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Fauna Observations at Phantom Lake Cave, Reeves County, Texas

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FAUNA OBSERVATIONS AT PHANTOM LAKE CAVE, REEVES COUNTY, TEXAS

Prepared for
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Abstract

Cave divers from Texas A&M University at Galveston, Texas Parks and Wildlife, and University of Texas Grotto met in Balmorhea, Reeves County, Texas to dive and sample in Phantom Lake Spring Cave from 13 to 17 March 2014. The purpose of the dives was to perform in-cave biological sampling, create species images, perform photomonitoring of root mats, and conduct familiarization dives. Biologists collected at least one new potential troglobite species, an ostracod, and made several other collections to assist a taxonomic and genetic research project on subterranean silverfish. Biologists created images of five spring species and five cave species. Comparing photos of root mats taken in 1999 vs 2014 shows water level declines of one meter, and that the root mats have not extended significantly to 'catch up' to the dropping water level. This could contribute to a loss of habitat for stygobitic species such as the rare *Lirceolus cocytus* isopod which is found nearly exclusively on root mats, as well has a change in the surface plant community.

Introduction

Mapping and exploration efforts in recent years have expanded the known length and depth of Phantom Lake Spring Cave (http://www.admfoundation.org/projects/phantom/phantomcave.html). Additionally, Veni (2013) reports on the hydrological connection of Phantom Lake Spring Cave to San Solomon Springs, based on a dye trace. Phantom Lake Spring Cave has five federally listed species at the spring pool just outside of the entrance to the cave. Table 1 summarizes these species, and images of each are contained in the Appendix.

Table 1. Federal Endangered Species List for Phantom Lake Spring Cave, Reeves County, Texas.

Species	Federal Status	Final listing rule
Fish		
Pecos Gambusia (*Gambusia nobilis*)	Endangered	35 FR 16047
Comanche Springs pupfish (*Cyprinodon elegans*)	Endangered	32 FR 4001
Invertebrates		
Phantom Springsnail (*Pyrgulopsis texana*)	Endangered	78 FR 41227
Phantom Tryonia (*Tryonia cheatumi*)	Endangered	78 FR 41227
Diminutive Amphipod (*Gammarus hyalleloides*)	Endangered	78 FR 41227

Methods

All sample collections occurred within the cave, and no animals were collected in the spring area where endangered species occur. On 14 March 2014, divers placed a drift net in a high flow area at the pull rope in the beginning of the downstream section of the cave, approximately 300 ft. from the entrance. The drift net was retrieved early in the morning of 16 March 2014.

Divers searched submerged roots, floors, and walls for aquatic species during three dives on 14 and 15 March 2014. Divers collected samples underwater by hand using a baster and small plastic centrifuge vial. Cavers searched mud, walls, roots, the undersides of rocks, and debris in the air-filled portions of the cave. These samples were placed into small plastic vials by hand on a single collecting trip on 15 March 2014. Biologists photographed (Appendix) and accessioned the material for deposition into the Texas Memorial Museum on 21 March 2014.

Divers included TAMUG participants: Dr. Thomas Iliffe, Terrence Tysall, Lindy Arbuckle, Jacque Cresswell, Victoria Zambrano, Jake Emmert, Vianne Euresti and Tyler Winkler. From Texas Parks and Wildlife Department: Chris Ledford. From Zara Environmental: Jean Krejca and James Brown. Bill Tucker provided assistance with the historic photograph.

Results

Photomonitoring of root mats show that the water levels have dropped approximately one meter since 1999. The distance the root mats hang from the ceiling is unchanged, and currently only a small portion of the original root mat extends beyond the water surface. Figure 1 shows the historic picture by Lori Bell and Bill Tucker, with markers for historic (upper arrow) and modern (lower arrow) water levels. The images in Figure 2 and Figure 3 were captured in March 2014.

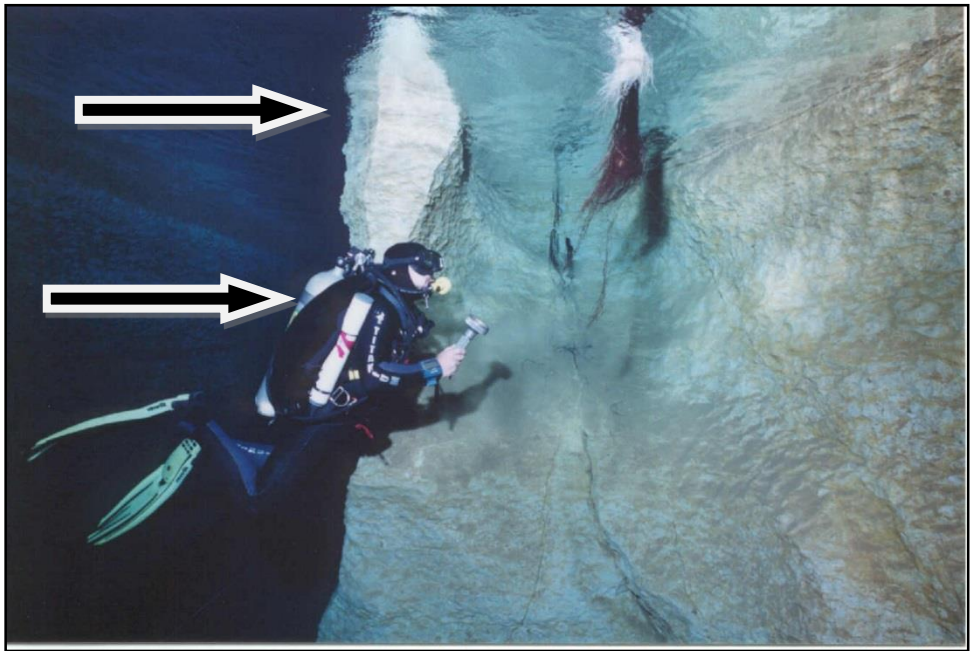


Figure 1. Lori Bell and Bill Tucker photo taken on 4 July 1999. Top arrow shows water level at that time; bottom arrow is 2014 water level.

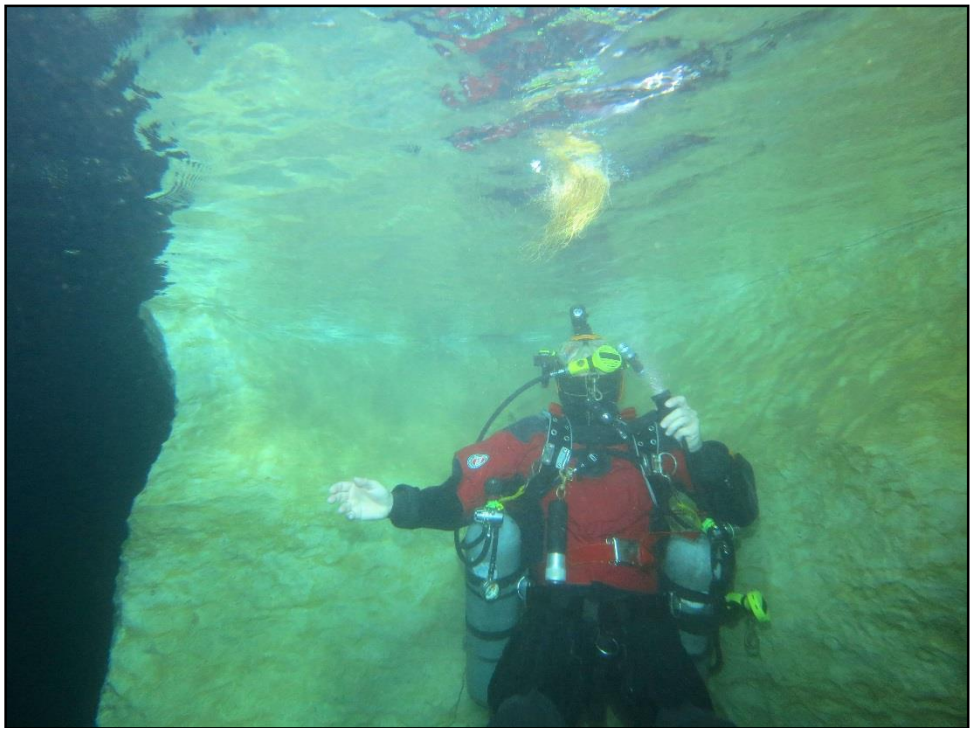


Figure 2. Jean Krejca photo from 2014 showing small portion of root mat in water.

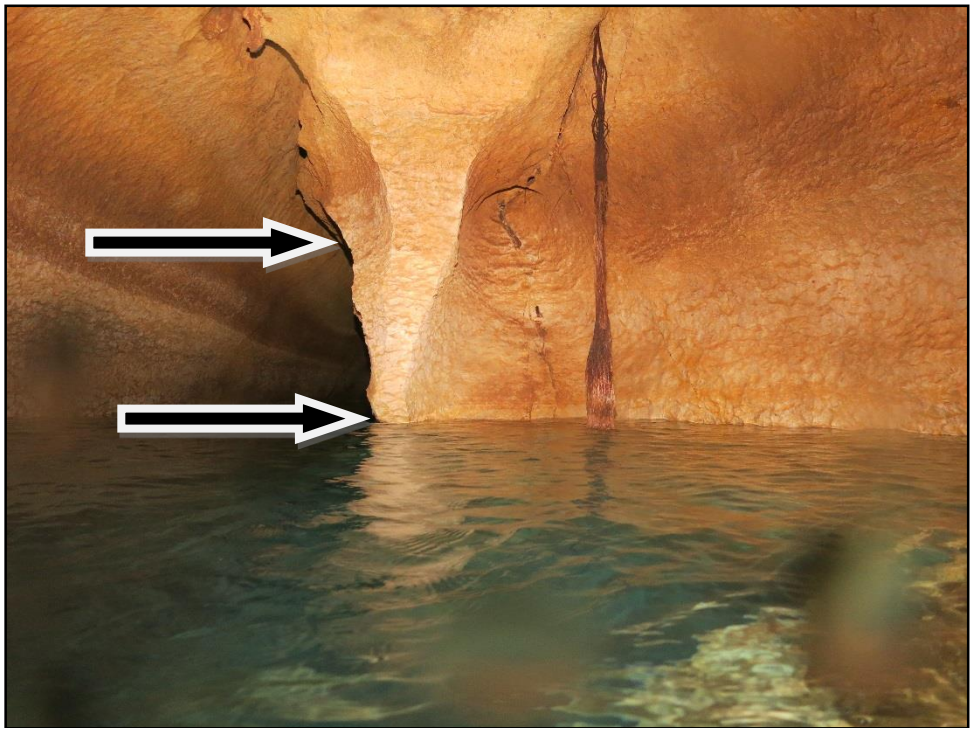


Figure 3. Jean Krejca photo from 2014. Top arrow shows water level in 1999, bottom arrow is current water level. Root mat hangs down from a crevice in the ceiling.

The species list for the interior of this cave, based on Texas Memorial Museum records, includes:

KINGDOM: ANIMALIA
PHYLUM: MOLLUSCA
CLASS: GASTROPODA
Undetermined material
Order: Sorbeoconcha
Family: Hydrobiidae
Cochliopa texana Pilsbry

PHYLUM: ARTHROPODA
SUPERCLASS: CRUSTACEA
CLASS: OSTRACODA
SUBCLASS: PODOCOPA
Order: Podocopida
Suborder: Metacopina
Undetermined material

CLASS: ISOPODA
Order: Isopoda
Suborder: Flabellifera
Family: Cirolanidae
Cirolanides texensis Benedict
Suborder: Asellota
Family: Asselidae
Lirceolus cocytus Lewis

SUPERCLASS: CHELICERATA
CLASS: ARACHNIDA
Order: Araneae (spiders)
Infraorder: Araneomorphae
Family: Nesticidae (cave spiders)
Eidmannella tuckeri Cokendolpher and Reddell
Order: Acarina (mites and ticks)
Undetermined material

The author's personal communications indicate that in addition to these taxa, an immature amphipod was collected from this cave, as well as eyeless *Cicurina* spiders.

Daily log:

14 March 2014: Jean Krejca, James Brown, 30 minutes, 23 feet depth. Travelled to room with roots, saw about 15 *Lirceolus cocytus* on one root mat. Turned dive due to hole in inflator hose.

14 March 2014: Jean Krejca, James Brown, 53 minutes, 65 feet depth. Travelled about 1200 ft. into cave. Saw 8 *Cirolanides texensis* on an old (said to have been in cave about 1 year) battery canister. Saw about 15 *Lirceolus cocytus* on one root mat.

14 March 2014: Had other dive team install a drift net at constriction near downstream passage.

15 March 2014: Jean Krejca, James Brown, 80 minutes, 63 feet depth. Travelled about 1600 ft. into cave. Did photography and video, looked for amphipods and found none.

16 March 2014: Jean Krejca pulled drift net out of downstream passage, collected some ostracod pieces from the drift net.

New collections from this effort include known unprotected species of which more material is needed for taxonomy. The list of these collections included:

Zara-8352:USA:TX:Reeves
Phantom Lake
Spring Cave
14-Mar-13
J.Krejca
Cirolanides texensis n = 2 95%

Zara-8353:USA:TX:Reeves
Phantom Lake
Spring Cave
15-Mar-13
J.Krejca
Texoreddellia n =2 95%

Zara-8354:USA:TX:Reeves
Phantom Lake
Spring Cave
15-Mar-13
J.Krejca
Brackenridgia n = 2 95%

Zara-8355:USA:TX:Reeves
Phantom Lake
Spring Cave
15-Mar-13
J.Krejca
Eidmanella n = 2 95%

Zara-8356:USA:TX:Reeves
Phantom Lake
Spring Cave
15-Mar-13
J.Krejca
Symphyla n = 1 95%

Zara-8357:USA:TX:Reeves
Phantom Lake
Spring Cave
15-Mar-13
J.Krejca
Ostracod shell fragments n = 4 95%

Sight records included one *Astyanax* fish, one turtle shell, and one giant water bug, Belostomatidae; images in Appendix.

Discussion

Biologists collected one new terrestrial invertebrate, a symphylan, during this collecting trip, and made three new site records for the cave (one *Astyanax* fish, one turtle shell, and one giant water bug, Belostomatidae). Material for genetic analysis of *Texoreddellia* was also collected and photo identification provided by James Reddell. Shell fragments of an ostracod may be identifiable and ultimately lead to a new record for that taxon from this important cave.

Biologists also documented water level declines of approximately one meter inside the cave. These water level declines are relevant in terms of the root mats that provide habitat for aquatic species, and for the spring species downstream.

Future work should include drift net sampling in more places in the cave, over longer periods, and with a finer mesh size in order to capture whole, intact ostracods as well as adult amphipods. Future work should also include more intensive sampling of the terrestrial fauna.

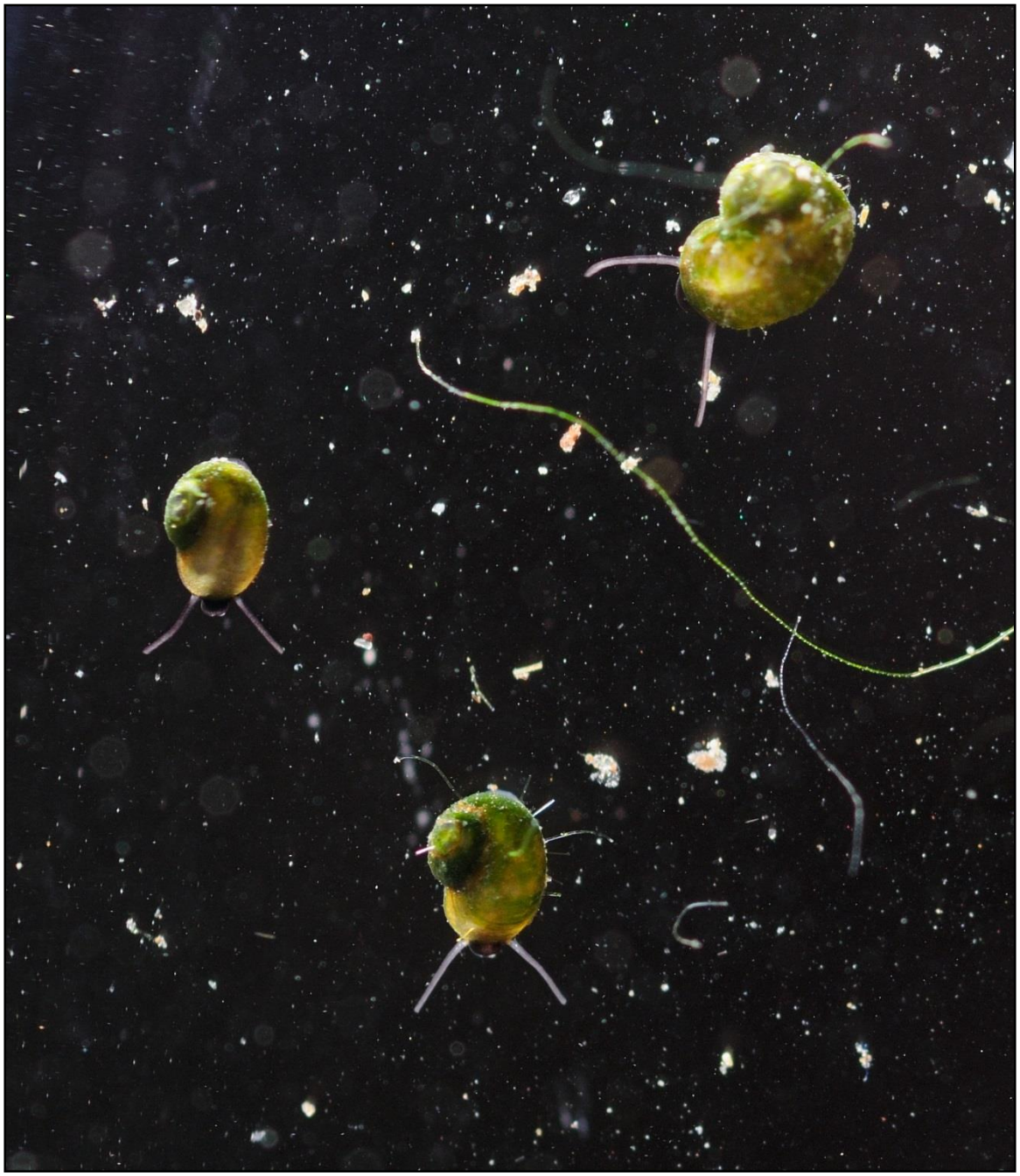
Jean Krejca 2 February 2015
USFWS Permit No. TE85077A-1

Literature Cited

Veni, G. 2013. Impact of climate change and human and ecological use of karst groundwater resources: a case study from the southwestern USA. Proceedings of the 20th National Cave and Karst Management Symposium pages 51-60.

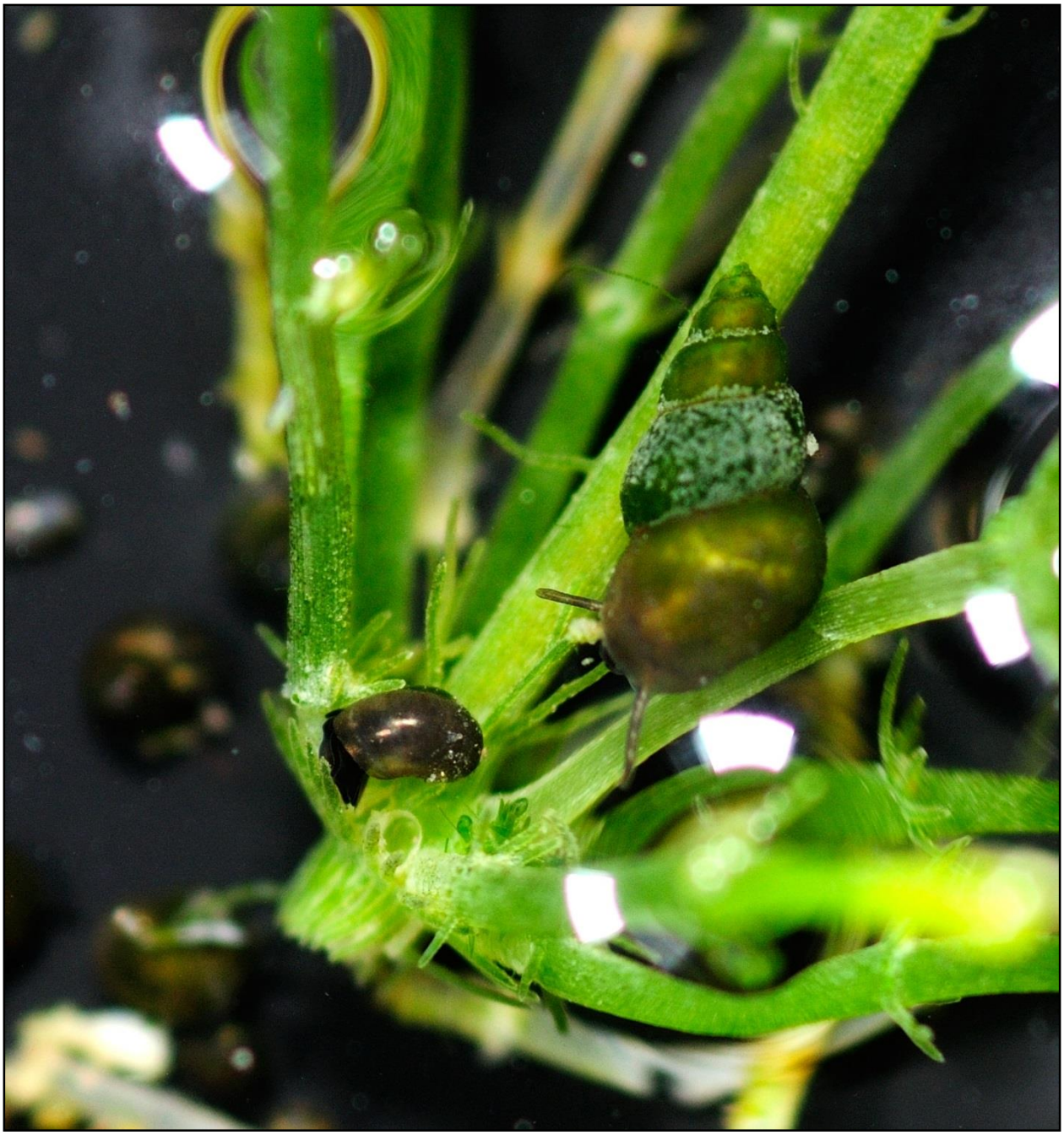
Appendix. Images collected from Phantom Lake Spring Cave, by Jean Krejca.

Cyprinodon elegans, Comanche Springs pupfish, on left, and males and females of *Gambusia nobilis*, Pecos Gambusia, on right.



Pyrgulopsis texana, Phantom Springsnail

Tryonia cheatumi, Phantom Tryonia.



Two snails shown together for scale. *Pyrgulopsis* on left, *Tryonia* on right.

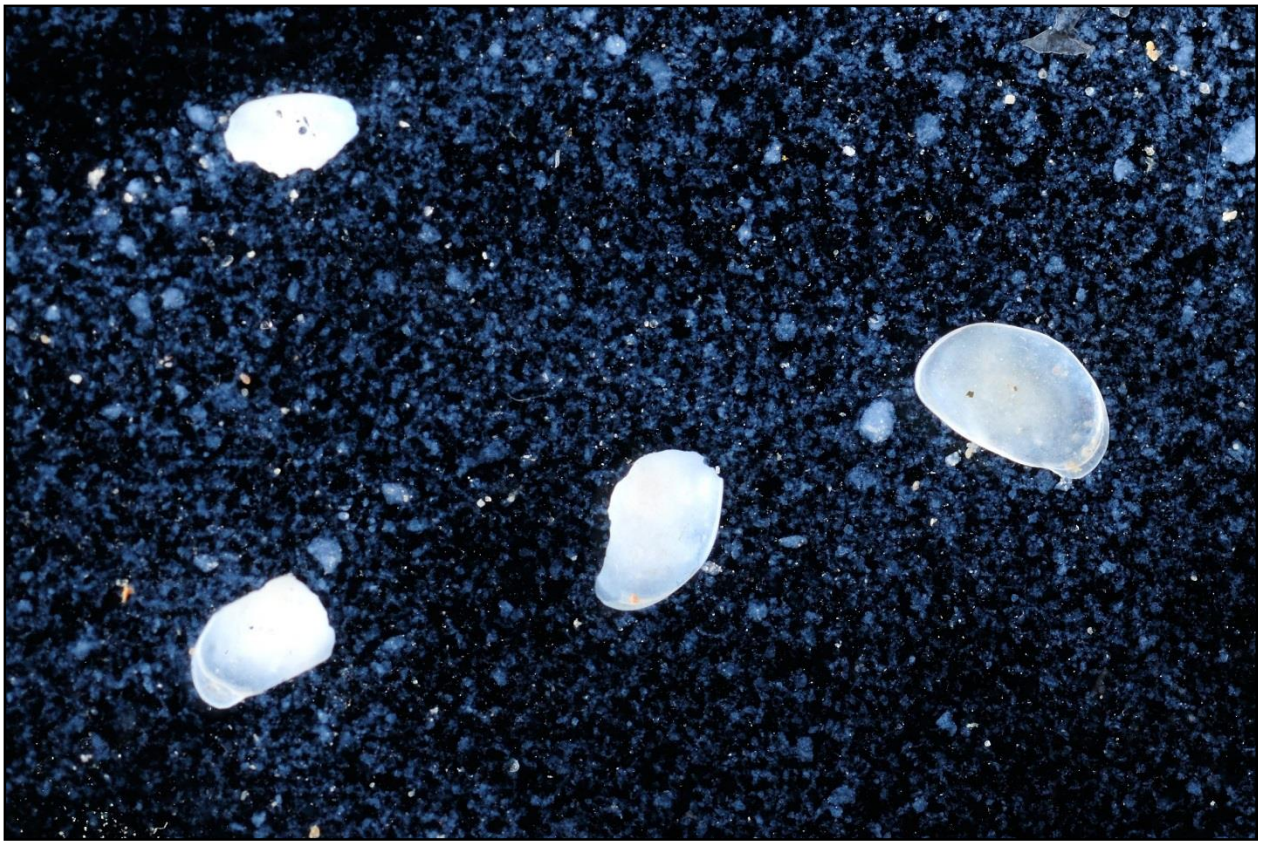
Gammarus hyalleloides, Diminutive Amphipod.

Isopod, *Cirolanides texensis*.

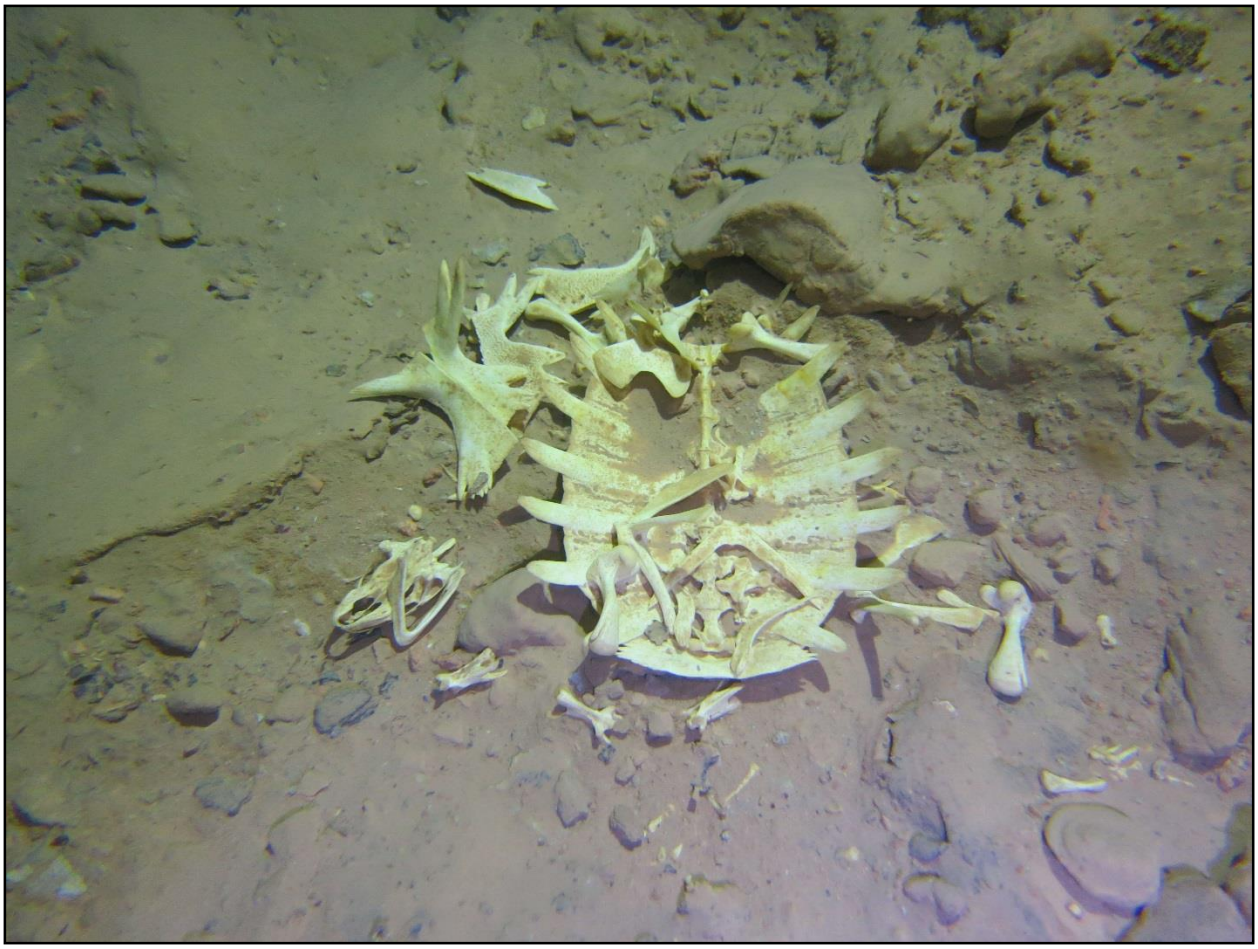
Isopod, *Lirceolus cocytus* shown on rootlet where they are nearly always found.

Silverfish, *Texoreddellia capitesquameo*, Espinasa and Giribet. This species is endemic to Phantom Lake Cave.

Spider, *Eidmannella tuckeri.*

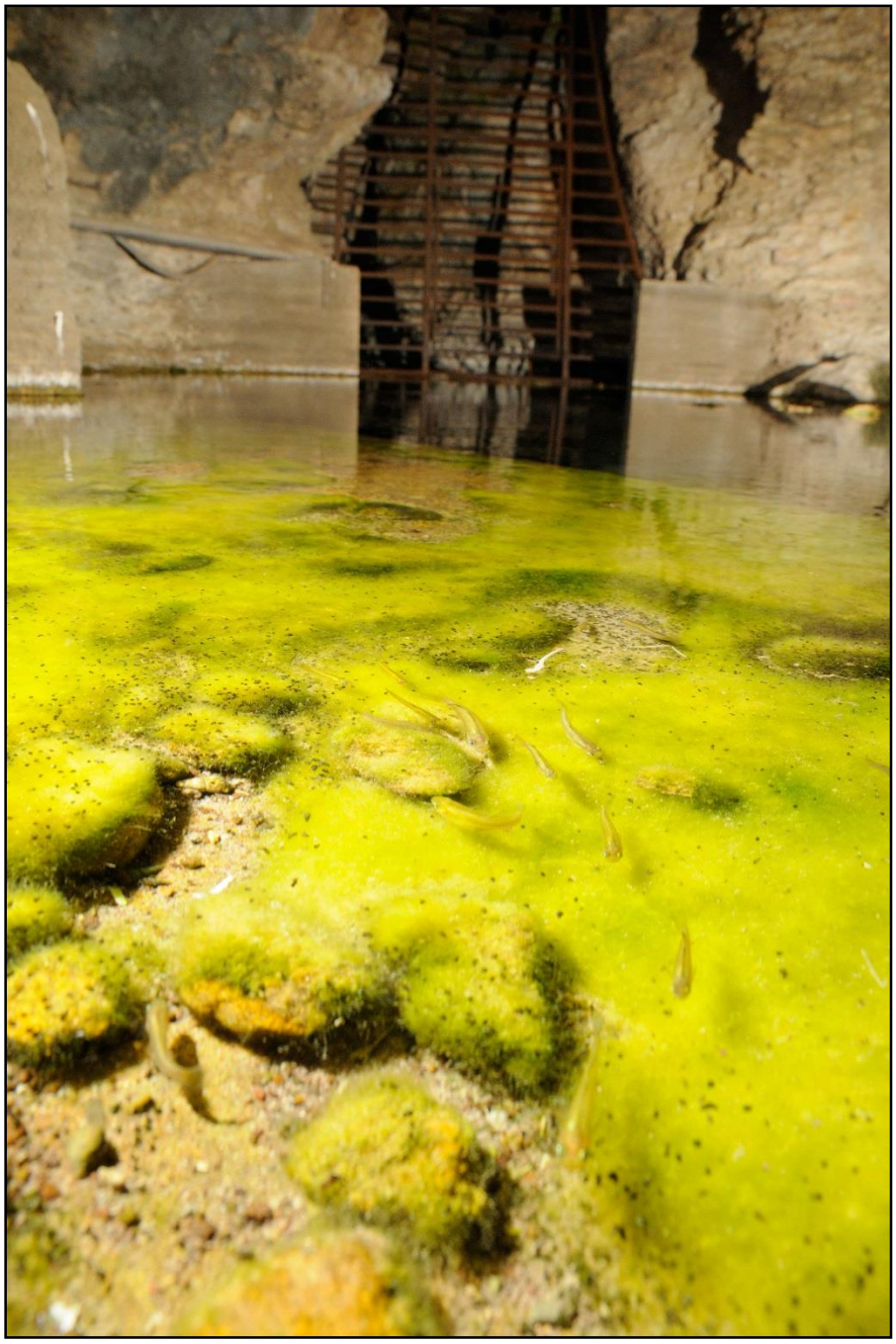


Ostracod shells.



Turtle shell approximately 1500 ft. into cave.

Giant water bug, Belostomatidae, next to *Astyanax* fish approximately 100 ft. into cave.



Overview of cave entrance with endangered fish and snails (small black dots) in algal mats in foreground.