

Discovery of Endangered Mexican Blindcat, *Prietella phreatophila*, in Texas: Implications for International Groundwater Management and Evolution of the Regional Karst Aquifer Biota

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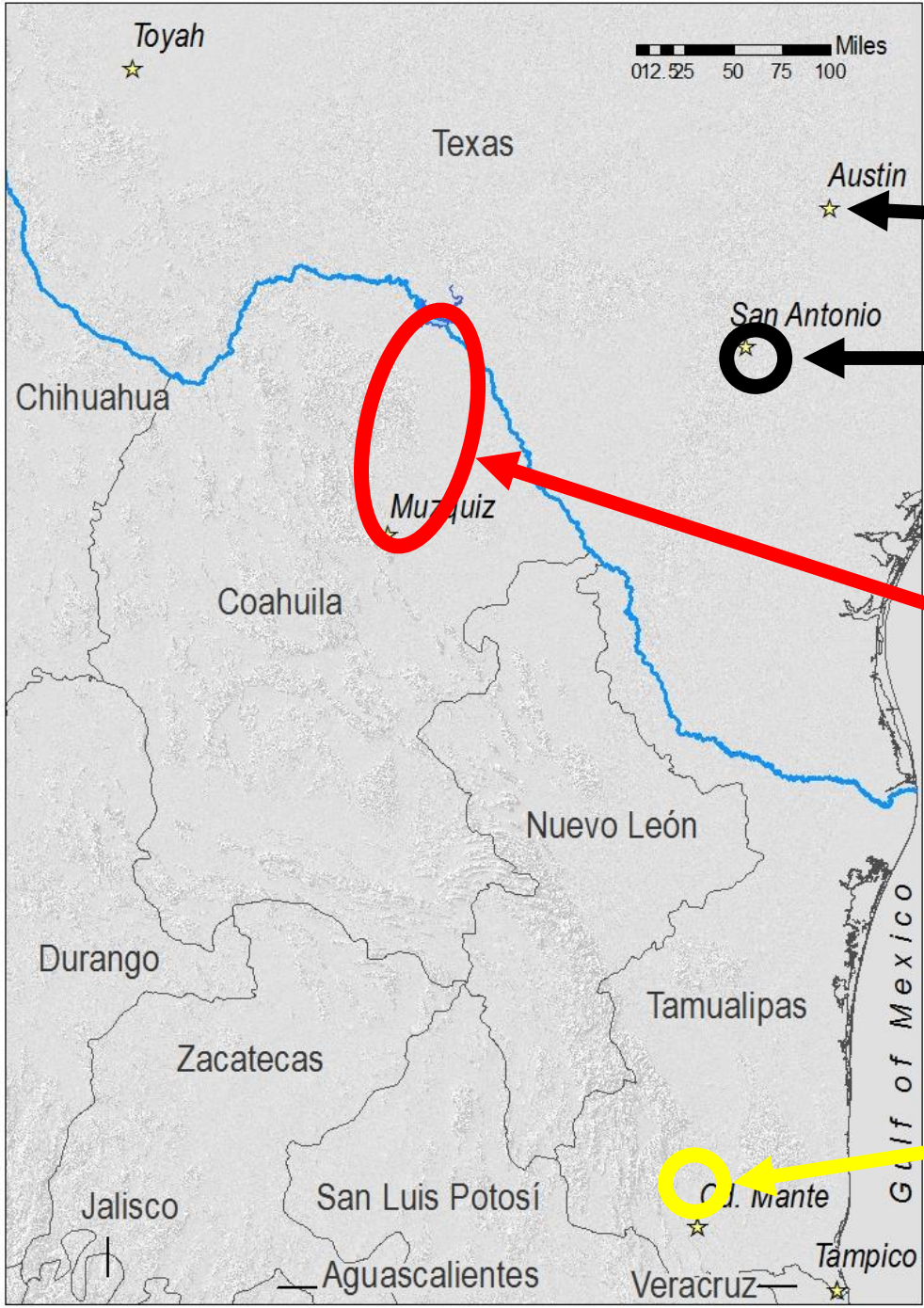
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(8) U.S. National Park Service, Del Rio, Texas, USA

(9) Centro de Investigaciones Biológicas del Noroeste, La Paz, Baja California, Mexico

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Satan eurystomus (Widemouth Blindcat)
Trogloglanis pattersoni (Toothless Blindcat)

Prietella phreatophila
(Mexican Blindcat)

Prietella lundbergi (Tamaulipan Blindcat)





- **Blind, depigmented cave – obligate catfish**
- **One of 4 stygobitic Ictalurid species (in 3 genera) endemic to North American karst aquifers that feed rivers from San Antonio River (Texas, USA) to Río Pánuco (Tamaulipas, México)**





- Carranza 1952 – 1 locality, 66 specimens in 2 days trapping
- 1961, 1969, 1984, 1986 – various single specimens from type locality or very close
- 1986 – TNHC (UT) – 1 specimen from Ojo Yermo, 48 km N of type locality



Listing history

- **1970 - U.S. Fish and Wildlife Service listed (on Foreign Species List) as Endangered**
- **1990 – Endangered by IUCN**
- **1994 – Endangered by México - D.O.F.**

NOM-059-ECOL



Environmental Biology of Fishes 62: 315–337, 2001.
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- **1992** – Sotano de Amezcuca specimens to TNHC
- **1993, 1994, 1996-8**
Hendrickson et al. fieldwork in México
- **1992-2016** Captive stock in Hendrickson lab
- **2001** Hendrickson, Krejca, Rodríguez Martínez

Mexican blindcats genus *Prietella* (Siluriformes: Ictaluridae): an overview of recent explorations

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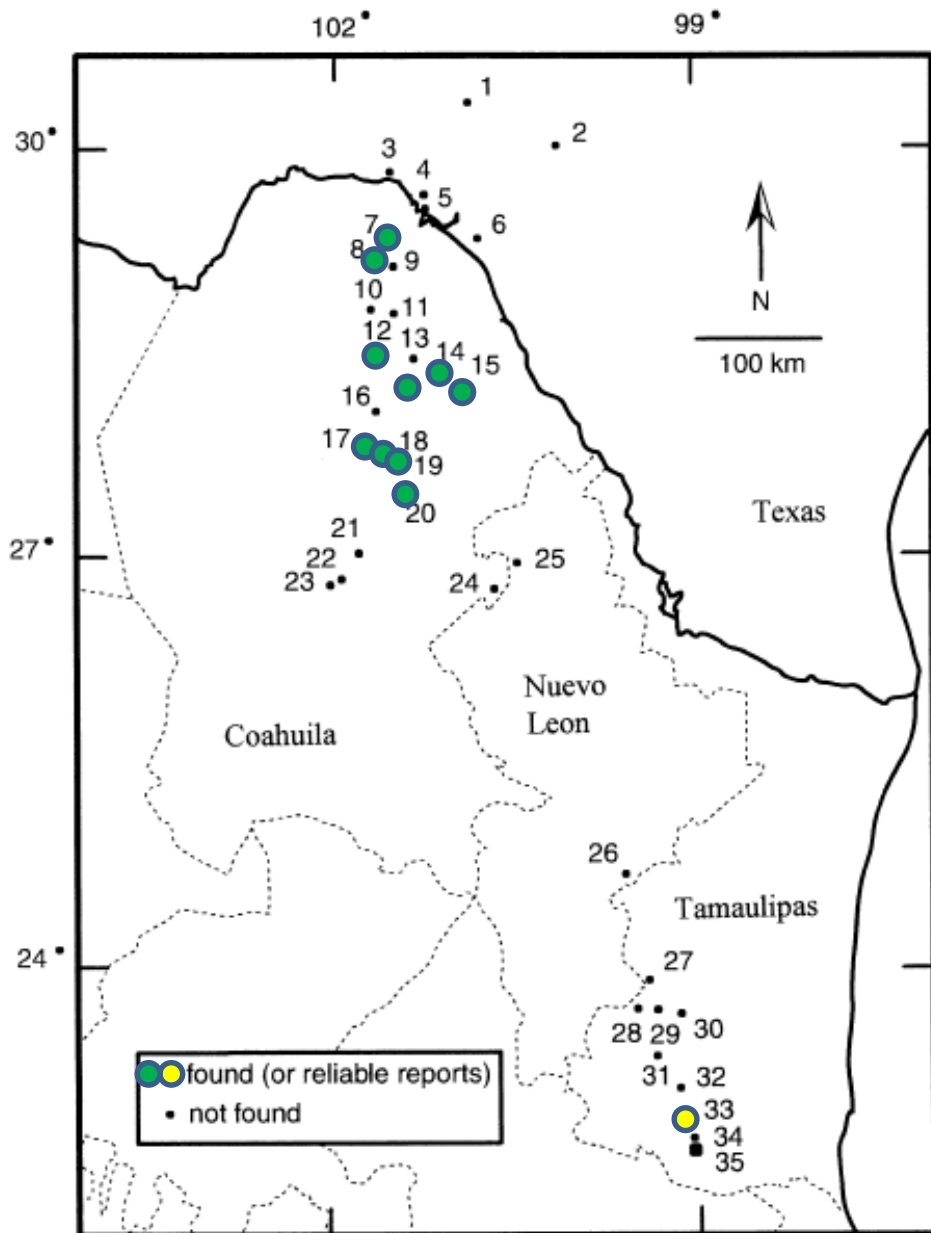
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Accepted 12 December 2000

Key words: cave fish, stygobite, fish conservation, distribution, behavior, habitat

Synopsis

The ictalurid genus *Prietella* was described from a single locality in northern México (Coahuila) in 1954, and until very recently went largely unstudied. Cave explorers have recently uncovered new localities and a second species much farther to the south (México: Tamaulipas). Our team visited over 50 sites, including all of the previously known sites possible, and explored many new sites, expanding the known range of *Prietella* and describing their habitat. We identified geological units and mapped caves, identified associated troglobitic invertebrates, estimated population sizes and measured water chemistry parameters. We also comment on laboratory diet, parasites, sensory biology, behavior (such as jaw locking and periods of inactivity), reproduction and systematics based on preliminary genetic data. *Prietella phreatophila* is listed as endangered, and due to the recent discovery of many more sites (formerly documented from three localities, now known from twelve sites, though some are hydrologically connected) we recommend threatened status, with careful attention to growing threats such as over pumping and contamination of the aquifer it lives in. Should these patterns continue unchecked, re-listing this species as endangered may be called for. *Prietella lundbergi* was also described from one site but is now known from two, though it is quite rare at both (only five specimens have ever been seen). *P. lundbergi* was described after the most recent revision of the Mexican endangered species list and should probably be considered as endangered.



Hendrickson et al. 2001 sampled 34 localities:

- Texas – 6 (present at 0)
- Coahuila – 18 (present at 9 ●)
- Nuevo León – 2 (present at 0)

- Tamaulipas – 7 (*P. lundbergi* present at 1 [#33 ●, not at 35, the type locality)

Some of the live stock from 1997 still lives. Lots of interesting observations





- Male dominance contests
- Spawning, guarding, no hatching
- Starvation tolerance
- No reaction to visible light

Some of the live stock from 1997 still lives



Taking a break (this one 16 minutes)

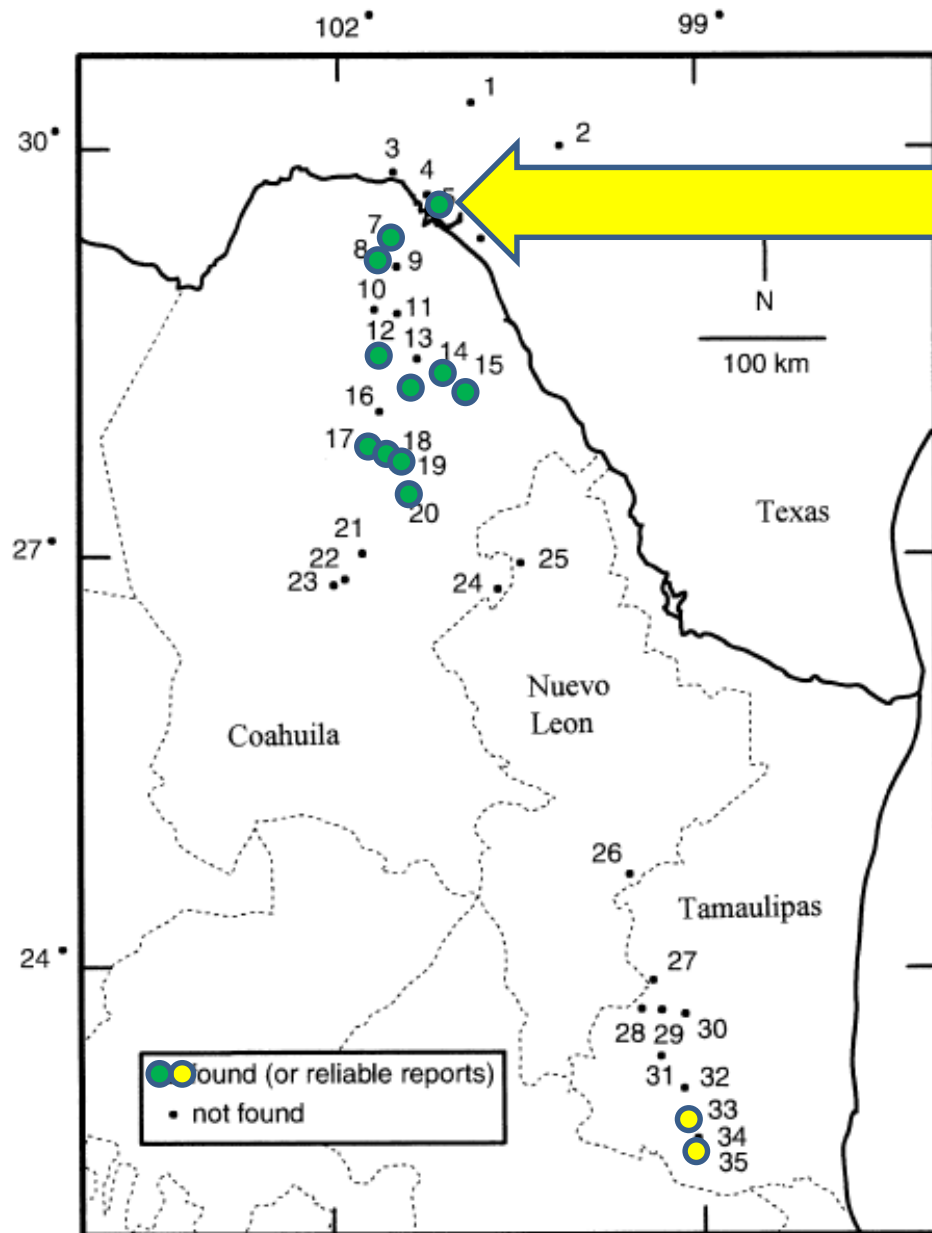


April 22, 2015 – 2-3 “white catfish” seen in cave survey in Amistad National Recreation Area near Del Rio, Texas

National Park Service quickly issued permit and funded periodic monitoring of several caves in vicinity & more caving explorations

4 visits before:





2015-2016 - new Texas locality

- May 11, 2016 - 3 specimens collected in cave of original sighting
- Live specimens to UT Austin Fish Collection (TNHC)

And, it immediately had full protection as Endangered in U.S.



Texas cave - variable water levels (likely connection to Lake Amistad) affected access and sampling



Prietella phreatophila – 2016 – TX specimen

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© Jean Krejca, Zora Environmental LLC





- **Morphology & Cyt b sequence validated
conspecificity of Texas and Coahuila specimens
(1% divergent)**





May 25, 2016 – 2 remaining live Texas specimens transferred on loan to San Antonio Zoo Conservation Program

June 2016 – both remaining live 20+ year old specimens from Coahuila collections to San Antonio Zoo



NEWS

From the College of Natural Sciences

Font size:  | Share

Rare, Blind Catfish Never Before Found in U.S. Discovered in Texas

★ Featured ○ Friday, 17 June 2016 ✍ Christine S Sinatra 📁 Integrative Biology

An extremely rare eyeless catfish species previously known to exist only in Mexico has been discovered in a National Recreation Area in Texas.



These Mexican blindcats were discovered in an underwater cave in Texas. Photo: Danté Fenolio.

Dean Hendrickson, curator of ichthyology at The University of Texas at Austin, identified the live fish, discovered in a deep limestone cave at Amistad National Recreation Area near Del Rio, Texas, as the endangered Mexican blindcat (*Prietella phreatophila*). The pair of small catfish, collected by a team in May, have been relocated to the San Antonio Zoo.

June 17, 2016 – Press release

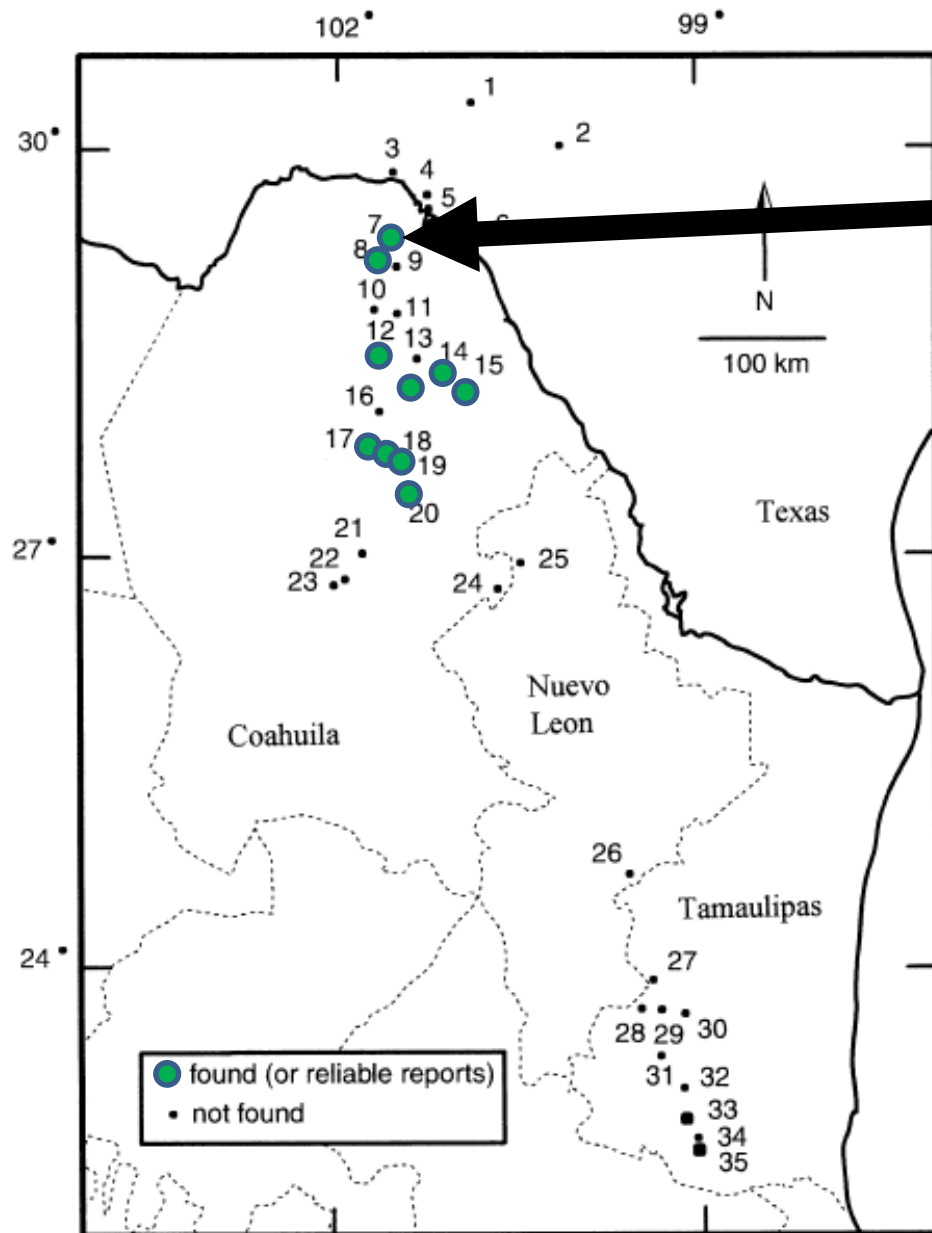
Since then:

- **Obtained USFWS Endangered Species research permit**
- **NPS-sponsored Texas fieldwork**
- **TPWD Sec6 eDNA – just funded**

Proposals in process include:

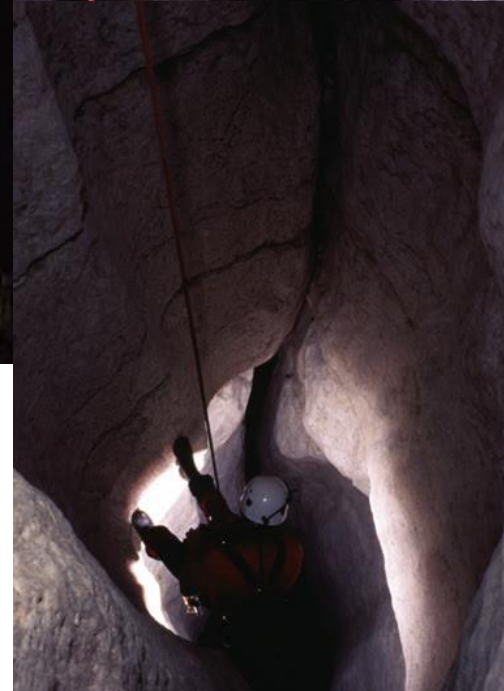
- **Coahuila re-survey to update conservation assessment, aquifer hydrogeologic studies, population genetics**
- **Captive breeding at SA Zoo**





Sótano de Amezcua





Found in diverse habitats, including hand-dug wells, but mostly relatively deep caves in intermittent, very dynamic underground desert streams. Similar to flashy surface Chihuahuan Desert streams, but on steroids!

Sótano de Amezcuca - Total length surveyed 675 m; depth 83m



Prietella phreatophila –1992-1997 results

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Prietella phreatophila – HABITAT

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Sótano de Amezcuca

Coahuila, Mexico

Compass and tape survey 1993-1998

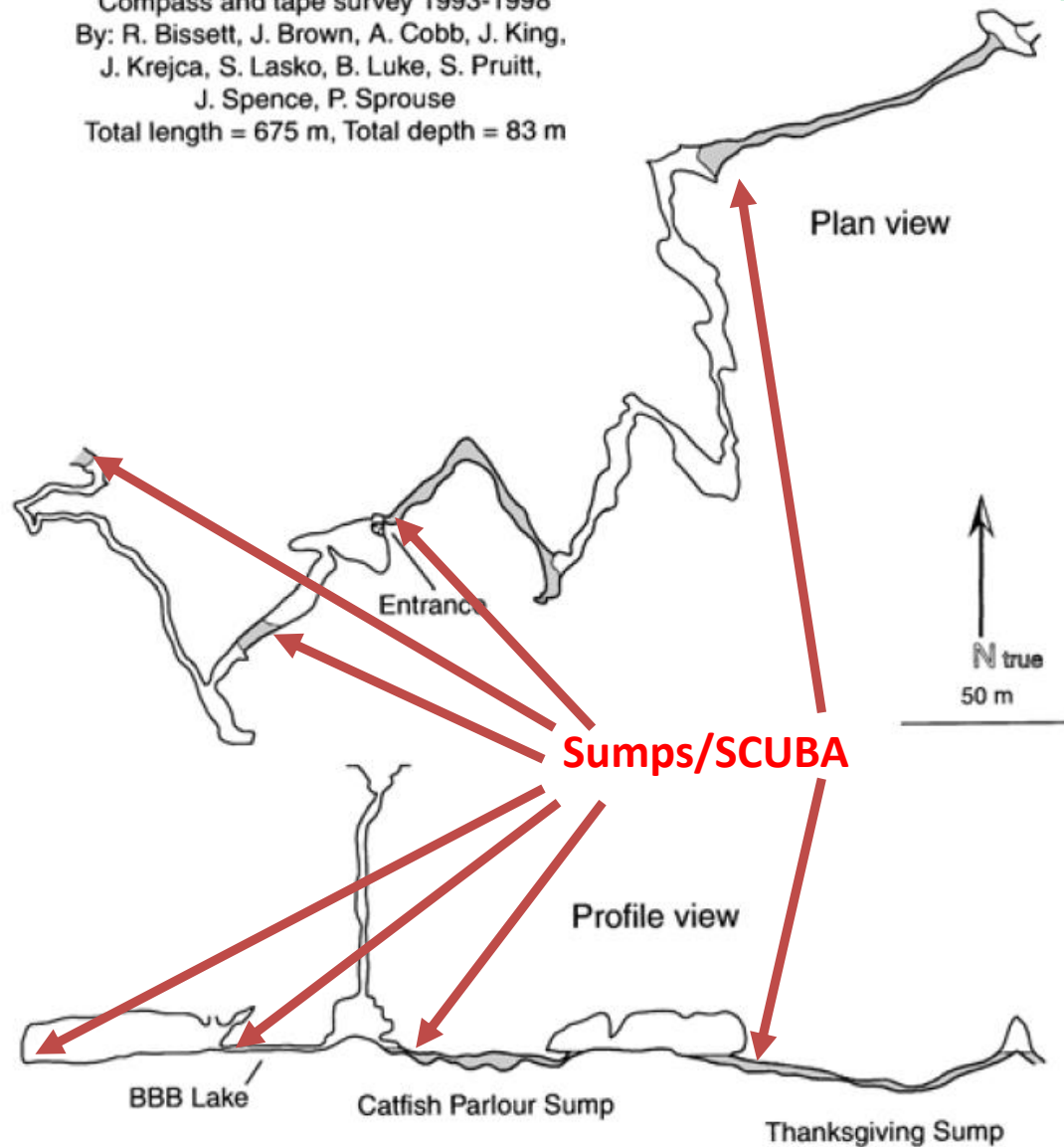
By: R. Bissett, J. Brown, A. Cobb, J. King,

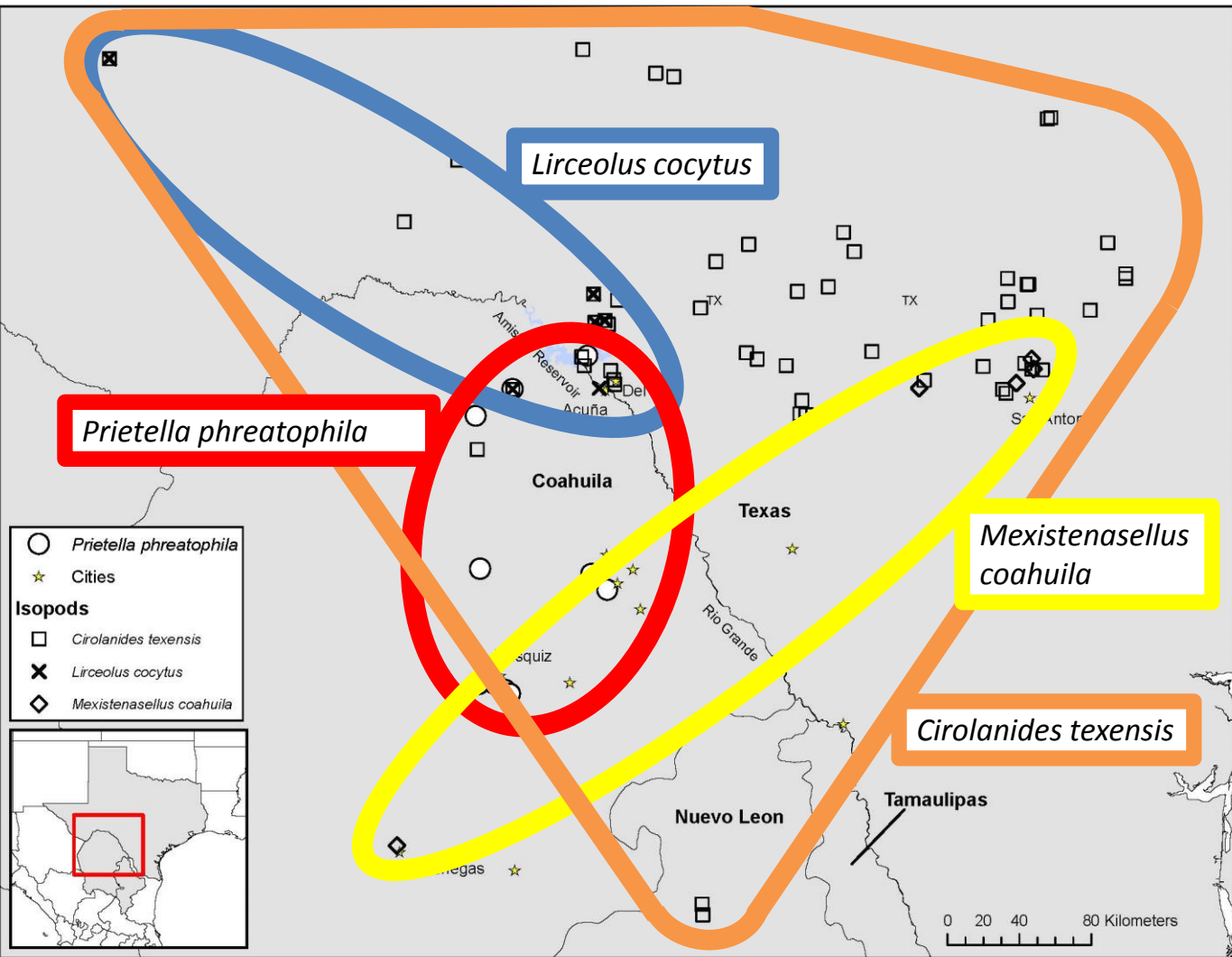
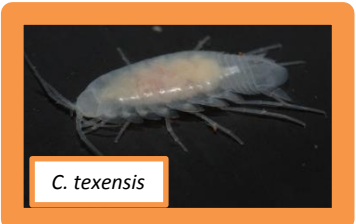
J. Krejca, S. Lasko, B. Luke, S. Pruitt,

J. Spence, P. Sprouse

Total length = 675 m, Total depth = 83 m

to Texas?







Contents lists available at [ScienceDirect](#)

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journal homepage: www.elsevier.com/locate/jhydrol



Identifying and characterizing transboundary aquifers along the Mexico–US border: An initial assessment



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SUMMARY

The transboundary nature of water dividing Mexico and the United States (U.S.) transforms the entire border region into an instrument of cooperation, a source of conflict, a national security issue, and an environmental concern. Reasonable data collection and research analysis have been conducted for surface waters by joint governmental institutions and non-governmental bodies. However, with the exception of the U.S. Transboundary Assessment Act Program (TAAP) (focusing on the Hueco Bolson, Mesilla Bolson, San Pedro and Santa Cruz aquifers), there is no comparable research, institutional development, or assessment of transboundary groundwater issues on the frontier. Moreover, data collection and methodologies vary between the two countries, there is no broadly accepted definition of the transboundary nature of an aquifer, and available legal and policy frameworks are constrained by non-hydrological considerations. Hence, there is a conceptual and institutional void regarding transboundary groundwater resources between Mexico and the U.S. The purpose of this paper is to bridge this void and characterize transboundary aquifers on the Mexico–US border. It reviews existing international frameworks for identifying hydrological and social criteria that characterize an aquifer as transboundary. It then assesses data from both countries to propose where and which aquifers could be considered transboundary. Finally, the paper proposes an agenda for assessing Mexico–US transboundary aquifers as a means for improving groundwater management in the border region.



R. Sanchez et al./Journal of Hydrology 535 (2016) 101–119

105°0'0"W

100°0'0"W

95°0'0"W

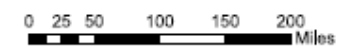
90°0'0"W

Satan eurystomus (Widemouth Blindcat)
Trogloglanis pattersoni (Toothless Blindcat)

- Mexico Aquifers**
- CONEJOS-MEDANOS (22)
 - VALLE DE JUAREZ (23)
 - VALLE DEL PESO (24)
 - BAJO RIO CONCHOS (25)
 - ALAMO CHAPO (26)
 - MANUEL BENAVIDES (27)
 - SANTA FE DEL PINO (28)
 - SERRANIA DEL BURRO (29)
 - CERRO COLORADO-LA PARTIDA (30)
 - PRESA LA AMISTAD (31)
 - PALESTINA (32)
 - ALLENDE-PIEDRAS NEGRAS (33)
 - HIDALGO (34)
 - LAMPAZOS-ANAHUAC (35)
 - BAJO RIO BRAVO (36)
- Texas Minor Aquifers**
- IGNEOUS
 - WEST TEXAS BOLSONS
 - YEGUA JACKSON
- Texas Major Aquifers**
- CARRIZO
 - EDWARDS-TRINITY
 - GULF_COAST
 - HUECO_BOLSON
 - MESILLA BASIN
 - RIO GRANDE RIVER

Prietella phreatophila (Mexican Blindcat)

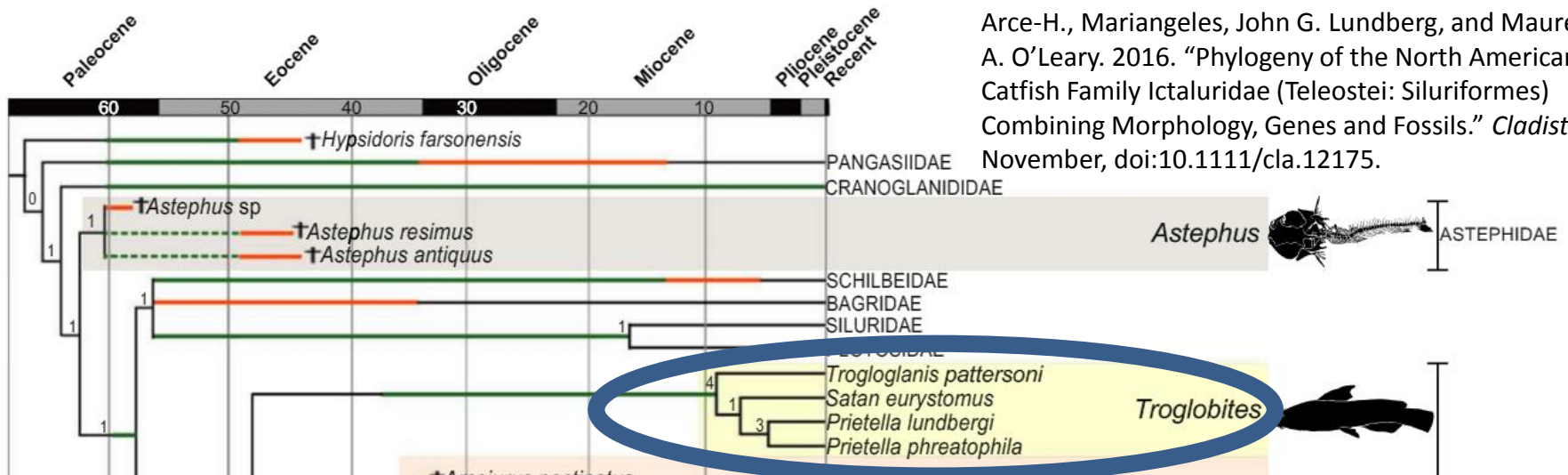
L Local aquifers of varying quantity and quality



Blindcat team – neutral zone on dam - May 2017

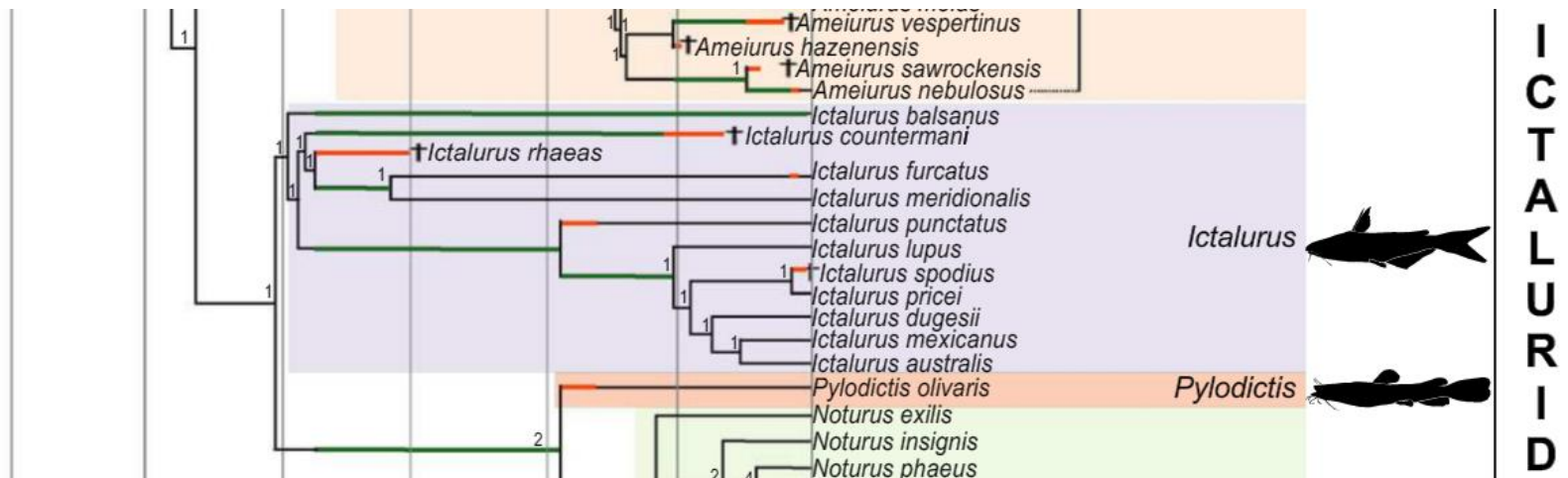
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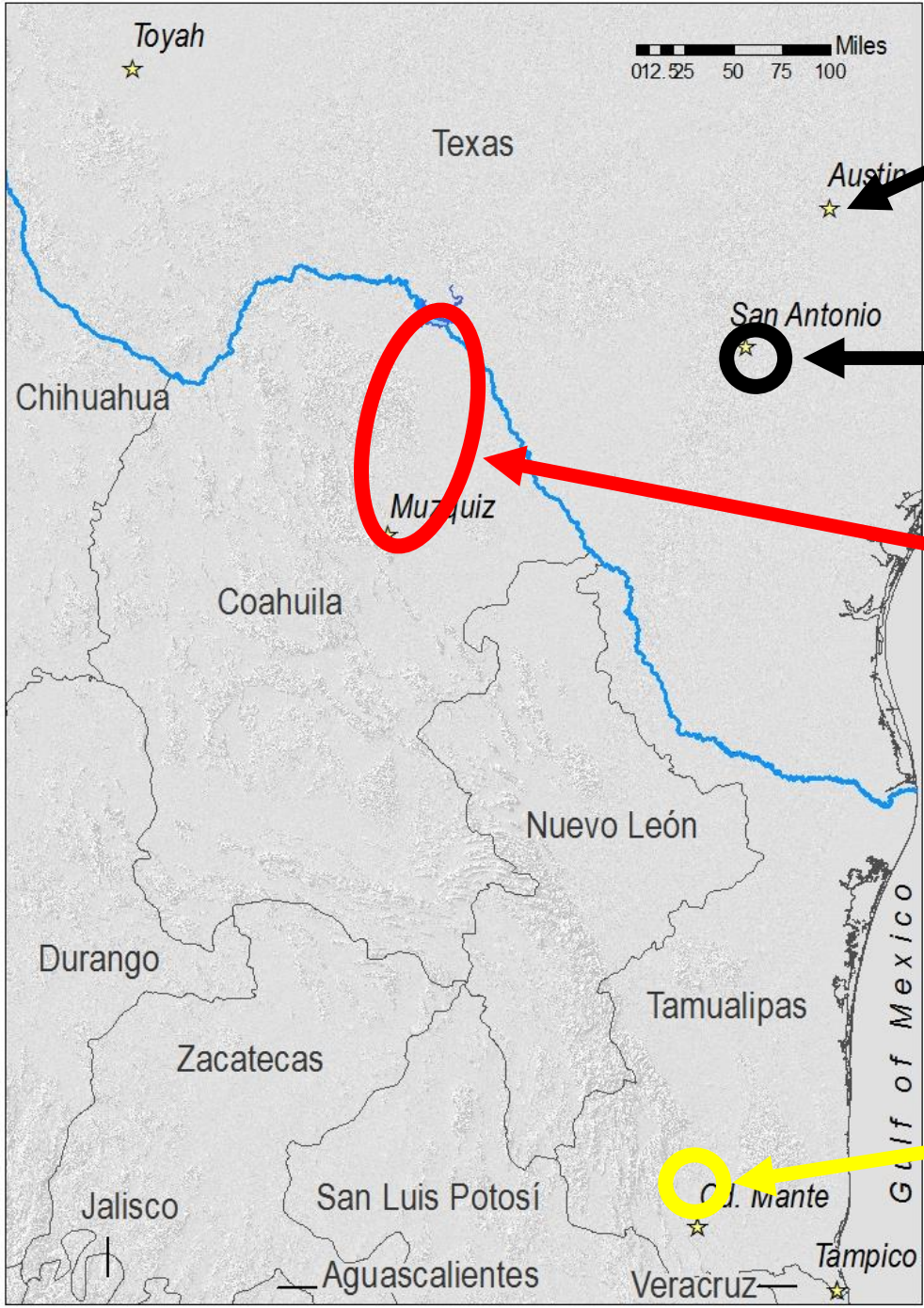




Aquifers and isopods indicate maybe.....

Anybody have DNA from *Satan*?????





YOU ARE HERE

Satan eurystomus
(Widemouth Blindcat)

Prietella phreatophila (Mexican Blindcat)

Prietella lundbergi (Tamaulipan Blindcat)



**FAUNA OF WELLS NEAR THE SALINE WATER LINE OF THE EDWARDS AQUIFER,
TEXAS**



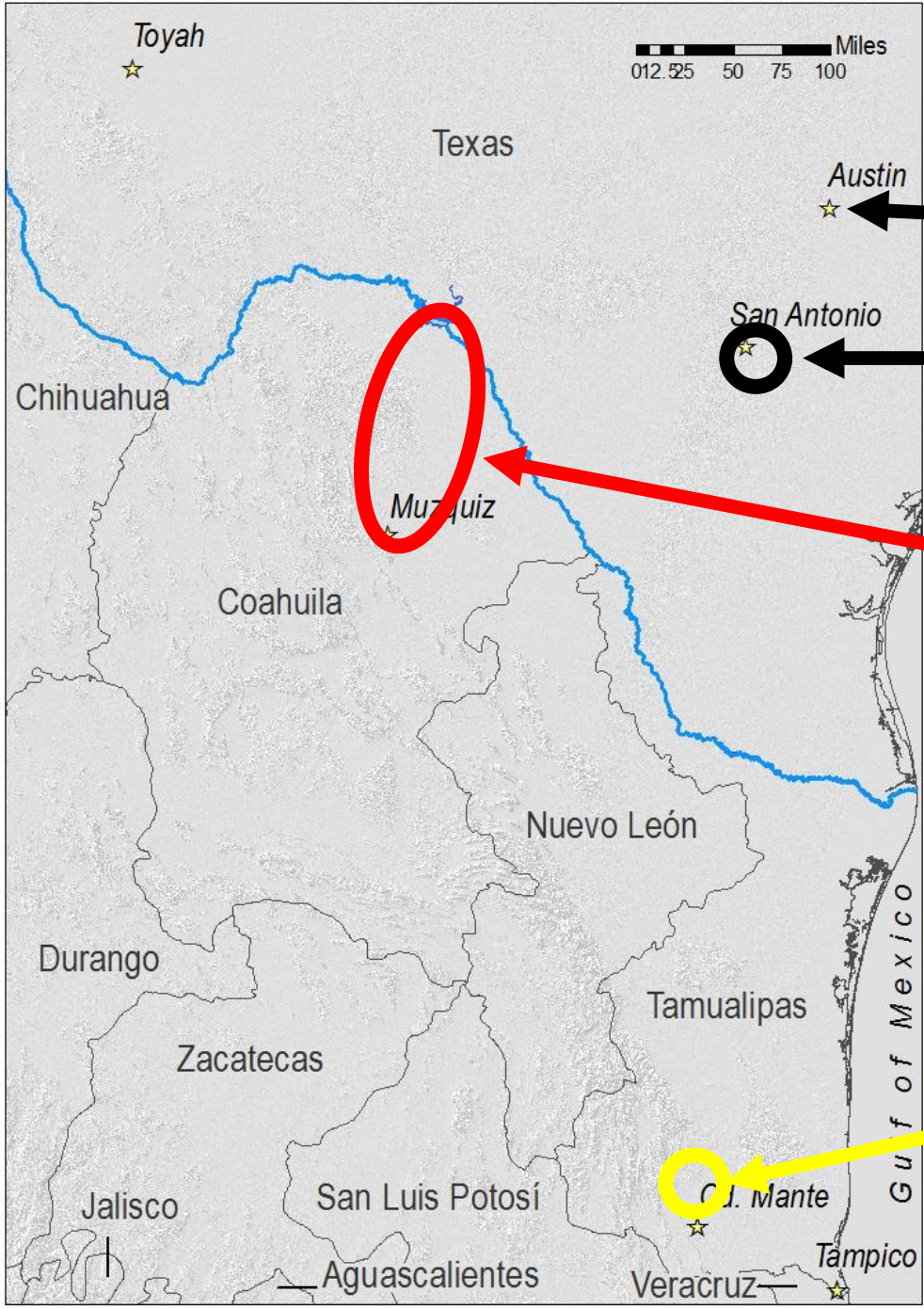
In line barrel sampler on an irrigation well in Bexar County, Texas.



1978 Karnei	2008-2014 Zara	
33	41	n wells
26	14	n <i>Trogloglanis</i>
14	0	n <i>Satan</i>

Zara - if CPUE from Karnei 1978 applies, **WOULD HAVE EXPECTED 7 TO 14 SATAN**. At 3 Zara wells with *Trogloglanis*, CPUE was > CPUE of Karnei. Zara sampling effort greatly exceeded Karnei ... “suggests lack of *Satan* not due to an ineffective sampling scheme

IS SATAN EXTINCT????????!!!!!! Last specimens 1980s.



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Satan eurystomus (Widemouth Blindcat)
Trogloglanis pattersoni (Toothless Blindcat)

Prietella phreatophila (Mexican Blindcat)

***Prietella lundbergi*
(Tamaulipan Blindcat)**



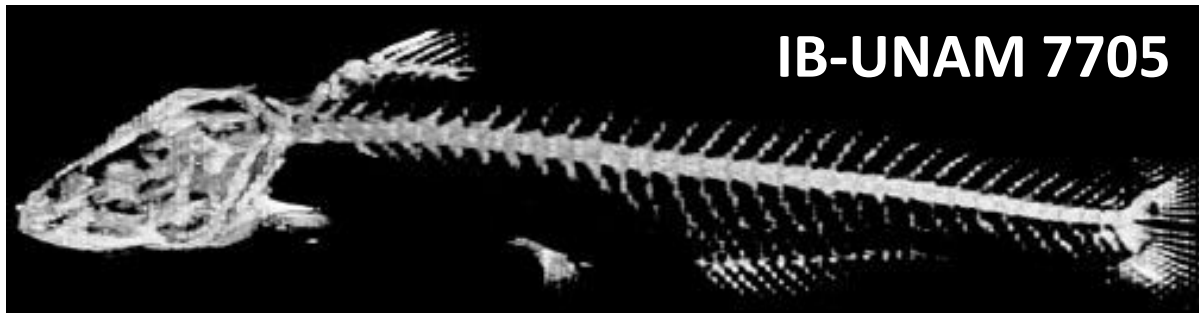


holotype - 45.2 mm SL female

Described on basis of single specimen. No DNA

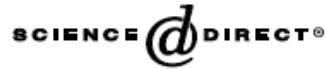
Multiple dives in type locality failed to produce more specimens

1998 CT scan not very informative





Available online at www.sciencedirect.com



Molecular Phylogenetics and Evolution 31 (2004) 1101–1113

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Convergence among cave catfishes: long-branch attraction and a Bayesian relative rates test

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- Previously, morphology placed *Prietella* sister to *Noturus*.
- Finally took 4 specimens (*P. cf. lundbergi*) in isolated cave 10 mi N of type locality
- Molecular analysis found *Prietella phreatophila* (Coahuila) & Tamaulipas specimens to be distant relatives and genus paraphyletic. *P. phreatophila* derived from *Ameiurus* and *P. cf. lundbergi* from *Ictalurus*.



10 miles north - *Prietella lundbergi* or ???

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TNHC 25767 - 10 miles N of the type locality we took 4 specimens. DNA of this, the largest, and 2 small specimens, was used in that long branch attraction paper....

MADE IN U.S.A.

1

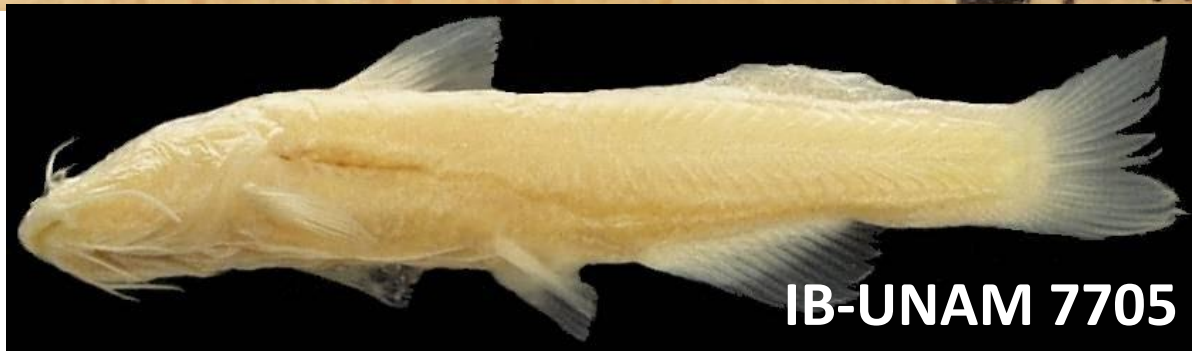
2

10 miles north - *Prietella lundbergi* or ???

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TNHC 25767 - 10 miles N of the type locality - lateral view, same specimen

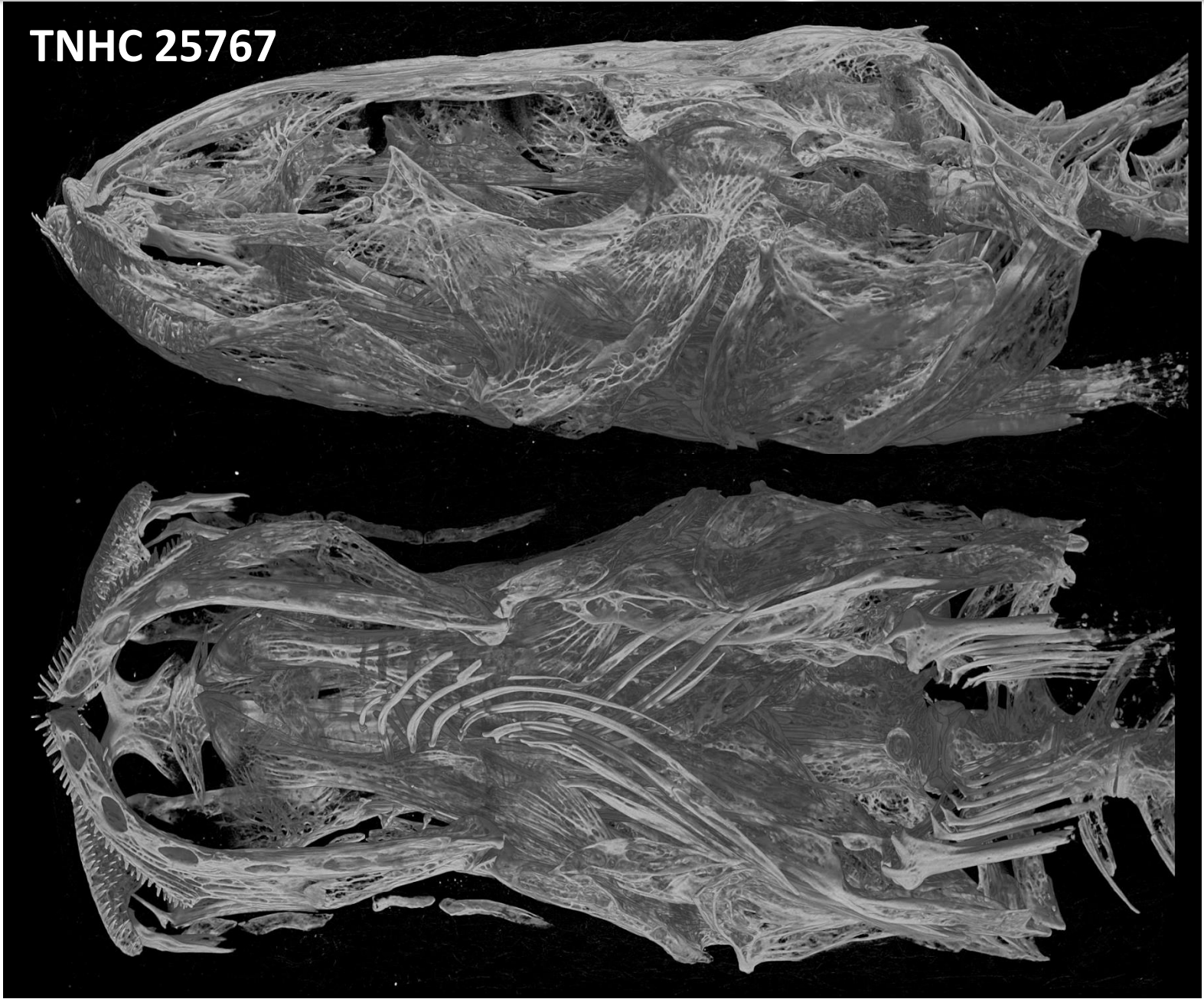


IB-UNAM 7705

10 miles north - *Prietella lundbergi* or ???

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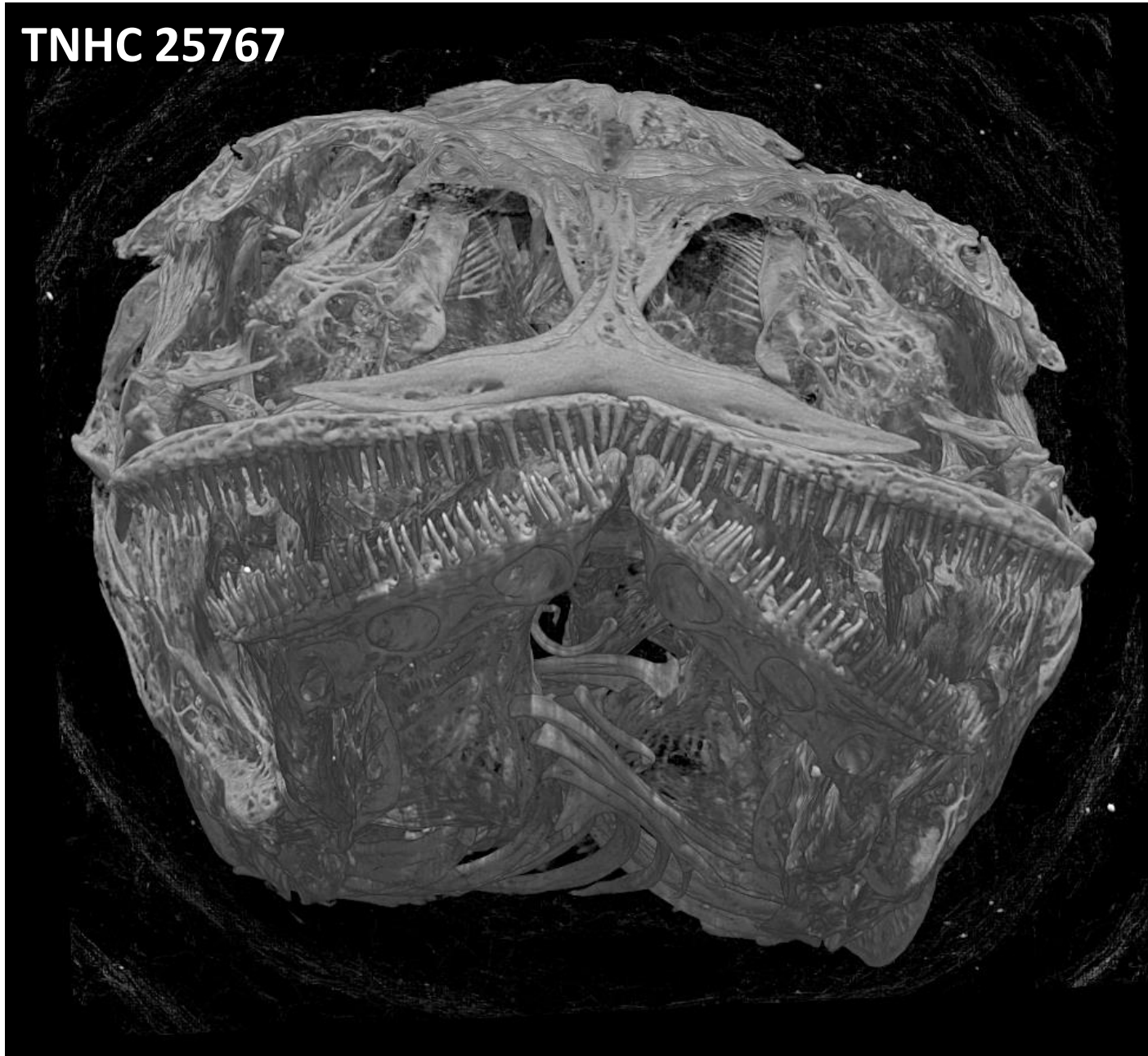
TNHC 25767



10 miles north - *Prietella lundbergi* or ???

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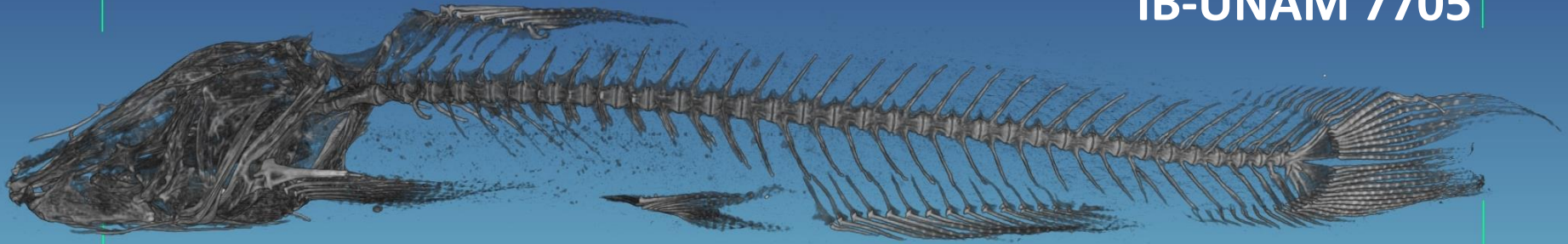
TNHC 25767



Prietella lundbergi holotype

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