Groundwater biodiversity in non-karst systems in Texas, Australia, and Slovenia

Benjamin F. Schwartz[1,2]

[1]Edwards Aquifer Research and Data Center, Texas State University, San Marcos, Texas, USA
[2]Department of Biology, Texas State University, San Marcos, Texas, USA

Texas – Australia - Slovenia

Groundwater biodiversity in karst *vs* non-karst systems

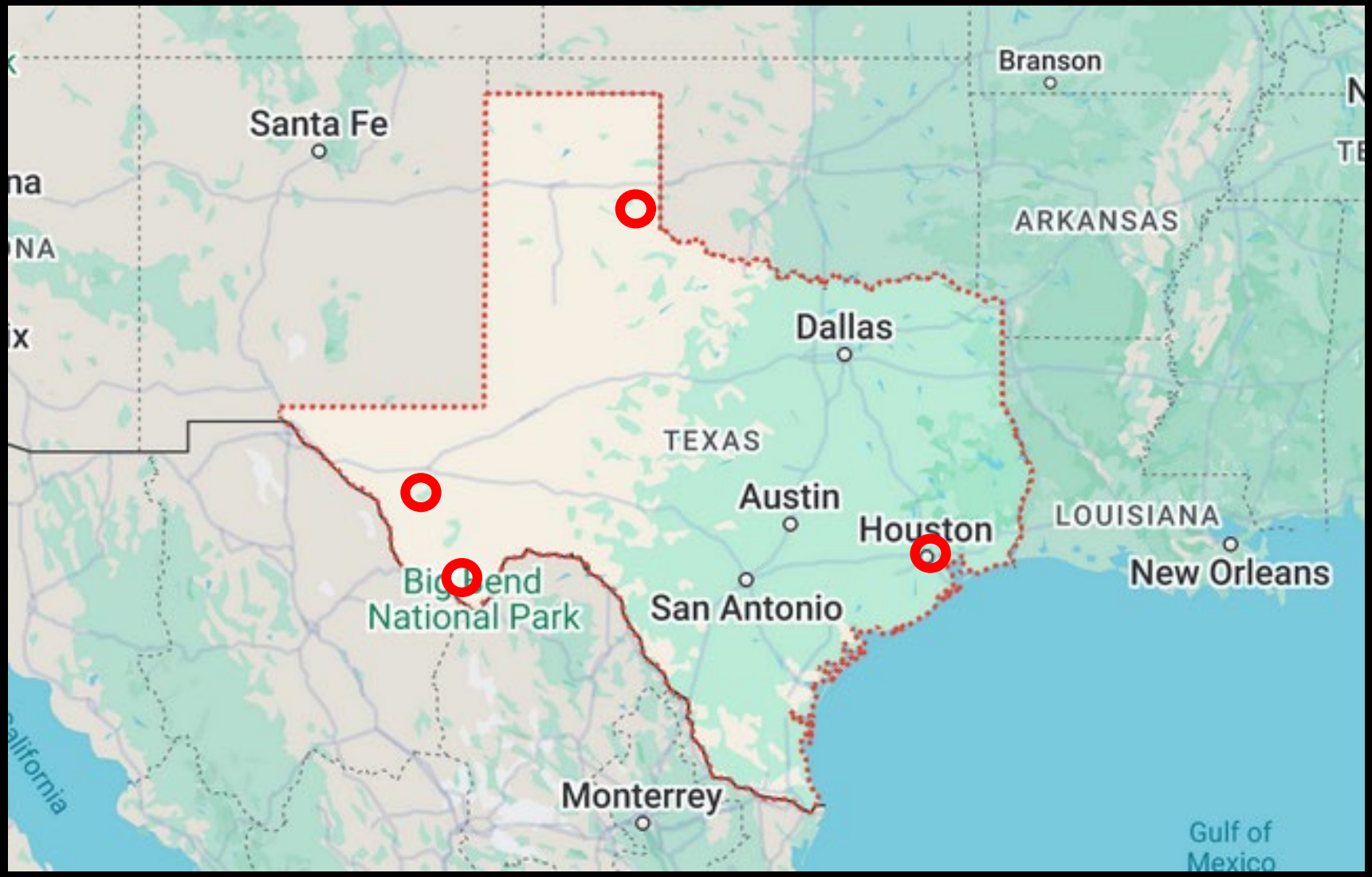
- Why are stygobiont records biased toward karst?
  - Long history of sampling and discovery
  - Ease of sampling
  - Sampling methods optimized for karst
  - Assumptions about hydrogeology and habitat
  - Size of organisms (larger)
  - Species richness (higher)

Neoniphargus sp in South Australia

Niphargus sp in Slovenia

  - ** Samples from karst systems integrate much larger areas/volumes and types of habitat

Texas – Australia - Slovenia



Texas – Australia - Slovenia

- Fractured igneous rocks in Davis Mountains (*Lirceolus sp*)

Texas – Australia - Slovenia

- Thin volcanic gravels on welded tuff: Big Bend NP (*Lirceolus sp*)

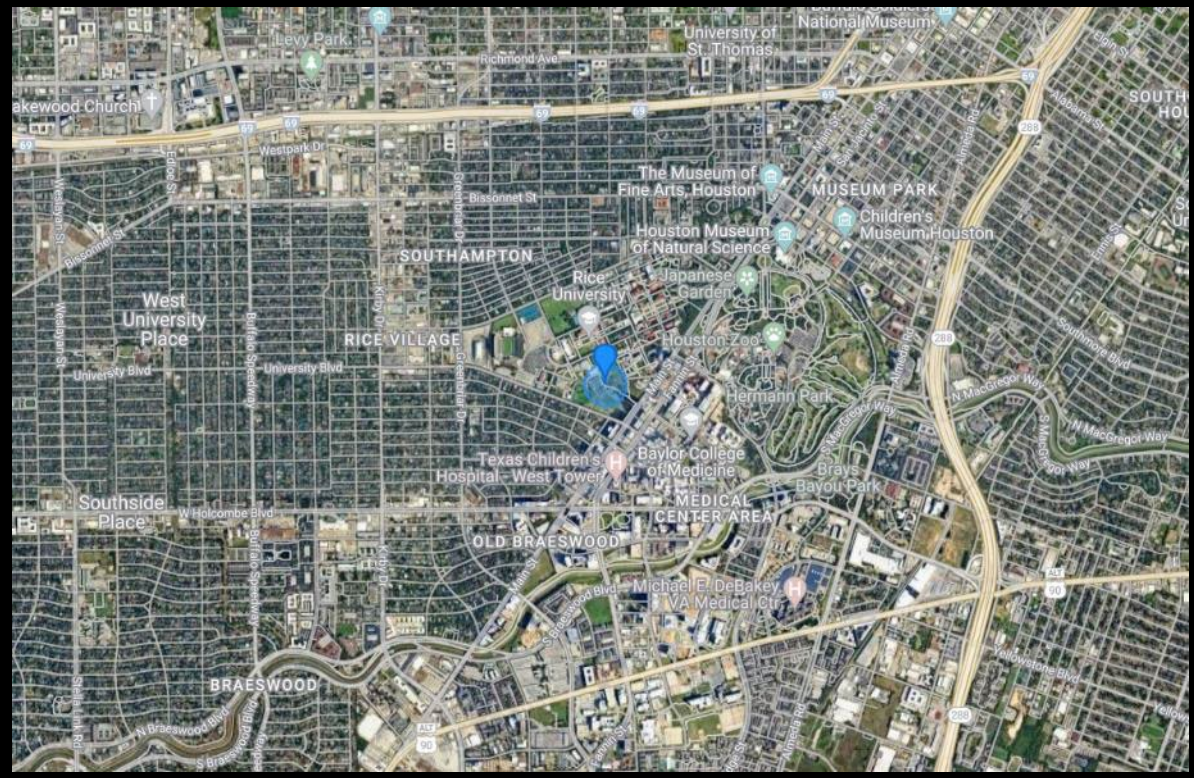
Texas – Australia - Slovenia

- Fine sands in the Salt Fork of Red River (*Leptanobathynellidae*)

Photo: Ben Hutchins (*Leptobathynellidae sp*)
The third species in USA?

Texas – Australia - Slovenia

- Rice University campus (*Asellidae – Caecidotea sp?*)



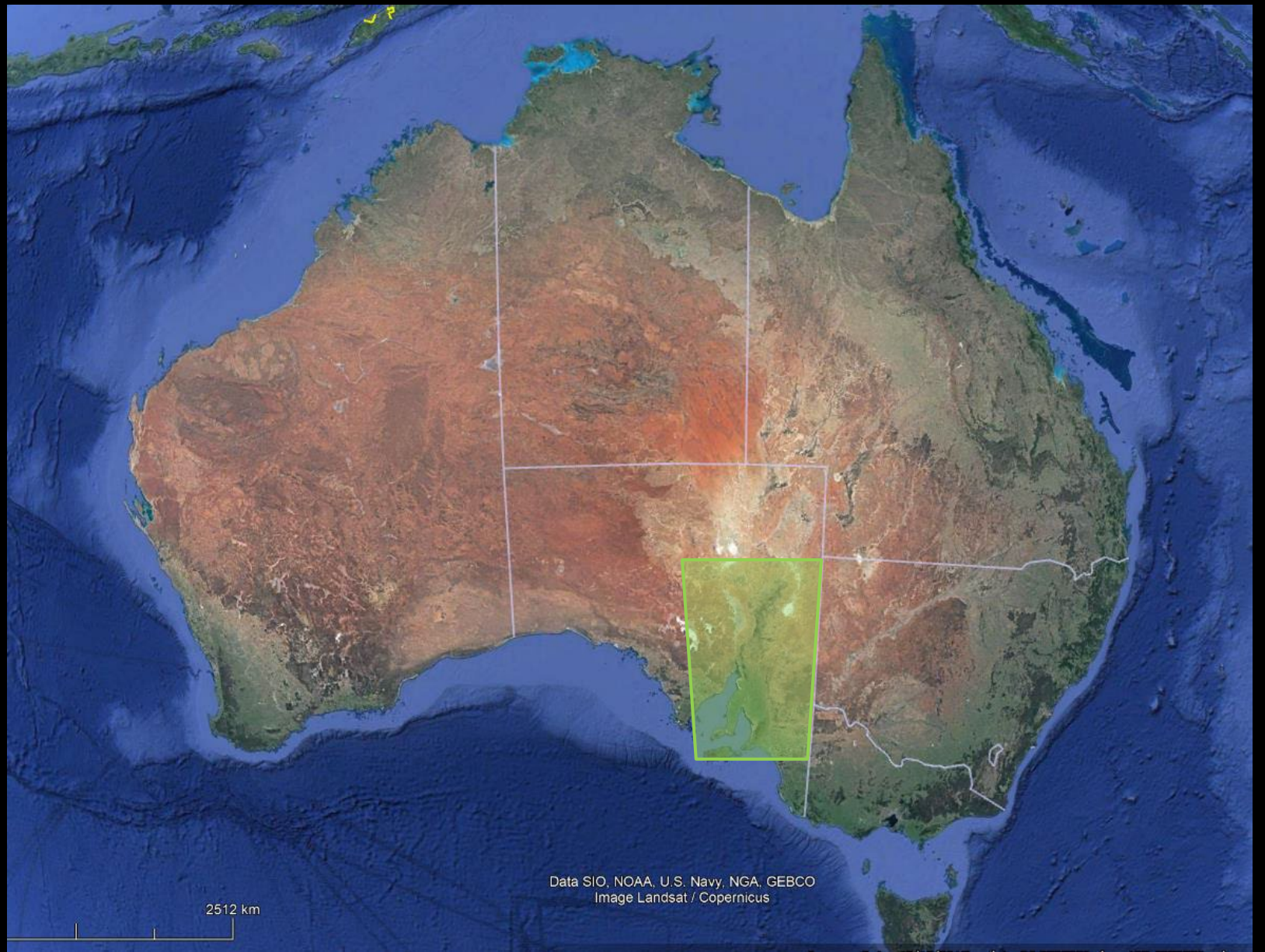
https://www.inaturalist.org/observations/37248201 Photo by: Cin-Ty Lee, some rights reserved (CC-BY-NC)

Texas – Australia - Slovenia

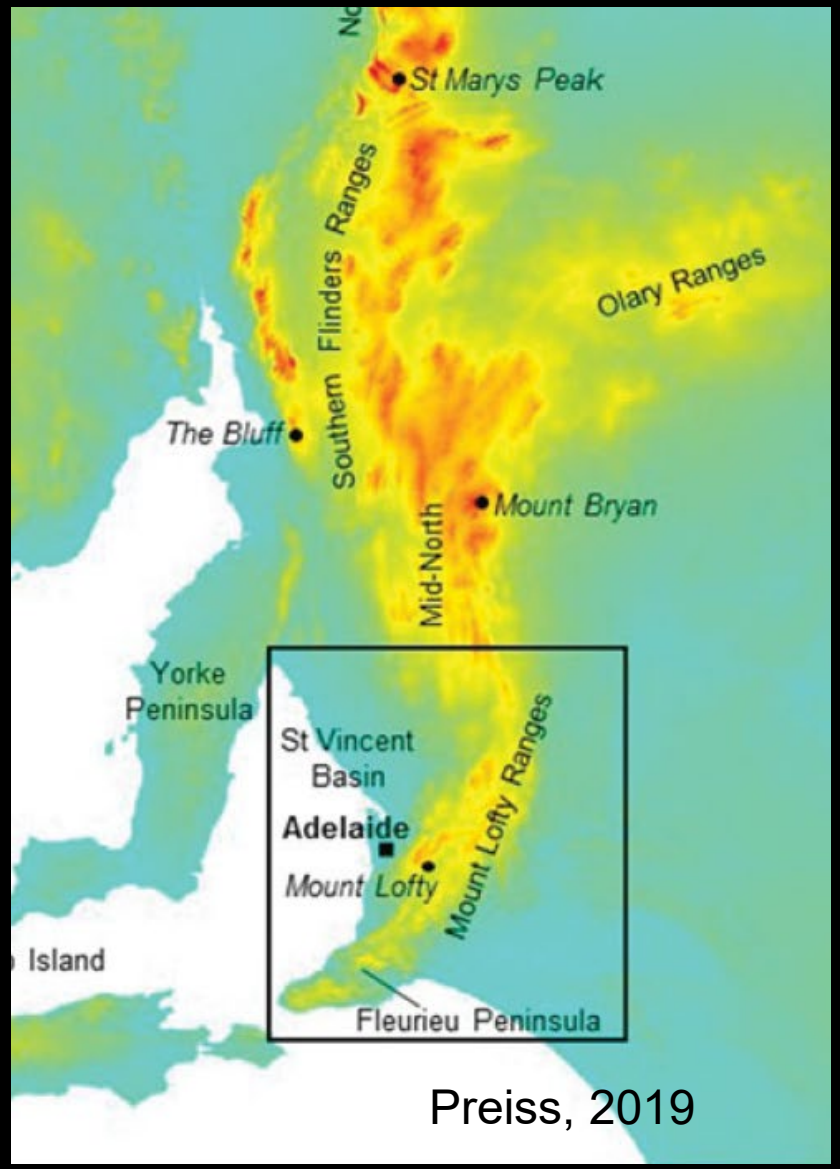
Thoughts

- Discovery is largely a by-product of sampling for other reasons
- Not targeted for ‘ideal’ habitats
- Habitats (hyporheic and alluvial) distal to karst have high species richness

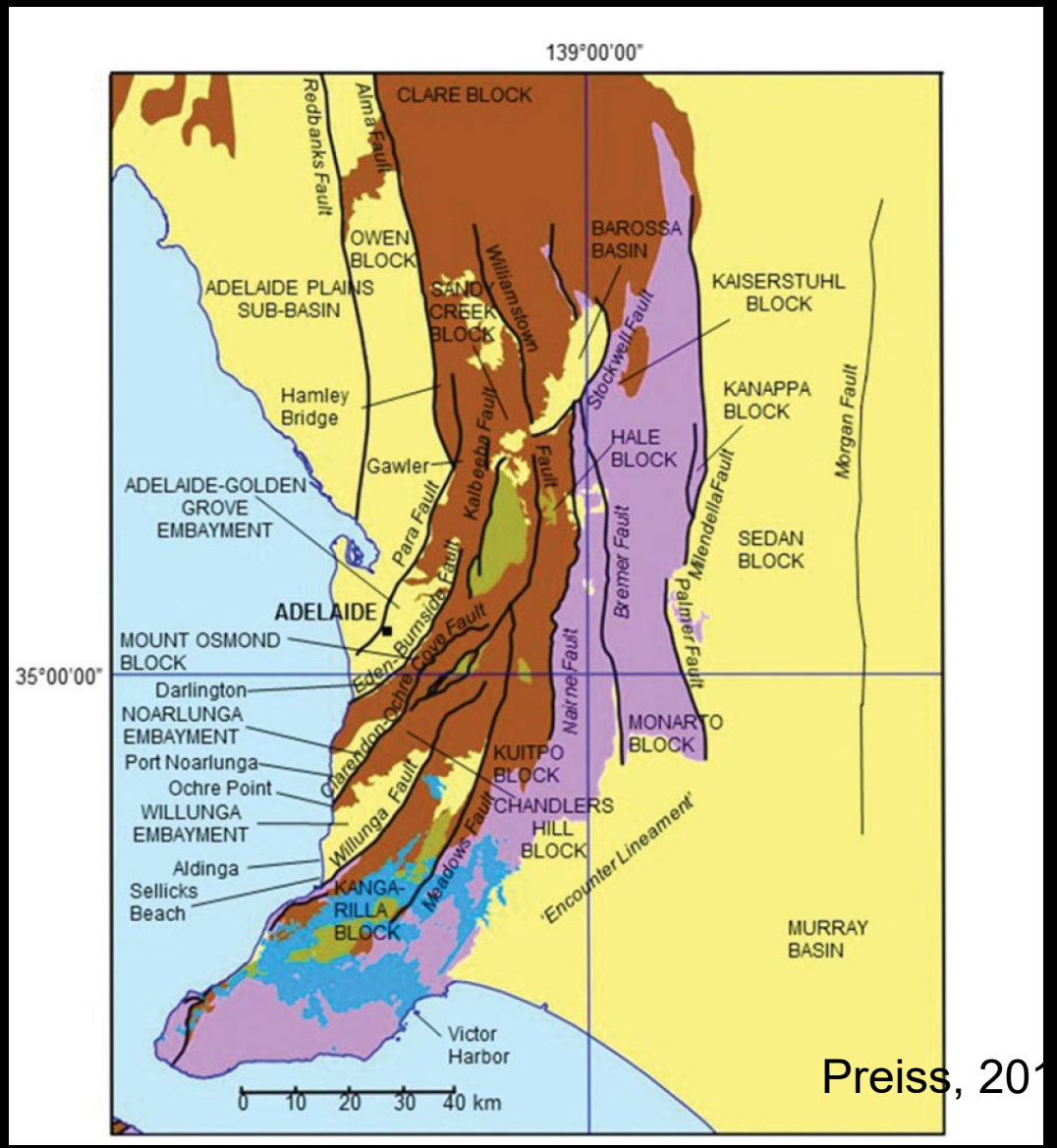
Texas – Australia - Slovenia



Texas – Australia - Slovenia



Preiss, 2019



Preiss, 201

Texas – Australia - Slovenia

Texas – Australia - Slovenia

Texas – Australia - Slovenia

Texas – Australia - Slovenia

Texas – Australia - Slovenia

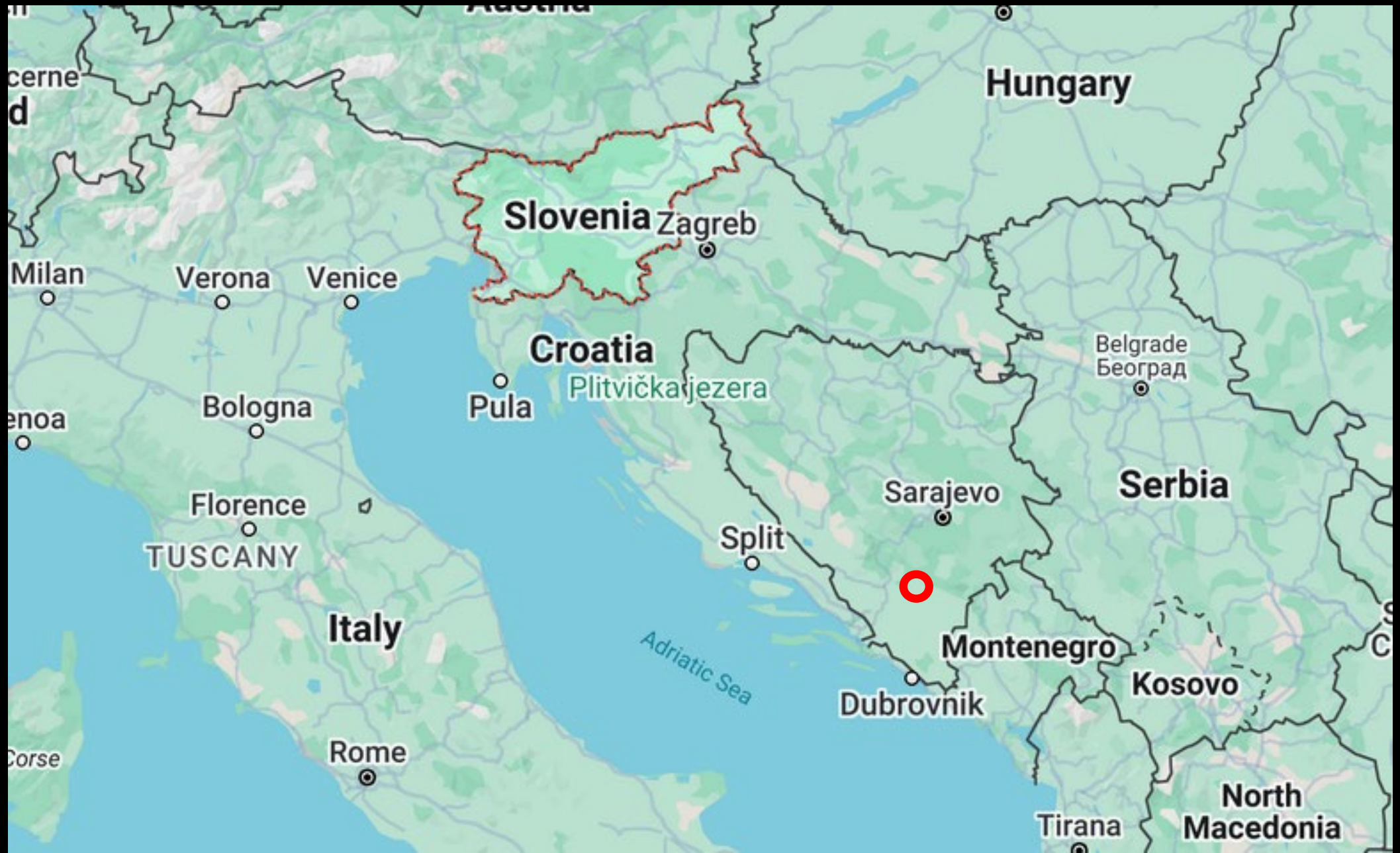
Results

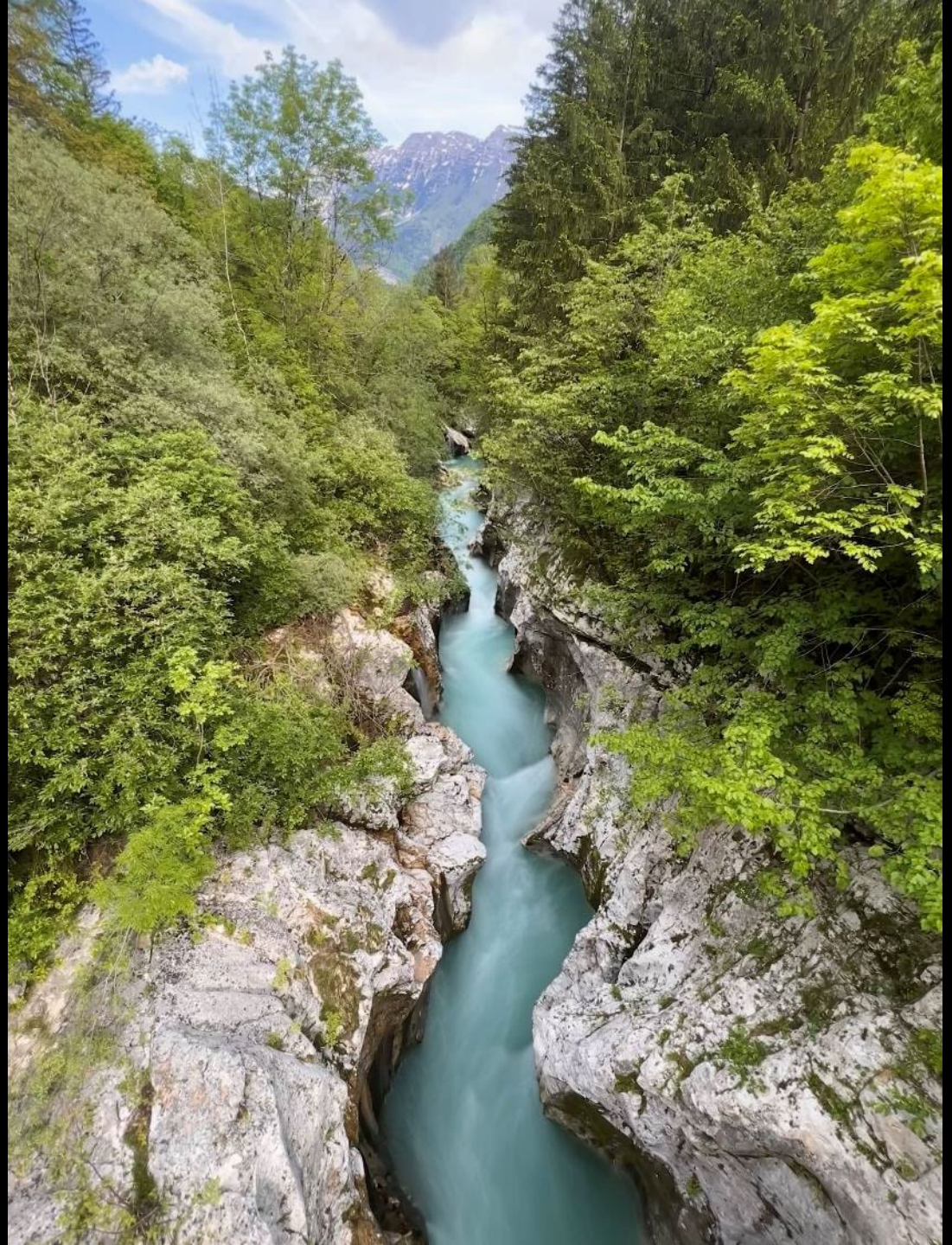
- 57 sites sampled at least once
- 16 sites with stygobionts 16

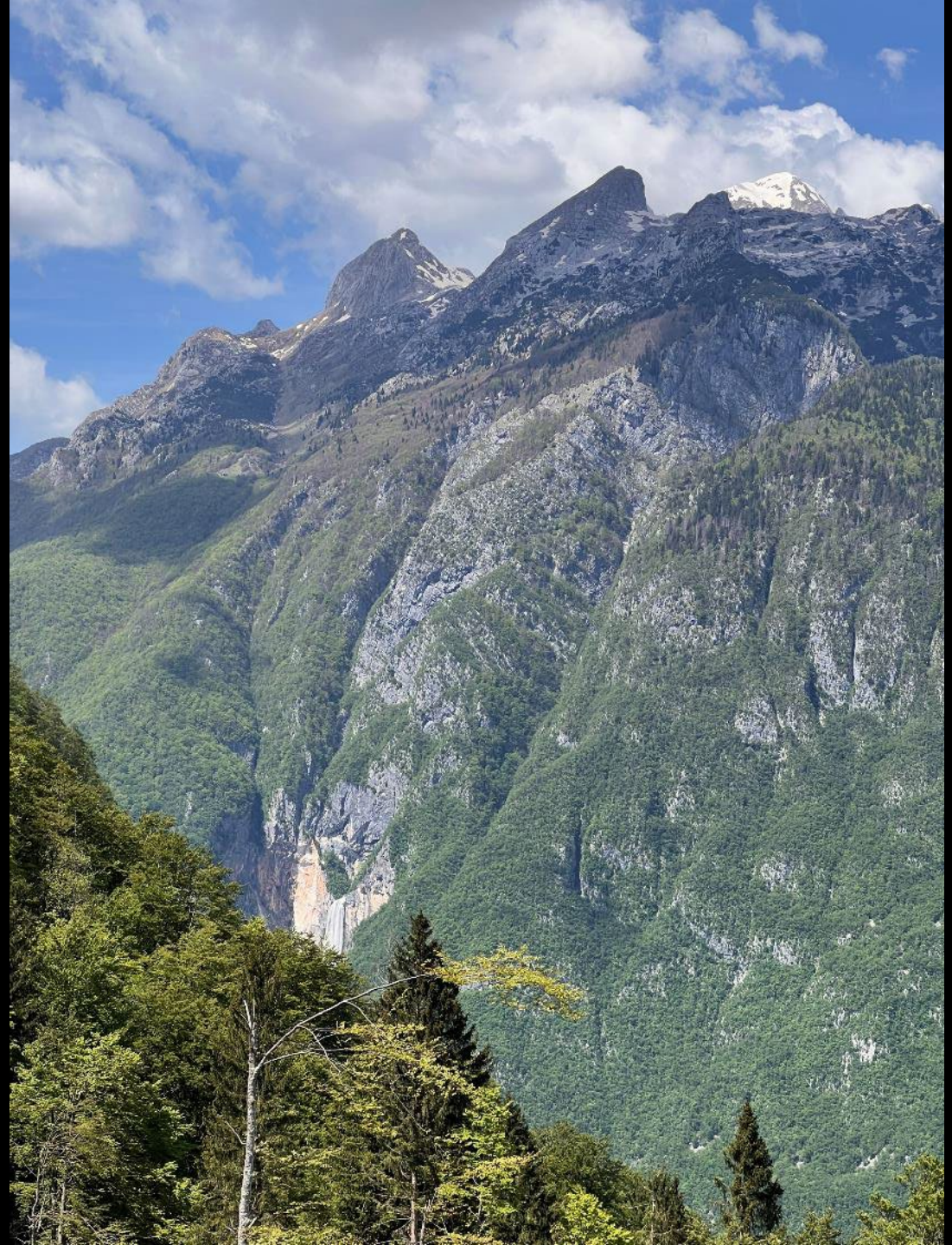
- Wells
- Bores
- Springs
- Hillslope marshes
- Urban groundwater drains
- Hyporheic zone
- Water collection tunnels

Map Figure. Localities that were visited. Blue marks indicate localities that were sampled and contained groundwater fauna. Yellow marks indicate localities that were sampled but contained surface aquatic fauna. Green marks indicate localities that were impossible sample for groundwater fauna.

Texas – Australia - Slovenia








BUNKER
SITARJEVEC
LITIJA

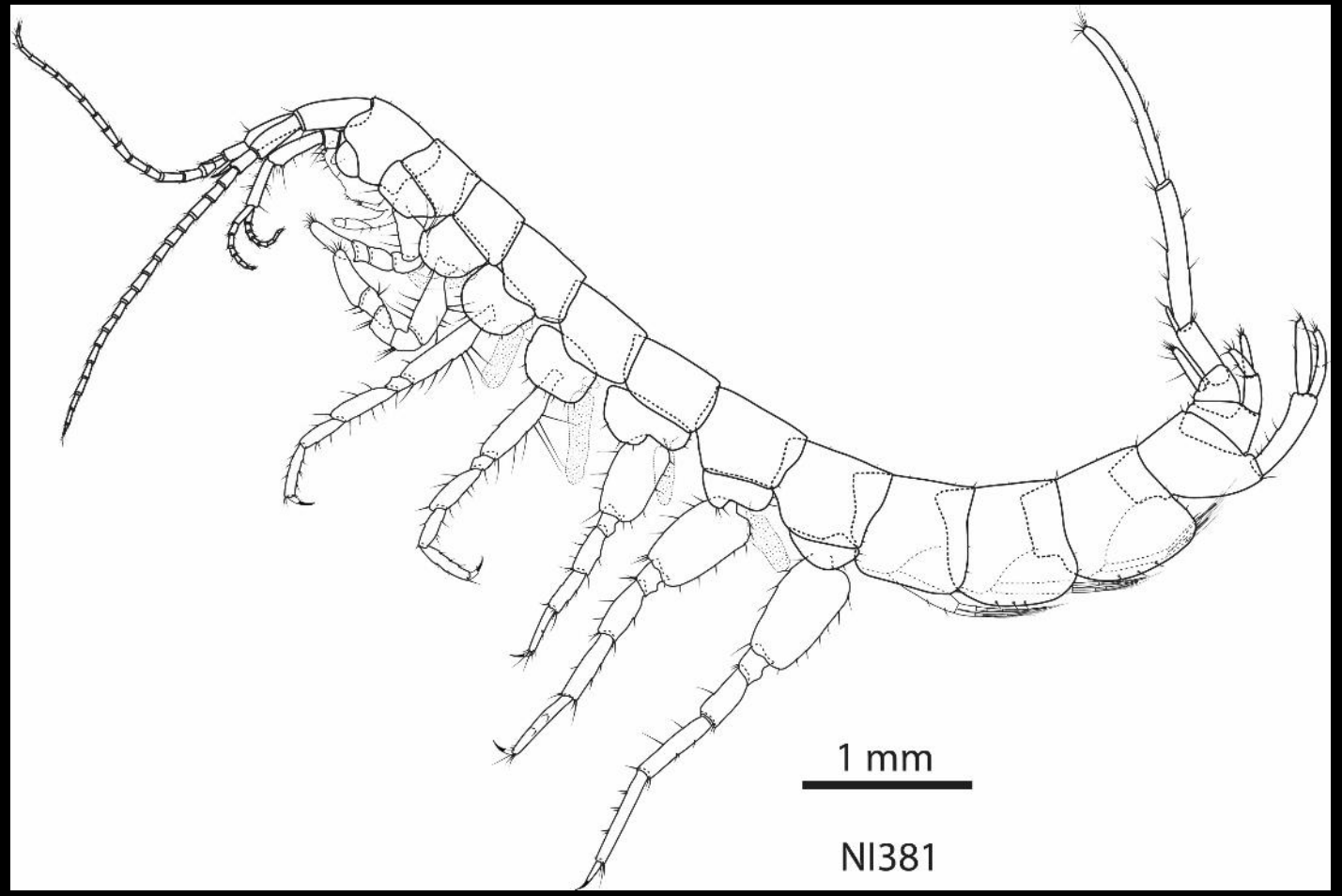
Texas – Australia - Slovenia

Results

- 2 non-karst sites sampled
- Both have stygobionts

- Non-karst habitats are understudied in Slovenia

- Surprise! ☺



Niphargus sp from iron mine in Slovenia

Texas – Australia - Slovenia

Conclusions

- Non-karst regions are understudied
  - Shallow, small, fractured rock systems in weathered non-karst
  - Sandy and alluvial interstitial
  - Ranges can be only a few km^2
  - DO limits available habitat?
- Different sampling approaches required

- High conservation value
- Habitats easily damaged/destroyed
- Smaller species under-described