You may use the information and images contained in this document for non-commercial, personal, or educational purposes only, provided that you (1) do not modify such information and (2) include proper citation. If material is used for other purposes, you must obtain written permission from the author(s) to use the copyrighted material prior to its use.
Extensive Field Effort Using a Novel Gear Type to Detect Recruitment of American Eel (Anguilla rostrata) in Texas

Jenny Oakley¹, Justin Hansen¹,², Stephen Curtis³, George Guillen¹,²

¹ Environmental Institute of Houston, University of Houston – Clear Lake, Houston, Texas
² College of Science and Engineering, University of Houston – Clear Lake, Houston, Texas
³ Texas Parks and Wildlife Department, River Studies Team, San Marcos, Texas

Texas Academy of Science
Houston, TX
February 26, 2022
American Eel (Anguilla rostrata)

- Superorder: Elopomorpha
- Catadromous
- Semelparous
- Distinct life stages
  - Larval: Leptocephalus
  - Juvenile: Glass → Elver
  - Sub-Adult: Yellow Eel
  - Breeding Adult: Silver Eel
- IUCN: Endangered
- Texas: SGCN (Species of Greatest Conservation Need)
Commercial Fishery for American Eel

• Bait
• Sushi
  • Unagi (freshwater eel)
Commercial Fishery for American Eel

• Bait
• Sushi
  • Unagi (freshwater eel)
• Aquaculture
  • Juvenile (glass and elver eels)
  • $1,849/lb
  • Black market/poaching
  • YouTube: America’s Hottest Black Market: Inside the Eel Gold Rush
Objectives

1) Distribution and abundance

2) Habitat use and associated water quality needs

3) Identify temporal recruitment window
Sampling Events

- Bi-Weekly sampling
- Phase 1 (2018-19)
  - Year-round
  - 127 sites
- Phase 2 (2020)
  - 5-month window
  - 9 sites
Sampling Events

• Bi-Weekly Sampling
• Phase 1 (2018-19)
  • Year-round
  • 127 sites
• Phase 2 (2020)
  • 5-month window
  • 9 sites
• Site selection
  • Impediment
  • Tidal
  • <5 ft depth
Sampling Gear

• Fyke Nets
  • Both phases
  • Downstream orientation
  • One wing adjacent to bank
  • Soak overnight
  • Full tidal cycle

• Water Quality/Habitat
  • Temp (°C)
  • DO (mg/L)
  • Conductivity (µS/cm)
  • Salinity (psu)
  • pH (standard units)
  • Shoreline and in-water habitat
Data Analysis

- Catch Per Unit Effort (CPUE)
  - # of individuals/hour soak time

- CPUE & presence/absence with water quality and habitat variables.

Ladyfish
(*Elops saurus*)

Speckled Worm Eel
(*Myrophis punctatus*)
Results

• Fyke Nets
  • 330 net sets
  • 6,852 hours
  • 93 species of nekton
  • 51 families
  • 130,860 fishes
  • CPUE 19.1 fish/hour

Top 10 fish species caught in fyke nets

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Count</th>
<th>Relative Abundance</th>
<th>CPUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brevoortia patronus</td>
<td>Gulf Menhaden</td>
<td>39,795</td>
<td>31.52</td>
<td>7.82</td>
</tr>
<tr>
<td>Anchoa mitchilli</td>
<td>Bay Anchovy</td>
<td>23,880</td>
<td>18.91</td>
<td>4.69</td>
</tr>
<tr>
<td>Elops saurus</td>
<td>Ladyfish</td>
<td>18,115</td>
<td>14.35</td>
<td>3.56</td>
</tr>
<tr>
<td>Cyprinodon variegatus</td>
<td>Sheepshead Minnow</td>
<td>12,501</td>
<td>9.90</td>
<td>2.46</td>
</tr>
<tr>
<td>Micropogonias undulatus</td>
<td>Atlantic Croaker</td>
<td>6,624</td>
<td>5.25</td>
<td>1.30</td>
</tr>
<tr>
<td>Lucania parva</td>
<td>Rainwater Killifish</td>
<td>4,802</td>
<td>3.80</td>
<td>0.94</td>
</tr>
<tr>
<td>Gambusia affinis</td>
<td>Western Mosquitofish</td>
<td>2,484</td>
<td>1.97</td>
<td>0.49</td>
</tr>
<tr>
<td>Myrophis punctatus</td>
<td>Speckled Worm Eel</td>
<td>2,272</td>
<td>1.80</td>
<td>0.45</td>
</tr>
<tr>
<td>Poecilia latipinna</td>
<td>Sailfin Molly</td>
<td>2,096</td>
<td>1.66</td>
<td>0.41</td>
</tr>
<tr>
<td>Dorosoma petenense</td>
<td>Threadfin Shad</td>
<td>1,877</td>
<td>1.49</td>
<td>0.37</td>
</tr>
</tbody>
</table>

No American Eel Captured
Results

Elopomorph recruitment window

- Ladyfish
- Speckled Worm eel
Results
Results

Salinity (psu)

Dissolved Oxygen (mg/L)

Secchi Depth (m)

Elopomorphs: Not Detected (0) / Detected (1)

$p = 0.0269$

$p = 0.0313$

$p = 0.0333$
Discussion

• No glass or elver American Eel were caught

• Fyke nets are effective at catching juvenile elopomorphs
  • Share general gross transport mechanisms (Munk et al. 2010)
  • Recruitment window overlap with American Eel in Florida (Bonvechio, 2016)
  • However, Speckled Worm Eels and Ladyfish are true estuarine/marine species.

• If glass or elver eels were present, we presume that we would have been able to detect their ingress.
Future Work

- 2022-23
  - Eel Ramps
  - eDNA
  - Plankton
Acknowledgments

• Funding:
  • Texas State Wildlife Grant: TX T-172-R-1, F17AF01067

• Field assistance:
  • Tito Molina
  • Josh Jaeger
  • Sherah Loe
  • Natasha Zarnstorff
  • Tyler Swanson
  • Kaylei Chau
  • McKenzie Farrell
  • Mandi Gordon
  • Cory Scanes
  • Randon Peirson
  • Samantha Salas

• Scientific permit: SPR-0504-383
Questions

Contact Info
Jenny Oakley, Ph.D.
Associate Director, Research Programs
Environmental Institute of Houston
University of Houston-Clear Lake
oakley@uhcl.edu
281-283-3947