mill Creek Sink's large basin. The Mill Creek Sink Cave begins beyond a large cavern on the southeast side of the sink. The cave gradually descends to about 140 feet, where an upstream/downstream passage is encountered. The upstream passage typically has a strong flow of clear groundwater. Surface drainage that enters the sink via the swallet flows into the downstream passage that has been confirmed to be hydrologically connected to Hornsby Sink and Spring by a dye trace study performed in 2005 (Butt, et.al., 2006).

SITE SURVEY PARAMETERS

The survey of Mill Creek Sink was conducted on June 6, 2022, by Tom Morris, Mark Long and Mutt Hubner. Pete Butt provided surface support. See Photos 43 to 45. The survey was conducted using conventional SCUBA cave diving gear. The dive was conducted between 15:03 and 15:44 to perform a visual scan for cave animals, extending about 220 feet into the cave, and reaching a maximum depth of 130 feet. The visual search was oriented along the existing guideline, and covered the basin and cavern sloping floor, walls and ceiling, and terminating at the upstream-downstream cave junction. Crayfish were counted on the way in and during the exit. Temperature was 71° F at depth. Water clarity improved with depth, increasing from about 5 to 10-feet visibility above 15 feet deep in the basin, to above 50-feet visibility below 100 feet. Long took photos during the dive. Water samples were collected between 32 and 38 feet deep at 15:40 for analysis by ACEPD.

FAUNAL COUNTS/ESTIMATES

Cave animals were counted on the way into the cave and on the return. On the survey into the cave 30 Pallid Cave Crayfish (*Procambarus pallidus*) were counted. These were mostly mid-sized crayfish, about 1.5 inches long. The first crayfish was encountered at 60 feet deep, and crayfish were present all the way to the end of the survey at 130 feet deep. During the survey on

the way out, at least 42 Pallid Cave Crayfish were counted. At a depth of about 100 feet, there was an area of about ten feet in diameter along the left wall where about 28 crayfish were concentrated. The increased in crayfish count on the return was due to diver exhalation bubbles dislodging crayfish from the ceiling, which then "parachute" to the cave floor. The last crayfish seen on the way out was, as before, at 60 feet deep. No crayfish were observed above 60 feet deep, but crayfish have previously been observed in the basin from the surface.

No troglobitic isopods or amphipods were observed during the survey.

Six yellow bullheads (*Amieurus natalis*), each about six inches long, were observed during the dive.

No tubificid worms, which commonly colonize bottom sediments in aquifer caves that receive surface water inputs, were observed during the survey.

FAUNA COLLECTED

No fauna was collected.

OBSERVATIONS AND COMMENTS

What appeared to be colorless sulfur-oxidizing bacteria was present on organic detritus on the bottom of the basin and cavern, especially at around 30 feet of depth. These bacteria are suggestive of low DO levels.

Morris previously reported unidentified cave amphipods from this site (Franz, 1994).

This site is susceptible to runoff from development at the rapidly developing I-75/Hwy 441 intersection. However, retention ponds have recently been constructed and the situation may be somewhat ameliorated.

DISCUSSION

SUMMARY OF TROGLOBITE OCCURRENCE

This study surveyed twelve groundwater sites in Alachua County for troglobitic and troglophilic taxa. Two of them, Boulware and Glen Springs, are associated with surficial or intermediate aquifers and as expected, only a surface form crayfish species, the common Peninsular Crayfish, was found. The ten other sites are in the western part of the county where the upper Eocene Ocala Group limestones of the Floridan Aquifer are not covered by deep sand and clay overburden. Here, organic materials pass freely into subterranean cave habitats and support cave adapted fauna.

Franz, et.al, (1994) documented 267 biologically significant caves in Florida and southern Georgia. Four counties, Alachua, Marion, Suwannee and Jackson, accounted for over half of these localities. Forty-seven of the sites were in Alachua County, the largest number for any county. Since Franz's publication new caves harboring troglobitic species have been discovered, but the overall pattern of distribution still holds.

Franz (1994) identified six distinct Florida and southern Georgia regional cave faunas, based on specific regional geologic and hydrologic characteristics and representative taxa. Alachua County falls within the largest regional fauna, the Ocala Fauna. Franz (1994) further divided the Ocala Fauna into six assemblages, with Alachua County falling within the Upper Suwannee Assemblage. The aquatic crustacean taxa composing this assemblage include: two isopods (*Caecidotea hobbsi* and *Remasellus parvus*); two amphipods (*Crangonyx grandimanus* and *Crangonyx hobbsi*); one cave-adapted shrimp (the Squirrel Chimney Cave Shrimp, *Palaemonetes cummingi*); and four crayfish, of which three occur in Alachua County (*Procambarus pallidus*, *P. lucifugus alachua*, and *Troglocambarus maclanei*).

Troglobitic taxa were found during this survey at all Floridan Aquifer groundwater sites except Poe and Trestle Springs. There is one troglobite record from Trestle Spring (Morris collected one Pallid Cave Crayfish in September of 2019), but none from Poe Spring. Poe Spring most likely harbors troglobitic taxa but is difficult to survey for two reasons; the small vents and caves exclude diver access for visual searches, and with few exceptions, baited traps at spring vents are ineffective because the current carries the scent of bait *away from* the cave habitat.

The remaining eight aquifer cave sites were diver accessible and so effective visual surveys for cave taxa was possible. This is the preferable survey method for several reasons. First, cave fauna typically does not hide and are easily spotted with bright cave lights. Second, some taxa, such as the Northern Spider Cave Crayfish, do not come to baited traps. And finally, visual searches provide opportunity to assess habitat conditions.

Troglobitic Crayfish

This section will review the number of documented locations of the three Alachua County troglobitic crayfish and discuss the significance of new site occurrences documented in this survey.

The endemic Northern Spider Cave Crayfish (*Troglocambarus maclanei*) has the broadest distribution of Florida's troglobitic crayfish, ranging from southern Suwannee County southwest to Pasco County, but it has only been documented at twenty-five locations. Three of those locations (Herzog Cave, Squirrel Chimney and Goat Sink) are in Alachua County. This study has documented two additional Alachua County sites, Bobika Sink and Backyard Sink, which have significantly increased its documented range in the county. Backyard Sink and Bobika Sink are now the farthest upstream locations for the Spider Cave Crayfish in the SFR drainage. And, Bobika Sink is the closest *Troglocambarus* location to the Cody Escarpment and the western edge of the Northern Highlands, where thick overburden limits cave development. Furthermore, these new records represent a 13-mile range extension to the north from the two sites near Newberry and a 19-mile extension to the north from Herzog Cave. The closest Northern Spider Cave Crayfish site to Bobika Sink, besides Backyard Sink, which is 2 miles to the SW in High Springs, is Jess' Hole, which is across the SFR and 3.7 miles to the WNW in Columbia County.

Only one Northern Spider Cave Crayfish location in Alachua County, Herzog Cave, is in protected ownership. Herzog Cave is located within the Herzog Cave Conservation Area which is owned by the ACT and is leased by them to the Haile Plantation West Owners Association. The other locations are in private ownership.

The Northern Spider Cave Crayfish, previously recorded from Herzog Cave, was not seen here by Morris during this survey, but, in his opinion, they are undoubtedly still present at this site.

The Alachua Light-Fleeing Crayfish (*Procambarus lucifugus alachua*) is restricted to groundwater habitats in the Newberry Karst Plain. It has been documented by Franz (1994) from eleven sites in Alachua County, and two sites outside the county. This survey documents one more Alachua County location, Jerome Sink. This is the second survey KES has done at Herzog Cave (the first was in 1996), allowing for a comparison of conditions over a 26-year period. Herzog Cave appears to be in decent shape and supports the largest known population of the Alachua Light-Fleeing Crayfish in the county.

The Pallid Cave Crayfish (*Procambarus pallidus*) occurs in Franz' Ocala Fauna, Upper Suwannee Assemblage, which ranges from Marion County north to the upper Suwannee River and Withlacoochee River. This almost-Florida-endemic also occurs at two sites just barely up the latter stream into Georgia. This is the crayfish with the widest distribution and greatest number of locations (20) documented by Franz (1994) in Alachua County. This survey has documented three additional Pallid Cave Crayfish locations; Braddock Sink, Backyard Sink, and Bobika Sink, and makes note of Morris' previous record at Trestle Spring.

Cave-adapted Isopods. Franz (1994) recorded two species of cave-adapted isopods from Alachua County; the Swimming Florida Cave Isopod (*Remasellus parvus*) and Hobbs' Cave Isopod (*Caecidotea hobbsi*).

The Swimming Florida Cave Isopod has been found in the county only in Ten Inch Cave, the type locality for this species. It has only been recorded from three other localities, one each in Madison County, Wakulla County, and Suwannee County.

Hobbs' Cave Isopod, is more widely distributed, and has been recorded at nine groundwater sites in one Georgia and four Florida counties. Four of the nine sites are in Alachua County. This species is not restricted to groundwater habitats based on one occurrence in the burrow of a burrowing crayfish in Calhoun County. This species has been recorded in Bat Cave, but no isopods were seen there during this study.

This study has documented cave-adapted isopods at three more Alachua County groundwater sites; Braddock Sink, Backyard Sink, Hornsby Spring. Specimens were collected from Backyard Sink and Hornsby Spring and are in the collection of Dr. Tom Sawicki. They have yet to be identified.

Cave-adapted Amphipods. Two species of cave-adapted amphipods are known from Alachua County, the Florida Cave Amphipod (*Crangonyx grandimanus*) and Hobbs' Cave Amphipod (*Crangonyx hobbsi*).

The Florida Cave Amphipod is widely distributed and has been recorded from 25 sites ranging from Leon County south to Pasco County, with a single disjunct record from a well in Dade County. It has been recorded from six Alachua County groundwater sites.

The distribution of Hobbs' Cave Amphipod coincides with that of the Florida Cave Amphipod, and it has been found in 37 groundwater sites, nine of which are in Alachua County.

This study has documented four new sites in Alachua County for cave-adapted amphipods in the genus *Crangonyx*; Hornsby Spring, Hornsby Sink, Backyard Sink, and Braddock Sink. Specimens were collected from Backyard Sink, Hornsby Spring, Bat Cave, Braddock Sink and Jerome Sink and are in the collection of Dr. Tom Sawicki. They have yet to be identified.

Unidentified Taxa. Franz (1994) documents eleven Alachua County caves where "unidentified cave crayfish" were reported and six caves where "cave associated species" were reported. He also documents a number of locations where one or more taxa is identified along with "other cave-associated species". So, there is still plenty of work ahead to flesh out the occurrences and ranges of cave adapted taxa in Alachua County.

WATER QUALITY

Field parameters (See Table 2) show results for temperature, dissolved oxygen (mg/L & %), specific conductance and pH. Dissolved oxygen (DO) ranged from 0.31 mg/L (3.6% saturation) at Hornsby Spring to 8.16 mg/L (89.3% saturation) in the Lake Room waters at Bat Cave.

DO at Hornsby Spring was at the lower end of values normally measured at Florida springs. The near anaerobic condition of Hornsby Spring discharge influences the basin environment near the vents as exemplified by patches of colorless sulfur oxidizing bacteria, which cannot survive at DO concentrations above 1 mg/L.

Temperatures ranged from 19.5°C at Bat Cave, to 24.7°C at Mill Creek Sink. The anomalously cold water temperature reading at Bat Cave is probably due to cool winter season air pooling in the cave. Specific conductance ranged from 137 µS/cm at Mill Creek Sink to 540 µS/cm at Herzog Cave. Specific conductance and temperature values at Mill Creek Sink, taken by

lowering a sonde into the basin from the surface, were characteristic of surficial waters. It is likely that a recent rain before sample collection, as well as stratification in the basin, influenced the water conditions. Typically, water chemistry values from Mill Creek Sink are more indicative of the Floridian Aquifer water.

On the other hand, water samples for laboratory analysis from Mill Creek Sink that were collected at depth below a thermocline were mostly representative of water quality conditions we expect to see from the Floridan Aquifer. The only anomalous measurement was high suspended solids which may have been due to sediments dislodged during sample collection.

Laboratory analyses parameters (See Table 3) show results for nitrate-nitrite as N, TKN, Total N, ammonia, total phosphorus, ortho-phosphate, iron, sulfate, magnesium, sodium, fluoride, chloride and suspended solids.

Nitrate-nitrite (as N) is of special interest because of nutrient loading concerns and ranged from 0.30 mg/L at Poe Spring to highs of 2.39 mg/L and 2.74 mg/L at Jerome Sink and Trestle Spring. Except for Poe Spring, all other springs and sinks surveyed were above 0.35 mg/L, the maximum Florida numeric nitrate criterion for spring vents and the nitrate concentration-based Total Maximum Daily Load (TMDL) for the Santa Fe River.

RECOMMENDATIONS

This section makes recommendations for future studies aimed at filling information gaps in our understanding of Alachua County's troglobitic taxa. A broad understanding of a taxa's occurrence (range) and abundance, both within and beyond the county's boundaries, is essential for efforts aimed at conserving these unique biological resources. Critical to this understanding are the differences in the geologic/hydrogeologic makeup of the western and eastern portions of the county. The Cody Escarpment delineates a very rough north-south divide between these somewhat distinct areas, with the eastern portion's geologic structure heavily influenced by the presence of the Hawthorne Formation.

WESTERN ALACHUA COUNTY

All documented Alachua County groundwater sites harboring cave-adapted fauna are in the unmantled western part of the county. Here, the cavernous limestone is only covered by a veneer of unconsolidated sediments, mostly porous sand, allowing organic matter from the surface, which supports cave life, to freely enter the cave environment.

KES has performed biological inventories of groundwater sites in the western part of the county for both public and private clients. In addition to the sites visited in this report, past sites surveyed have included Squirrel Chimney Cave, Hog Sink Cave and Cherry Pits Cave. These reports may be the only detailed inventories of Alachua County troglobite sites, and as such constitute valuable baseline records. The county might consider redoing these surveys to track the health of its unique troglobitic resources, possibly on a decadal cycle.

Squirrel Chimney Cave Shrimp

The Squirrel Chimney Cave Shrimp (*Paleomonetes cummingi*) is known only from its type locality, Squirrel Chimney, a privately owned underwater cavern west of Gainesville. The shrimp is State and Federally listed as Threatened and as Critically Endangered by the International Union for Conservation of Nature. This is the only listed troglobitic species in Florida. The shrimp was first collected in 1953, and last seen in 1973. An extensive search by KES divers in 1992 failed to find the shrimp in Squirrel Chimney or in neighboring groundwater sites (Morris and Butt, 1992, and Doonan, T.J. 2001). The authors know of no efforts since then to find the shrimp. We recommend resurveying Squirrel Chimney Cave.

Swallets

Several swallets in the county are of biological interest but lack any current information concerning troglobitic resources. Swallets are suitable for trapping efforts because, unlike springs, the inflowing water at swallets carries the scent of bait to the target animals. A list of potential swallets for study follows herein.

Haile Sink is located north of Lake Kanapaha at the southwest end of Hogtown Prairie, where Hogtown Creek goes underground. The sink is 145 feet deep during low water conditions. Water leaves the sink through a series of thin vertical cracks on the SW wall and through small depressions in the sinkhole bottom. Trapping efforts at the cracks might prove successful during low water conditions when the sink is diveable. The nearest troglobite records are at Herzog Cave, 1.75 miles to the SSW.

An unnamed vertical shaft in Kanapaha Prairie about 950 feet SSW of the SW 92nd Street dead end is diveable and would be suitable for both a visual survey and trapping during low water conditions. The shaft is about 110 feet deep and ends in a small room. The sink is 4.5 miles south of Herzog Cave.

There is large unnamed swallet immediately NE of the SW 35th Terrace dead end with what appears to be pump infrastructure at the alluviated terminus. It is uncertain what methods would be required to trap this site.

There are several swallets in San Felasco Hammock Preserve State Park, in the transition zone between mantled and unmantled karst, including Lee Sink, Big Otter Sink (Mooses' Echo) and the terminus of Blues Creek, that may be suitable for trapping. A KES dye trace has confirmed a hydraulic connection between Lee Sink and Hornsby Spring (Butt, et.al. 2006).

The small swallets at the bottom of the Devil's Millhopper may also be suitable for trapping.

EASTERN ALACHUA COUNTY

In contrast to the western part of the county, the aquifer in the eastern part of the county is covered with a thick mantle of unconsolidated sediments, including the Hawthorne Formation, that restrict the movement of organic matter into the underlying aquifer. However, inputs from the surface are not always necessary for cave animal inhabitation. In the Edwards/Trinity Aquifer of Texas, the deep aquifer habitat has been sampled through municipal water supply wells, some over 1500 feet deep, and has revealed a diverse troglobitic community. There is no evidence that food is inputted from the surface, making it a near certainty that this community is powered by chemosynthetic bacteria.

There is certainly a chance that chemosynthetic based troglobitic associations might exist in the county's mantled karst. Well logs, transmissivity measurements, and infrequent sinkholes, such as Lake Mize in the Austin Cary Forest, attest to the cavernous nature of the Floridan Aquifer in the eastern part of the county. The caves exist. Furthermore, bacterial associations are common in many Florida aquifer caves, and deep supply wells are often troubled by bacteria. The necessary elements for cave life seem be present.

Several discoveries of troglobitic organisms have been made from water supply wells in Florida and southern Georgia, albeit in unmantled karst. Admittedly, there have been no records to date of troglobites being recovered from wells in eastern Alachua County, but cave crayfish have been recovered from one well in heavily mantled karst in nearby Putnam County.

The absence of direct access to the mantled aquifer environment restricts the investigation of this potential habitat to wells, which can be sampled for organisms in several ways. Cameras can be lowered downhole for visual surveys, a technique commonly used by geologists for subsurface studies; occasionally they see cave animals in their boreholes. Traps can also be lowered downhole if the borehole conditions are suitable, and nets can be placed at discharge pipes. The latter technique is used successfully in studies of the Edwards/Trinity Aquifer. Furthermore, well water can be analyzed for eDNA (environmental DNA). eDNA is DNA that is released

from an organism, and sources include feces, mucous, gametes, and shed skin. eDNA provides an alternative survey technique for subterranean species in habitats that are difficult to access.

The authors have identified Magnesia Springs, a private spring located between Gainesville and Hawthorne, as a possible site for a well survey. Magnesia Springs has at least one flowing artesian well that penetrates the mantle sediments and vigorously discharges what appears to be clear Floridan Aquifer water. Additionally, the discharge is not tainted by hydrogen sulfide, a naturally occurring chemical that lowers the chances of finding cave-adapted fauna. The pipes may be large enough for small traps, but the strong flow in the pipes may be problematic. Capturing discharged items in netting may be the appropriate survey method here**.**

Other eastern Alachua County wells suitable for trapping, camera monitoring, or netting might include municipal supply wells and groundwater monitoring wells. Wells suitable for eDNA surveys need to be in frequent use, as eDNA degrades within one to three weeks of release. Wells between Alachua Sink in Paynes Prairie and the Murphy Wellfield would be of particular interest, as a review of potentiometric maps suggests water entering the sink may flow under mantled aquifer and move towards the wellfield. This could give rise to a unique situation where a mantled aquifer environment is well supplied with surface derived organic inputs.

PROTECTED STATUS

The Squirrel Chimney Cave Shrimp is the only listed troglobitic species in Alachua County. The shrimp is State and Federally listed as Threatened and as Critically Endangered by the International Union of Conservation of Nature. The Florida Committee on Rare and Endangered Plants and Animals (Franz, 1982) suggested that several other troglobitic taxa occurring in Alachua County be listed as Species of Special Concern, including the Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*), the Pallid Cave Crayfish (*Procambarus pallidus*), the Florida Cave Amphipod (*Crangonyx grandimanus*), Hobbs' Cave Amphipod (*Crangonyx hobbsi*), and Hobbs' Cave Isopod (*Caecidotea hobbsi*). The Species of Special Concern category includes taxa that are not considered Endangered, Threatened or Rare yet warrant special attention.

SITE SPECIFIC THREATS

Until recently, the authors considered Mill Creek Sink to be the most threatened groundwater site in Alachua County due to runoff from the developed area around the Hwy 441/I-75 intersection. However, this threat has been at least somewhat mitigated by the construction of an integrated stormwater retention basin system. In general, swallets may be at higher risk for pollution incidents than springs or isolated sinkholes.

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APPENDIX I

PHOTOGRAPHIC LOG

Photo 1. Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*). Photo courtesy of Drew Fulton

Photo 2. Pallid Cave Crayfish (*Procambarus pallidus*). Photo courtesy of Drew Fulton

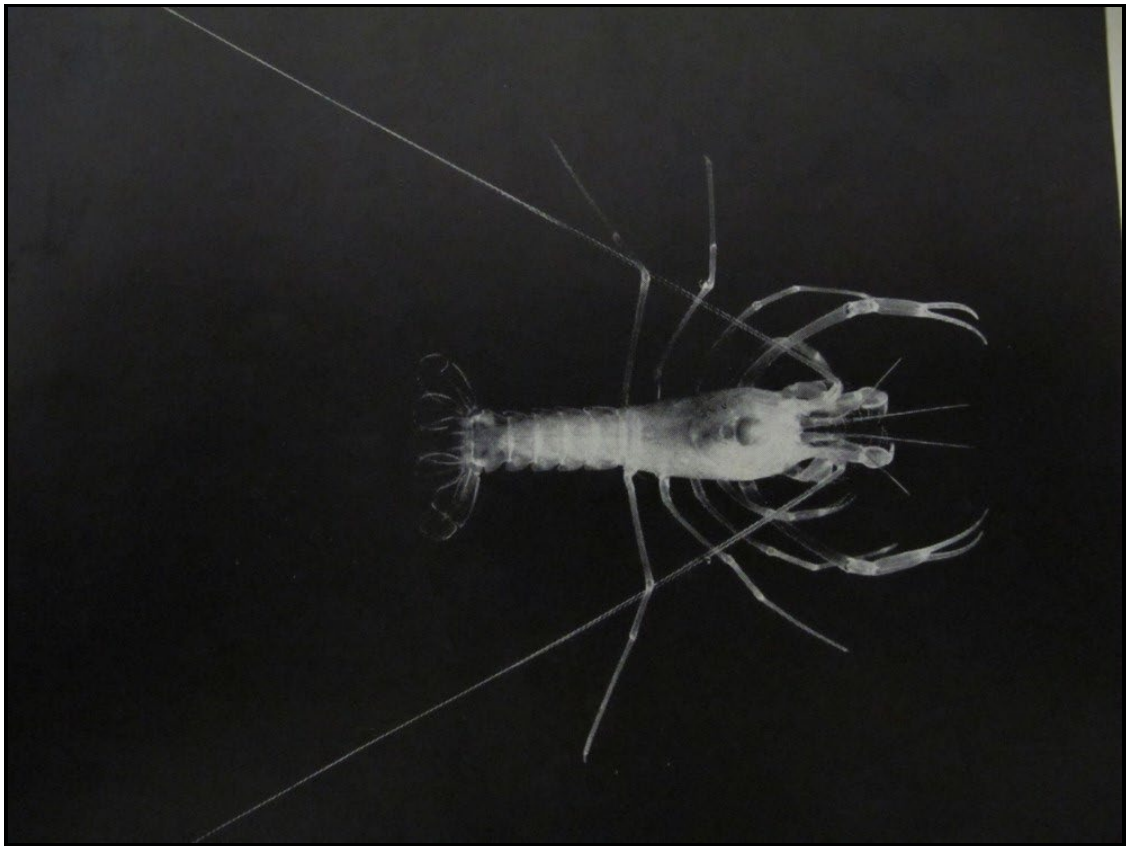

Photo 3. Northern Spider Cave Crayfish (*Troglocambarus maclenei*). Photo from Hobbs, 1942.

Photo 4. Peninsula Crayfish (*Procambarus paeninsulani*). This surface form crayfish is common throughout the study area. Photo courtesy of Drew Fulton.

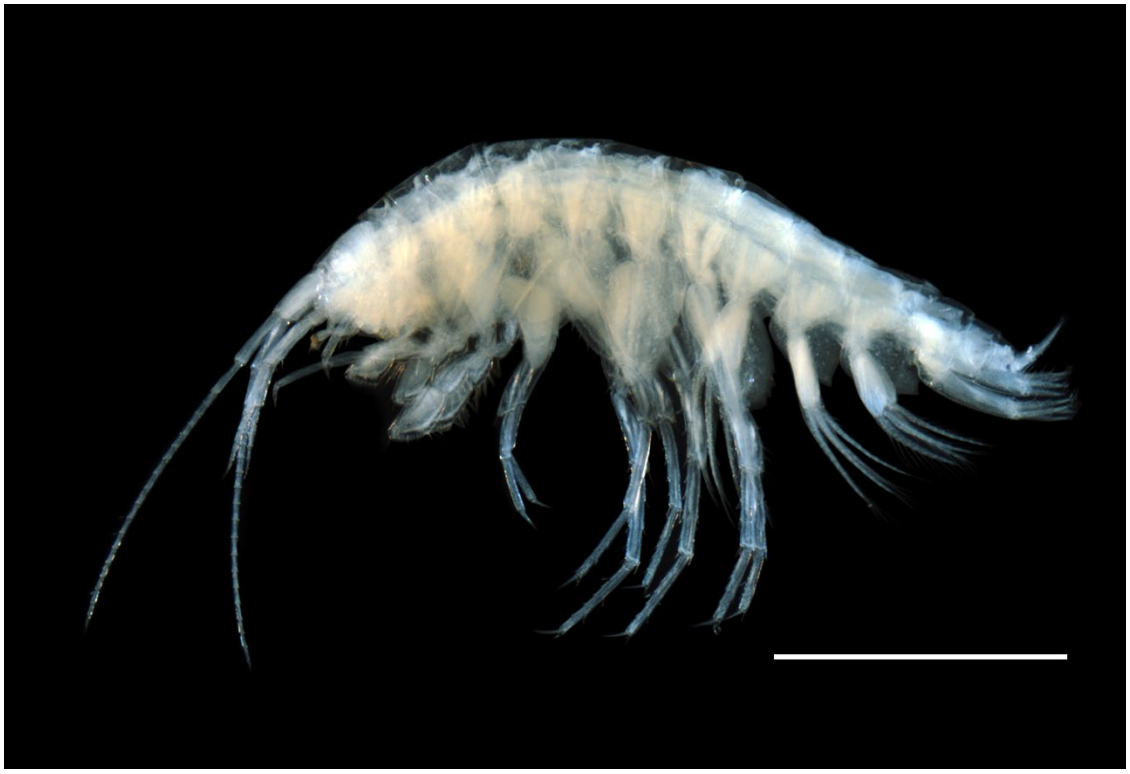

Photo 5. Example of Cave-adapted Amphipod, *Crangonyx species* (typically *C. hobbsi* or *C. grandimanus*). Photo courtesy of Thomas Sawicky, Ph.D., Florida A&M University.

Photo 6. Example of Cave-adapted Isopod, *Caecidotea* species, (typically *Caecidotea hobbsi*). Photo courtesy of Thomas Sawicky, Ph.D., Florida A&M University.

Photo 7. Boulware Spring House; the spring pool is the walled enclosure to its right of the spring house.

Photo 8. Boulware Spring head pool; the spring vent is to the left at the base of the wall opposite the intake pipe.

Photo 9. Glen Spring; view from the head pool looking downstream towards the outlet.

Photo 10. Glen Spring; view of head pool showing discharge at divider wall.

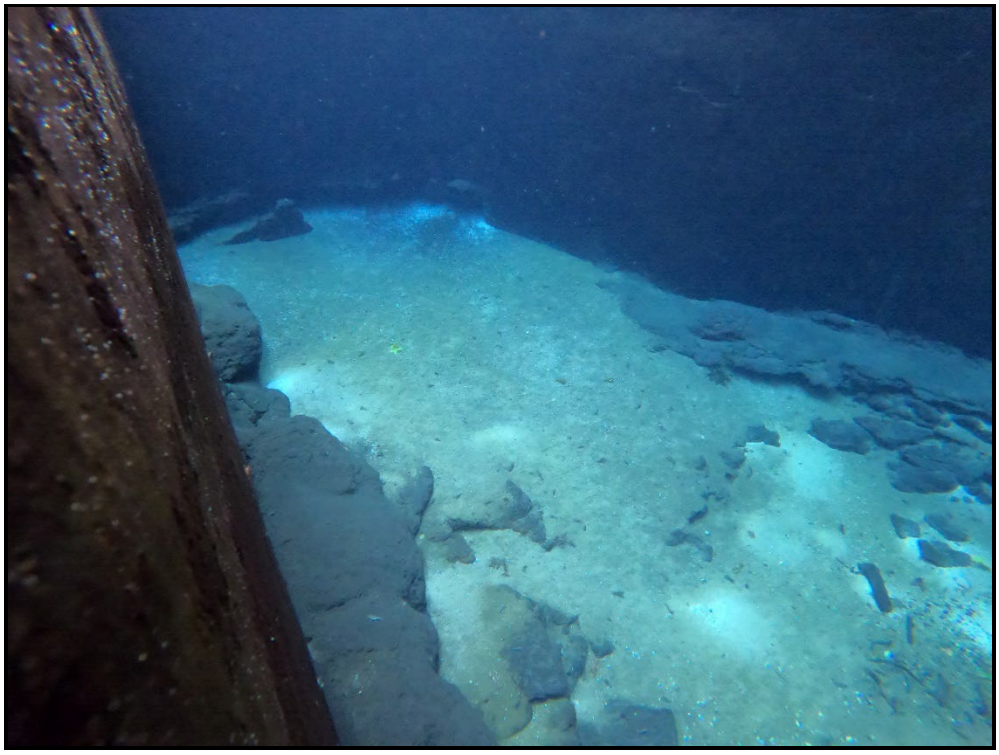

Photo 11. Glen Spring; underwater view looking upstream at head pool bottom. Scattered small dark objects are crayfish.

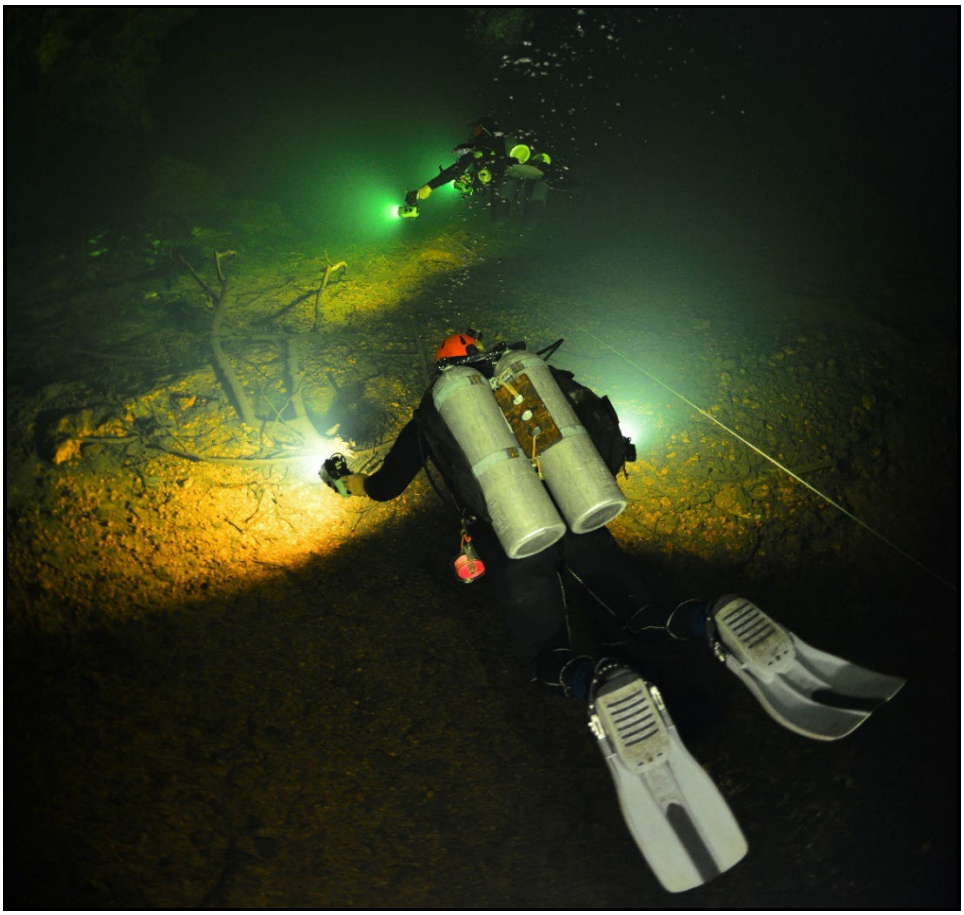

Photo 12. Hornsby Spring; debris on cave floor near entrance.

Photo 13. Hornsby Spring; main cave showing large passage dimensions.

Photo 14. Hornsby Spring; Pallid Cave Crayfish (*Procambarus pallidus*) (video screengrab).

Photo 15. Poe Spring; one of several vents visually searched during the survey (video screengrab).

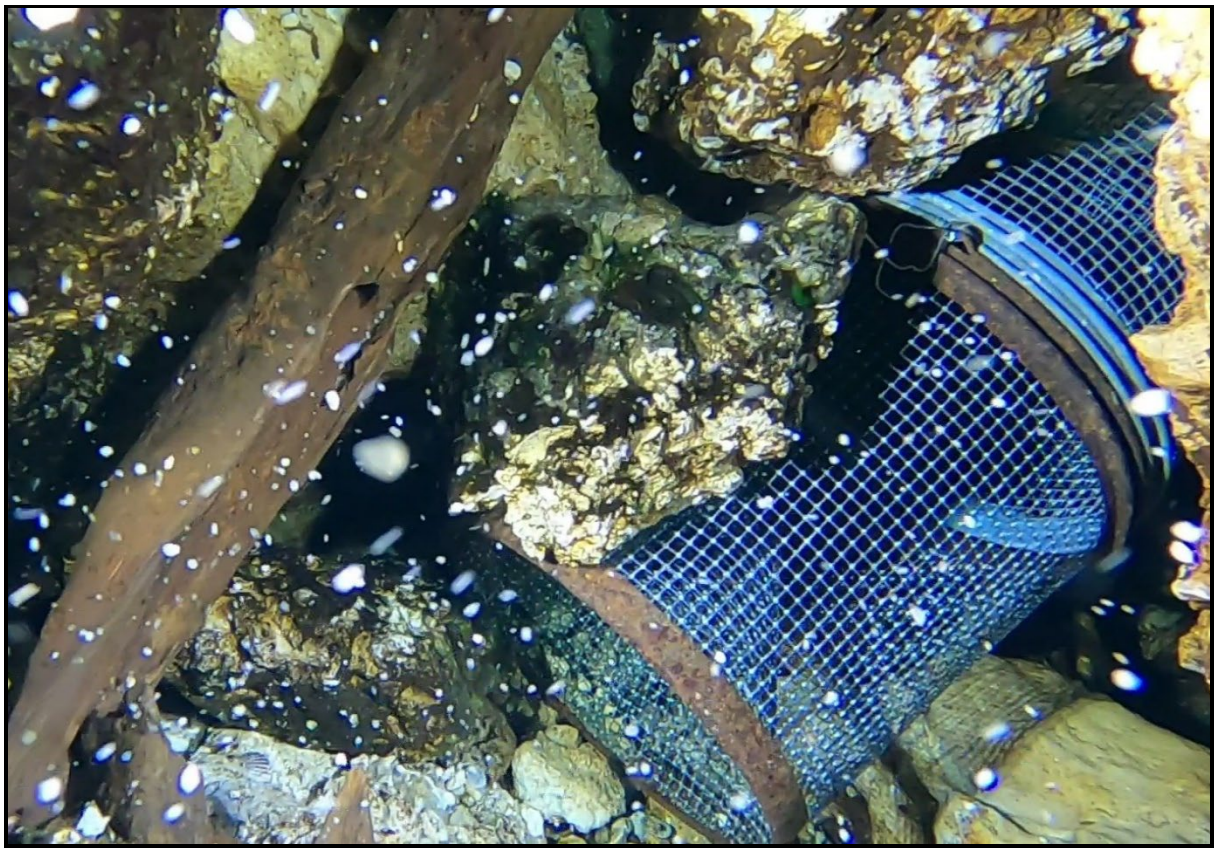

Photo 16. Poe Spring; crayfish trap installed in one of the main deep vents (video screengrab)..

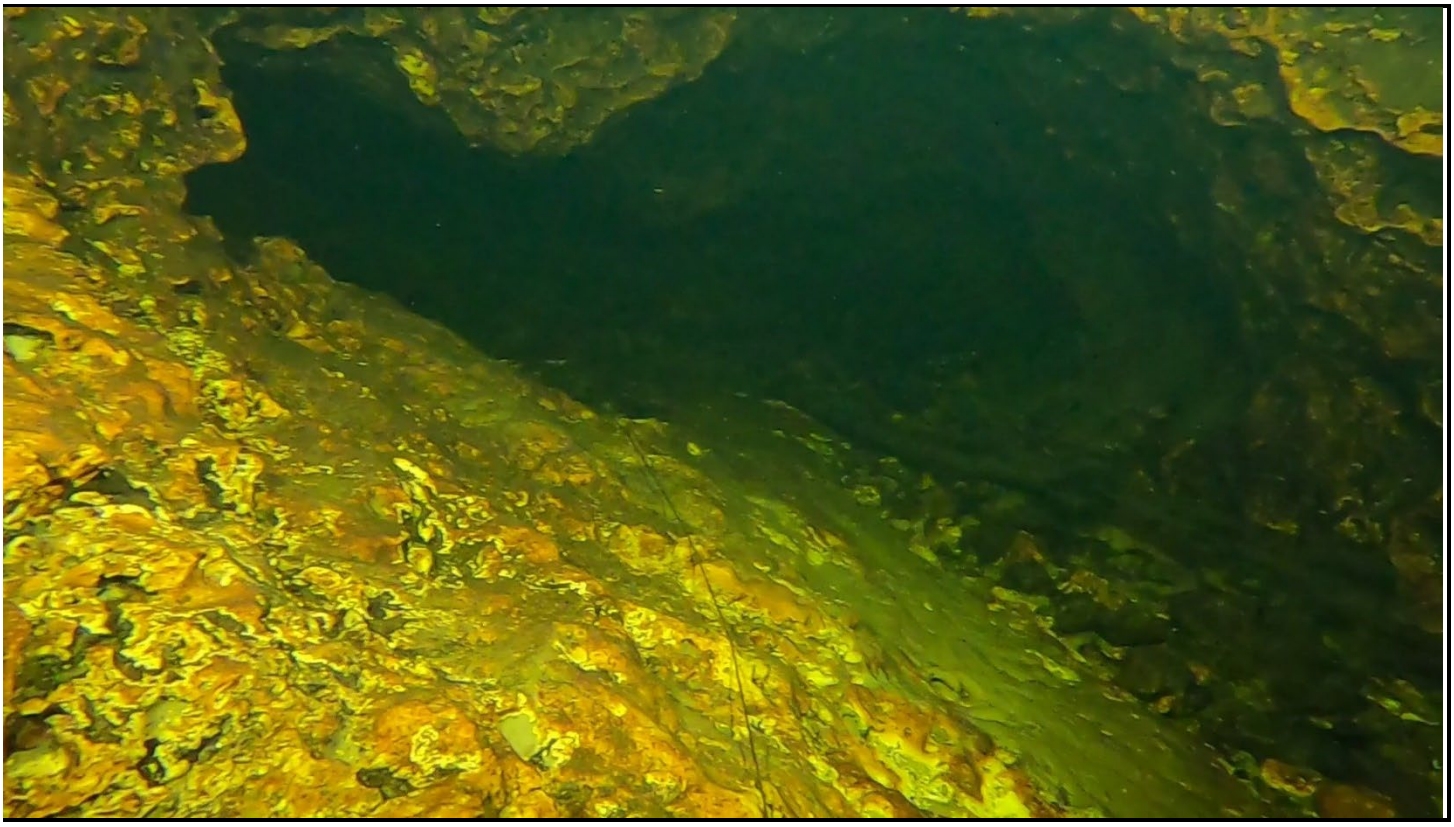

Photo 17. Trestle Spring; view into the entrance of the cave (video screengrab).

Photo 18. Trestle Spring; detritus accumulation observed sporadically throughout the portion of cave surveyed (video screengrab).

Photo 19. Backyard Sink surface pool.

Photo 20. Backyard Sink; silt ridge below edge of ledge, indicting very low or no flow conditions in the cave (video screengrab).

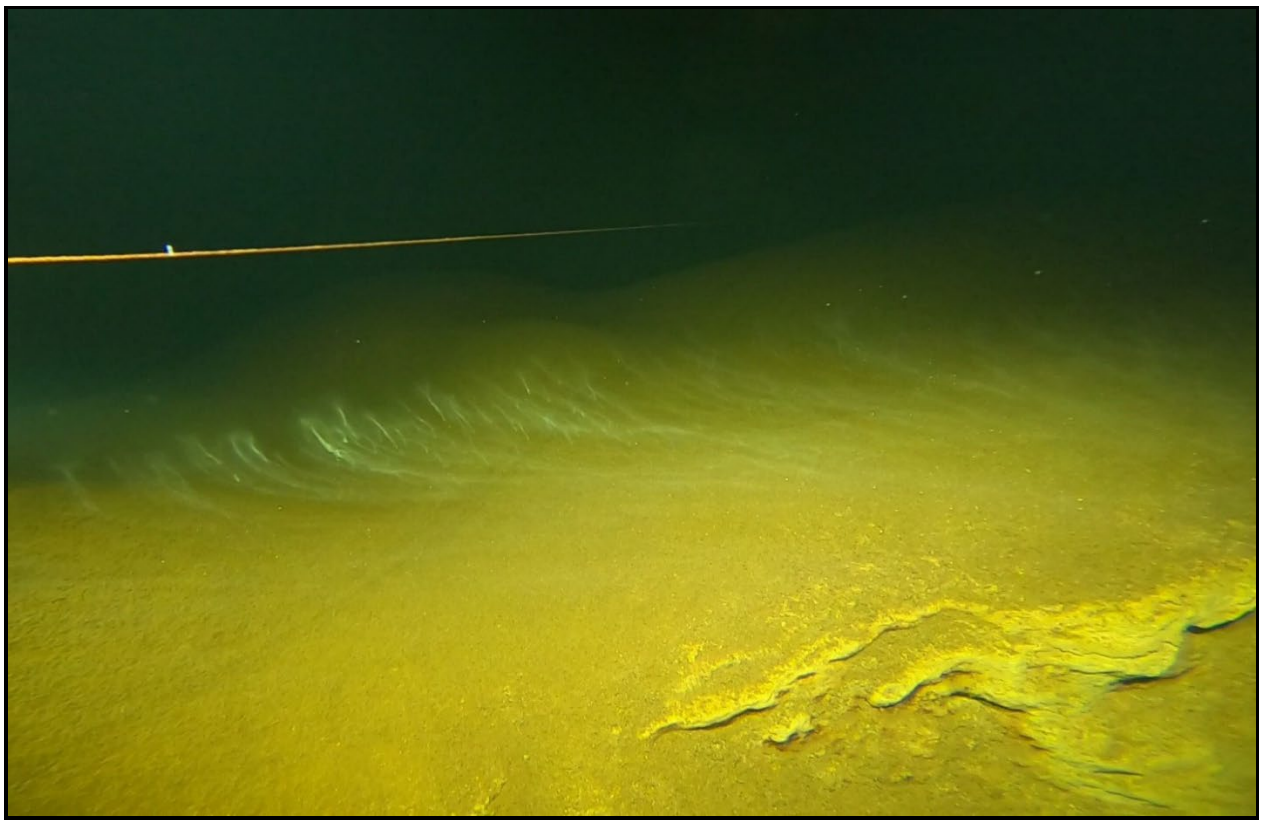

Photo 21. Backyard Sink; water column stratification of probable sulfide-oxidizing bacteria, indicative of low oxygen concentrations (video screengrab).

Photo 22. Backyard Sink; Pallid Cave Crayfish (*Procambarus pallidus*) surrounded by amphipods. Note stippling on soft sediments from crayfish activity (video screengrab).

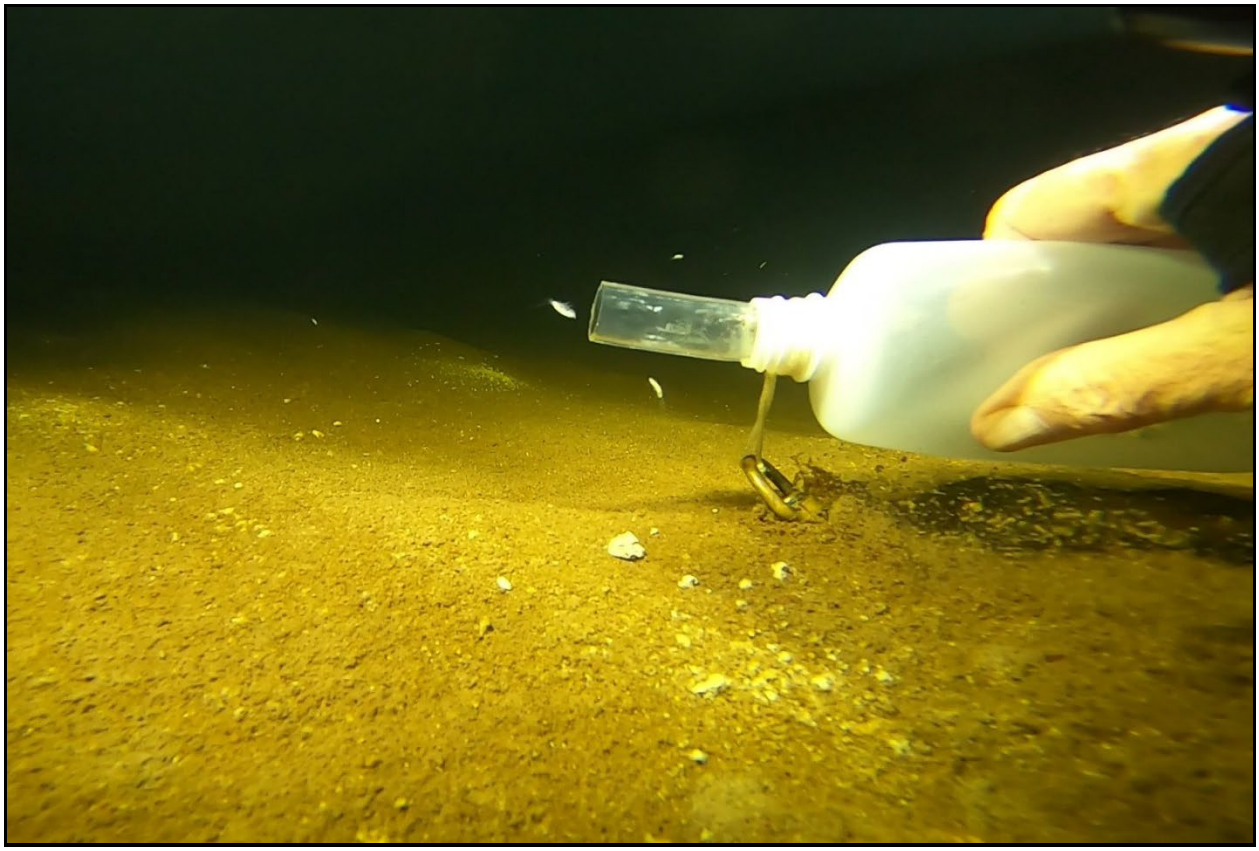

Photo 23. Backyard Sink; collection of amphipods with Sket bottle (video screengrab).

Photo 24. Backyard Sink; isopod suspended in water column above debris (video screengrab).

Photo 25. Bat Cave; view of the Lake Room pool from the Entrance Room.

Photo 26. Bat Cave; calcite raft forming on water surface in flooded passage southwest of the Entrance Room.

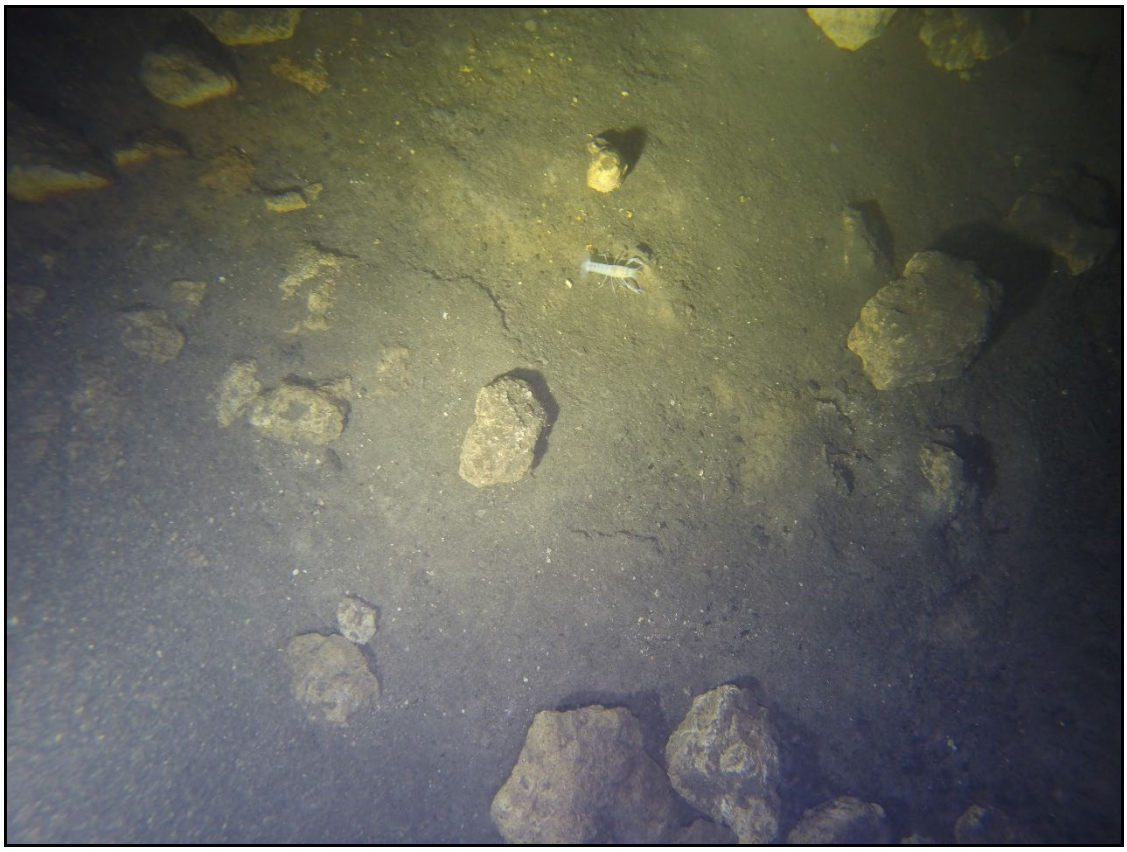

Photo 27. Bat Cave; Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*).

Photo 28. Bat Cave; Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*).

Photo 29. Bat Cave; Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*).

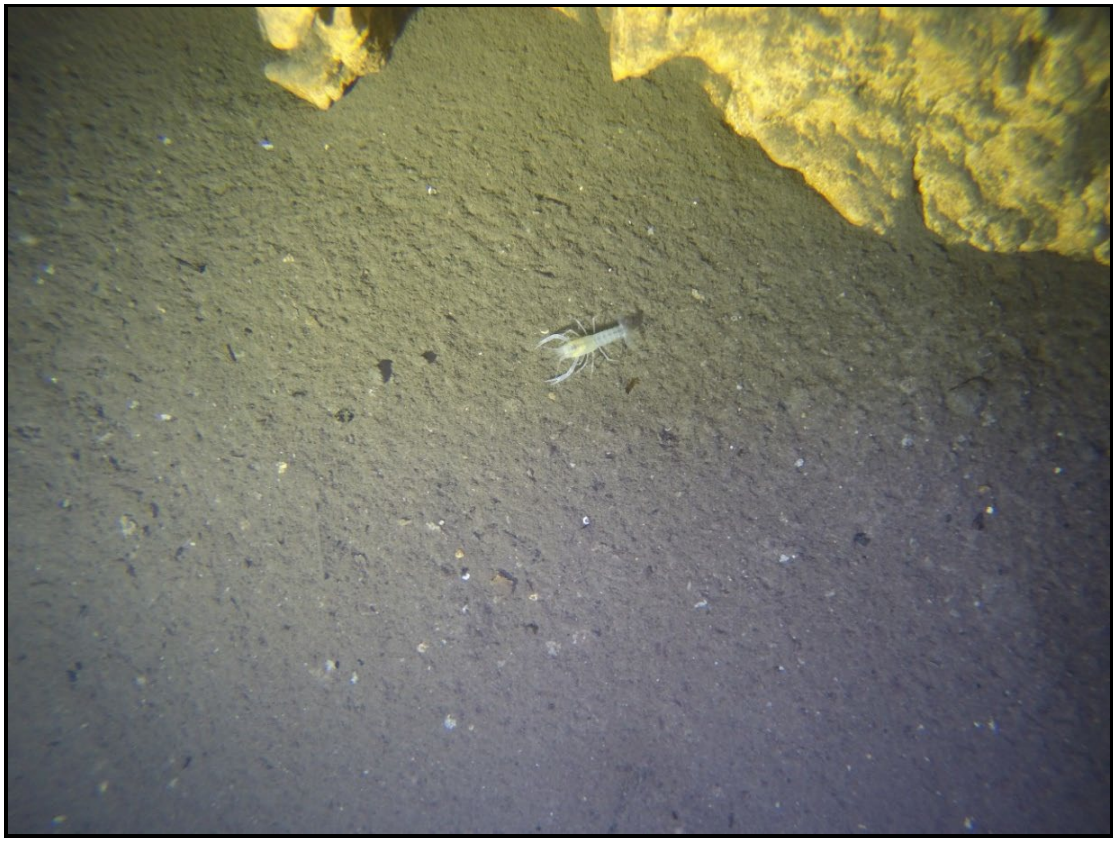

Photo 30. Bat Cave; Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*).

Photo 31. Braddock Sink; diver preparing to enter the cave via the eastern pool at bottom of sink.

Photo 32. Braddock Sink; *Procambarus pallidus* on debris cone below cave entrance.

Photo 33. Herzog Cave; looking up from water surface to entrance gate (video screengrab).

Photo 34. Herzog Cave; View of underground lake surface directly below entrance gate (video screengrab).

Photo 35. Herzog Cave; Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*). Note stipling on soft sediments from crayfish activity (video screengrab).

Photo 36. Herzog Cave; Pallid Cave Crayfish (*Procambarus pallidus*) observed directly below entrance gate (video screengrab).

Photo 37. Jerome Sink; view of pool at bottom of sink.

Photo 38. Jerome Sink; view towards entrance from a depth of about 35 feet deep in the cave (video screengrab).

Photo 39. Jerome Sink; silt-covered breakdown common on the floor of the cave (video screengrab).

Photo 40. Jerome Sink; goethite formations on the floor in the back of the cave (video screengrab).

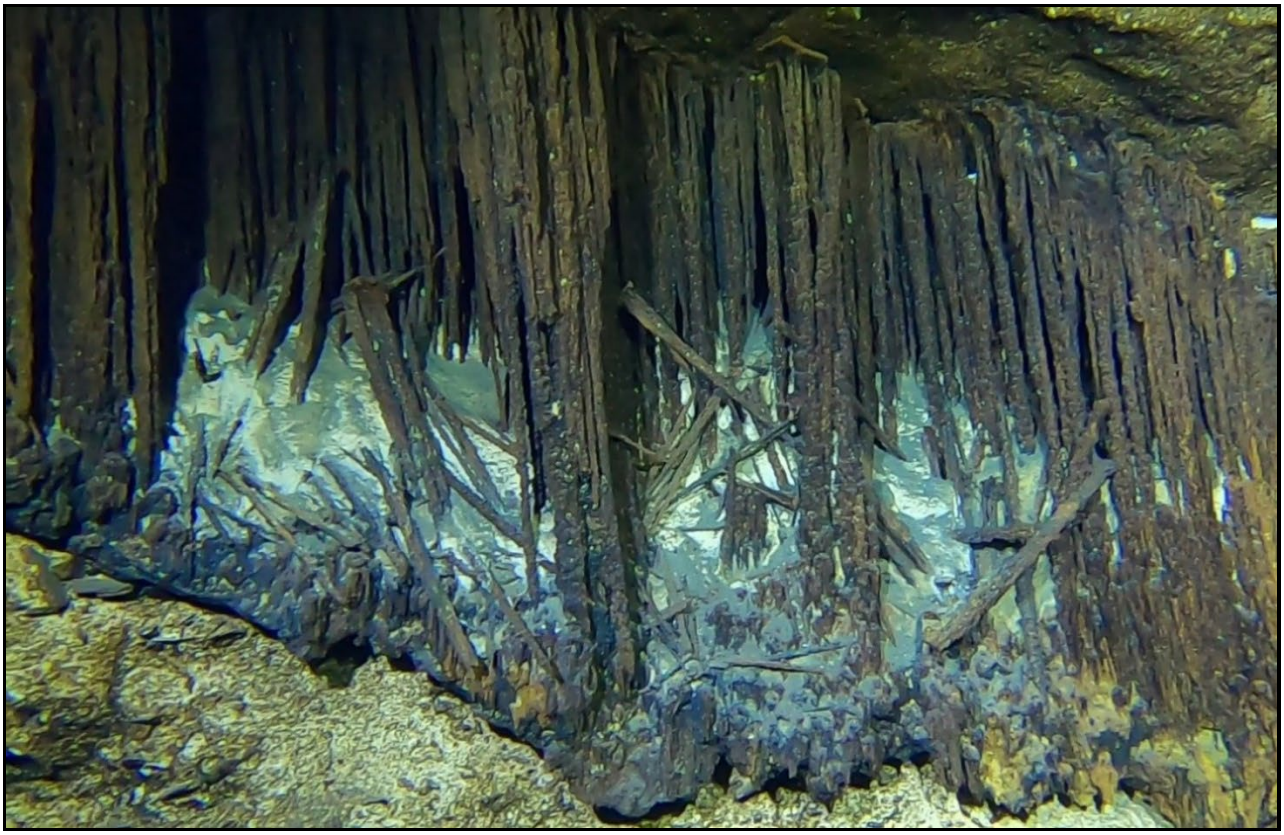

Photo 41. Jerome Sink; vertical goethite formations attached to the ceiling along the wall of the back of the cave (video screengrab).

Photo 42. Jerome Sink; Alachua Light-Fleeing Cave Crayfish (*Procambarus lucifugus alachua*). Note stipling on soft sediments from crayfish activity (video screengrab).

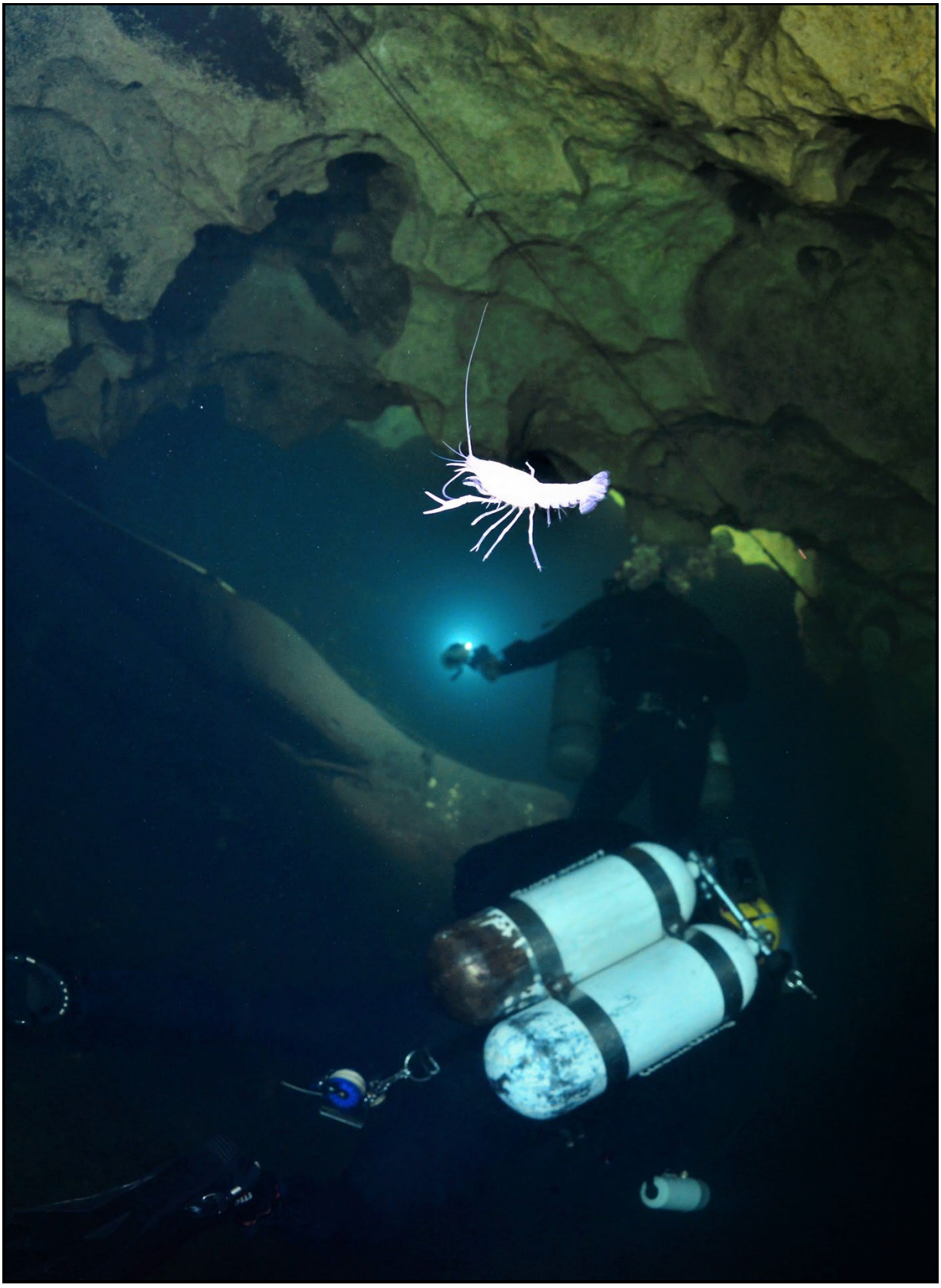

Photo 43. Mill Creek Sink; *Procambarus pallidus* 'parachuting' from cave ceiling.

Photo 44. Mill Creek Sink; survey team on slope of main passage.

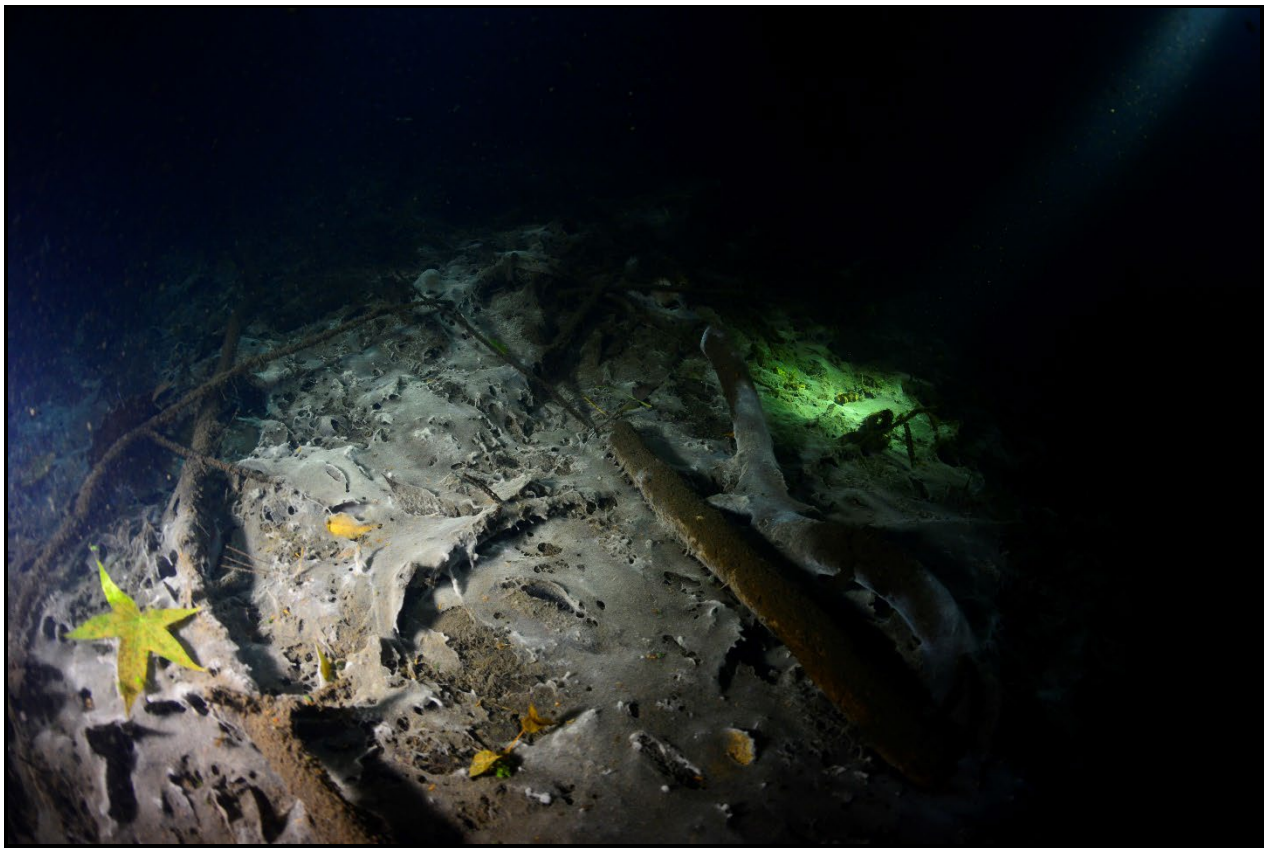

Photo 45. Mill Creek Sink; bacterial growth on detritus in sink basin just under entrance overhang.

APPENDIX II

SURVEY SITE WATER QUALITY DATA

Table 2. Water Quality Field Readings.

Table 3. Water Quality Laboratory Analysis.
(From AEL Environmental, Inc. Analytical Reports.)

Baseline Troglobitic Survey and Inventory of Selected Sites; Alachua County, Florida, May – June 2022								
By Karst Environmental Services, Inc., for Alachua County Environmental Protection Department								
Table 2. Water Quality Field Readings.								
Data for this table provided by ACEPD.								
	Sample Date	**Site Control**	**YSI Pro Series Field Readings**					
Parameter			Temperature °C	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (µS/cm)	pH (SU)	
Spring Name:								
Boulware Spring	May 19 + 20, 2022	Muni. Gvmt.	22.6	1.67	19.4	475	7.14	(May 11, 2022)
Glen Spring	May 12, 2022	Private	22.8	2.82	32.6	384	7.01	
Hornsby Spring	July 13, 2022	Private Park	22.6	0.31	3.6	445	6.9	SRWMD Data
Poe Spring	June 7,2022	County Gvmt.	22.5	4.16	48	443	7.05	SRWMD Data
Trestle Spring	May 24, 2022	Private	22.2	0.43	3.8	447	7.37	
Sink/Cave Name:								
Backyard Sink	June 2, 2022	Private	22.1	0.23	2.7	455	7.23	
Bat Cave	Nov. 23, 2022	NGO	19.5	8.16	89.3	407	7.98	
Bobika Sink	Jan. 20, 2023	Private	20.9	0.48	5.5	416	7.32	
Braddock Sink	May 10, 2022	Private	-	-	-	-	-	
Herzog Cave	May 25, 2022	NGO	20.9	5.12	57.4	540	7.19	
Hornsby Sink	June 27, 2022	Private Park	-	-	-	-	-	
Jerome Sink	Nov. 23, 2022	Private	22.8	2.69	31.3	414	7.43	
Mill Creek Sink	August 9, 2022	NGO	24.7	0.38	4.6	137	6.85	

Baseline Troglobitic Survey and Inventory of Selected Sites; Alachua County, Florida, May – June 2022

By Karst Environmental Services, Inc., for Alachua County Environmental Protection Department

Table 3. Water Quality Laboratory Analysis.

Data for this table provided by ACEPD. Analyses performed by AEL Environmental, Inc., Gainesville, FL.

	Sample Date	**Water Quality Analysis**												
		Metals			**Nutrients**									
Parameter		Iron	Magnesium	Sodium	Total Nitrogen	Total Kjeldahl Nitrogen	Ammonia	Nitrate+ Nitrite	Total Phosphorus	Ortho-phosphate	Chloride	Fluoride	Sulfate	Total Suspended Solids
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Spring Name:														
Boulware Spring	May 19 + 20, 2022	0.098**	21	11	1.27	0.244**	0.2	1.03	0.065	0.066	8.8**	0.10*	34	2.0*
Glen Spring	May 12, 2022	0.0067*	16	9.8	1.53	0.20*	0.04	0.043	0.335	0.389	20	0.28	16	2.0*
Hornsby Spring	June 27,2022	0.0067*	7.2	7.7	0.73	0.20*	0.1	0.73	0.068	0.084	-	-	-	2.0*
Poe Spring	June 27,2022	0.0067	5.5	6.6	0.3	0.20*	0.02*	0.300**	0.068	0.083	-	-	-	2.0*
Trestle Spring	May 24, 2022	0.013**	6.5	7.3	2.97	0.230**	0.02*	2.74	0.1	0.079	9.9**	0.16**	29	2.0*
Sink/Cave Name:														
Backyard Sink	June 2, 2022	0.13	2.9	5.3	1.4	0.55	0.07	0.84	0.176	0.101	8.9**	0.10**	16	8
Bat Cave	Not Sampled	-	-	-	-	-	-	-	-	-	-	-	-	-
Bobika Sink	Not Sampled	-	-	-	-	-	-	-	-	-	-	-	-	-
Braddock Sink	May 10, 2022	0.0067*	5.5	6.2	0.714	0.224**	0.06	0.49	0.068	-	8.7**	0.11**	9.8*	2.0*
Herzog Cave	May 25, 2022	0.037**	1.7	5	0.564	0.344**	0.04	0.220**	0.174	0.129	9.1**	0.10*	6.3**	2.0*
Hornsby Sink	Not Sampled	-	-	-	-	-	-	-	-	-	-	-	-	-
Jerome Sink	May 12, 2022	0.0067*	6.2	3.2	2.67	0.284*	0.02*	2.39	0.026	0.041	5.5*	0.10*	13	2.0*
Mill Creek Sink	August 9, 2022	0.42	2.5	3.3	1.03	1.03	0.05	0.2*	0.525	0.342	5.6**	0.15**	2.9**	9

***Analysis was run and undetected, lowest detection value is reported.**

****Analysis was detected between the minimum detection value and the practical quantitation limit.**