A Collaborative Approach to Assess the Status of American Eel in Texas

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Texas Parks & Wildlife Department – Inland Fisheries

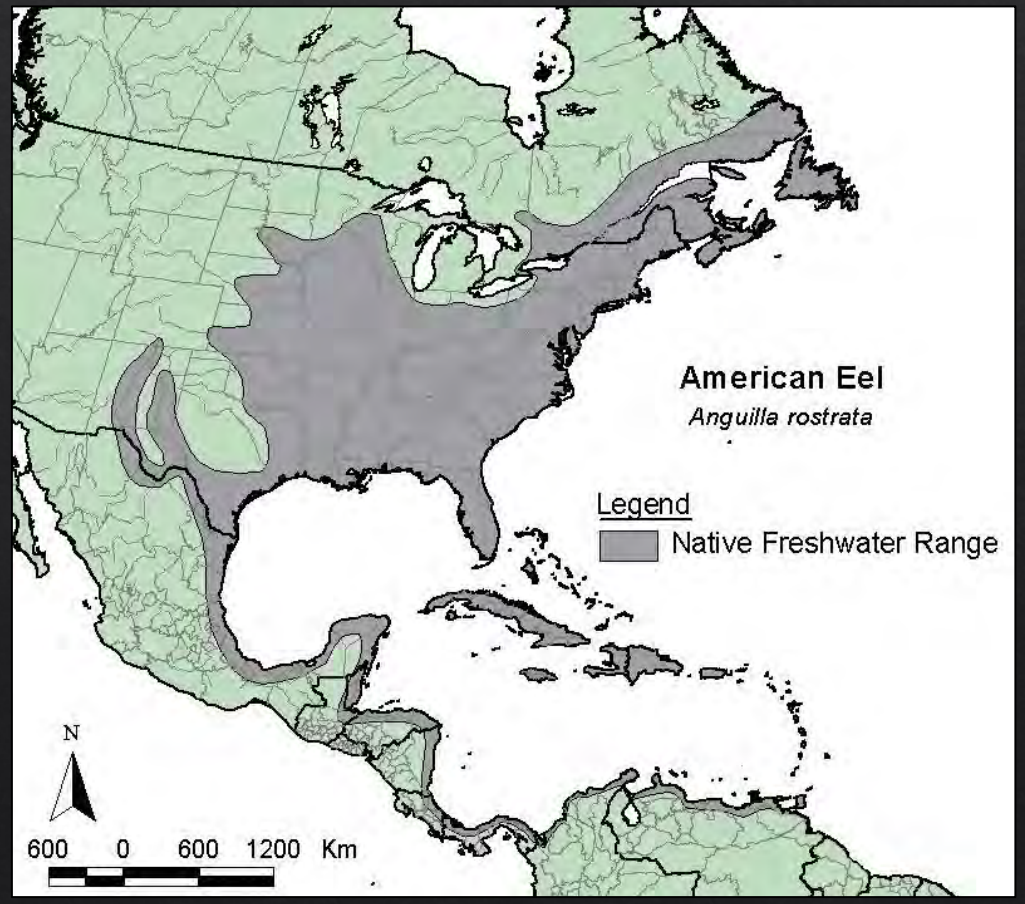
Galveston Bay Estuary Program – Monitoring & Research Subcommittee Meeting | December 10, 2025

TEXAS PARKS & WILDLIFE

Project Partners

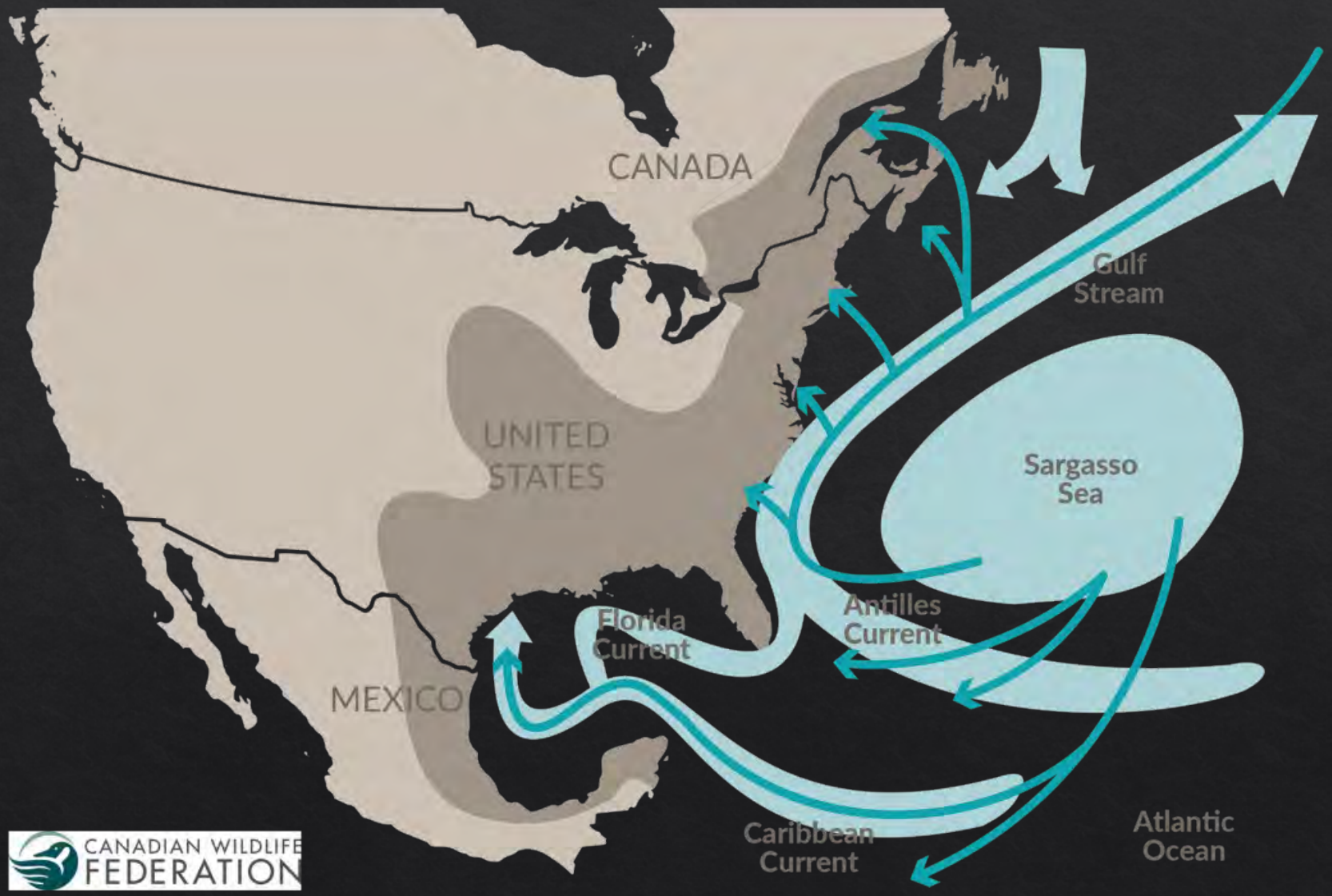
Life History of American Eel

- Greenland to South America[1]
- Facultative catadromous species
  - Spawn in saltwater
  - Migrate to estuarine and/or freshwater
- Panmictic population[2]
  - One single population
  - Ability to breed with any individual

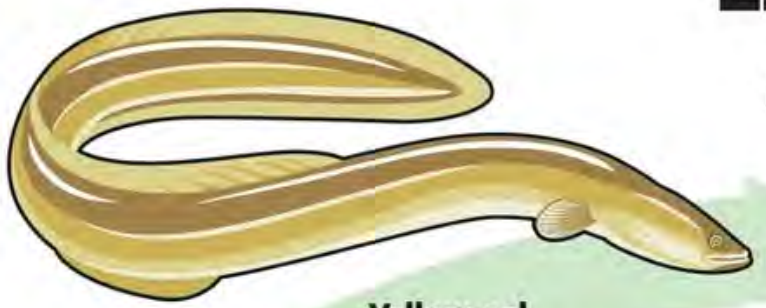


[1]USFWS; [2]Ulmo-Diaz et al. 2023

MIGRATION PATTERNS OF THE AMERICAN EEL



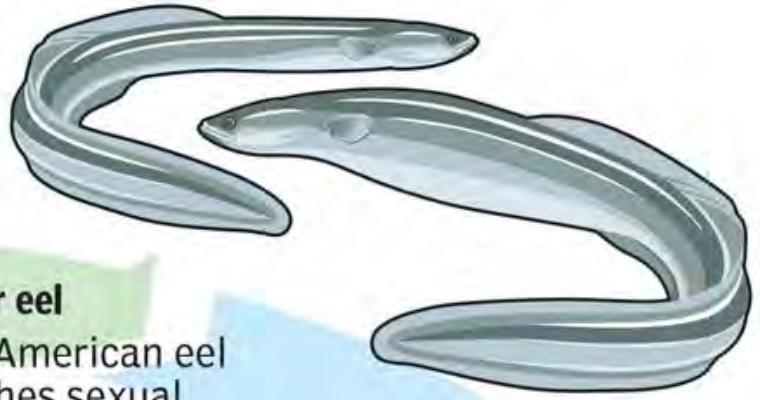
Life cycle of the American eel



Yellow eel

In their adult yellow phase, eels are nocturnal feeders. The male may reach 2 feet in length while the female can reach 4 feet.

Freshwater phase



Silver eel

The American eel reaches sexual maturity when it turns silver near the end of its life. It then leaves the freshwater habitat and heads for the Sargasso Sea to spawn and die.

Elver

The young eel at 4 to 5 inches in length has migrated to inland rivers and ponds where it may live for 30 years or more.

Saltwater phase

Eggs

A single female will lay 20 million to 30 million eggs.

Leptocephalus

Flat and transparent, these larvae will drift with ocean currents for a year or more before reaching the coast.

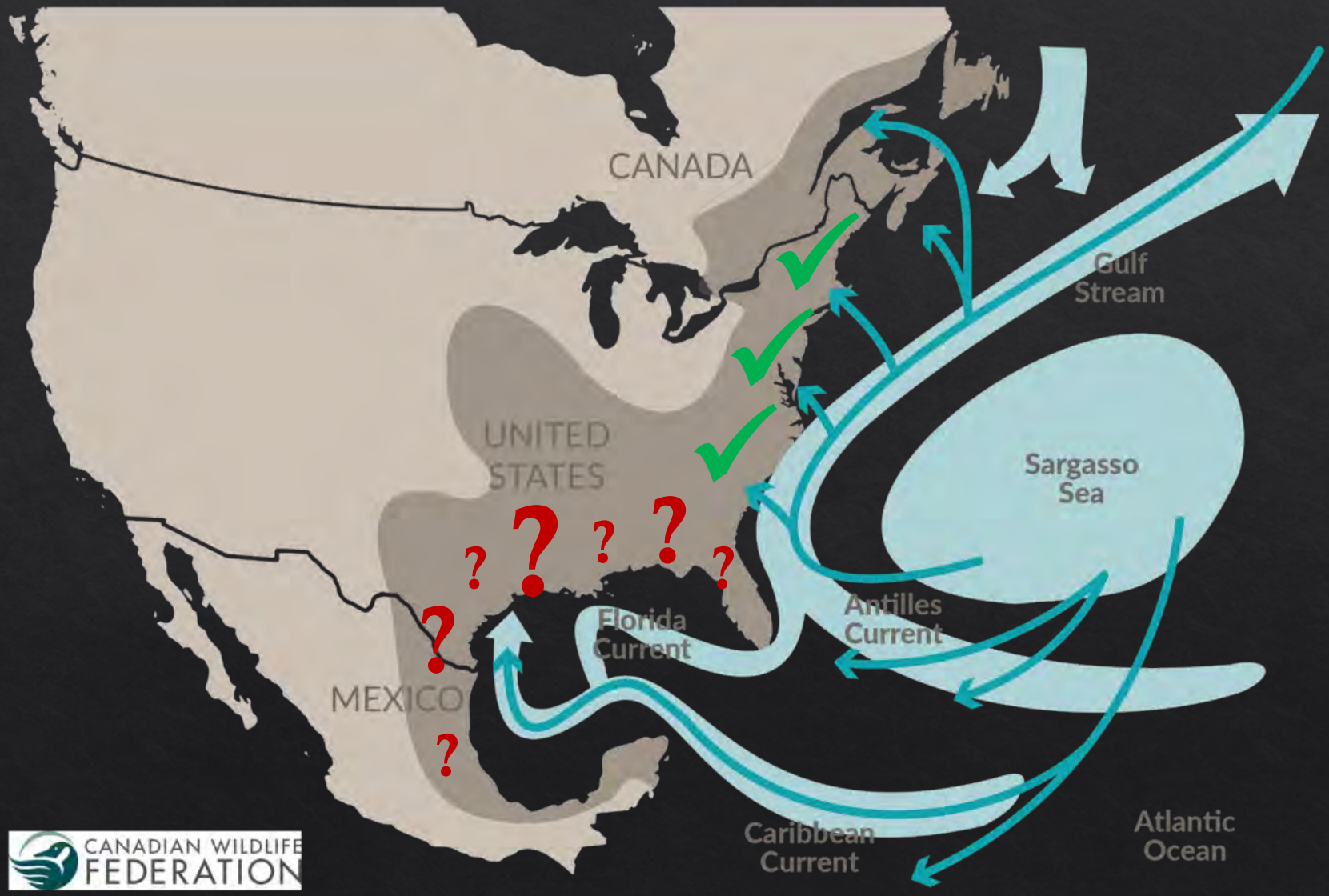
Glass eel

Now 2 to 3 inches long, and eel shaped, it has grown fins and is able to swim.

SOURCE: U.S. Fish and Wildlife Service

THE PROVIDENCE JOURNAL/TOM MURPHY

MIGRATION PATTERNS OF THE AMERICAN EEL



Project Components

Population Assessment

Juvenile Eel Recruitment

Population Assessment

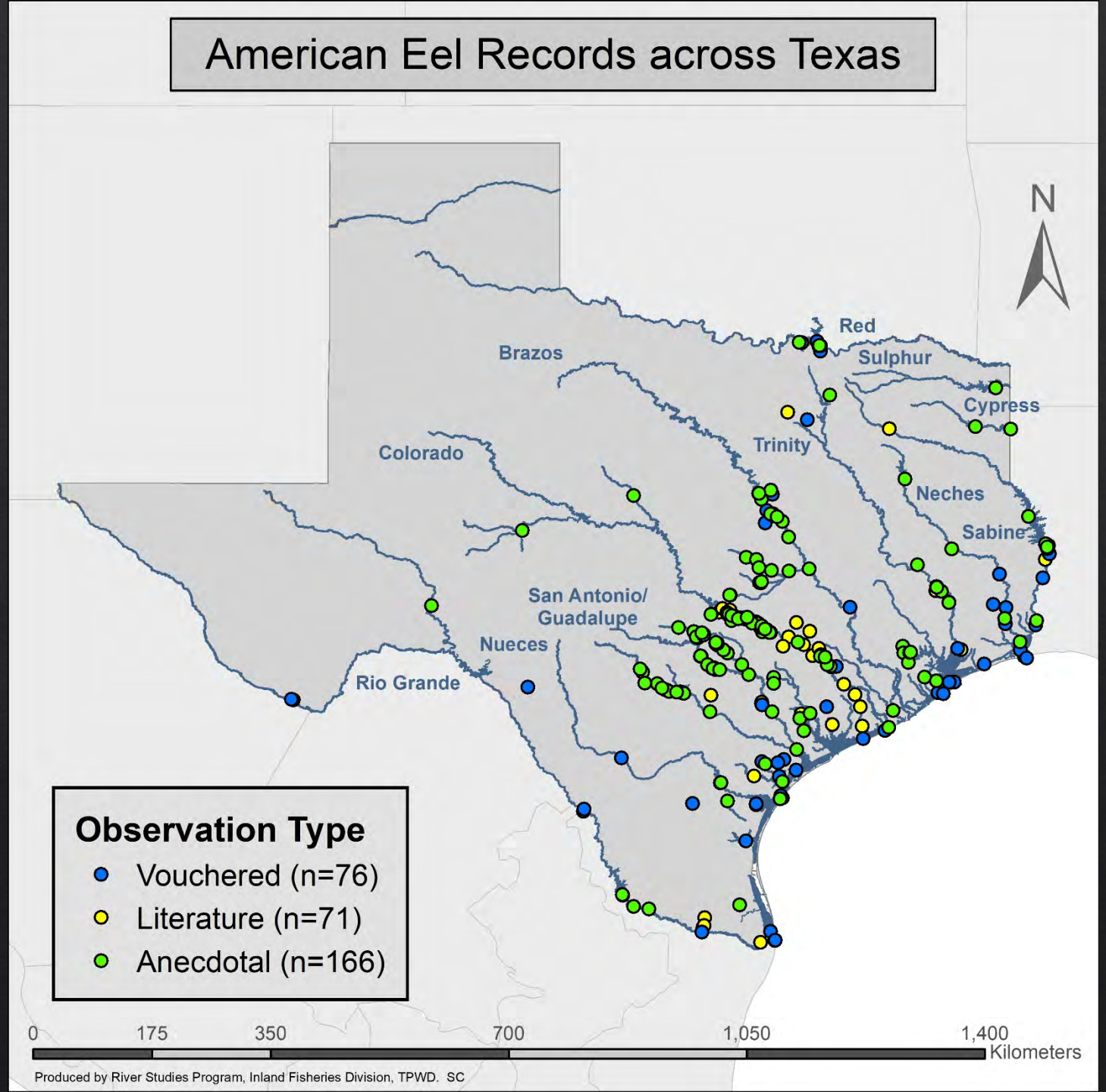
TEXAS
The University of Texas at Austin

UNIVERSITÉ LAVAL

TEXAS A&M UNIVERSITY CORPUS CHRISTI

Data Collection

1. Distribution & Abundance
2. Life History
   - Habitat Use
   - Diet
   - Parasites
3. Population Structure
   - Life stage
   - Genetics
   - Age
   - Sex

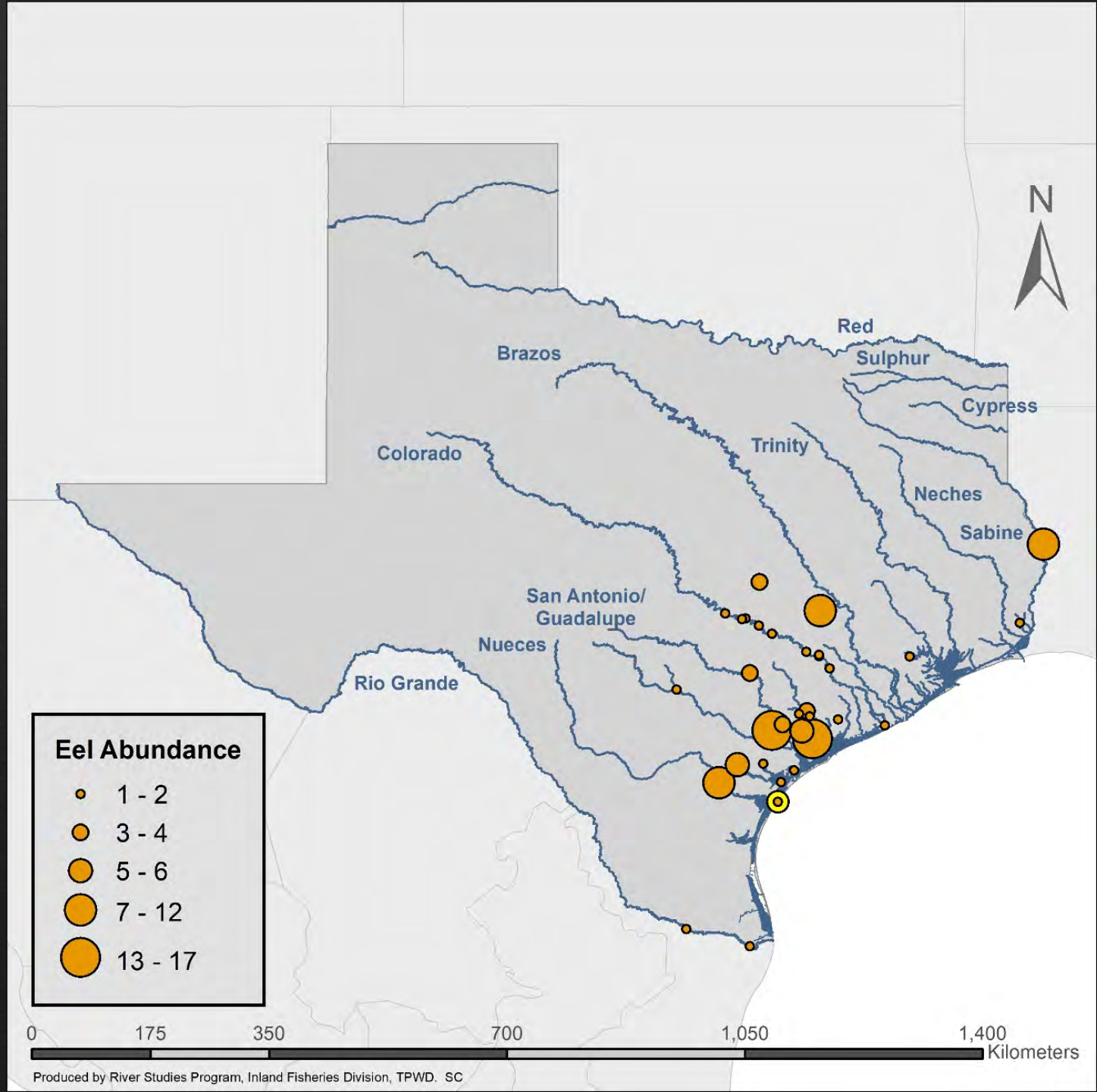

American Eel Records across Texas
N
Red
Sulphur
Brazos
Cypress
Trinity
Colorado
Neches
Sabine
San Antonio/
Guadalupe
Nueces
Rio Grande
Observation Type
Vouchered (n=76)
Literature (n=71)
Anecdotal (n=166)
0
175
350
700
1,050
1,400
Kilometers
Produced by River Studies Program, Inland Fisheries Division, TPWD. SC

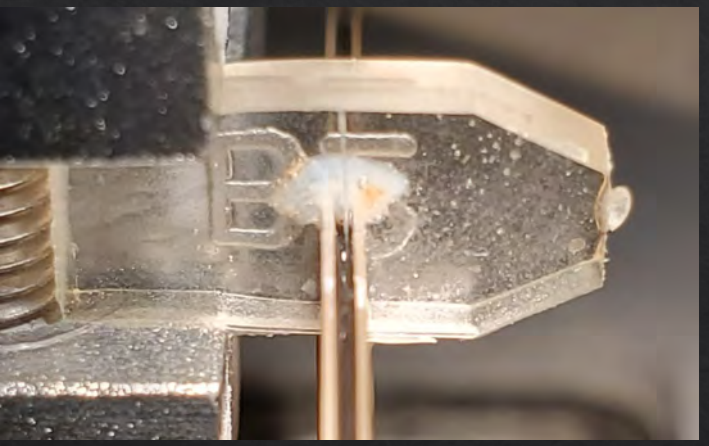
Field Sampling

- Statewide, below instream barriers
- Methods include electrofishing, trotlines, baited traps
- Begging for donations.

Specimens Collected

- 114 individuals
- 33 sites across 7 major river basins
- 113 yellow eel & 1 silver eel





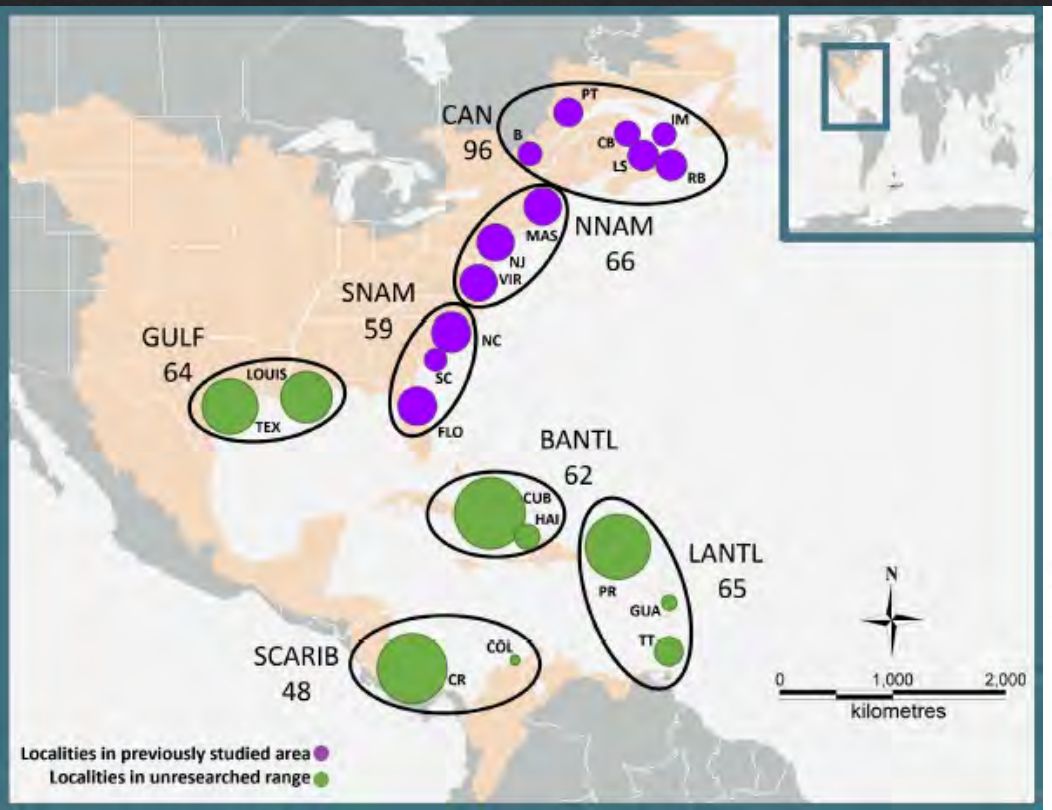
Laboratory Processing

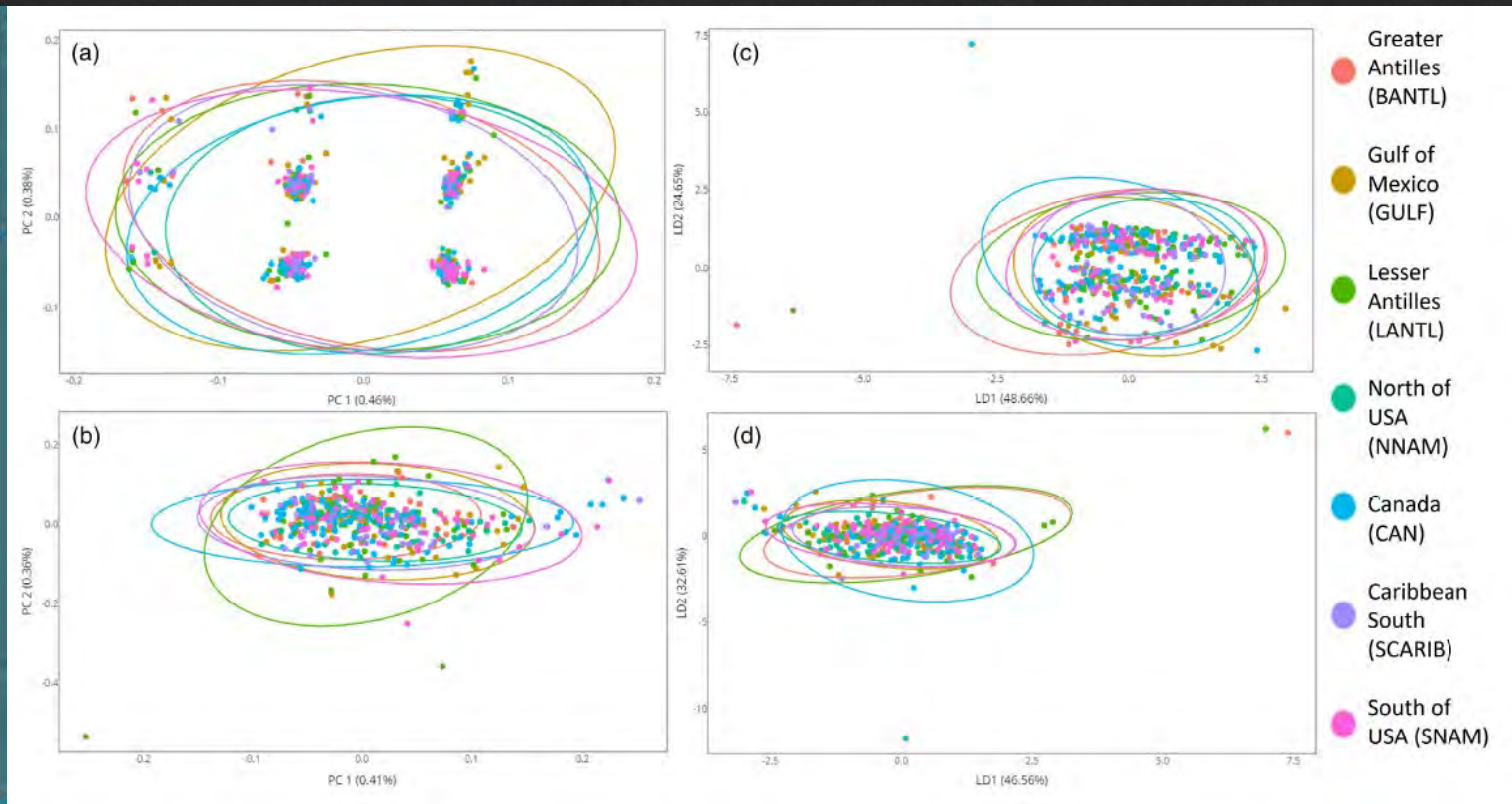
- Specimen management
  - Archive in UT's Biodiversity Center
  - Length, weight, sex, gonad stage
- Specimen processing
  - Muscle tissue (Genetics)
  - Otoliths (Aging & Microchemistry)
  - Swimbladders (*A. crassus* detection)
  - Stomachs (Diet)

Genetics

Panmixia in the American eel extends to its tropical range of distribution: Biological implications and policymaking challenges

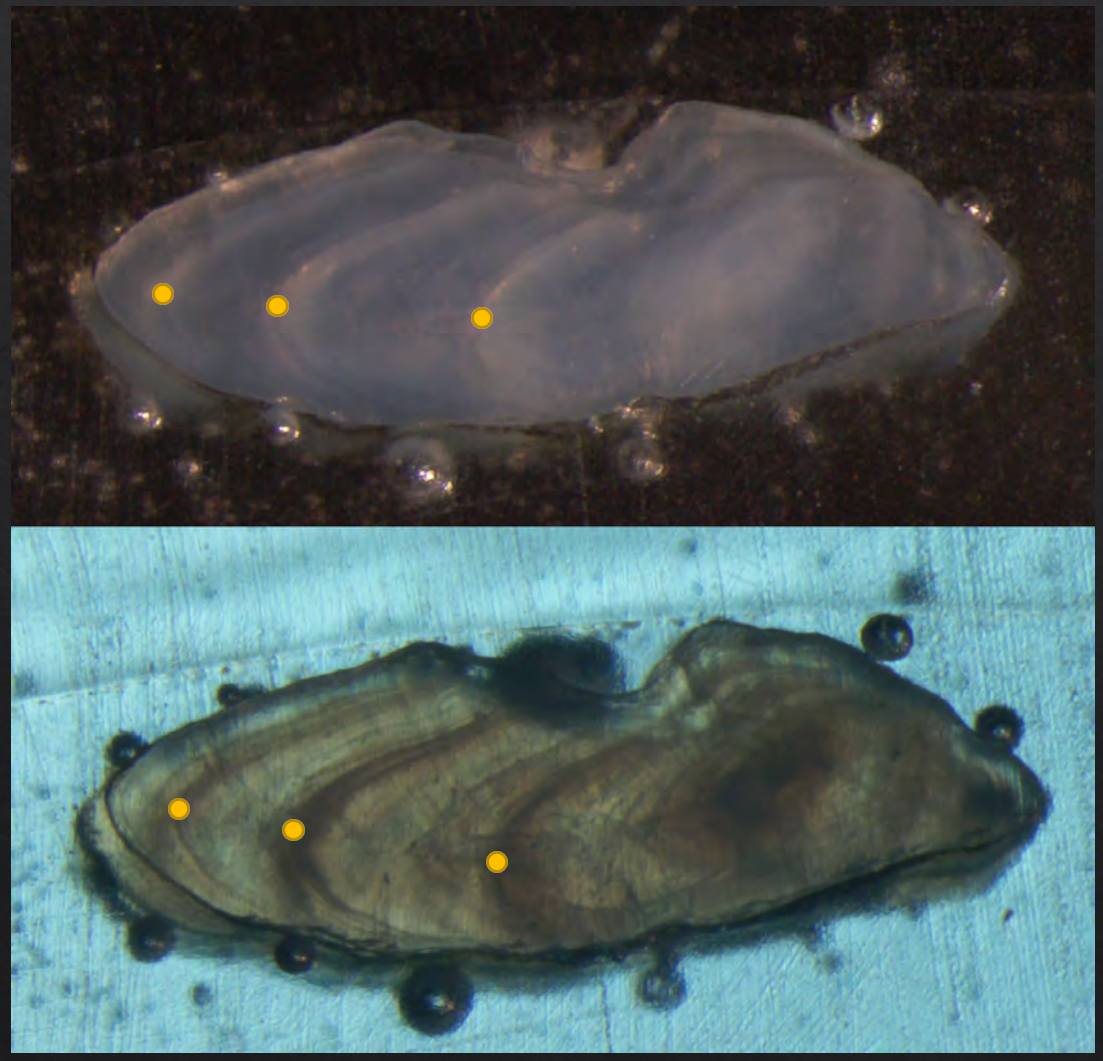
Ulmo-Diaz et al. 2023 – *Evolutionary Applications*



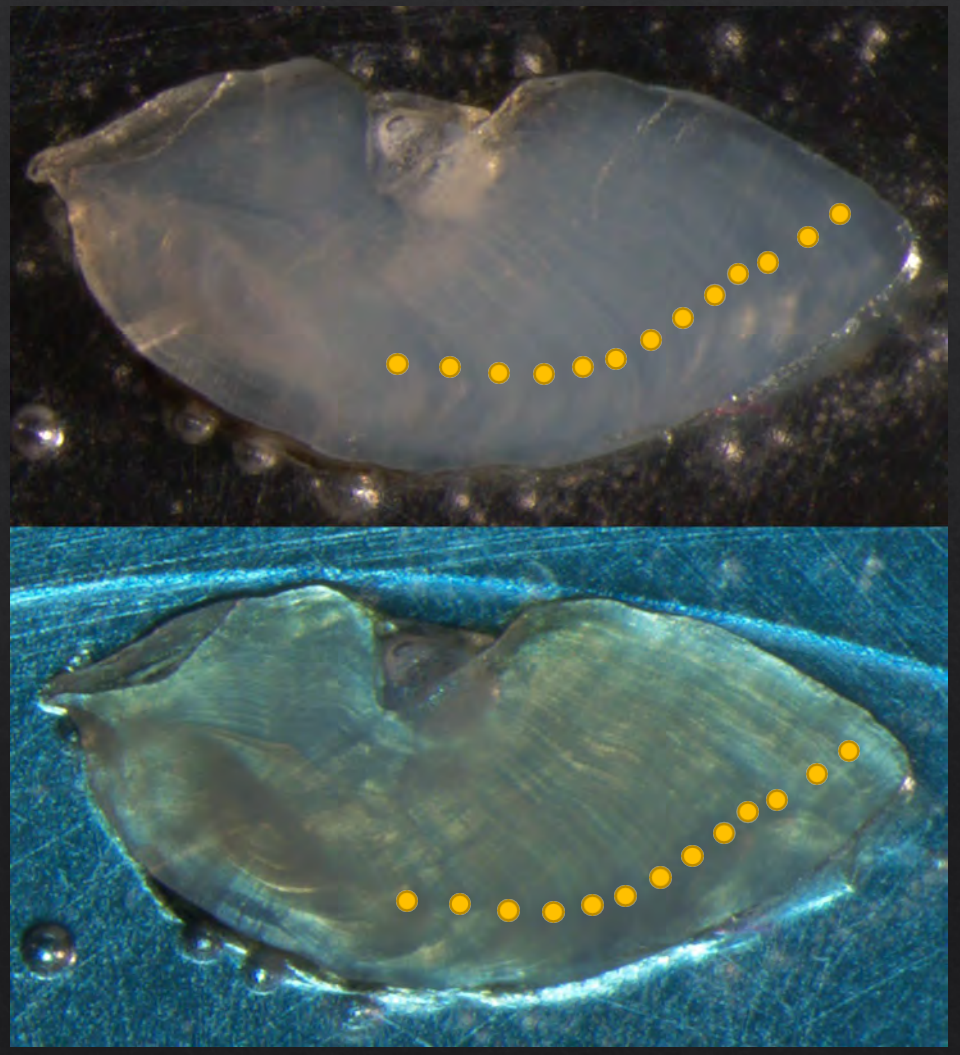


Otolith Aging

Young Eel

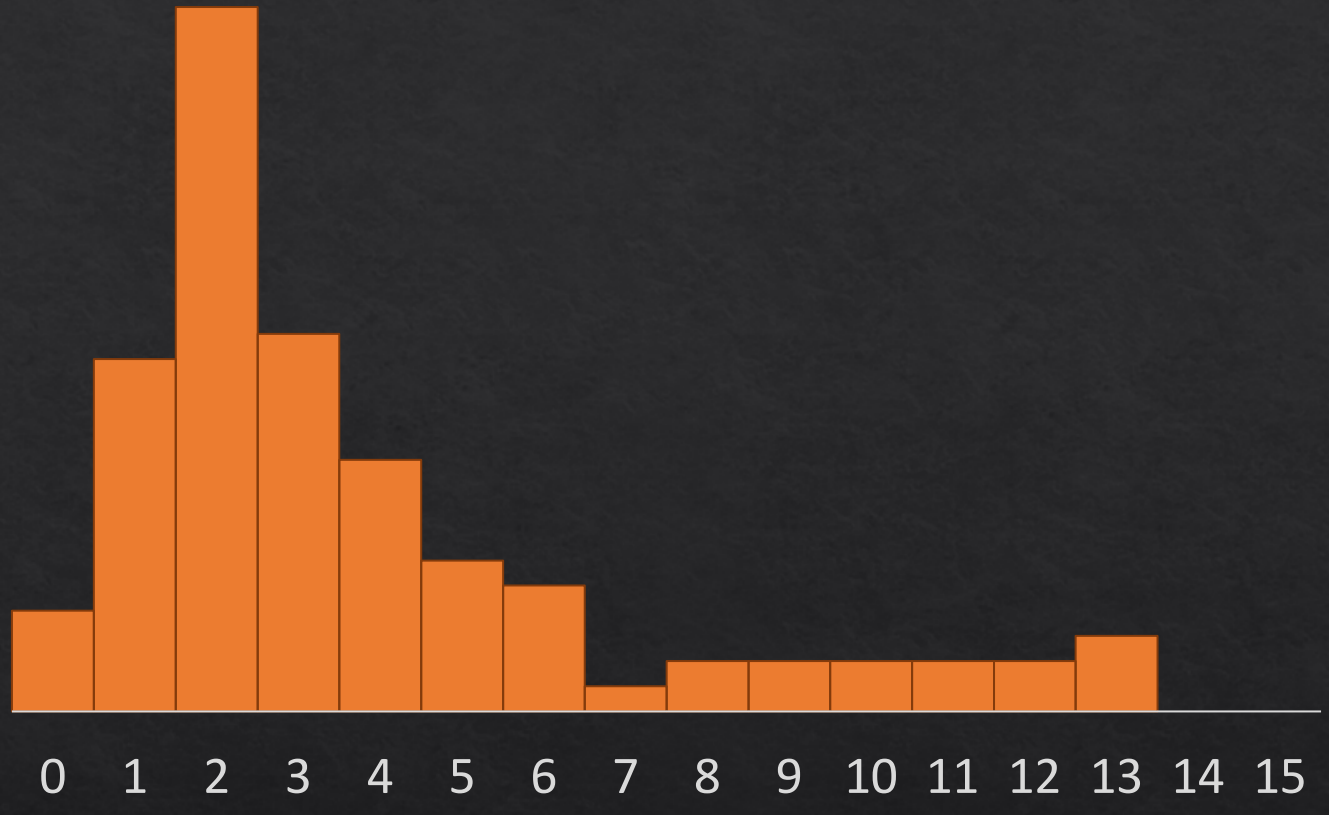


Older Eel



Otolith Aging

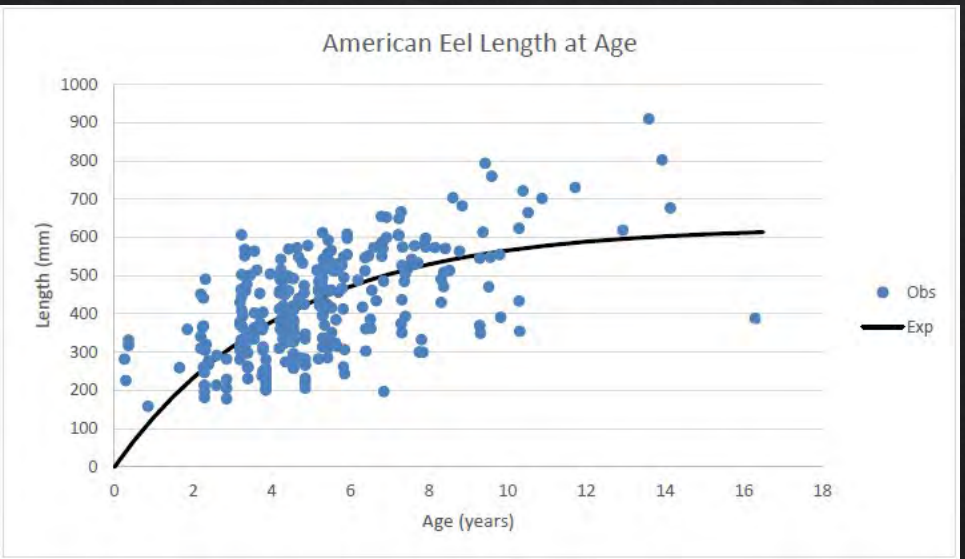
Age Distribution

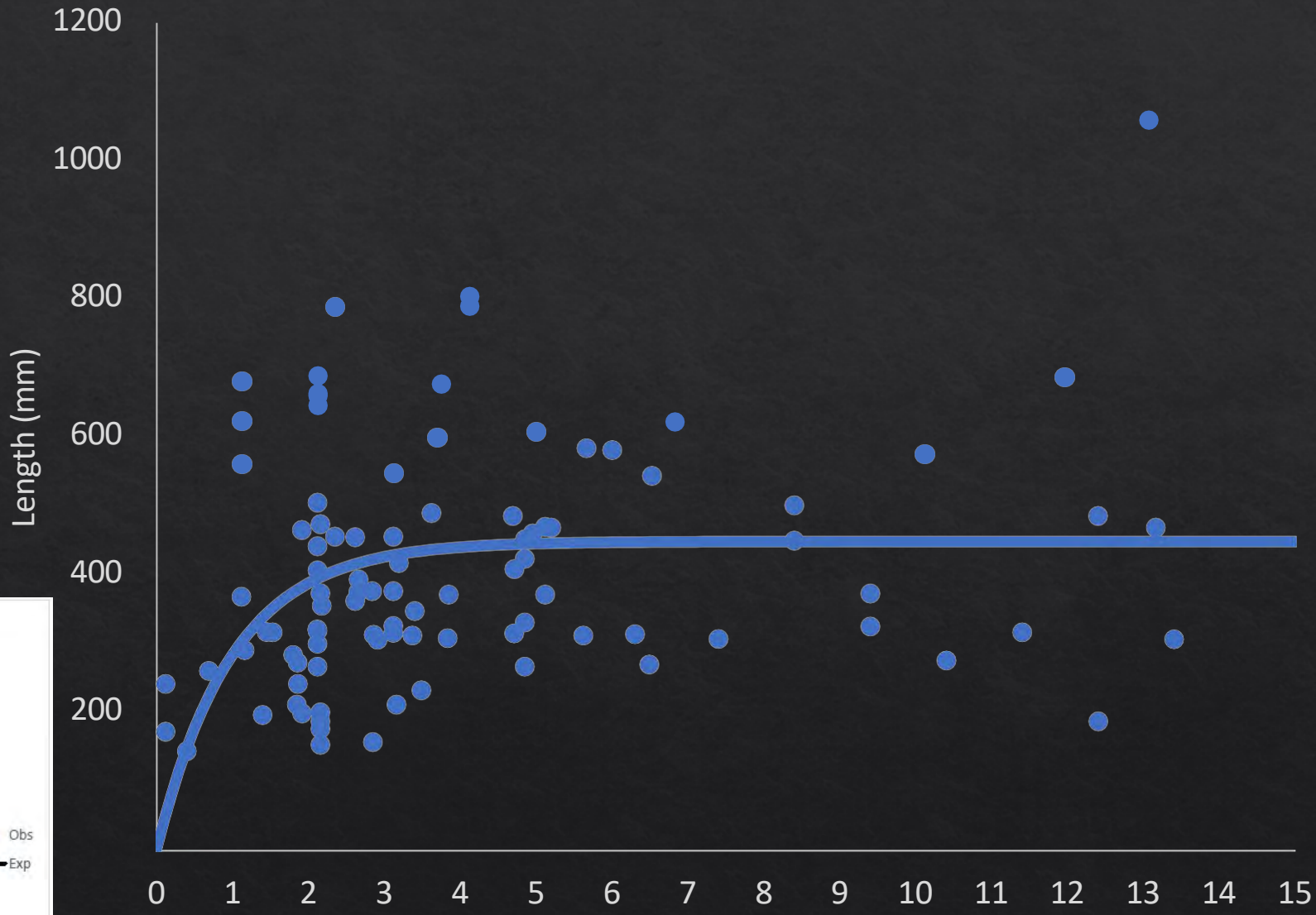


Otolith Aging

Growth Curve

Texas



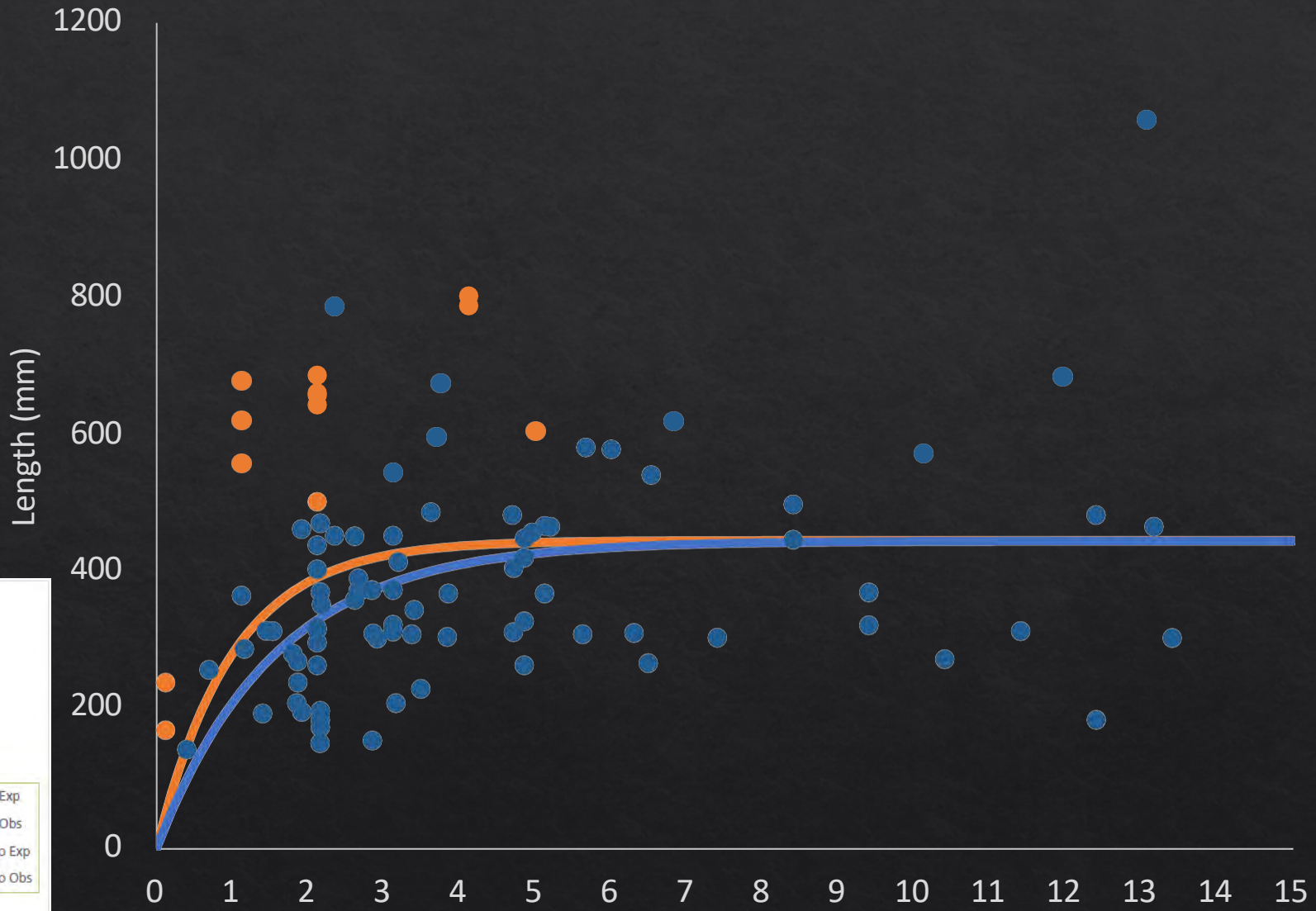


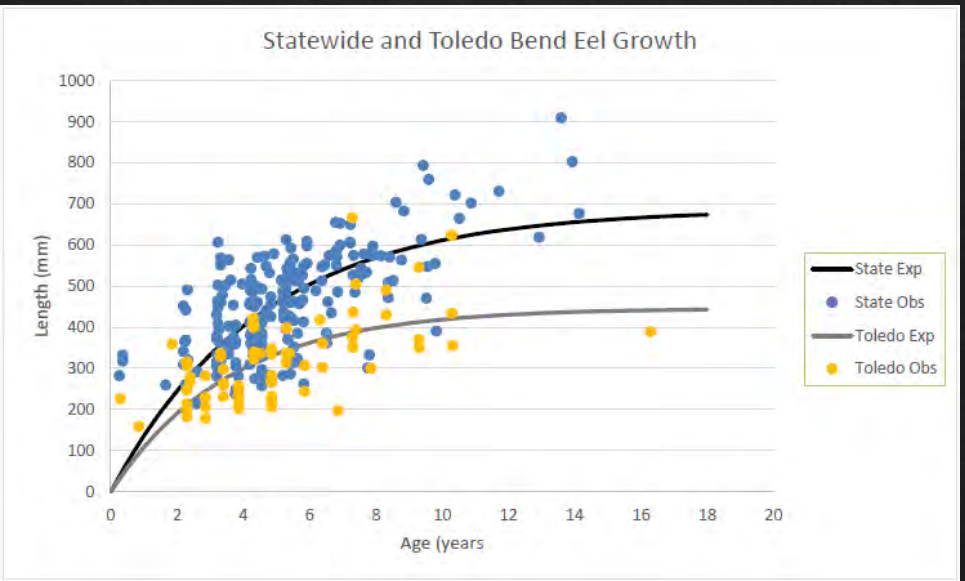
Porta & Snow 2017

Otolith Aging

Growth Curve

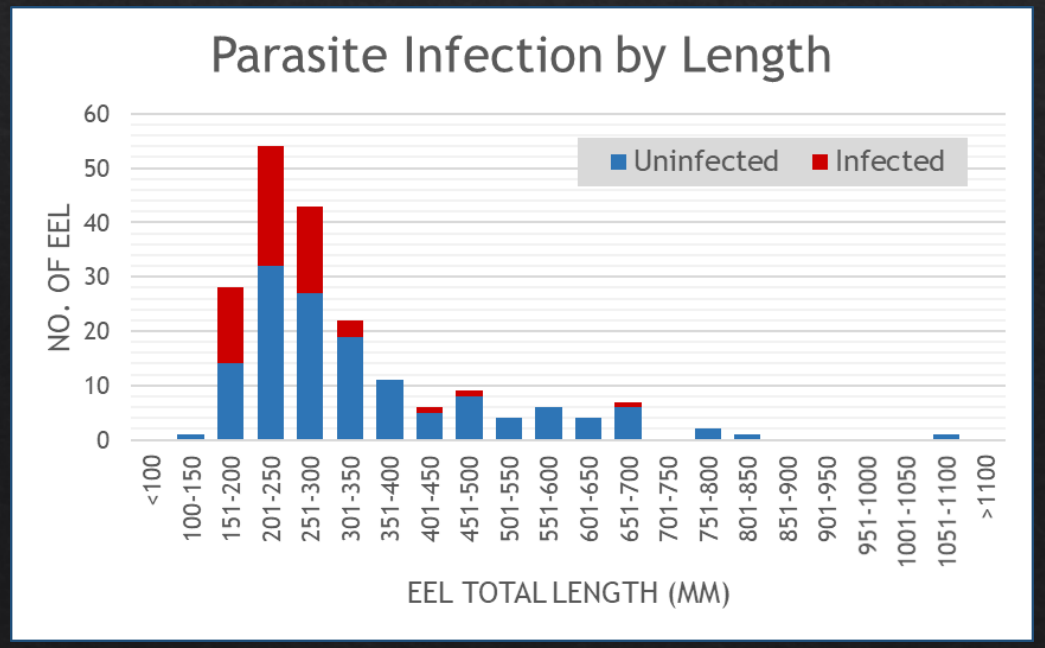
Texas
Texas Wastewater

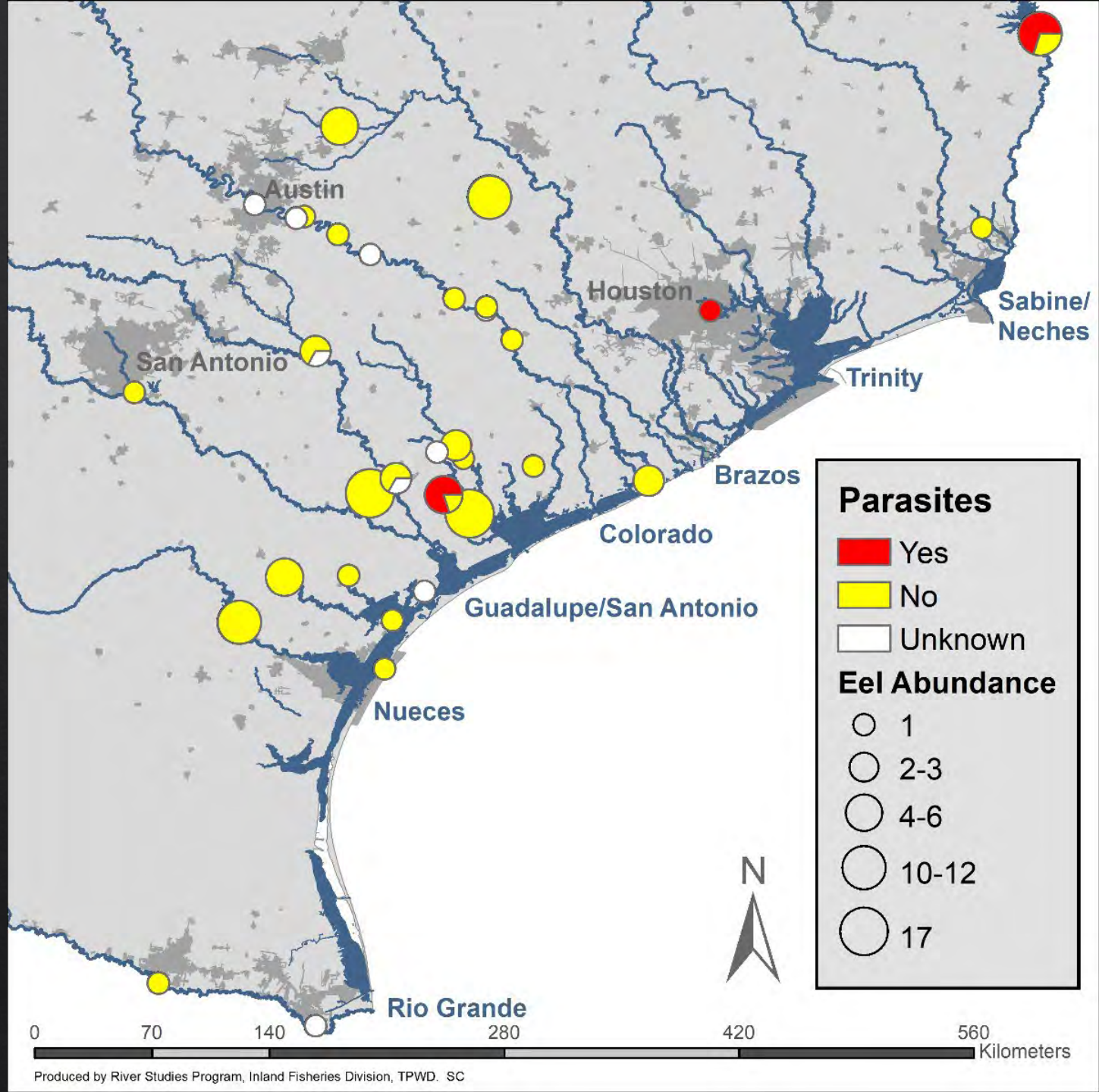




Swimbladder Parasites

- 12 out of 96 eels infected
- Infected eels collected at 3 sites
- Parasites NOT evenly distributed across eel lengths





Summary

	N Samples	Take Home
Distribution	---	Every major river basin in TX ✓
Genetics (Mussel Tissue)	**113**	Panmictic population ✓
Aging & Microchemistry (Otoliths)	**98/113**	Age 0-13; Facultative ✓
Parasites (Swimbladders)	**96**	12.5% infection rate @ 3 sites ✓
Diet (Stomachs)	**93**	?

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Juvenile Eel Recruitment

Historical Records

- Glass Eel Records
  - Mexico – May 1956[a]
  - Florida – Mar 2019[b]
- Elver Records
  - Guadalupe River, TX – Mar 1953[a]
  - Nueces River, TX – Aug 1952[a]
  - Aransas NWR, TX – Oct 2008[a]

[a]Texas Natural History Collection; [b]K. Bonvechio

Objectives

1. Determine recruitment window of American Eel in Texas
2. Quantify distribution, abundance, size, and life stage of juvenile American Eel in Texas
3. Evaluate factors that might influence recruitment timing

Fyke Nets & Eel Mops: Field Sampling

Small-mesh Fyke Nets

- Rotational sampling every 2 wks across 5 major bay systems for one year

Eel Mops

- Continuously deployed
- Checked every 2 wks

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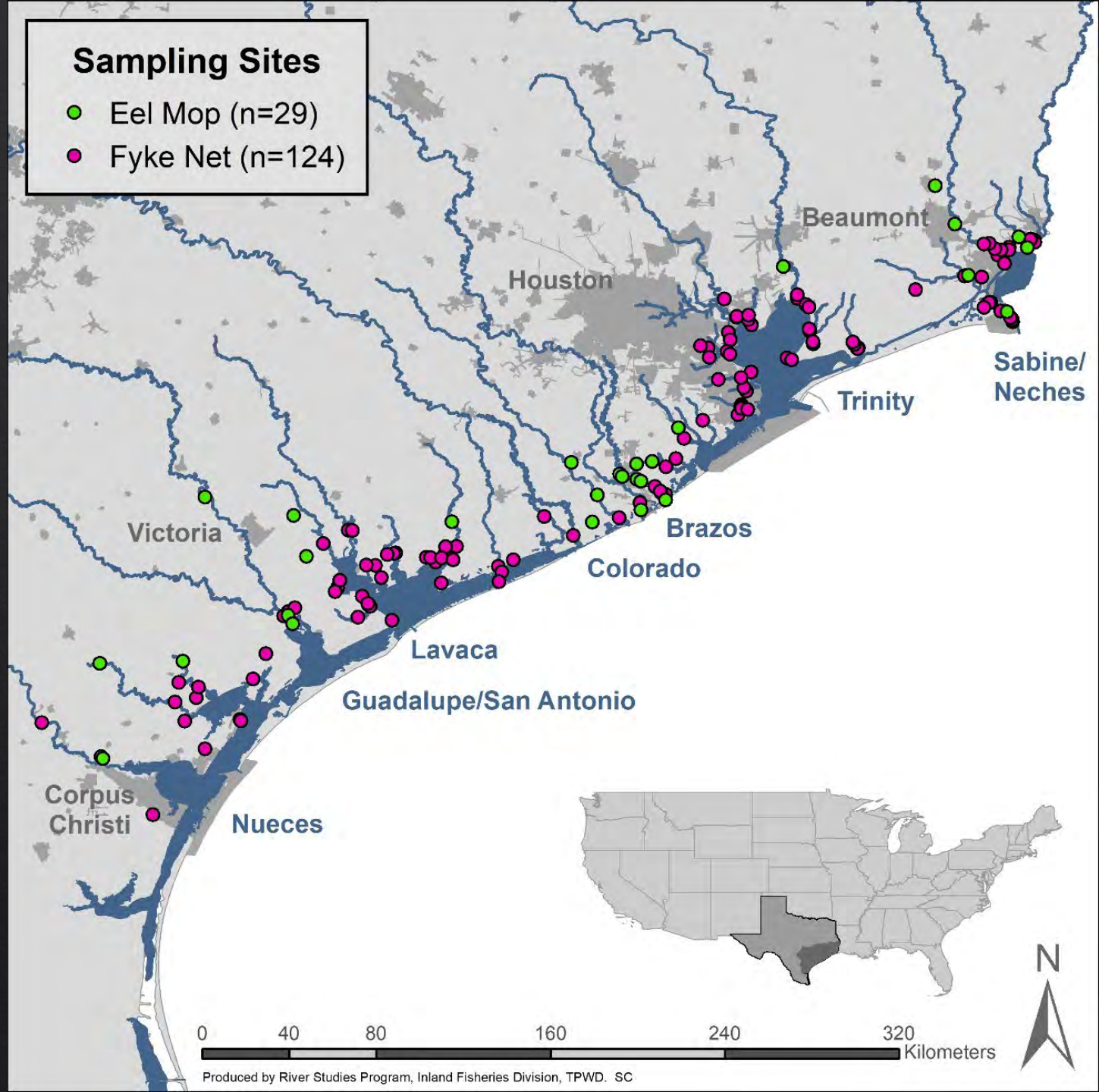
Eel Mops & Fyke Nets: Sampling Sites

Eel Mops

- 29 sites
- 4,510 nights & 217 mop checks

Fyke Nets

- 124 sites & 330 sets
- Cumulative soak time: 1,693 hrs

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Eel Ramps

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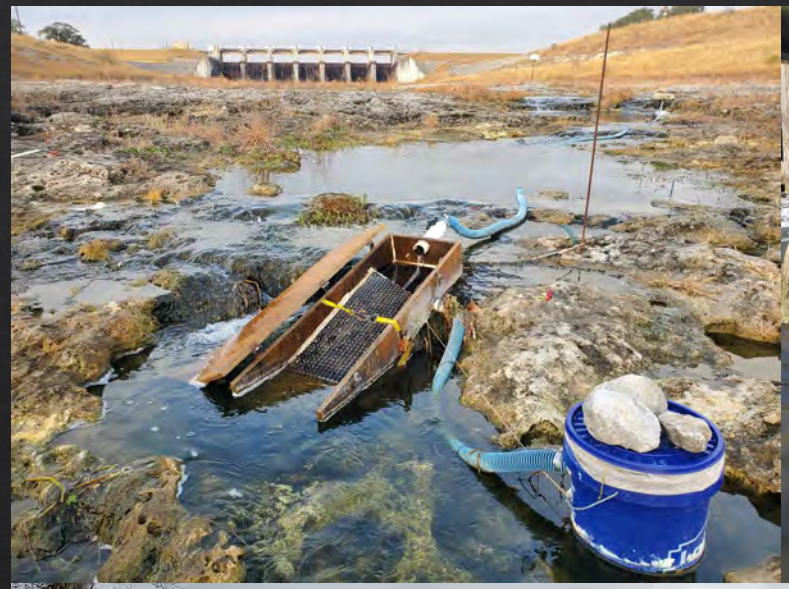
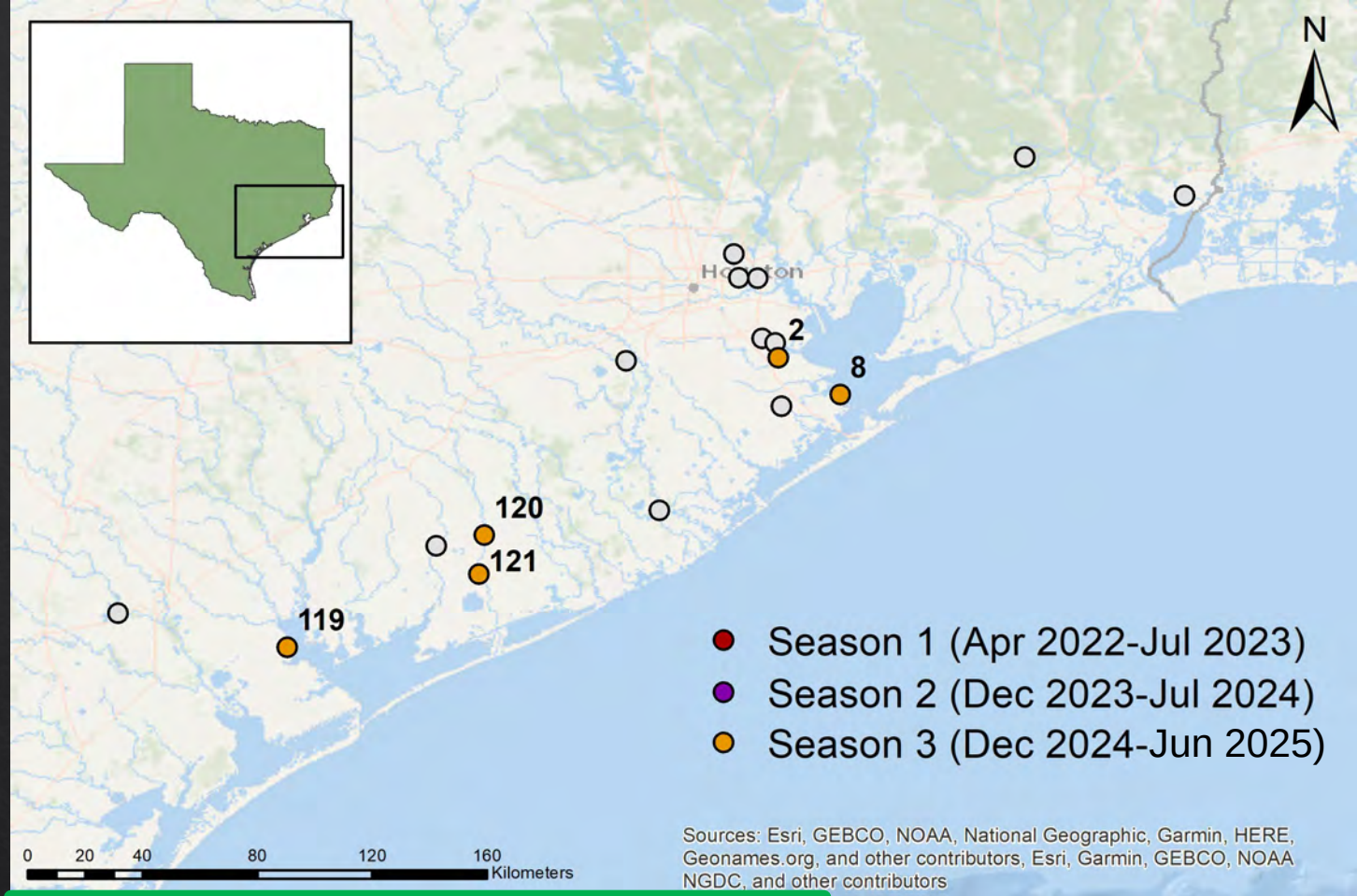
Site Selection & Gear Type



Study Design

- Season 1 (Apr 2022-Jul 2023)
  - Eel Ramps
  - 13 sites
  - Weekly checks
- Season 2 (Dec 2023-Jul 2024)
  - Eel Ramps + Fyke Nets + Eel Mops
  - 5 sites
  - Weekly/Bi-weekly checks
- Season 3 (Dec 2024-Jun 2025)
  - Eel Ramps + Eel Mops
  - 5 sites
  - Weekly/Bi-weekly checks



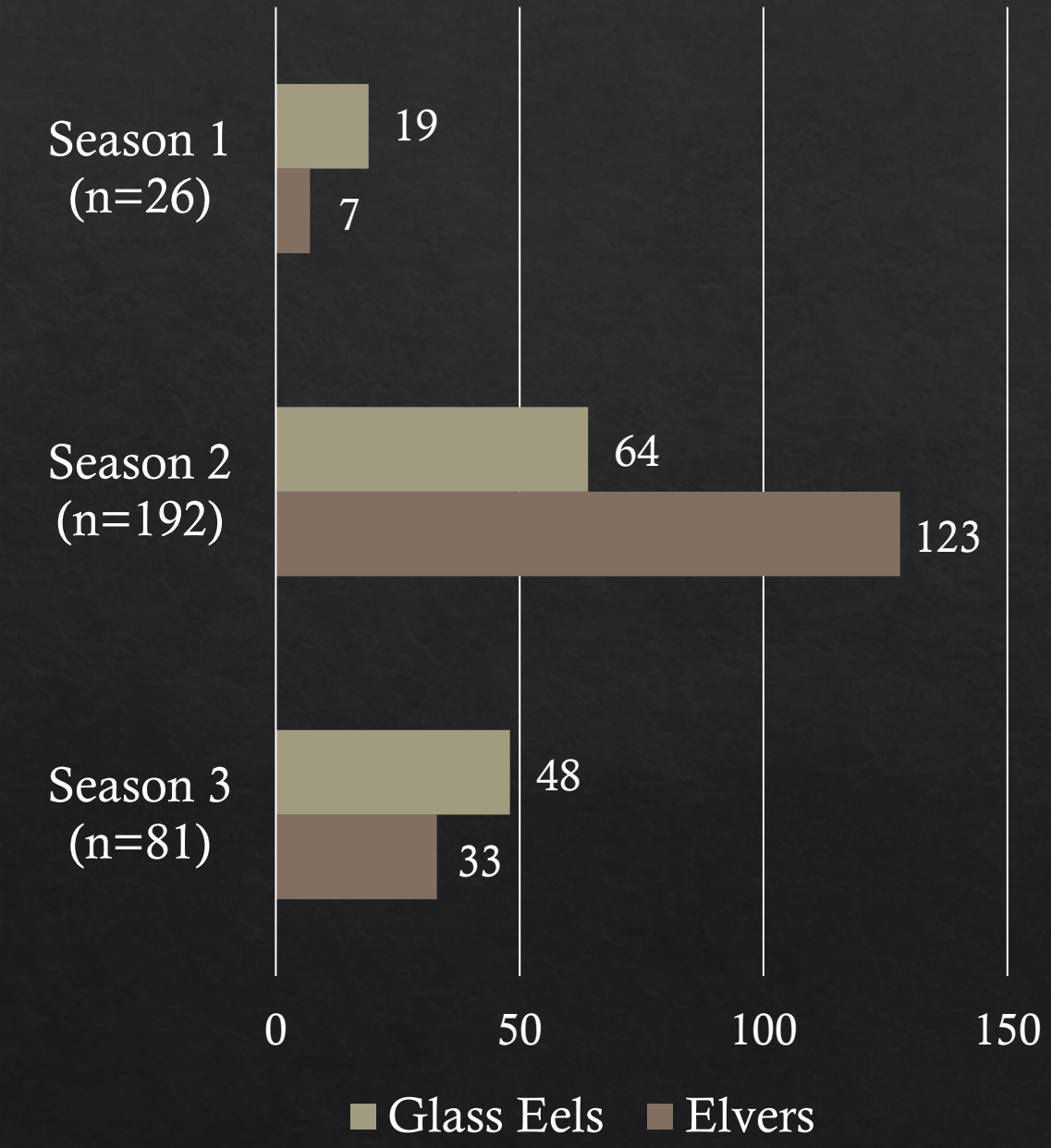
Methods

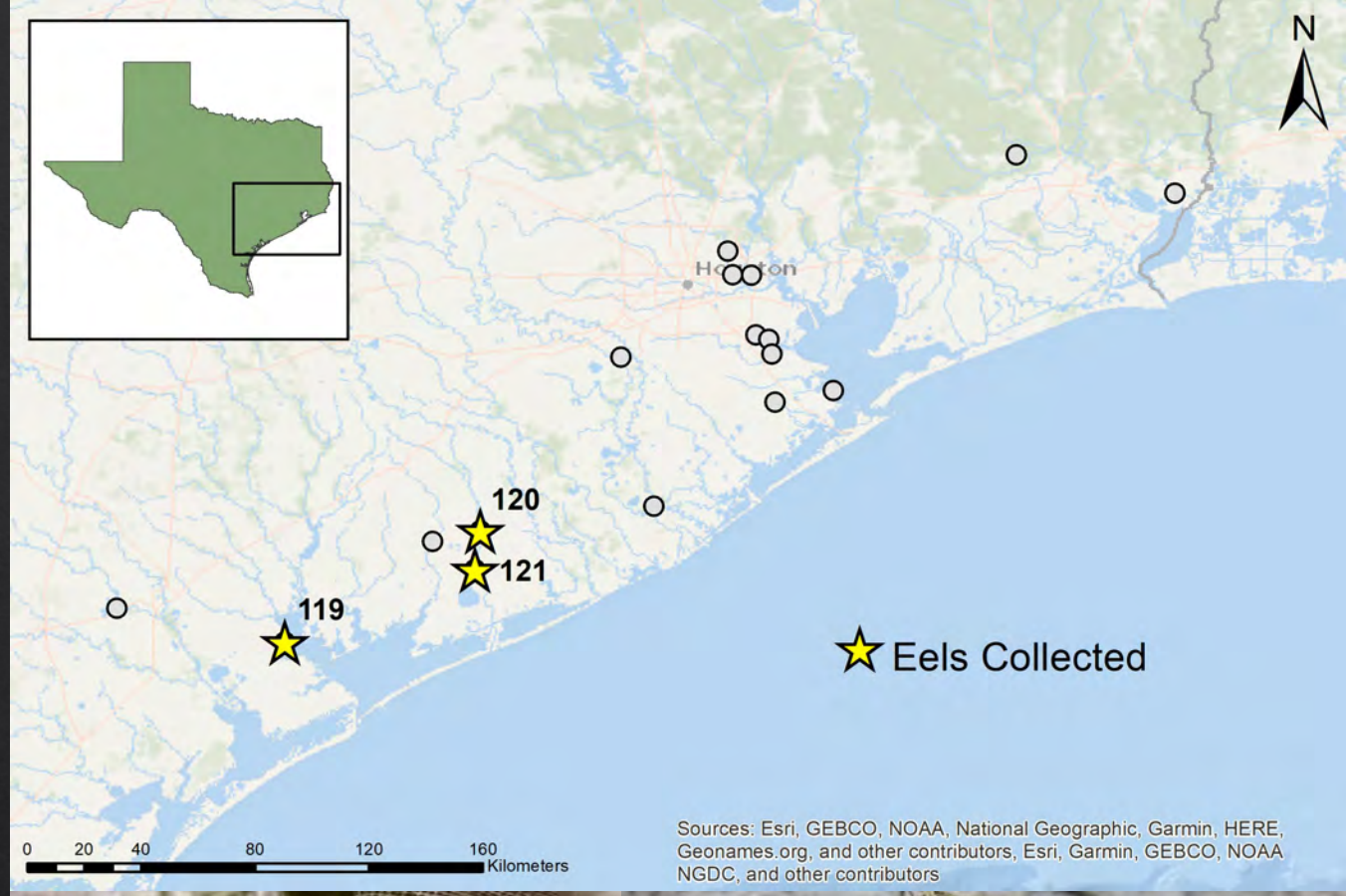
- Field Data Collection
  - Water Quality (temp, DO, pH, Sp. Cond, salinity, turbidity)
  - Environmental (water depth, tide, moon phase)
  - Fishing status, ramp angle
  - Catch – Eels & Bycatch
- Laboratory Processing
  - Morphometrics (length, weight, body depth, etc.)
  - Pigment stage (Haro & Krueger 1988)



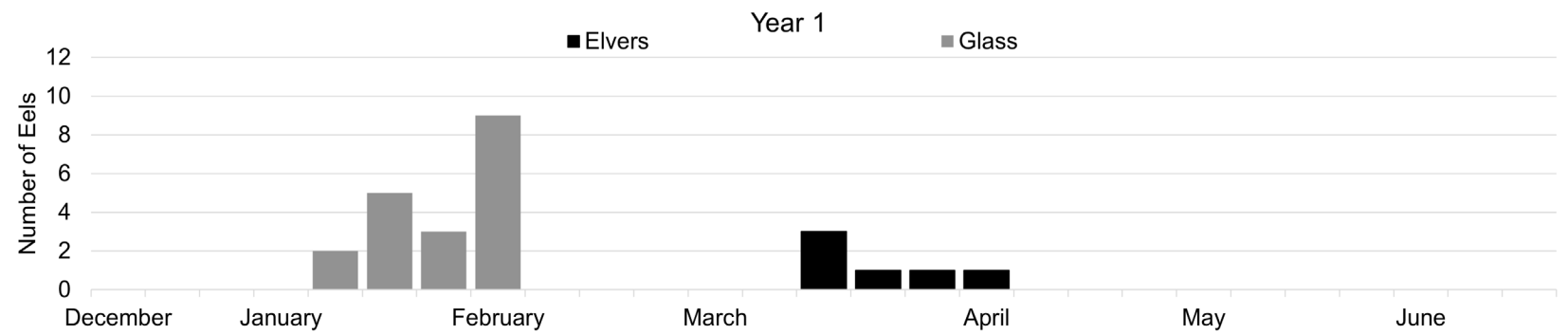


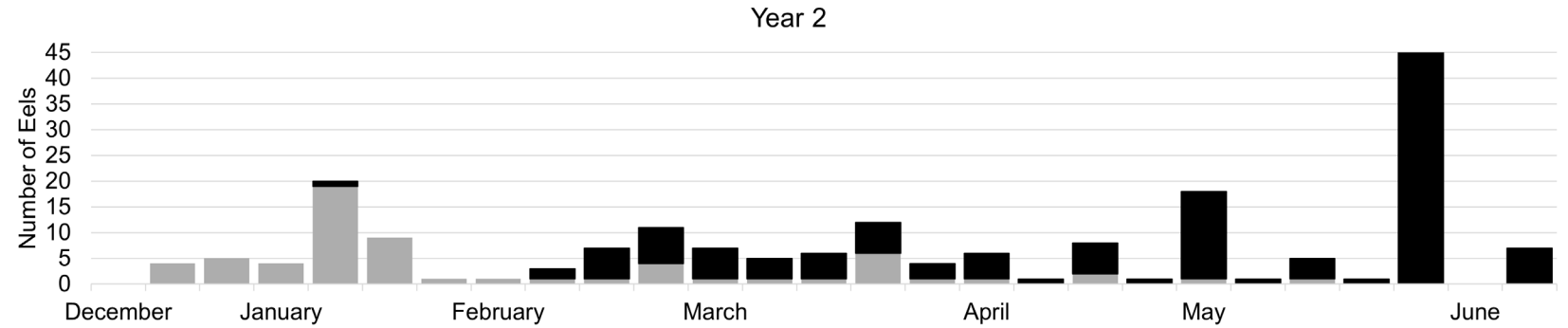
Results

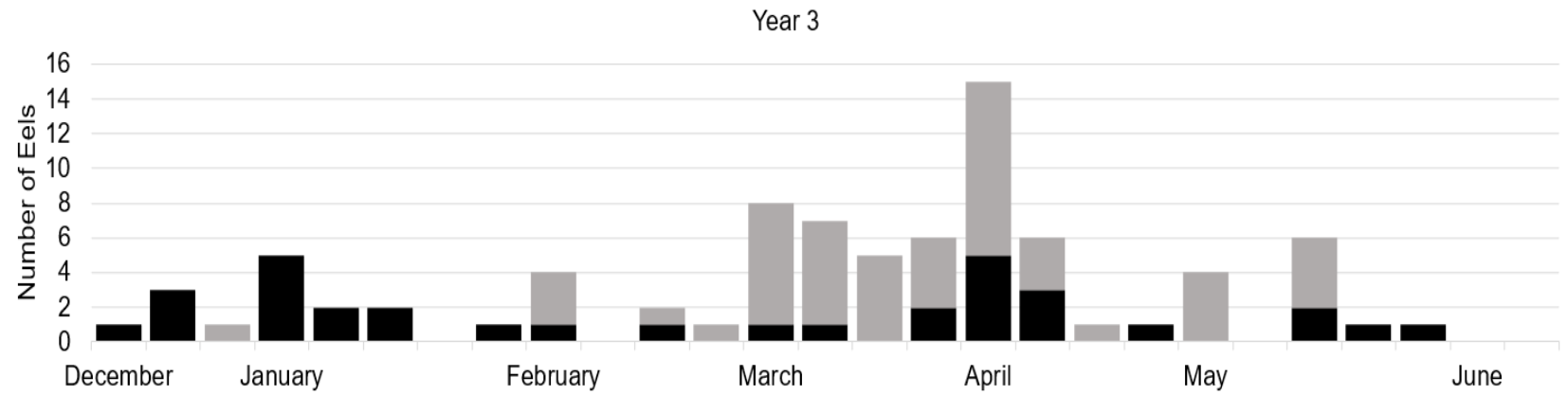

Season 1 (n=26)
19
7
Season 2 (n=192)
64
123
Season 3 (n=81)
48
33
0
50
100
150
Glass Eels
Elvers


N
120
121
119
Eels Collected
0 20 40 80 120 160
Kilometers
Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors, Esri, Garmin, GEBCO, NOAA NGDC, and other contributors


wildco





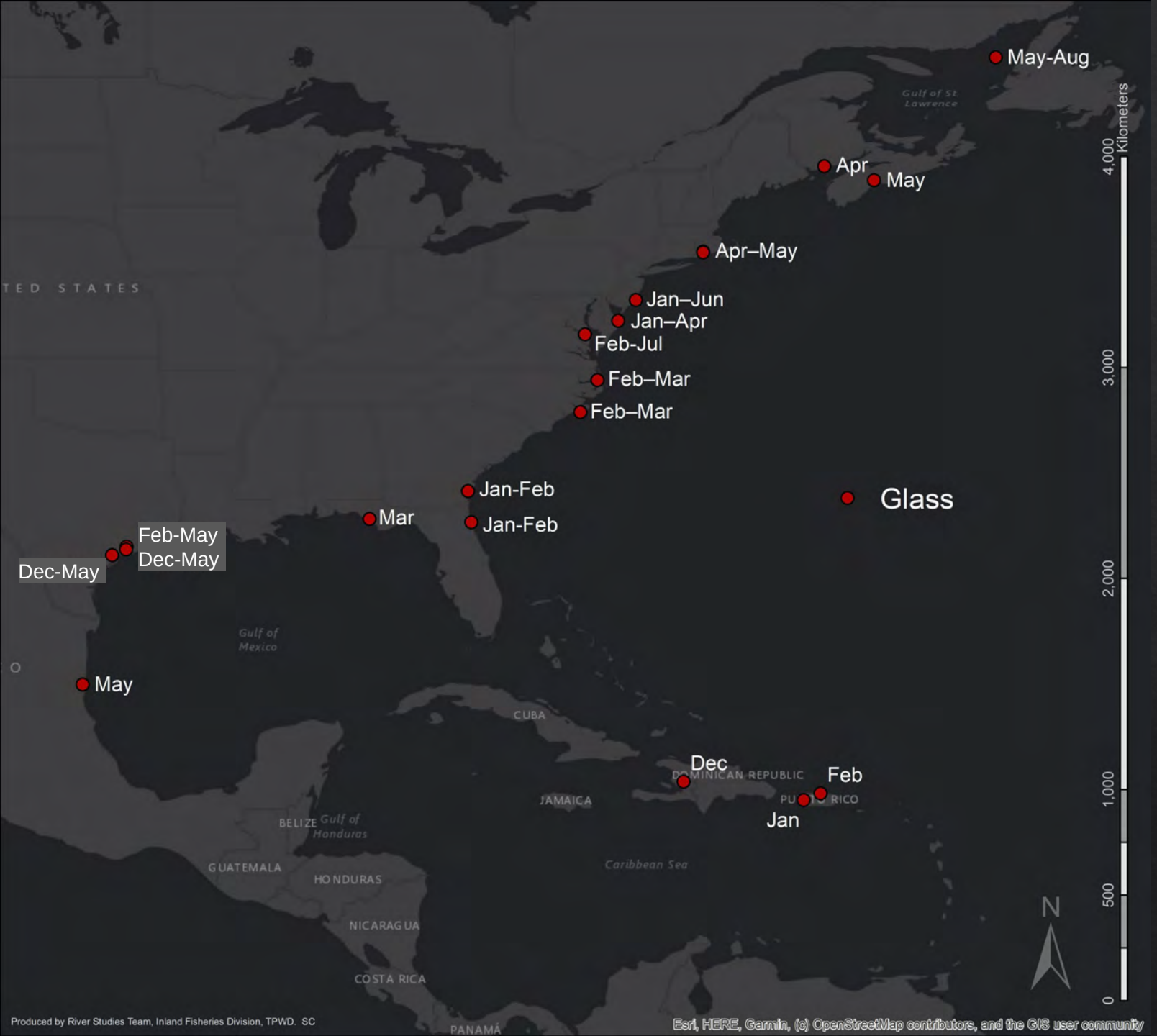


Recruitment Window

- Glass Eels: Jan
- Elvers: Mar-Apr

- Glass Eels: Dec-May
- Elvers: Jan-Jun

- Glass Eels: Dec-May
- Elvers: Dec-Jun



Glass Eel Timing

120

- Feb-May
- Freshwater (non-tidal)

121

- Dec-May
- Freshwater (tidal)

119

- Dec-May
- Estuarine (tidal)

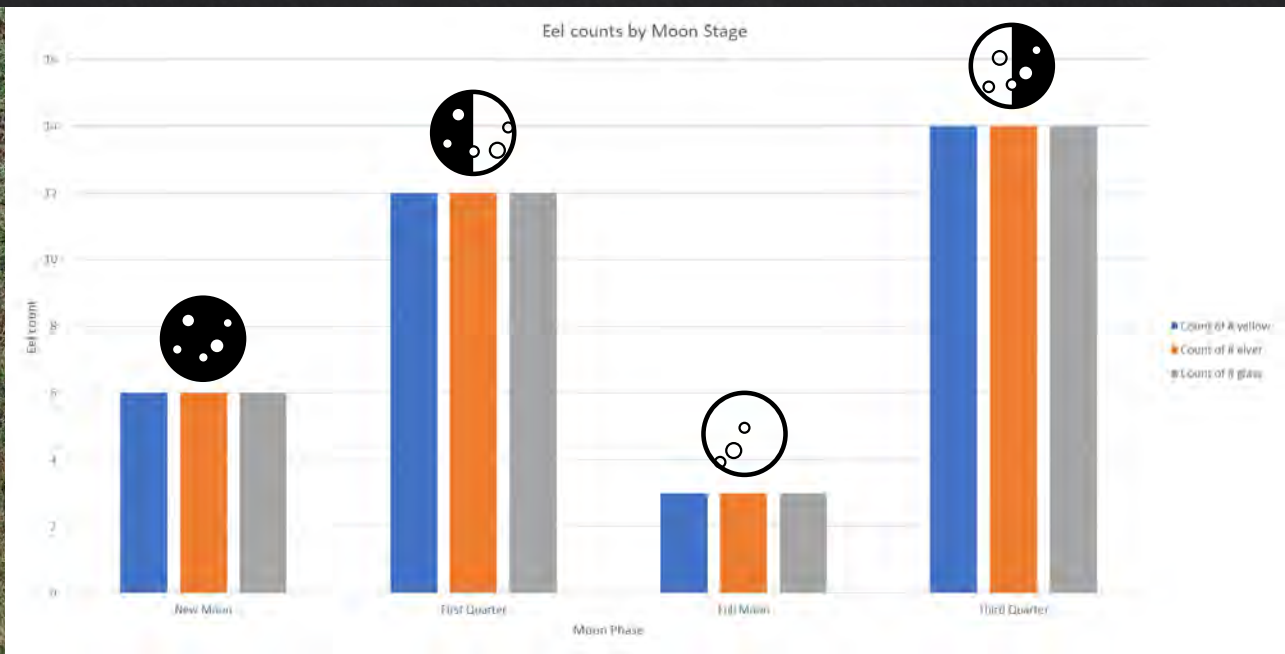
TNHC; ASMFC 2012

Management Implications

- Implement fish passage: permanent structure OR trap & transport
- Supplement flows during recruitment season
- Assess where/how we discharge effluent

Next Steps

- Process eels through season three
- Evaluate timing and catch differences at the site level
- Assess influence of environmental variables on recruitment timing
- Develop a pictorial glass eel staging guide (Haro & Krueger 1988)



Reports & Publications

- SWG Final Reports
  1. American Eel: Utilizing modern techniques to assess conservation status in Texas – *UT*
  2. Extensive Field Effort Using a Novel Gear Type to Detect Recruitment of American Eel (Anguilla rostrata) in Texas – *UHCL*

- Publications
  1. Panmixia in the American eel extends to its tropical range of distribution: Biological implications and policymaking challenges – *Evolutionary Applications*
  2. Eel ramps and environmental DNA reveal a preliminary recruitment window of the American Eel in Texas – *Marine and Coastal Fisheries*
  3. Geographic variation in stable isotope ratios of subtropical American Eel (Anguilla rostrata) – *Environmental Biology of Fishes*

Thank you!

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