

Aquatic caecilians (Amphibia, *Typhlonectes natans*) in Florida:
what we know about their relative abundance, distribution, and natural history



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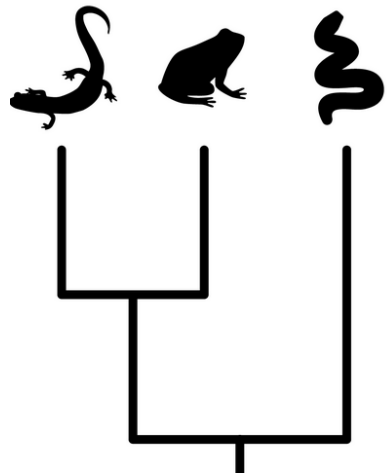


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What are Caecilians?

Caecilians are tropical amphibians in the Order Gymnophiona (= naked snake)

- Truly legless with no rudiments of pectoral or pelvic girdles
- Blind and worm-like, with annuli around the body (caecilian = Latin for “blind ones”)
- Carnivores - Caecilians have retractable tentacles which are sensory organs, likely used to locate prey
 - Tentacles are unique and retracted by the same muscle that retracts the eye in other vertebrates
- Strange reproduction involving internal fertilization, uterine milk, specialized embryonic teeth, etc.



Gymnophiona (caecilians)
222 species
3% of total amphibian species



Caudata (salamanders)
816 species
9% of species



Anura (frogs)
7,699 species
88% of species

Caecilia thompsoni

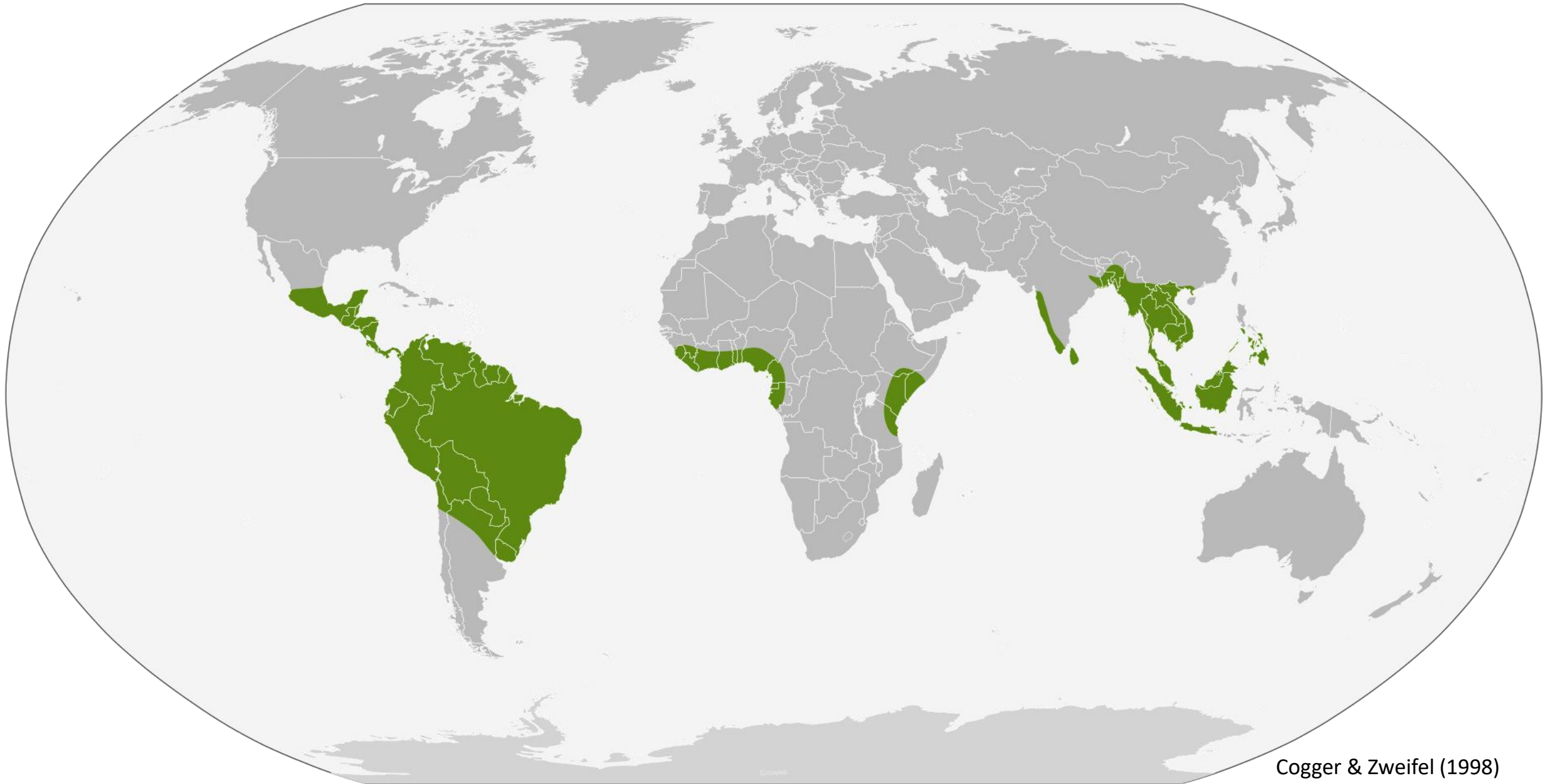


Siphonops annulatus



Ichthyophis kohtaoensis

Current distribution of caecilians – 10 families



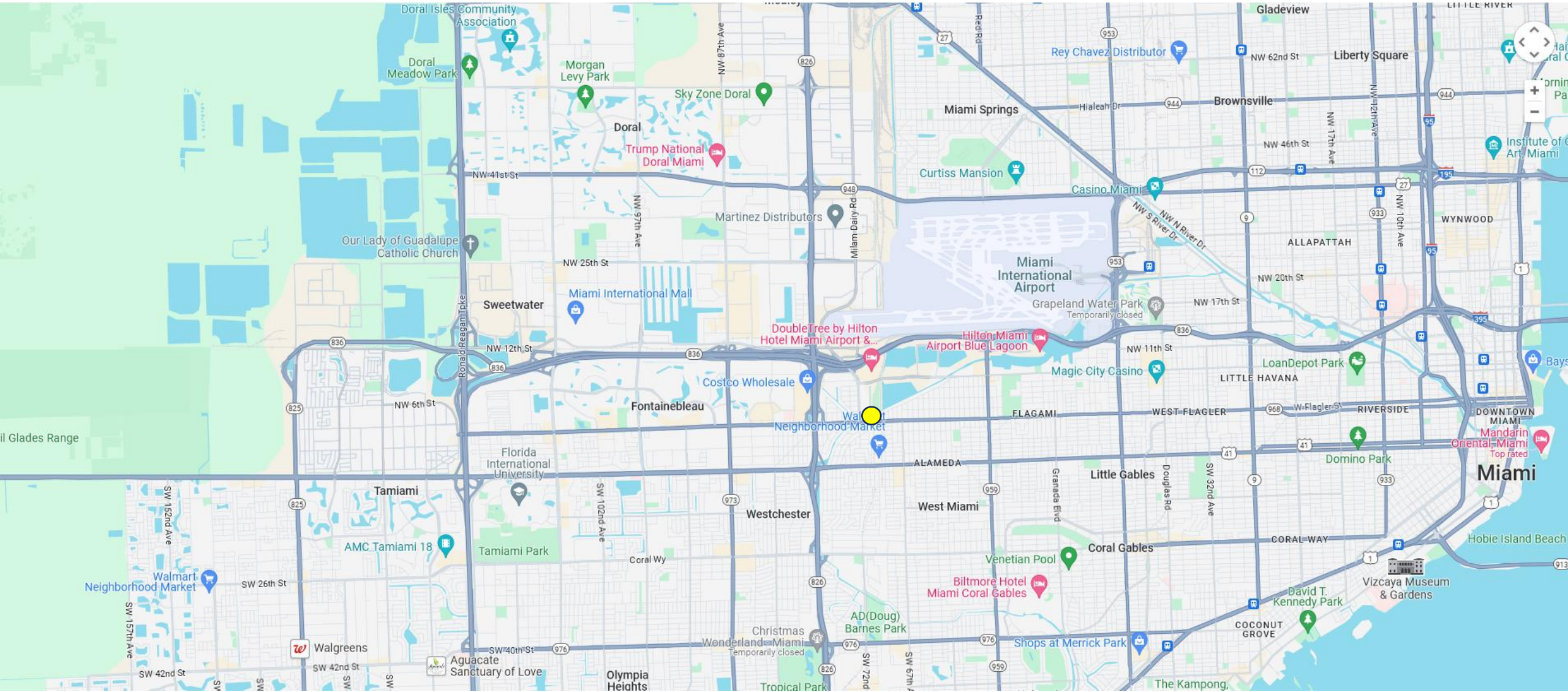


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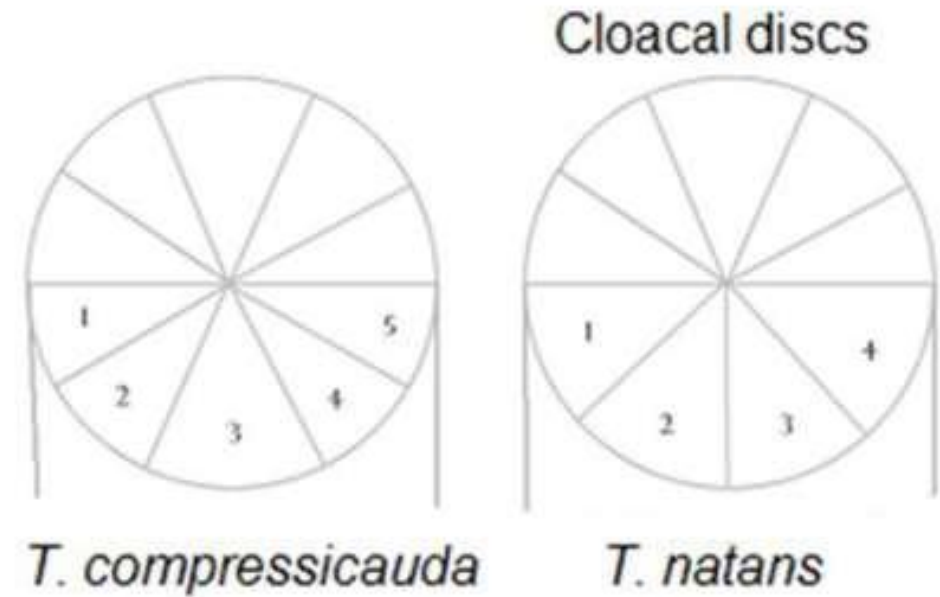
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2019 Florida Fish and Wildlife Conservation Commission (FWC) initial site – Tamiami (C-4) Canal





Typhlonectes sp. - a fully aquatic caecilian
But what species?



We used the cloacal disk, dentition, and molecular data to identify the specimen as an adult male *Typhlonectes natans* (Rio Cauca caecilian).



INTRODUCED SPECIES

First Record of a Caecilian (Order
Gymnophiona, Family Typhlonectidae,
Typhlonectes natans) in Florida and
in the United States

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The genus *Typhlonectes* (Amphibia; Gymnophiona; Typhlonectidae) contains two species of completely aquatic freshwater caecilians. The Cayenne Caecilian, *Typhlonectes compressicauda* (Duméril and Bibron 1841), is widely distributed in the Amazonian River Basin of Brazil,

Colombia, French Guiana, Guyana, Peru, and Venezuela, whereas the Rio Cauca Caecilian, *T. natans* (Fischer 1880), has a smaller distribution within the drainage basins of the Cauca and Magdalena Rivers in Colombia and the areas surrounding the Maracaibo Basin in Venezuela (Tapley and



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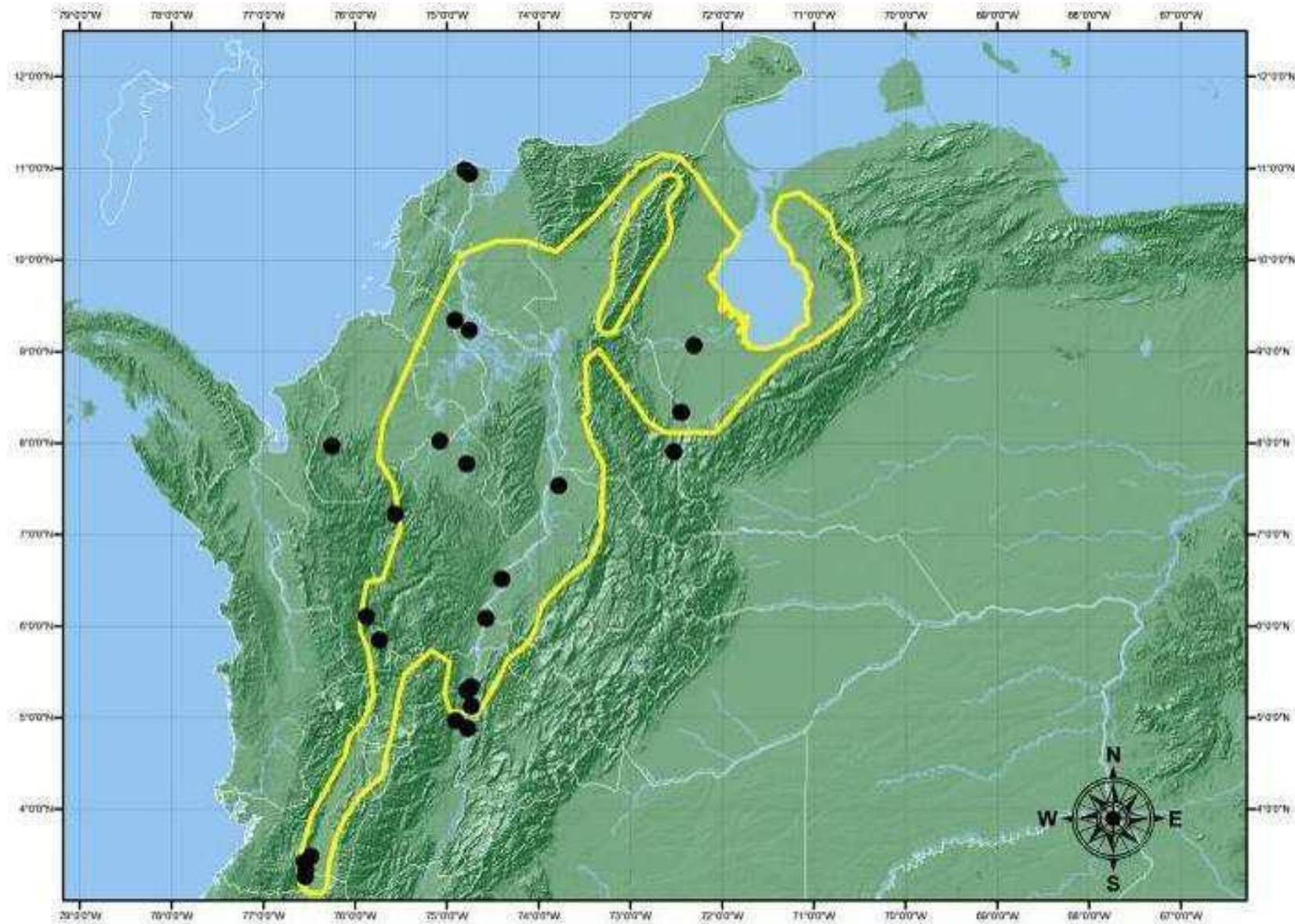
FLORIDA BIODIVERSITY

Weird, noodle-shaped amphibians known as caecilians found in South Florida canal

by Natalie van Hoose • July 28, 2021



Native distribution of *Typhlonectes natans* in Colombia and Venezuela (Tapley & Acosta, 2010).

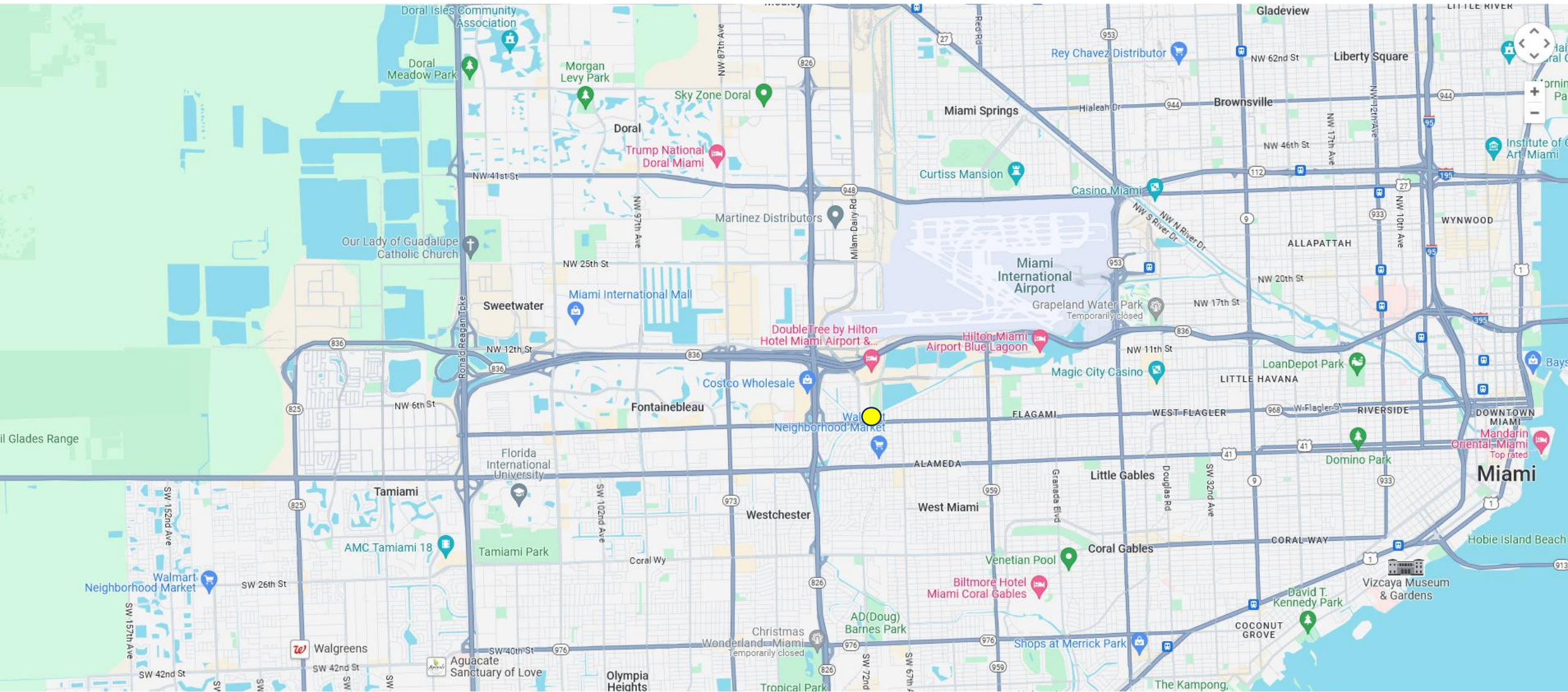


August 2021





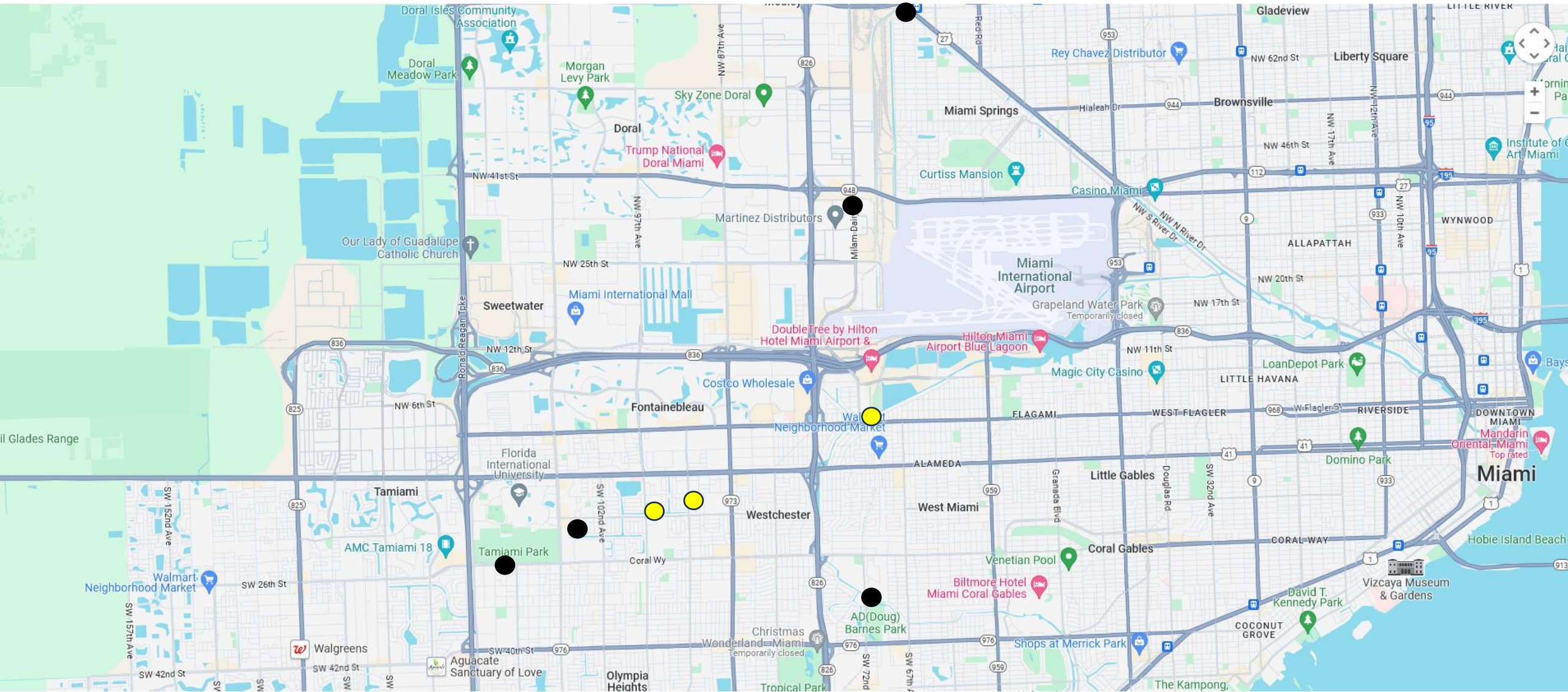
2019 FWC initial site – Tamiami (C-4) Canal



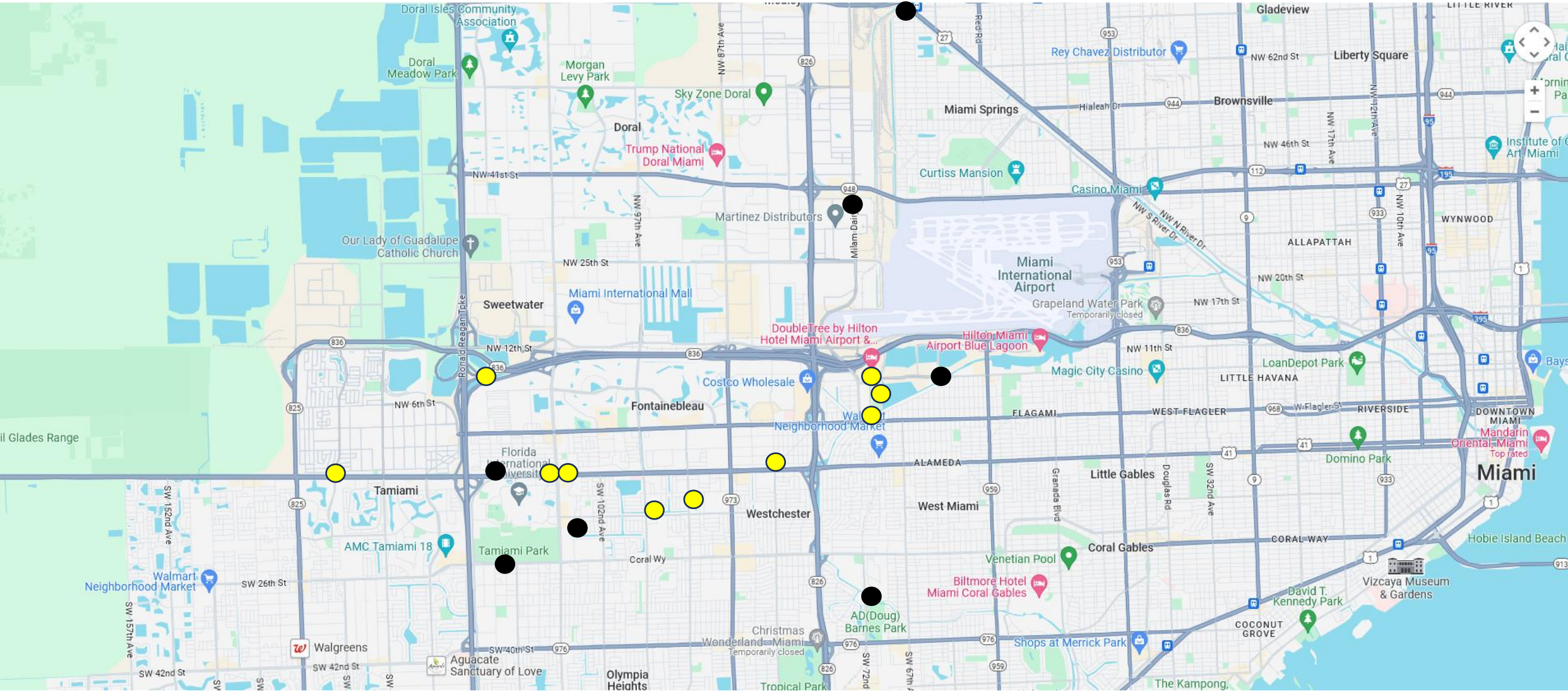
● = caecilians found

● = caecilians not found

Coleman Sheehy and Rob Robins sites (2021)



Additional collectors



● = caecilians found

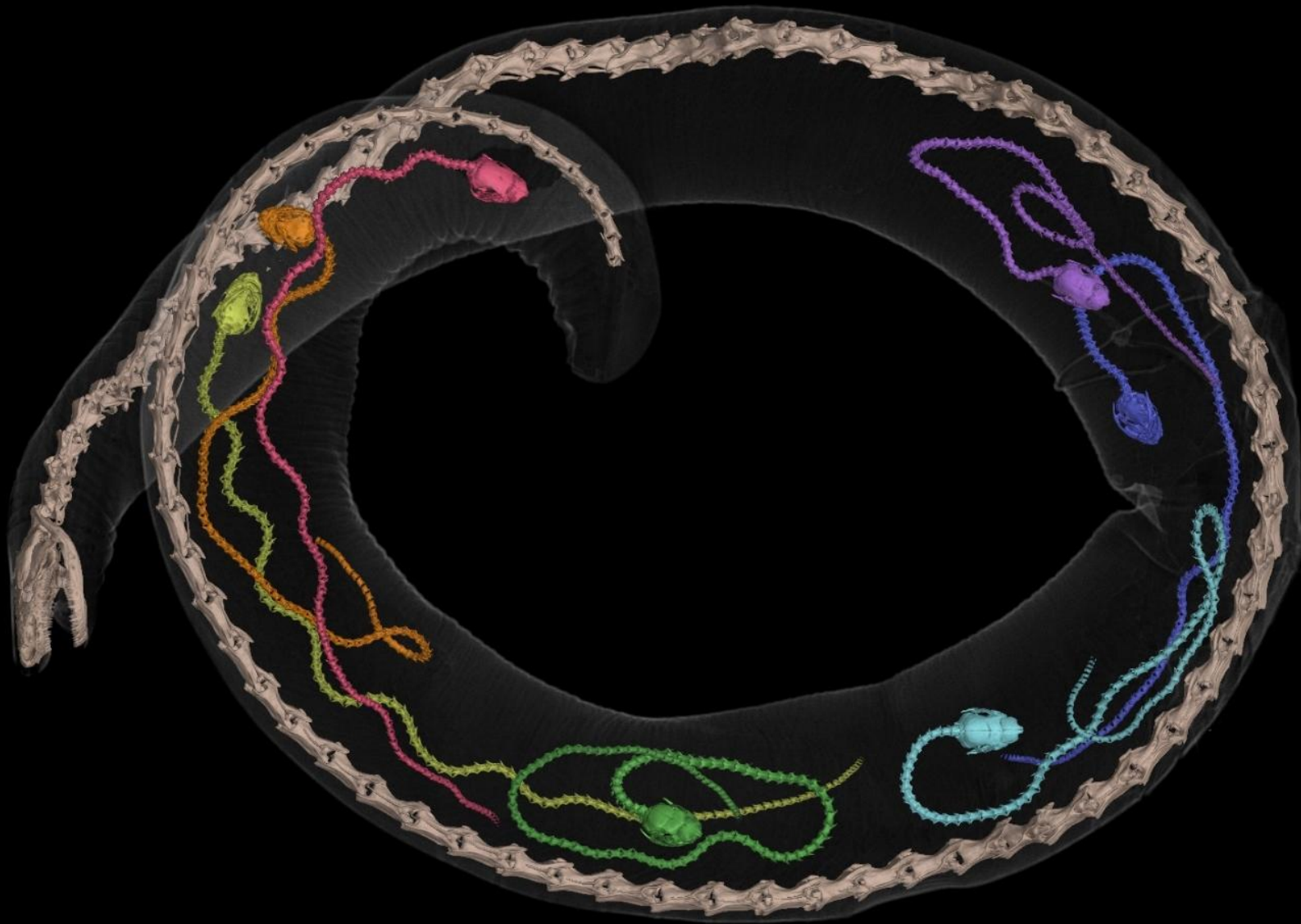
● = caecilians not found

Results

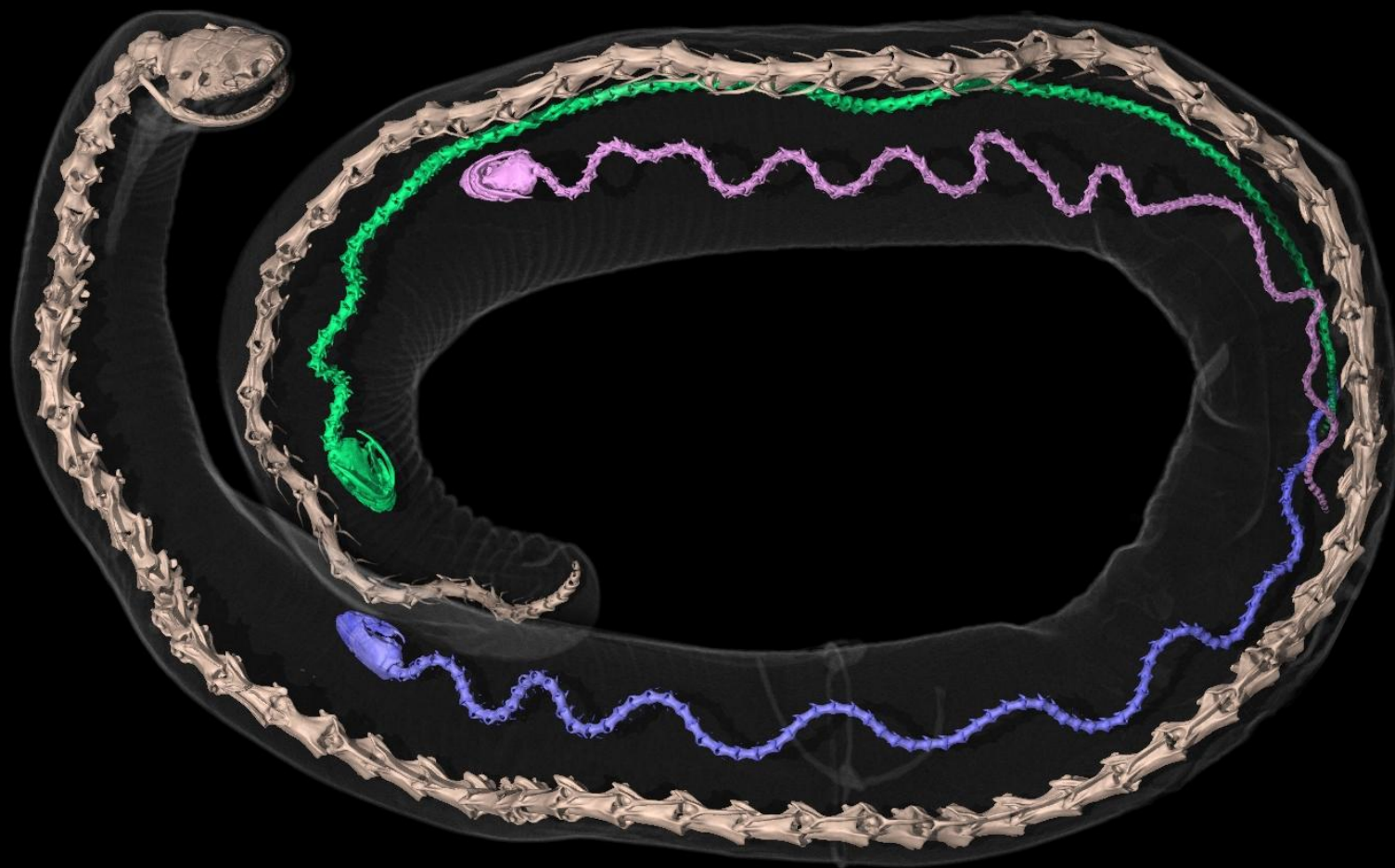
- Hundreds of vouchered specimens from C-4 Canal in Florida Museum herpetology collection
- One minnow trap captured 48 caecilians in three hours!
- Hundreds visually observed in many parts of C-4 canal system
- Males, females, and all age classes captured
- *Typhlonectes natans* is well established in C-4 Canal!

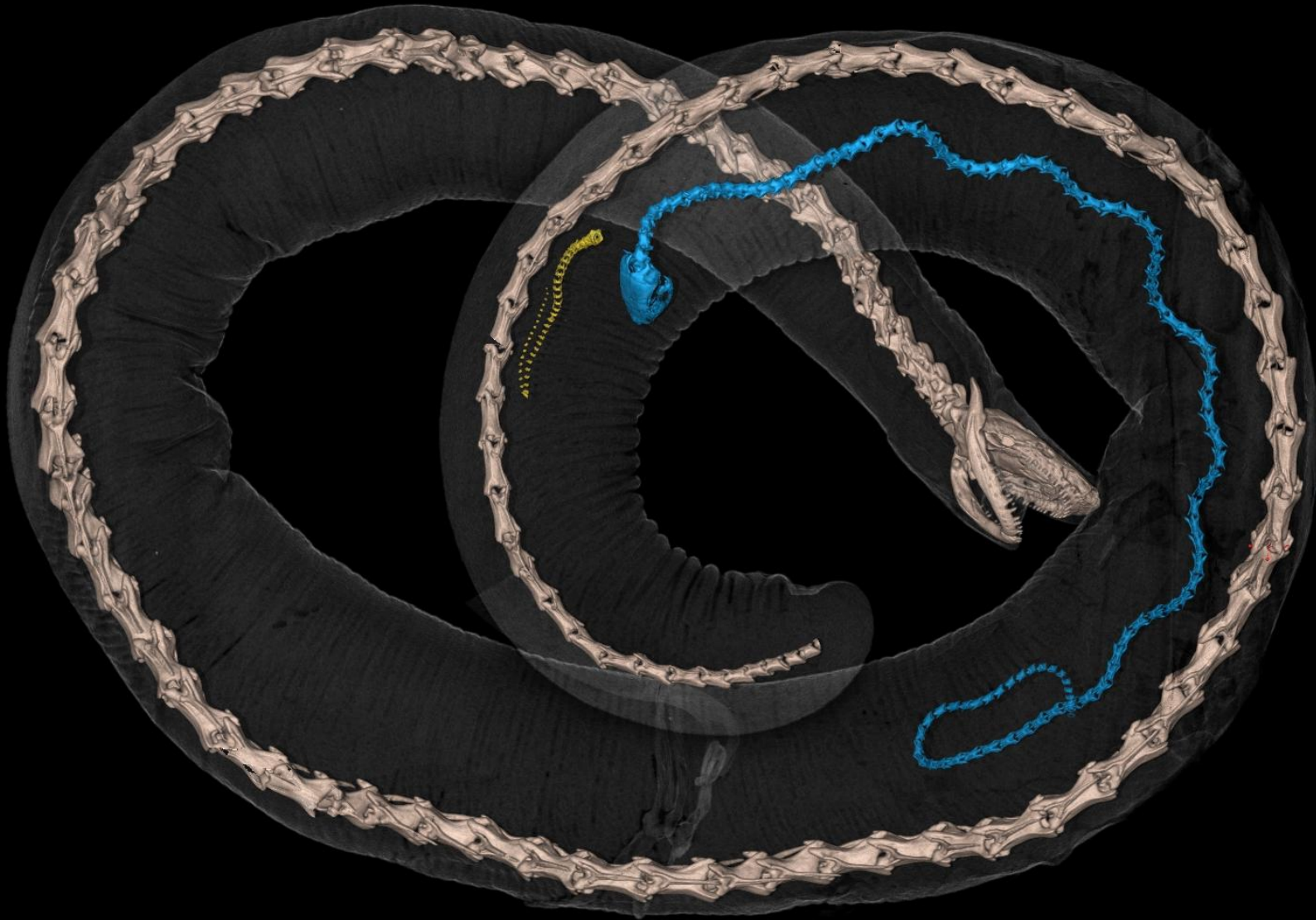


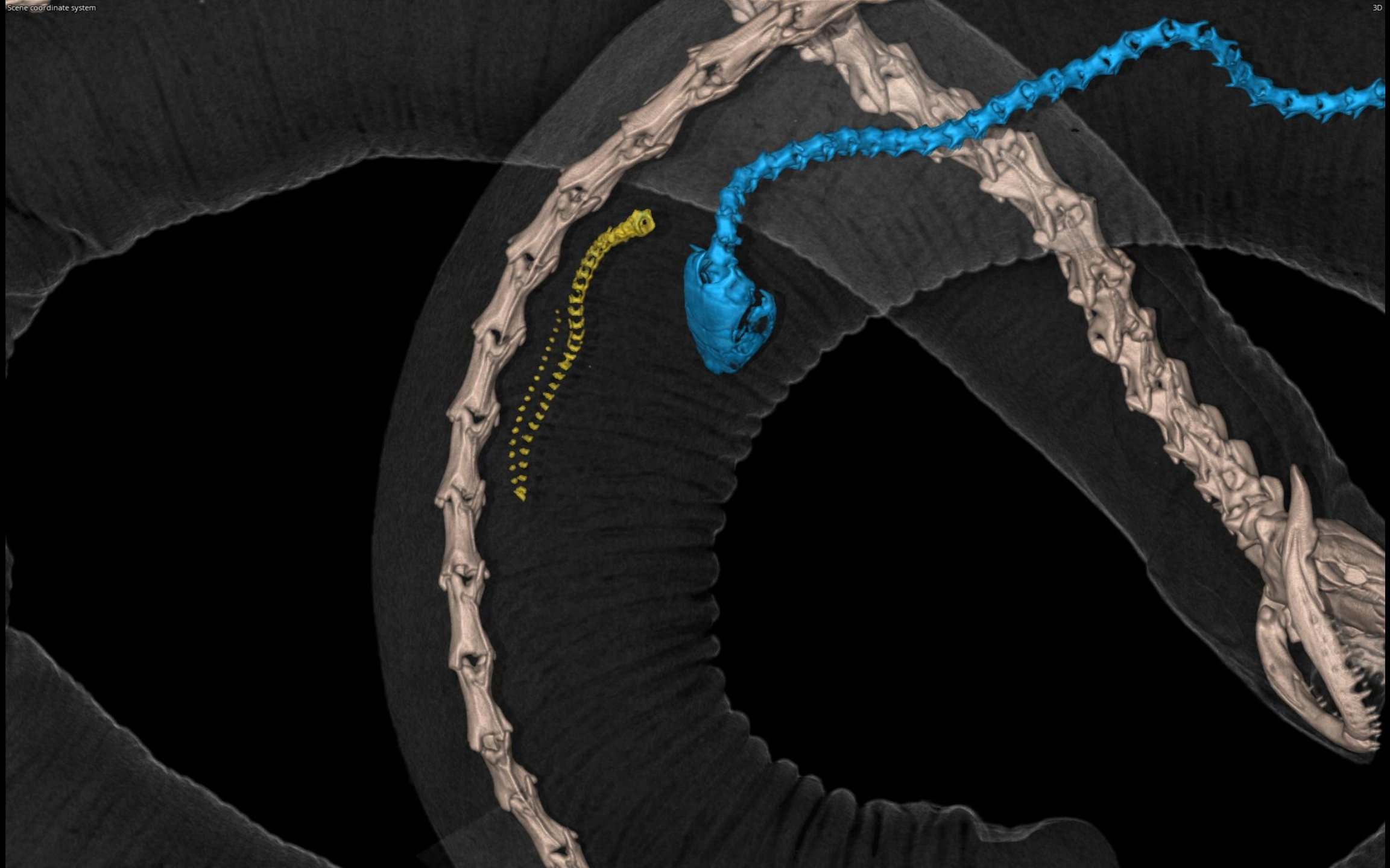
We scanned 33 preserved adult caecilian specimens for dense structures

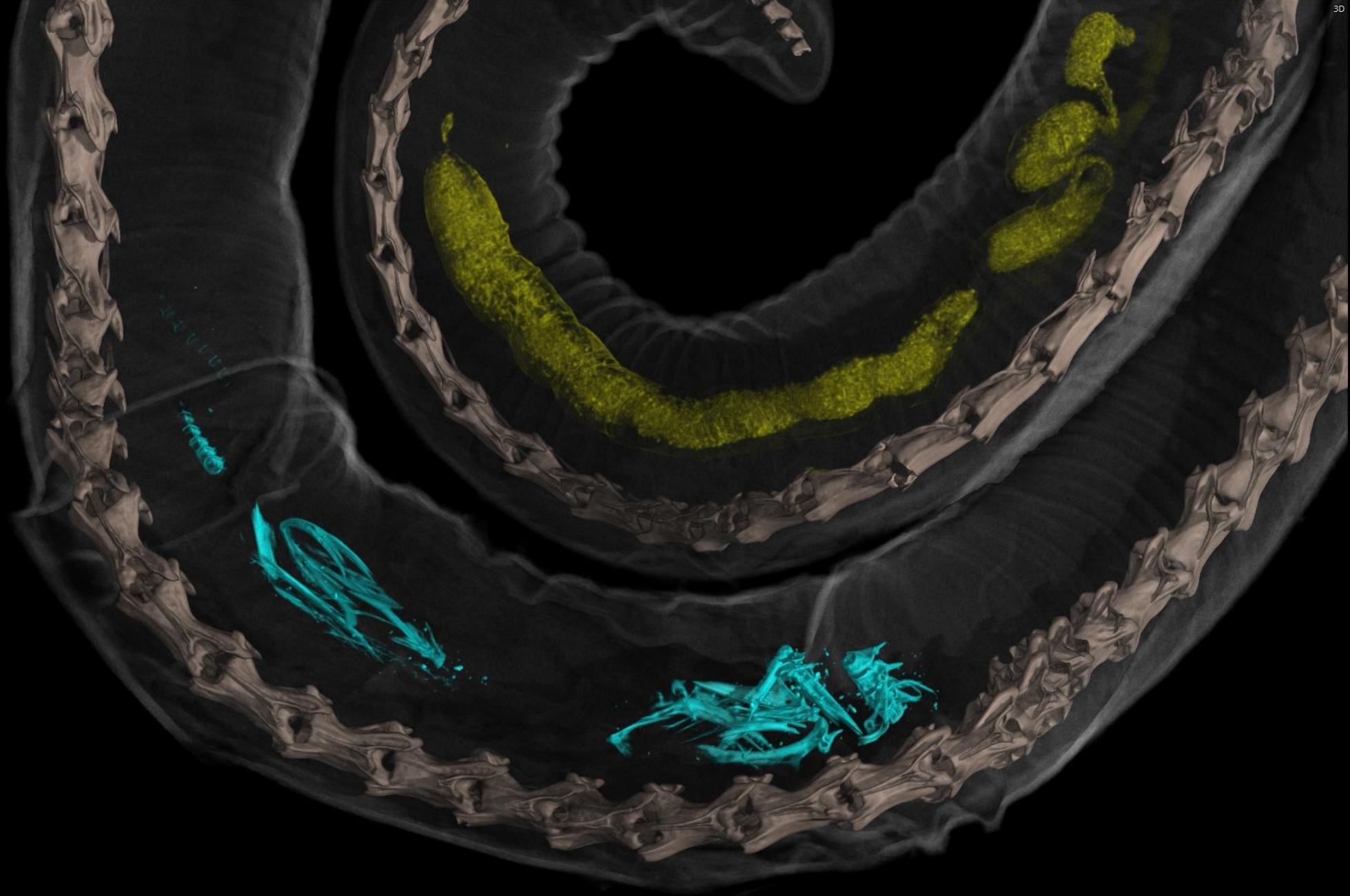


20000 μm









Diet of *Typhlonectes natans*

Published reports suggest these caecilians feed on live invertebrates and vertebrate carrion, but they do not seem to feed on live vertebrates (e.g., Hofer, 2000; Parkinson, 2004; Tapley et al., 2022).

>300 caecilians observed scavenging on carcasses of a freshwater turtle, a domestic Muscovy duck, a Hornet tilapia, a Green iguana, a Raccoon, a Virginia opossum, and a small domestic dog in C-4 Canal.



Diet of *Typhlonectes natans* in Florida

FWC grant awarded in 2024 to assess diet of *Typhlonectes natans* using DNA metabarcoding of gut contents

We collected and dissected 97 *T. natans* from multiple locations in the Tamiami (C-4) Canal

Only four specimens contained prey that could be identified based on external anatomy:

1. Juvenile Zebra tilapia (Cichlidae: *Heterotilapia buttikoferi*, standard length = 21.1 mm) located within the stomach. Non-native
2. Juvenile Swamp darter (Percidae: *Etheostoma fusiforme*, standard length = 24.9 mm) located within the stomach. Native
3. Cuban May beetle (Scarabaeidae: *Phyllophaga bruneri*, total length = 12 mm) located within the stomach. Non-native
4. Operculum of a freshwater Banded mystery snail (Viviparidae, *Callinina georgiana*) within the intestine. Native



Diet of *Typhlonectes natans* in Florida

Gut contents from 97 specimens were submitted for metabarcoding DNA analysis using MT-CO1 gene

DNA sequences recovered from 57 eukaryotic operational taxonomic units (OTUs)

The top 10 most frequent OTUs identified in the guts of the 97 caecilians we collected:

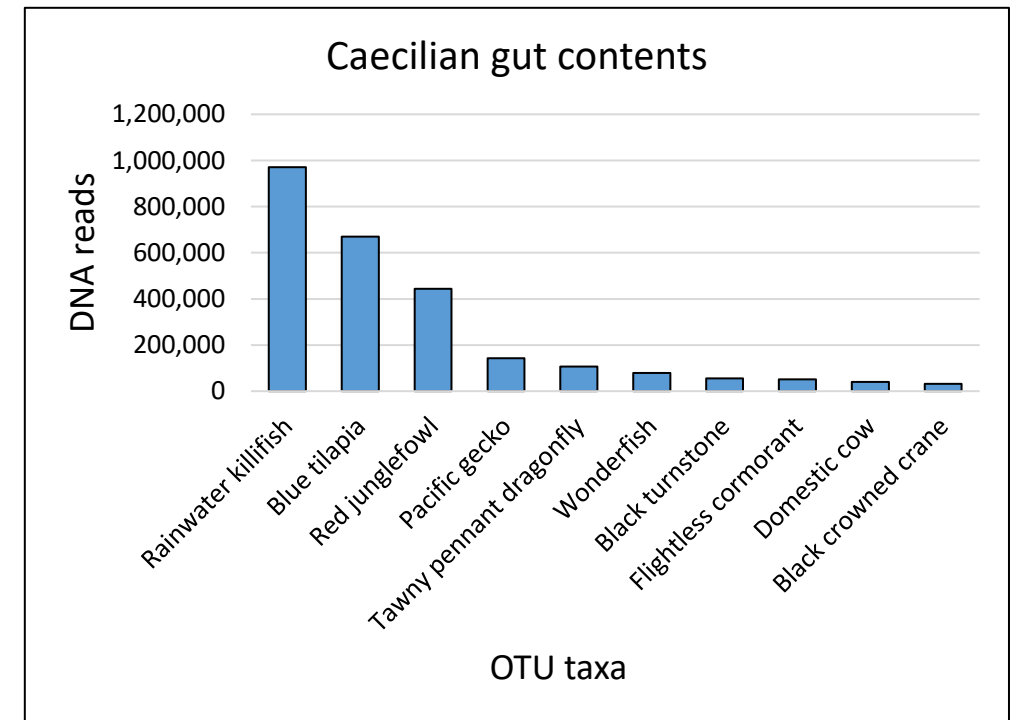
Diet of *Typhlonectes natans* in Florida

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The top 10 most frequent OTUs identified in the guts of the 97 caecilians we collected (preliminary):

OTU taxa	Species	# reads	Native
Rio Cauca caecilian	<i>Typhlonectes natans</i>	7,243,205	N
Rainwater killifish	<i>Lucania parva</i>	970,142	Y
Blue tilapia	<i>Oreochromis aureus</i>	669,412	N
Red junglefowl	<i>Gallus gallus</i>	443,476	N
Pacific gecko	<i>Gehyra mutilata</i>	143,471	N
Tawny pennant dragonfly	<i>Brachymesia herbida</i>	106,397	N
Wonderfish	<i>Thaumathichthys pagidostomus</i>	79,153	N
Black turnstone	<i>Arenaria melanocephala</i>	55,371	N
Flightless cormorant	<i>Phalacrocorax harrisi</i>	51,015	N
Domestic cow	<i>Bos taurus</i>	40,016	N
Black crowned crane	<i>Balearica pavonine</i>	32,312	N



Diet of *Typhlonectes natans* in Florida

These caecilians appear to have a broad and opportunistic diet, including vertebrate carrion

Are they feeding primarily on vertebrates in Florida?

Could they be eating small live fish?

Predator/prey interactions needed



© Chris Harrison

Ongoing work

- Predator/prey interactions
- Reproduction – could it be seasonal?
- Habitat – Adults appear to prefer deepest parts of canal. Are water depth and substrate important?
- Defense – Appear to produce glandular skin secretions that can irritate eyes and skin
- Predation – what eats them?
- Disease ecology – 78 specimens screened for *Batrachochytrium dendrobatidis* (*Bd*) - No *Bd* detected
- Distribution – full extent and limitations



Ongoing work

- Second manuscript currently in review to document their establishment and what we now know
- More fieldwork needed to answer more questions (e.g., distribution, biomass, ecological impact)
- Unprecedented opportunity to learn more about caecilian biology



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Thank you!

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