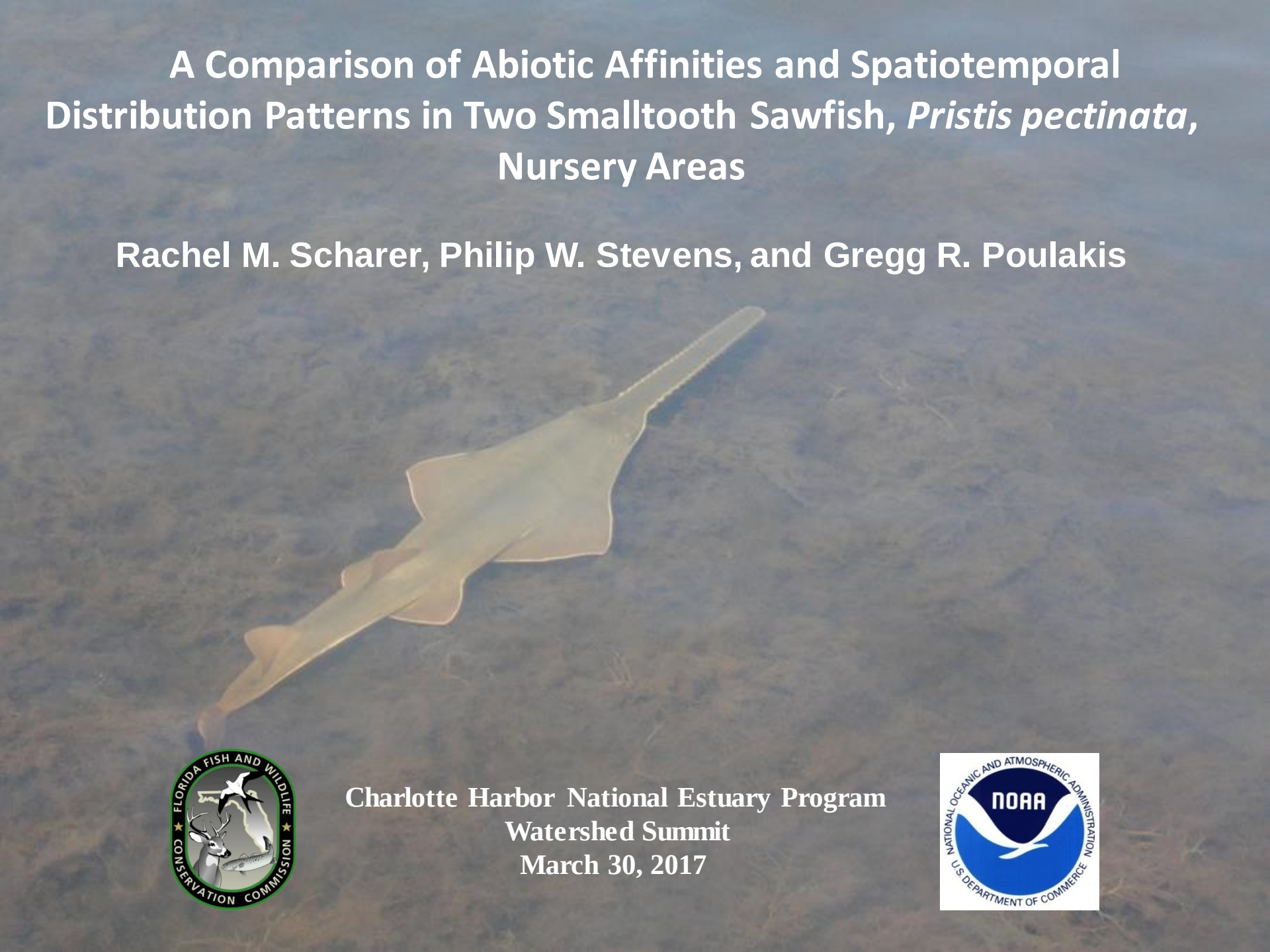
A Comparison of Abiotic Affinities and Spatiotemporal Distribution Patterns in Two Smalltooth Sawfish, *Pristis pectinata*, Nursery Areas

Rachel M. Scharer, Philip W. Stevens, and Gregg R. Poulakis



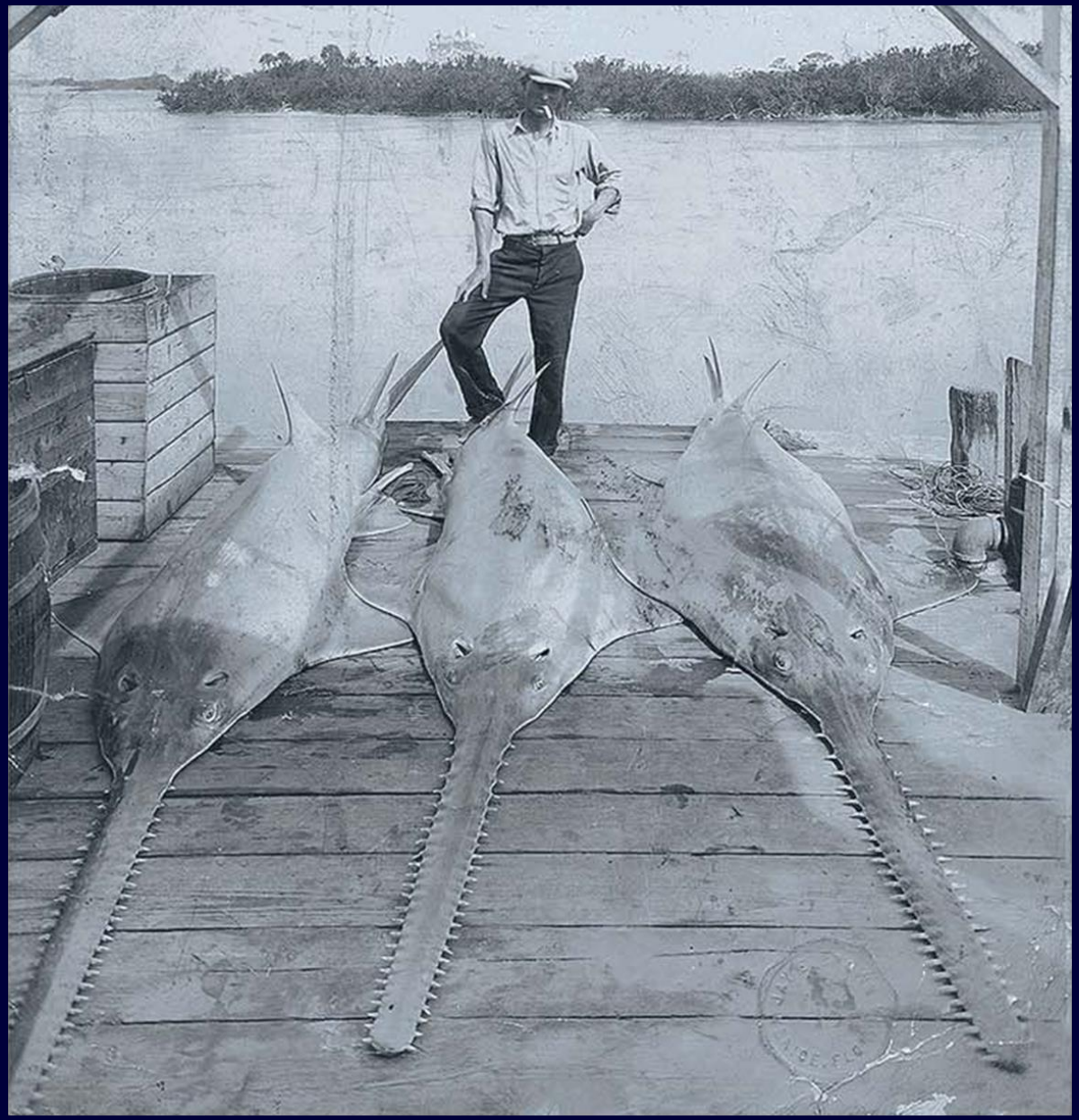
Charlotte Harbor National Estuary Program
Watershed Summit
March 30, 2017

Outline

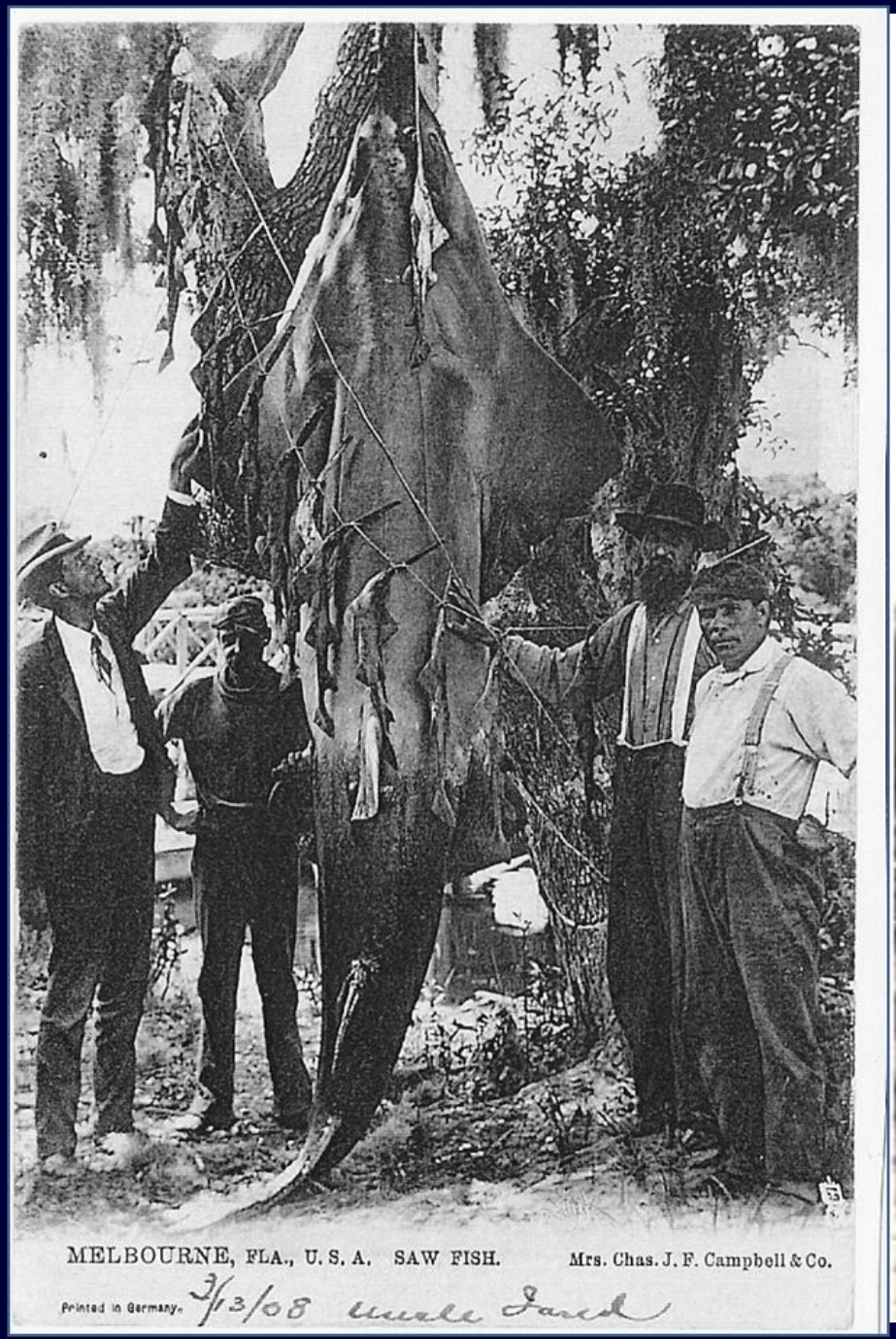
- Introduction and Methods

- Nursery comparison
  - Distribution
  - River background
  - Electivity
  - Habitat use
  - Movements
- Fine-scale movements (next sawfish talk)
- Exploring behavior
- Ultra fine-scale movements

Commercial fisheries



Recreational fisheries


MELBOURNE, FLA., U. S. A. SAW FISH.
Mrs. Chas. J. F. Campbell & Co.
Printed in Germany.
3/3/08

Population decline

Gill net bycatch

Trawl bycatch

Curiosity

Fin trade

Endangered status

Saws for sale

Sport

Aquarium trade

Marine debris

Liver oil

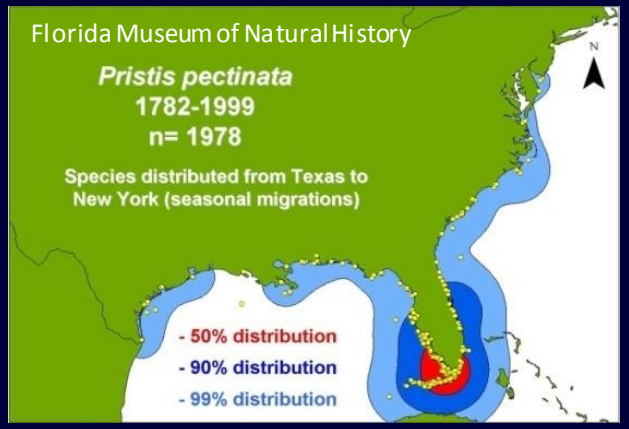
Fear

Smalltooth sawfish (*Pristis pectinata*)

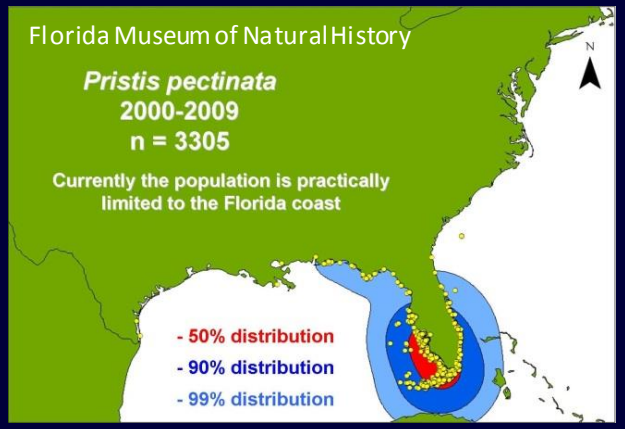
- 1992: Protected in Florida (only one species in Florida)
- 2003: U.S. Endangered Species Act
- 2007: CITES Appendix I (protection from international trade)
- 2009: NMFS Recovery Plan published

- Historical range = Atlantic Ocean (Faria et al. 2013)

Historical Distribution



Current Distribution



- ***Historical*** **U.S. range: New York (rare) to Texas**
- ***Current* range: *south Florida only***

) Adams and Wilson (1995)

***Purpose*: status of smalltooth sawfish**

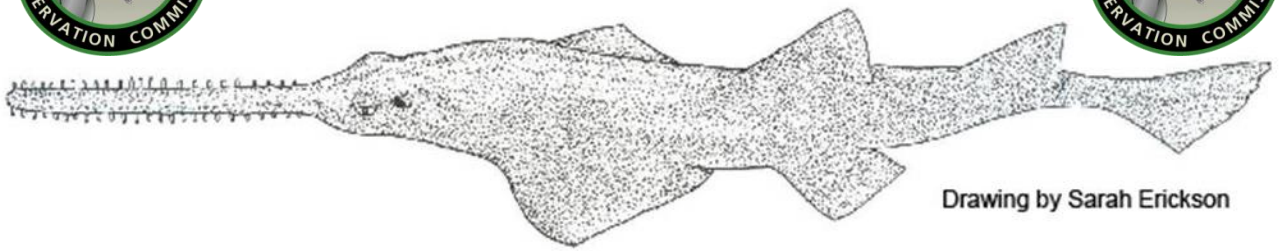
***Data sources*: coastal fishery surveys, records from state fisheries-management agencies, museums**

Conclusion:

"…the species can no longer be considered a functional member of the nearshore coastal community…"

[helped lead to public encounter report database]

Sawfish Hotline



Drawing by Sarah Erickson

HAVE YOU SEEN THIS FISH?

We would like information on your captures/observations of sawfish in Florida.

- Please contact us as we continue our tagging program.
- Lab phone: (941) 255-7403
- E-mail: sawfish@MyFWC.com
- Web site: http://research.MyFWC.com/sawfish

Your information is vital to the study of this new endangered species.

Your help is greatly appreciated!

Outreach

- Permanent signs
- Brochures
- Education
- Safe handling
- Reporting
- Statewide

NOTICE TO RECREATIONAL AND COMMERCIAL FISHERS

Sawfish are listed as endangered under the Endangered Species Act, which makes it illegal to harm, harass, or handle them in any way. It is illegal to hook or net one, except with a permit or in a permitted fishery. Accidental captures do occur while fishing for other species; if a sawfish is hooked or netted it should be released immediately. Remove as much fishing gear as safely as possible. DO NOT REMOVE THE SAW.

Sawfish Safe Release Guidelines

If hooked:

- Keep sawfish in the water at all times.
- If it can be done safely, untangle the line if it is wrapped around the saw and remove as much of the line as possible.
- Cut the line as close to the hook as possible.
- Do not handle the animal or attempt to remove any hooks on the saw unless you have a long-handled de-hooker.

If tangled in a net:

- Make every effort to free the animal from the net with minimal additional stress or injury.
- Keep sawfish, especially the gills, in the water as much as possible.
- Try to remove all the netting and release the animal quickly.
- DO NOT REMOVE THE SAW.

WARNING: Sawfish are large powerful animals that can cause serious injury. For your safety, and the safety of the sawfish, use caution if you do hook or net one of these animals.

Reporting a Sawfish Encounter

The Florida Museum of Natural History and Mote Marine Laboratory have established a sawfish tracking database to assist in sawfish conservation efforts. If you do accidently encounter a sawfish, you can greatly help conservation efforts by providing the following information:

- Your name, phone number, and email address
- Date, time, and location of the encounter
- Number, size, and behavior of the sawfish during encounter
- Your activity at time of encounter
- Information on any tags, scars, or distinguishing marks

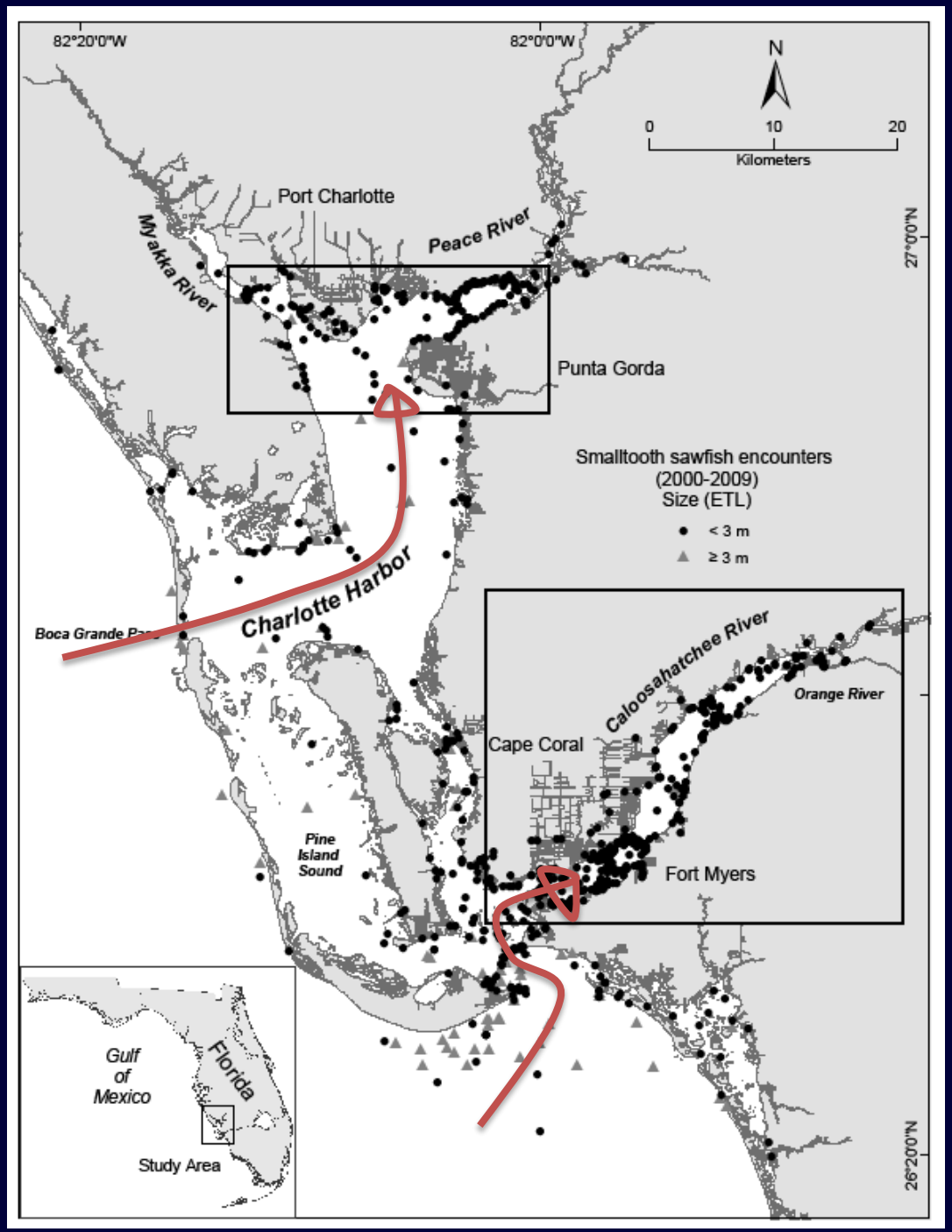
Please report this information to any of the below contacts:

George H. Burgess
Florida Museum of Natural History
Email: sawfish@flmnh.ufl.edu
Phone: (352) 392-2360

Colin Simpfendorfer
Mote Marine Laboratory
Email: sawfish@mote.org
Phone: (941) 388-4441

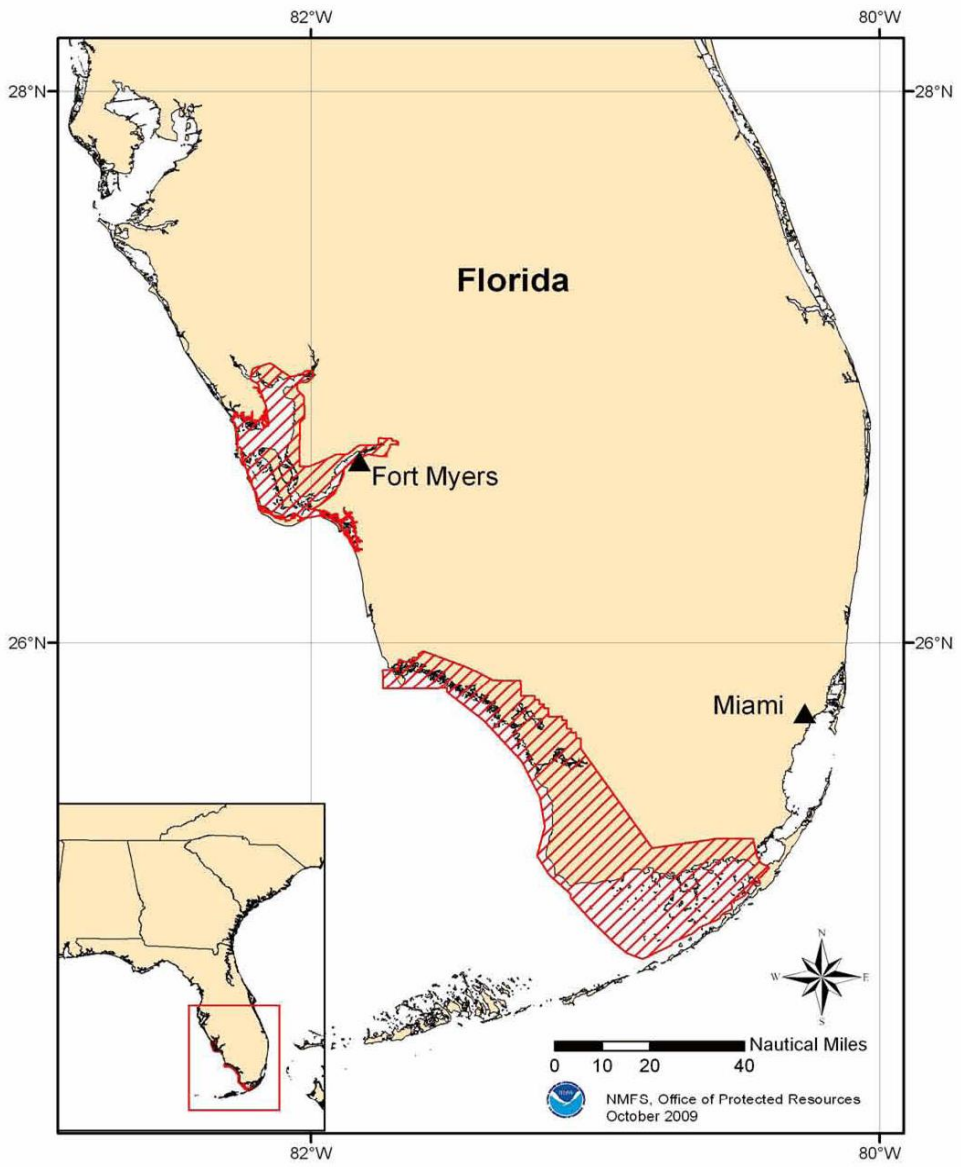
Gregg Poulakis
FL Fish and Wildlife Conservation Commission
Email: sawfish@myfwc.com
Phone: (941) 255-7403

Encounter database



1) 'Critical habitat'

2) Field work!



From NMFS (2009)

- 800,000+ acres along SW Florida coastline

Critical habitat for juveniles includes:

-Red mangroves

-Shallow (<3') euryhaline habitats

FWC research & monitoring

- Part of FWC's Fisheries-Independent Monitoring program
- Funding = Section 6 ESA through NOAA/NMFS Protected Resources
- Monitoring and research of two juvenile nursery areas
  - Caloosahatchee River 2004
  - Peace River (Upper Charlotte Harbor) 2009
- Sawfish hotline: Encounter reports from the public

FWC research & monitoring

Directed samples

- Gill nets; 46 m (150 ft) and 183 m (600 ft) (6 inch stretch)
- ~100 samples per year
- Year round (mostly Feb–Sept)
- Search time

Random samples

- Computer generated sites
- Gill nets; 61 m (200 ft) and 30 m (100 ft) (4 inch stretch)
- ~200 samples per year
- Feb–Sept

Work-up and Tagging

- PCL/FL/STL/DW/RL
- Rostral tooth counts
- Fin clip
- Marine debris
- Overall health (e.g., parasites)

Work-up and Tagging

- Roto tags
- PIT tags
- Acoustic tags
- Acoustic array

Catch Analysis

- Seasonality
- Logistic regression
  - Probability of catching a sawfish in X sample and in X environment
- Electivity index (= Habitat suitability)
  - $E = (r_i - p_i)/(r_i + p_i)$
  - Characterize patterns of habitat use
  - Affinity or avoidance response
  - 4 environmental gradients

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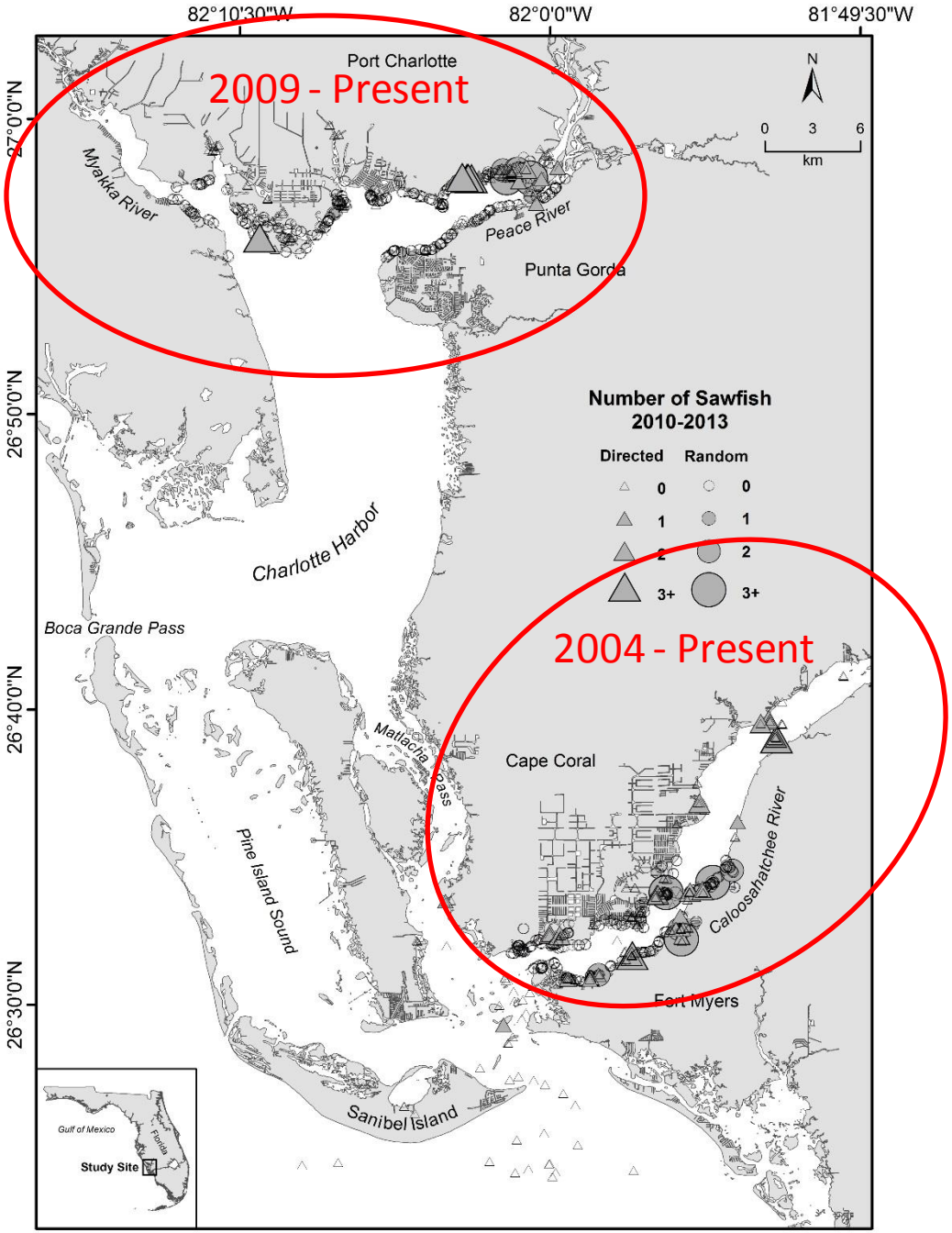
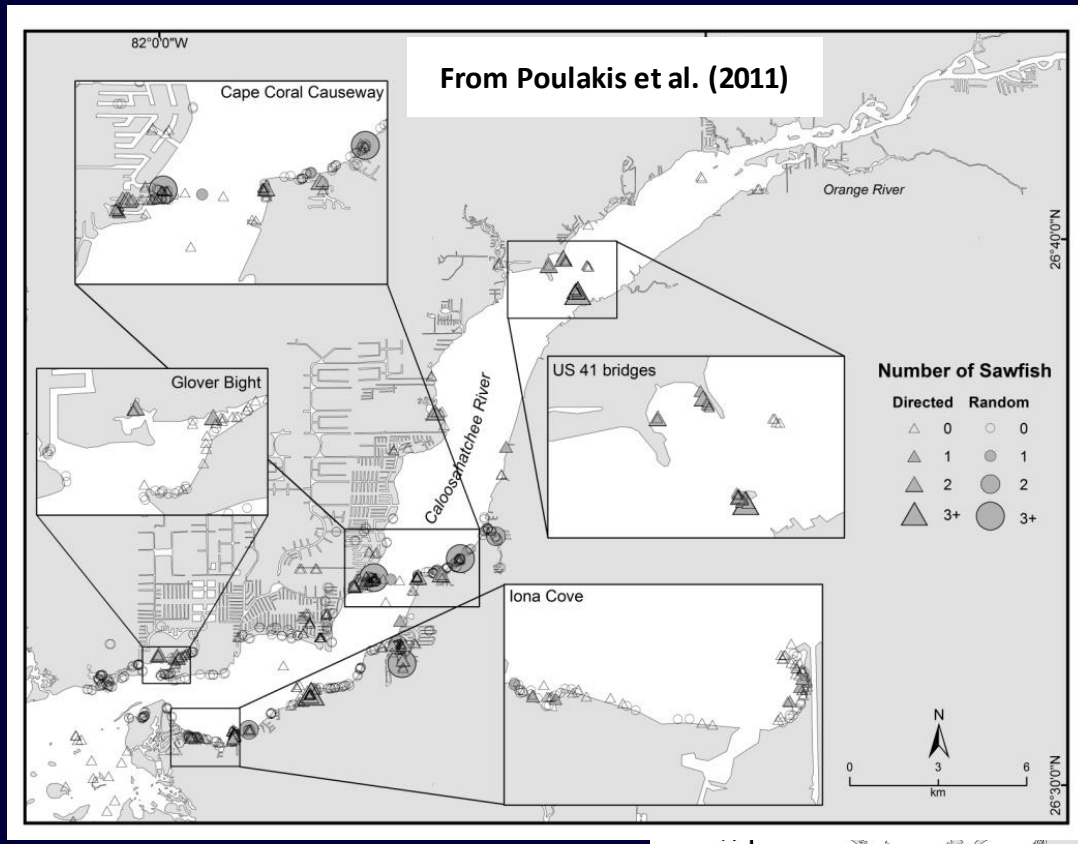
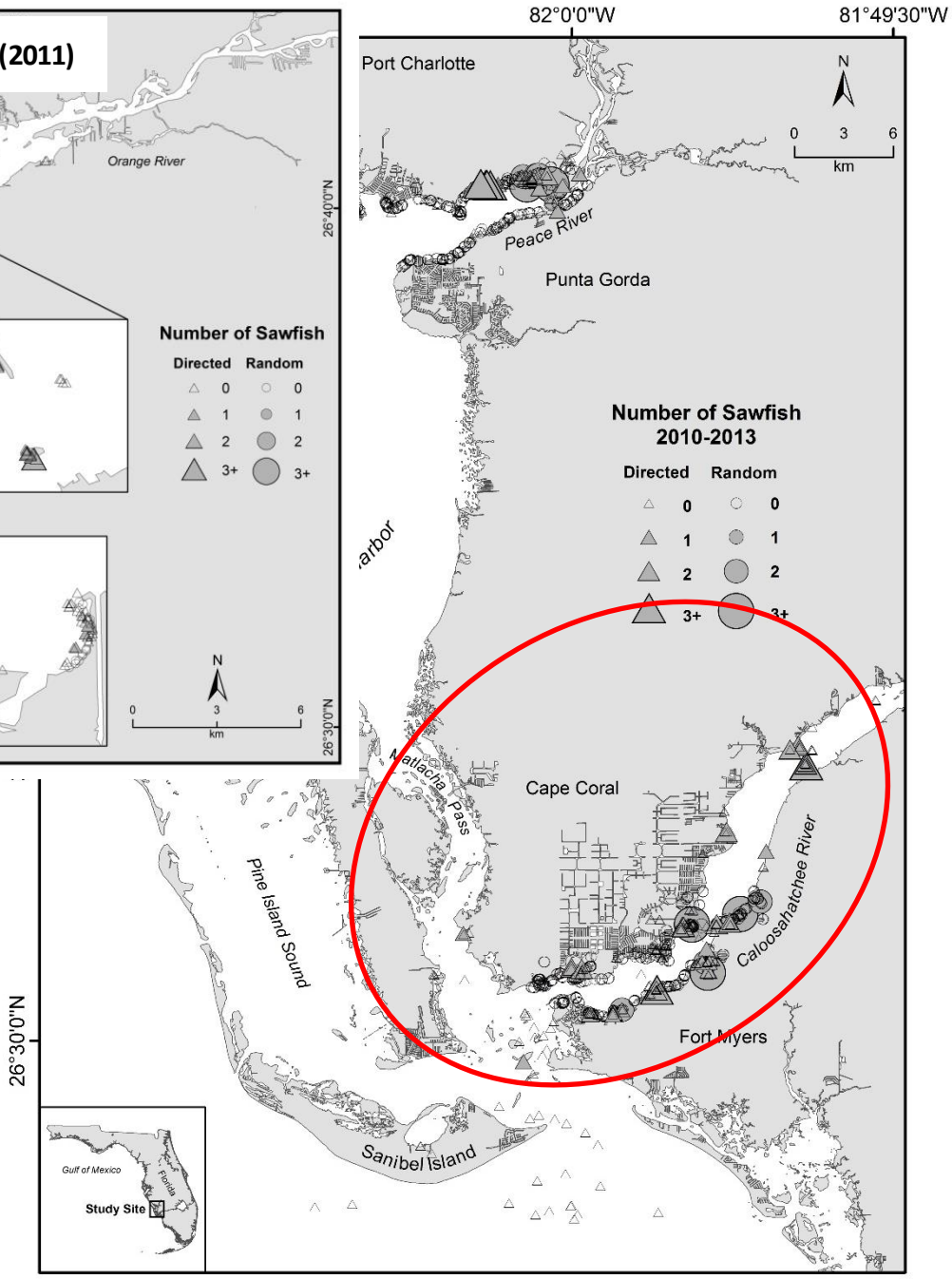
Study Area


82°10'30"W
82°0'0"W
81°49'30"W
27°0'0"N
26°50'0"N
26°40'0"N
26°30'0"N
2009 - Present
Port Charlotte
Myakka River
Peace River
Punta Gorda
N
0 3 6
km
Number of Sawfish
2010-2013
Directed
Random
0
1
2
3+
Charlotte Harbor
Boca Grande Pass
2004 - Present
Matlacha Pass
Cape Coral
Pine Island Sound
Caloosahatchee River
Fort Myers
Sanibel Island
Gulf of Mexico
Florida
Study Site

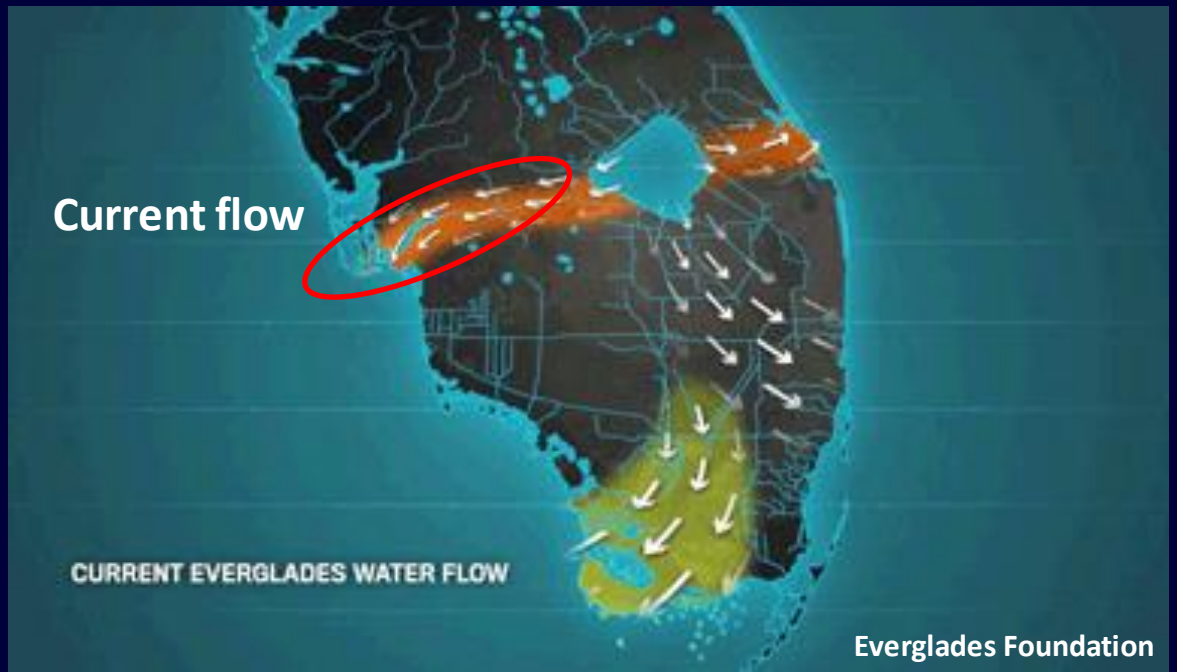




Caloosahatchee

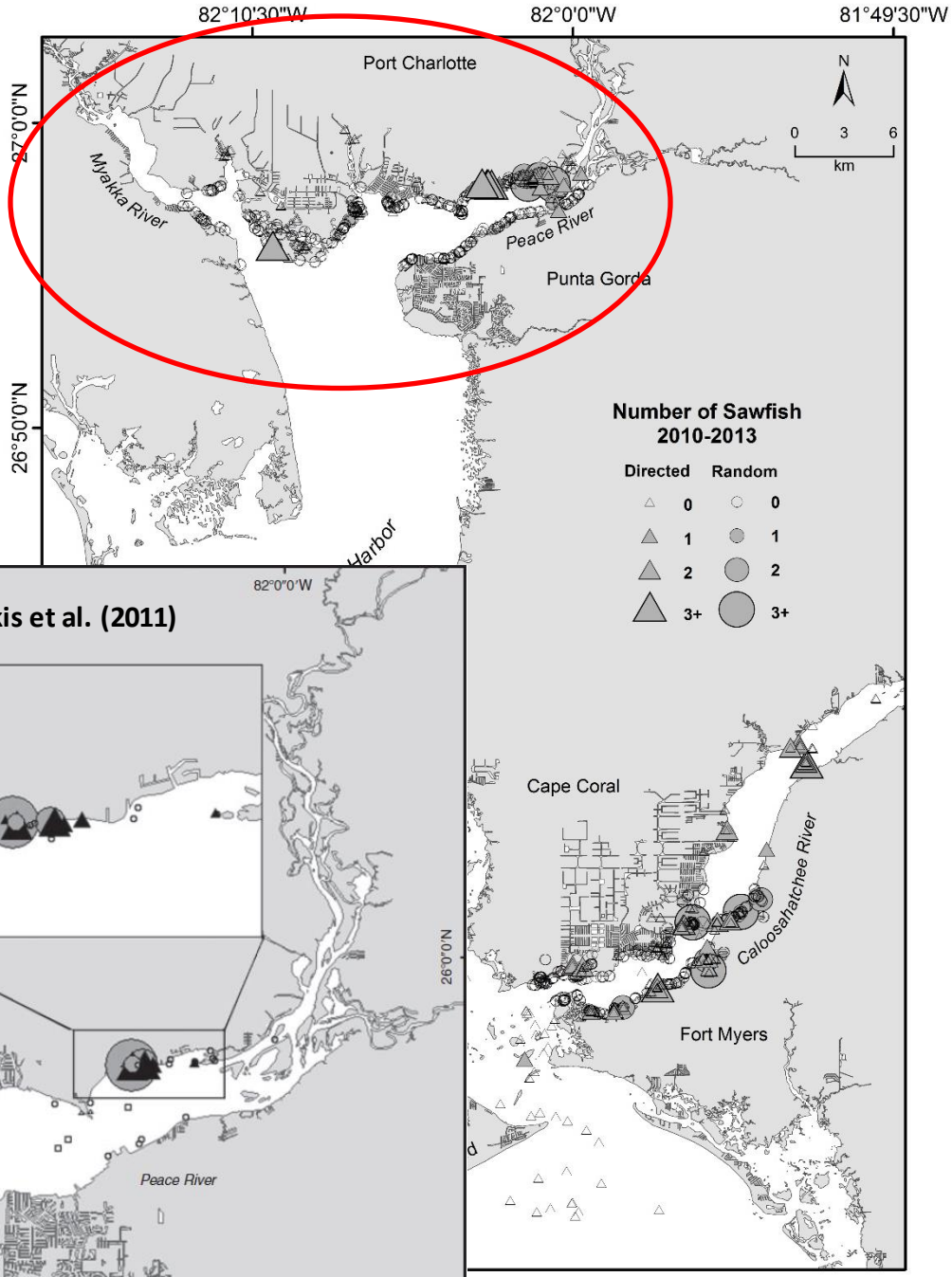
- Regulated Flow
  - US Army Corps of Engineers/SFWMD
- Multiple hotspots
- System long and narrow
- Highly urbanized

Caloosahatchee River

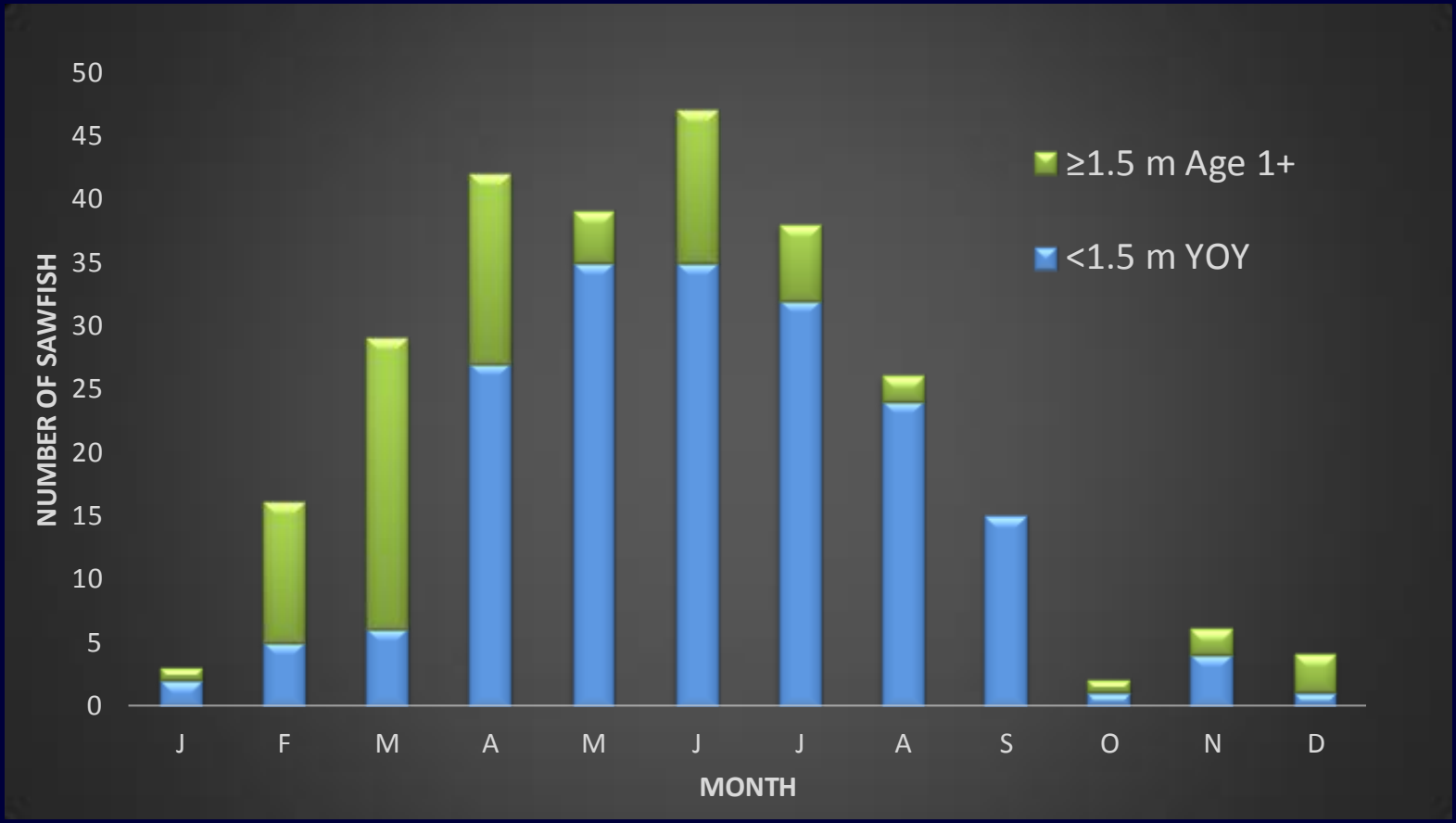


Peace River

- Natural flow
- One hotspot
- Natural habitat
- Cecily will talk more about this region…



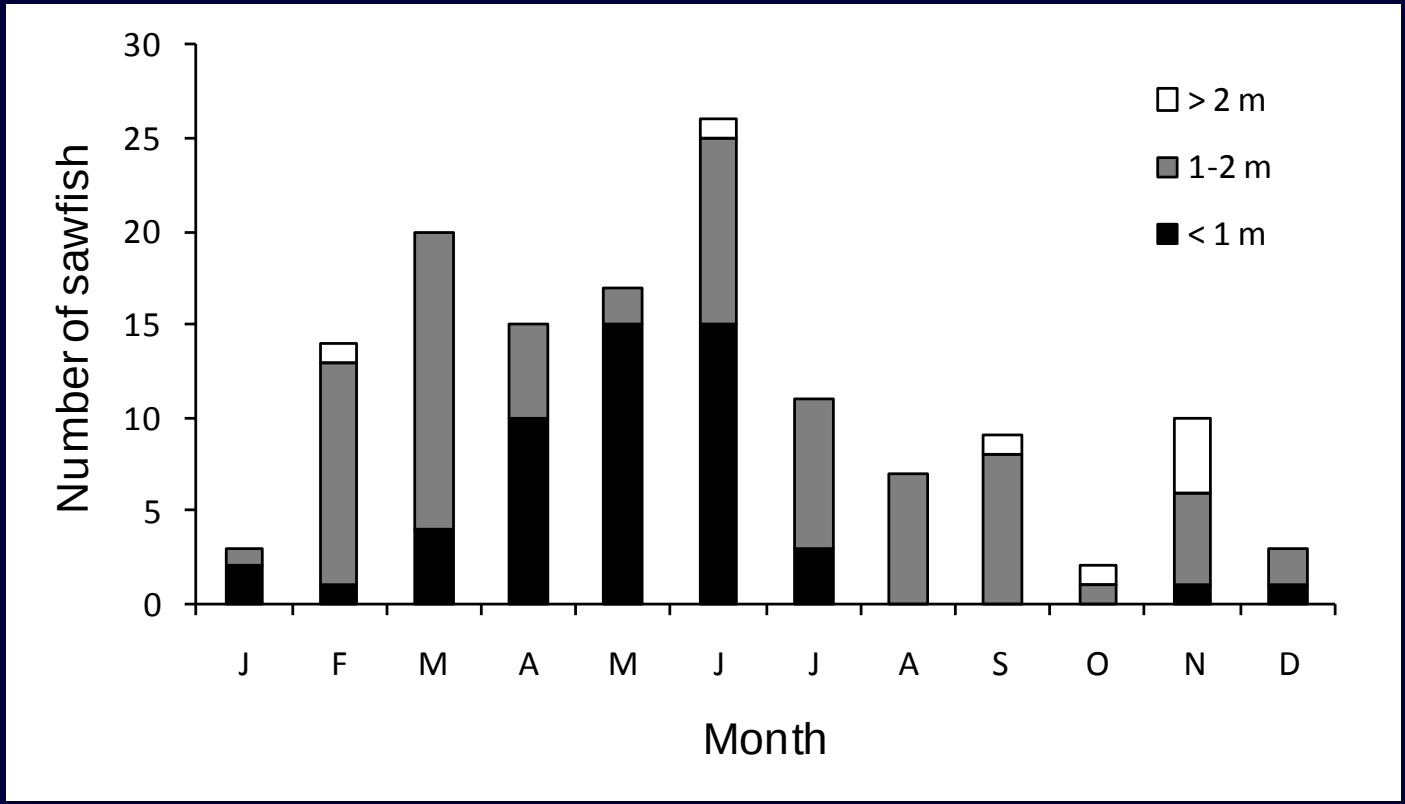
Seasonality



- Range = 671–2,172 mm STL (0–3 years old; Scharer et al. 2012)
- 403 juveniles captured, tagged, and released
- Recruitment peaks in spring

FWC Research

Recovery plan sizes



Logistic regression models

Looked for factors that influenced the probability of catching sawfish

3 full models: All sawfish*, < 1 year olds*, > 1 year olds*

Month*
Year
Gear type
Maximum water depth*******
Water temperature***
Salinity**
Dissolved oxygen****
Interactions
Overhanging vegetation*
Non-overhanging vegetation
Artificial shoreline

***no bottom type or bottom vegetation**

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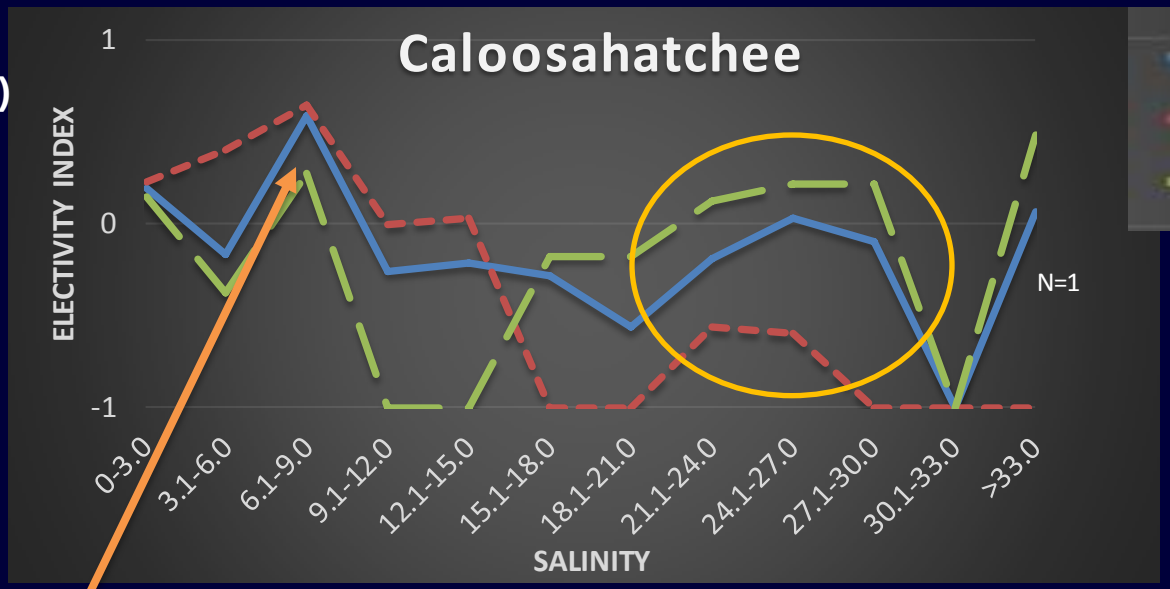
Salinity electivity indices

2005-2009: 18-30
(Poulakis et al. 2011)

Since 2010: 21-30



Since 2010: 12-27

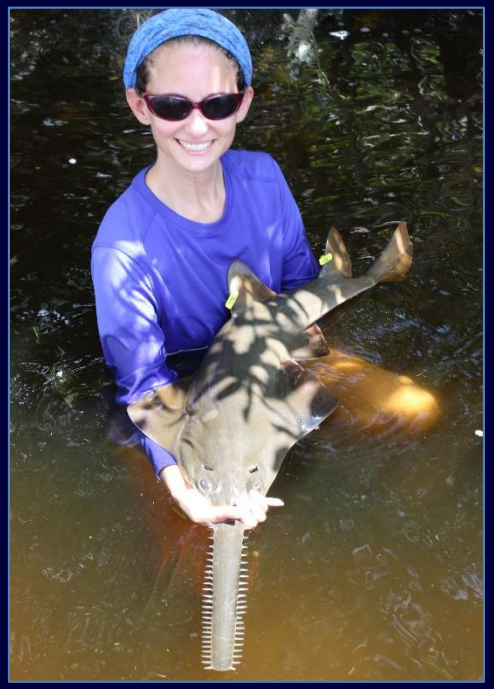
Fish captured at river mouths during high flows (they still didn't leave the rivers)

Electivity indices summary

- Characterize patterns of habitat use
- Overall: Juvenile sawfish in different regions have an affinity for similar abiotic variables
- **Differences related to management and hotspot effects**

River	Caloosahatchee	Peace
Depth YOY*	<1 m	<1 m
Depth Age 1+*	>1 m	>1 m
D.O.	>6 mg/L	>4 mg/L
Salinity	18-30	12-27
Temp	>24°C	>21°C

**<1.5m = YOY
>1.5m = Age 1+



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Advances in tagging technology have allowed us to examine movement patterns of organisms

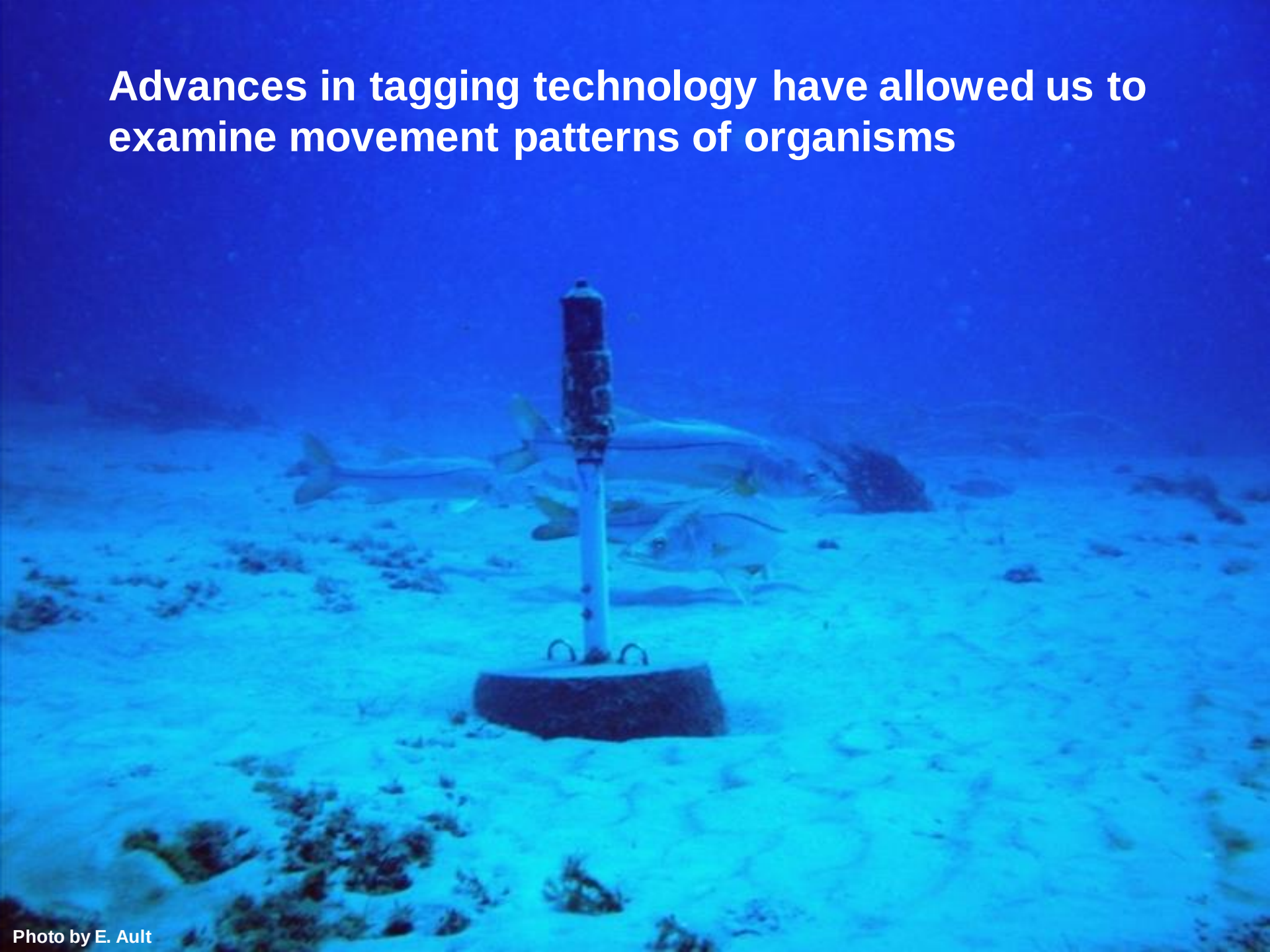
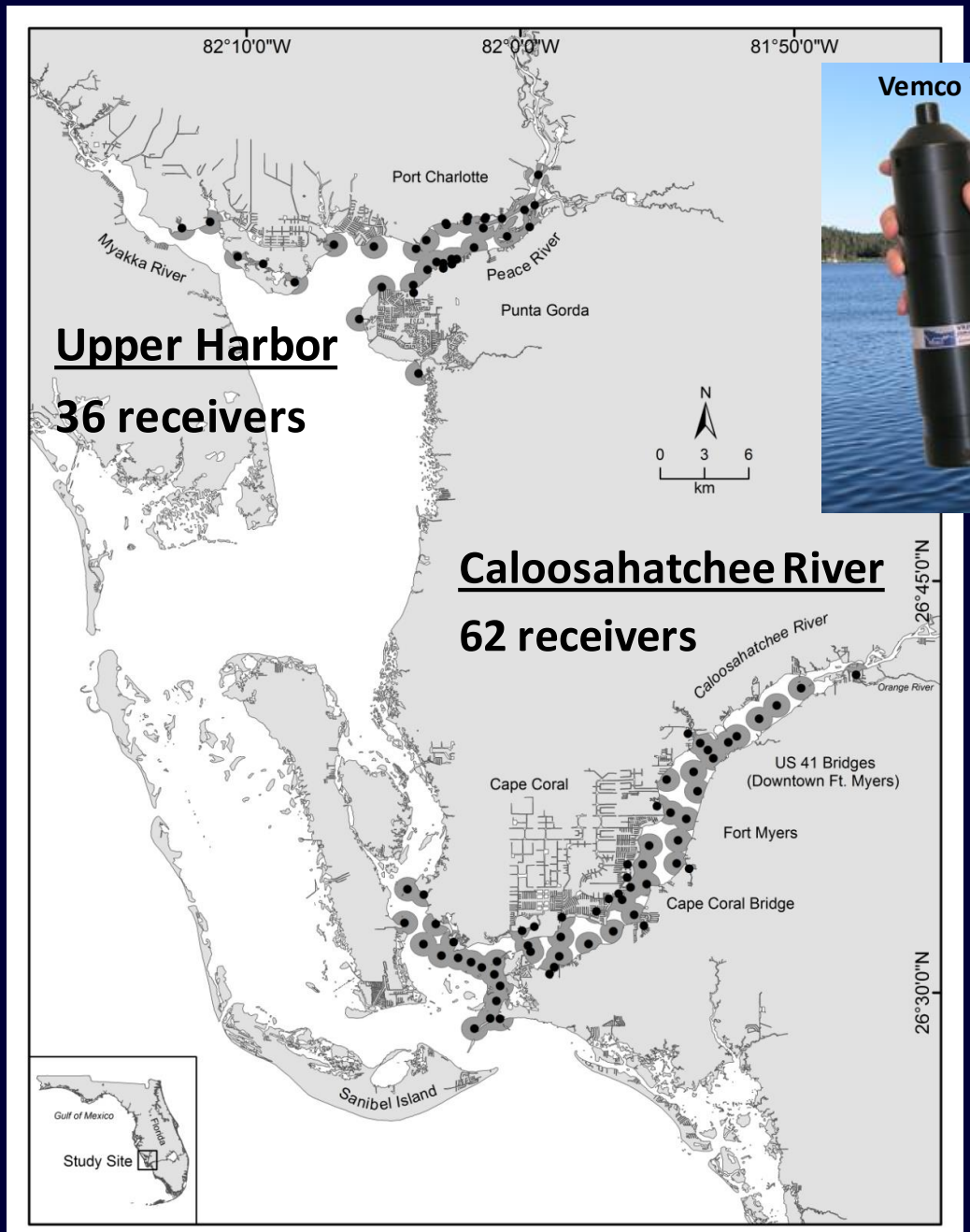


Photo by E. Ault

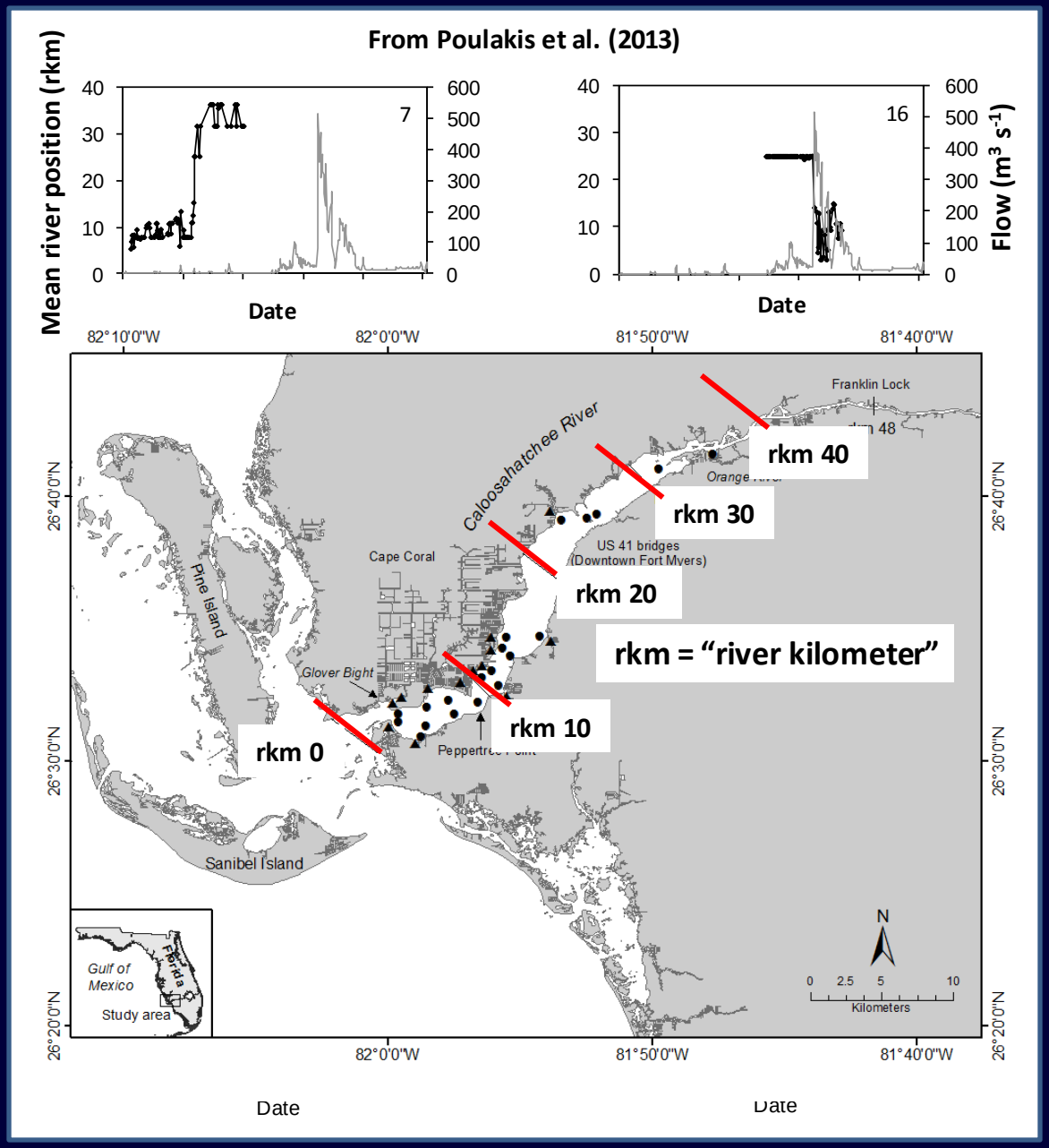
Acoustic monitoring arrays



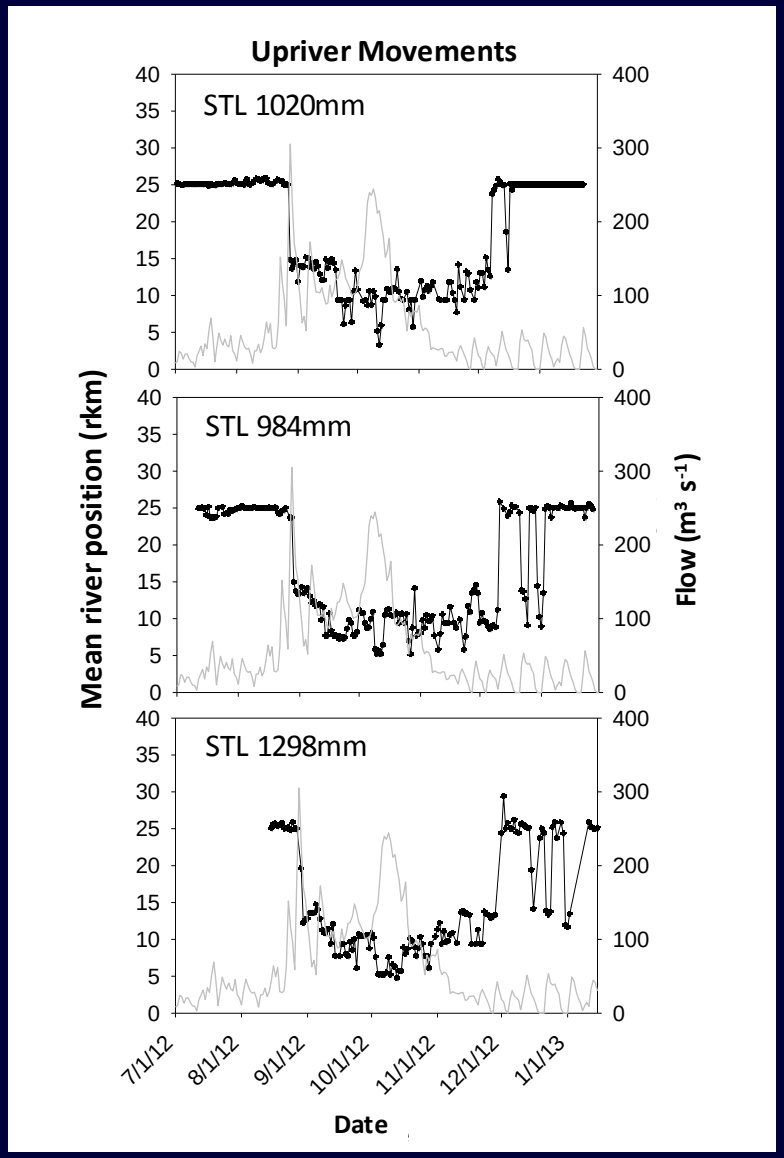
Caloosahatchee River

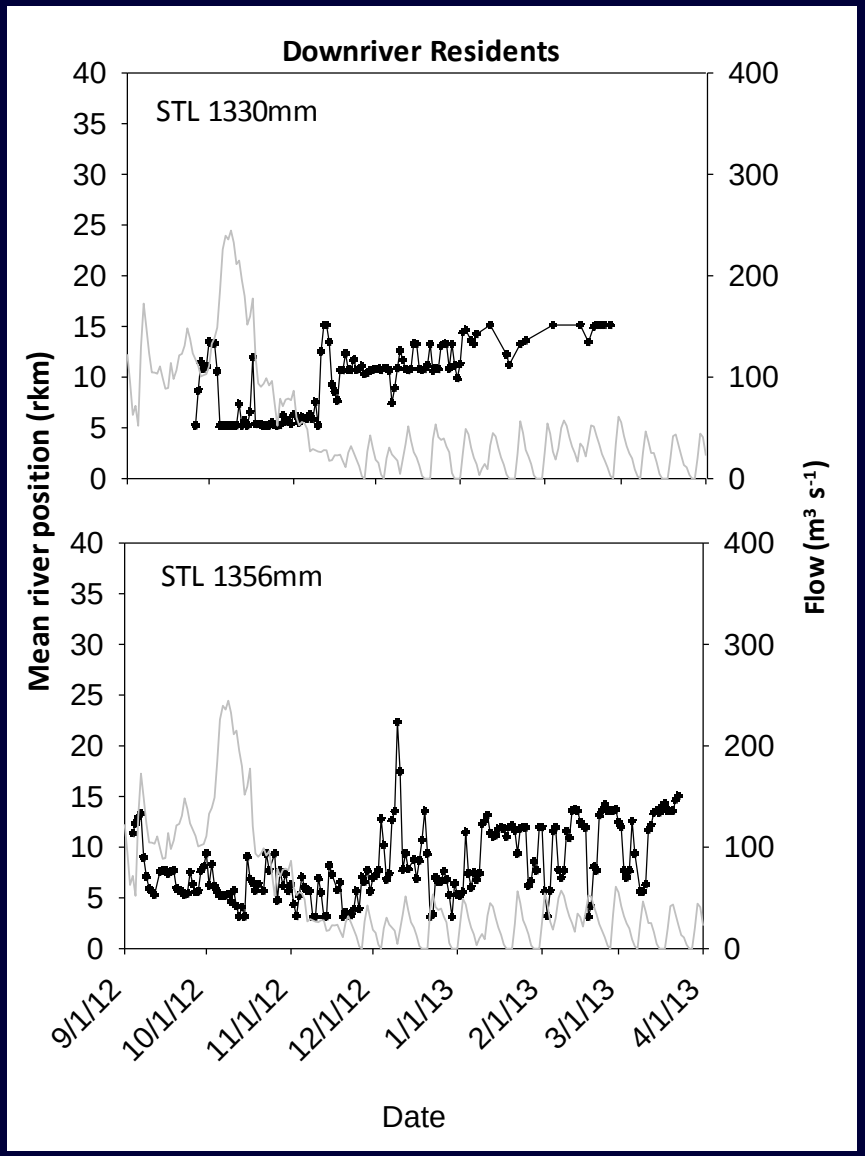
Upriver movement

Downriver movement

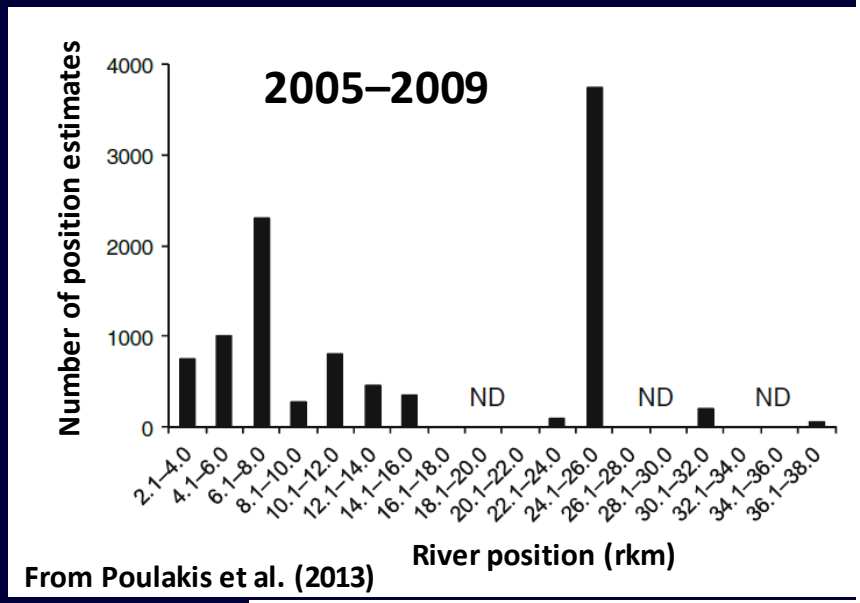


Caloosahatchee River movement

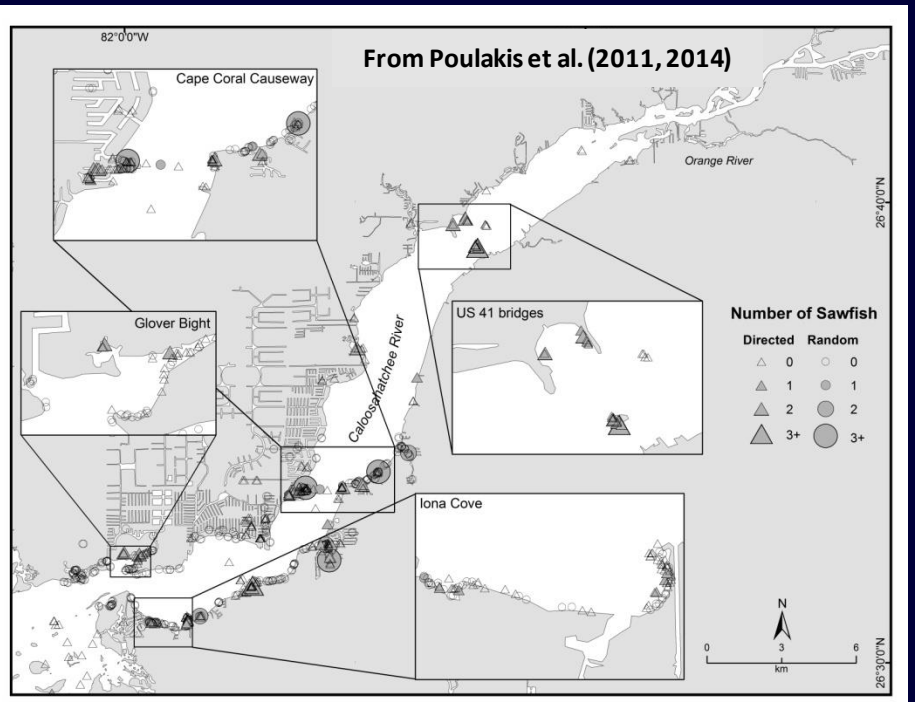


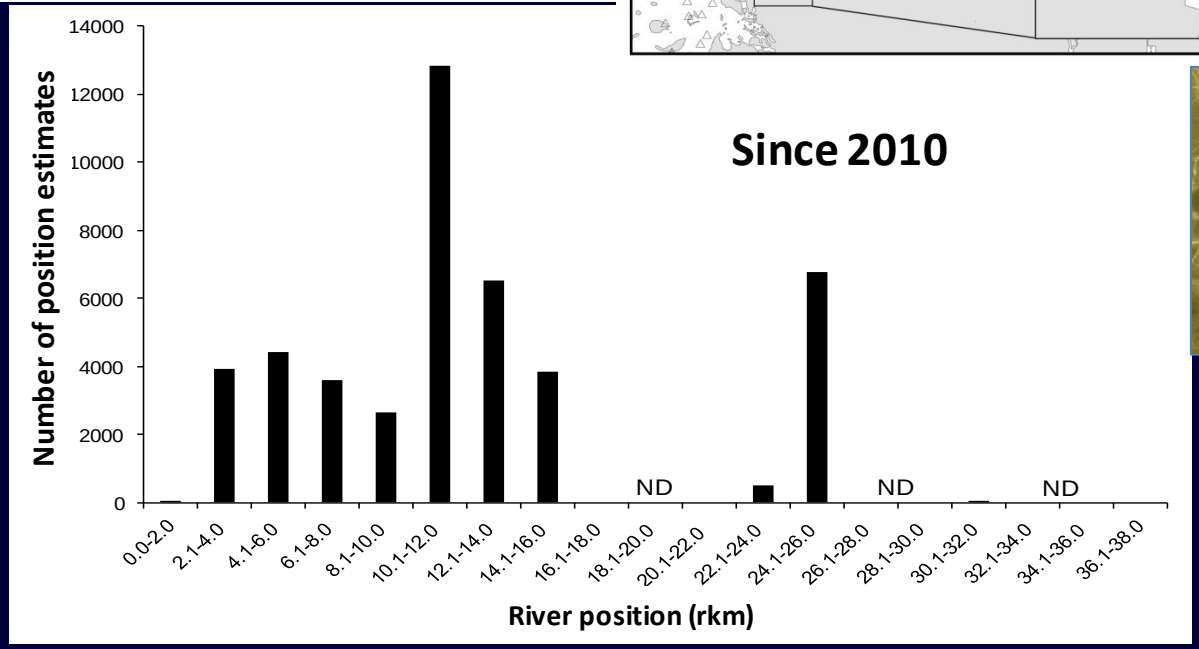


Caloosahatchee River

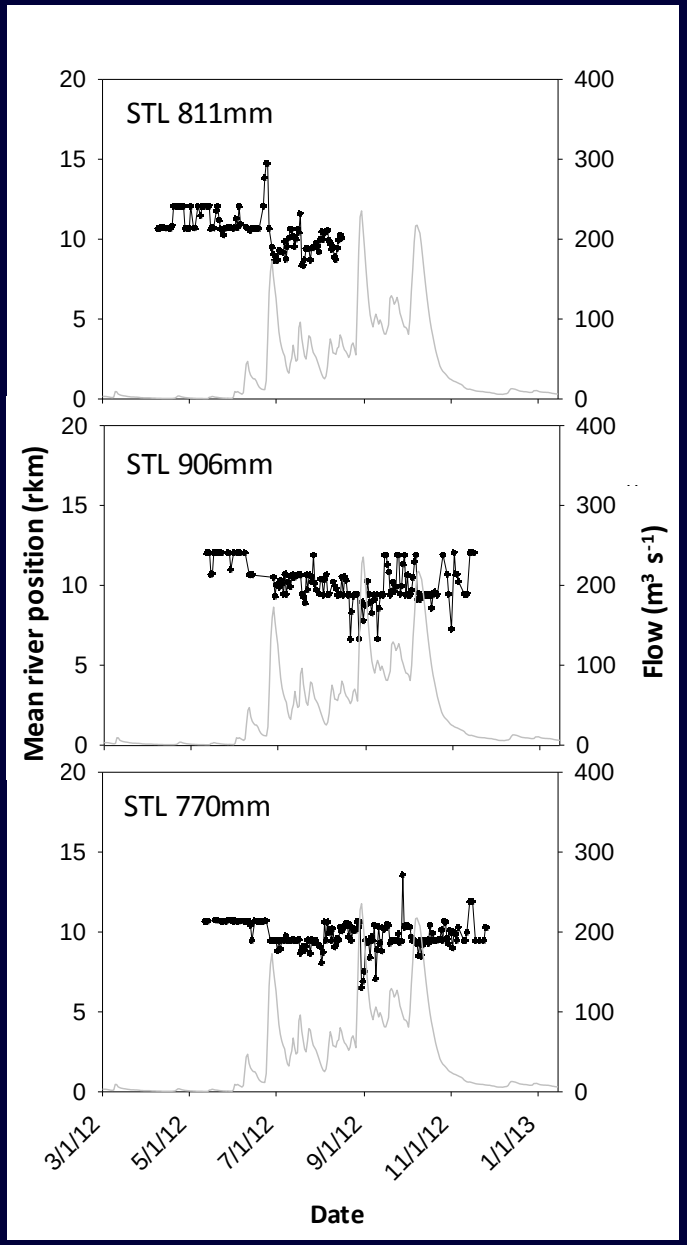


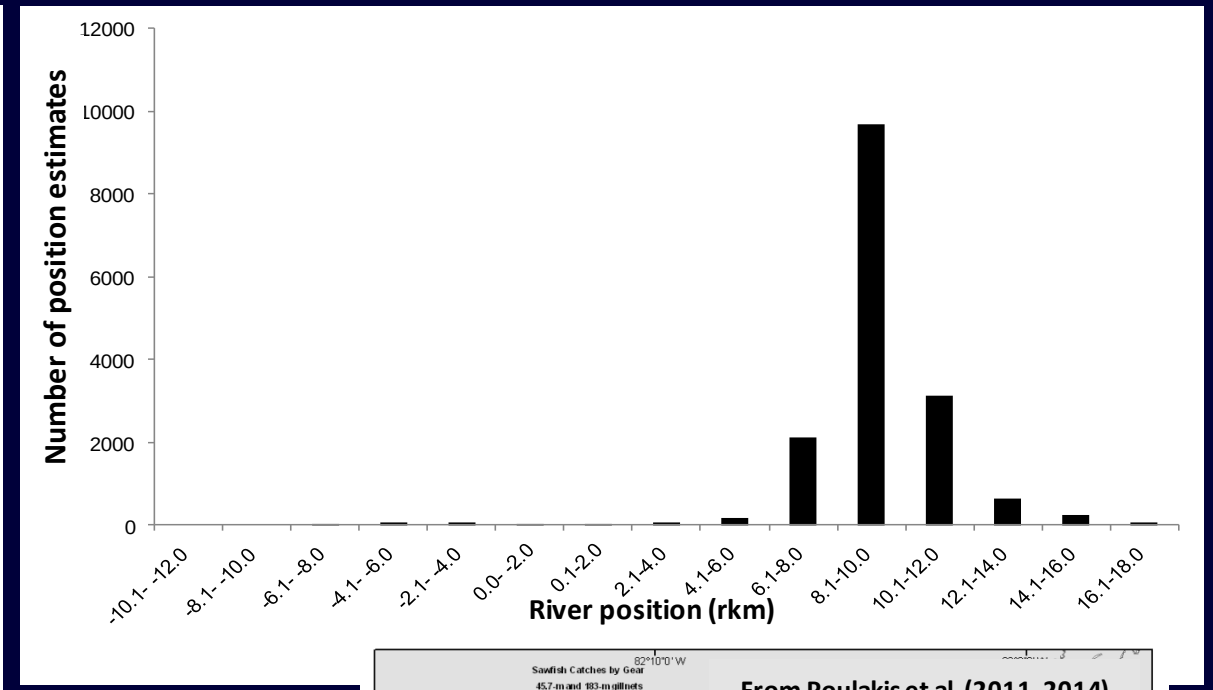
From Poulakis et al. (2013)

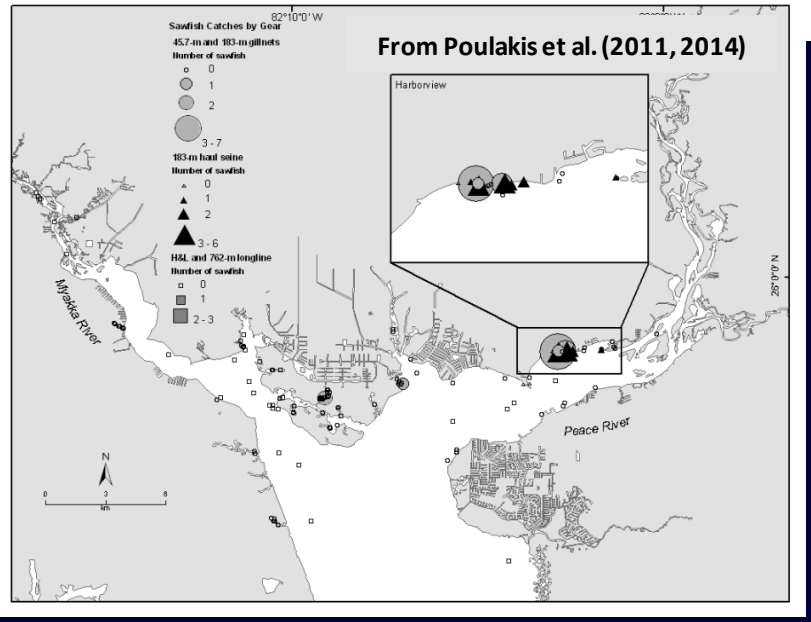




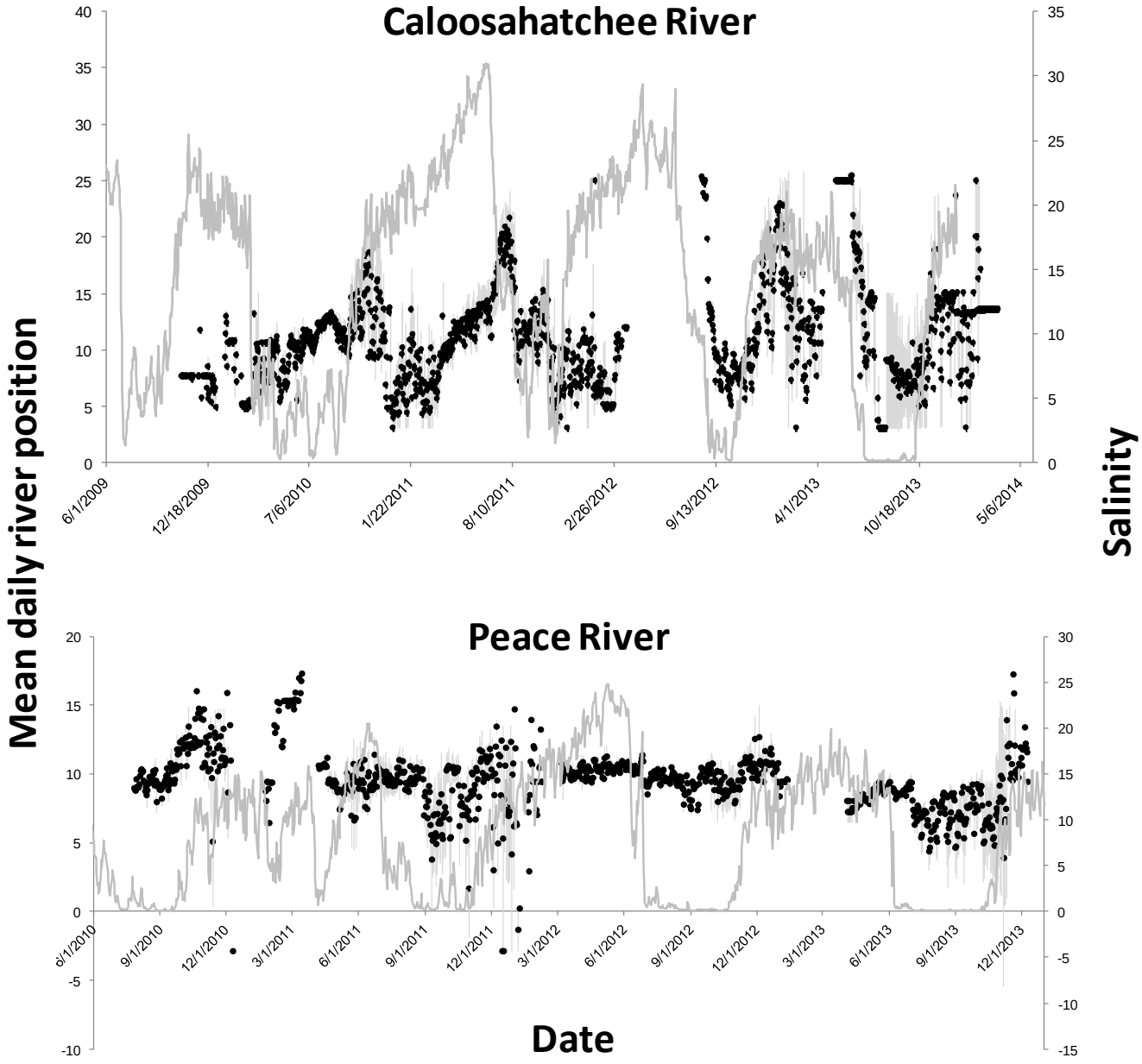
Peace River movements



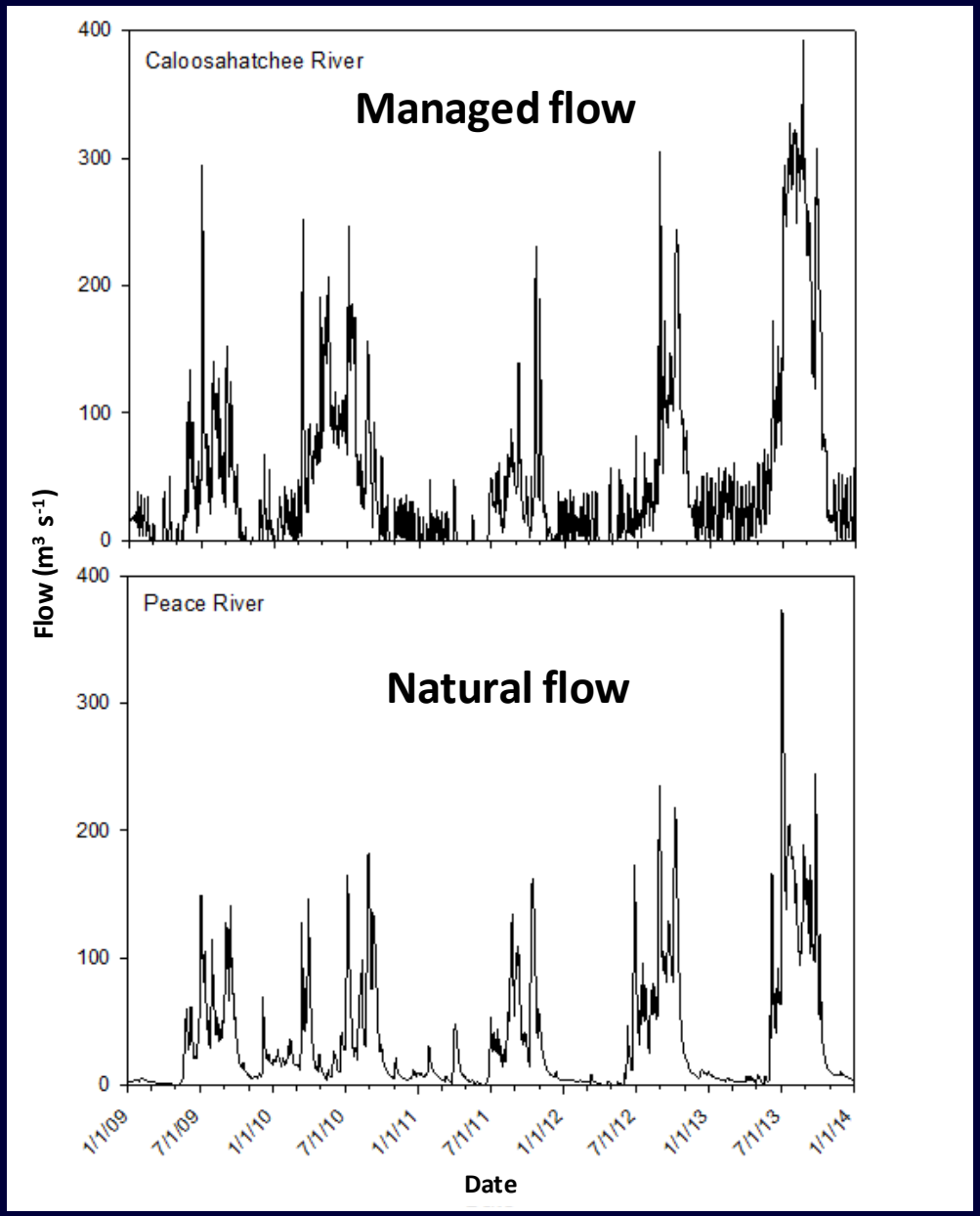




All sawfish vs. salinity



River flow comparison



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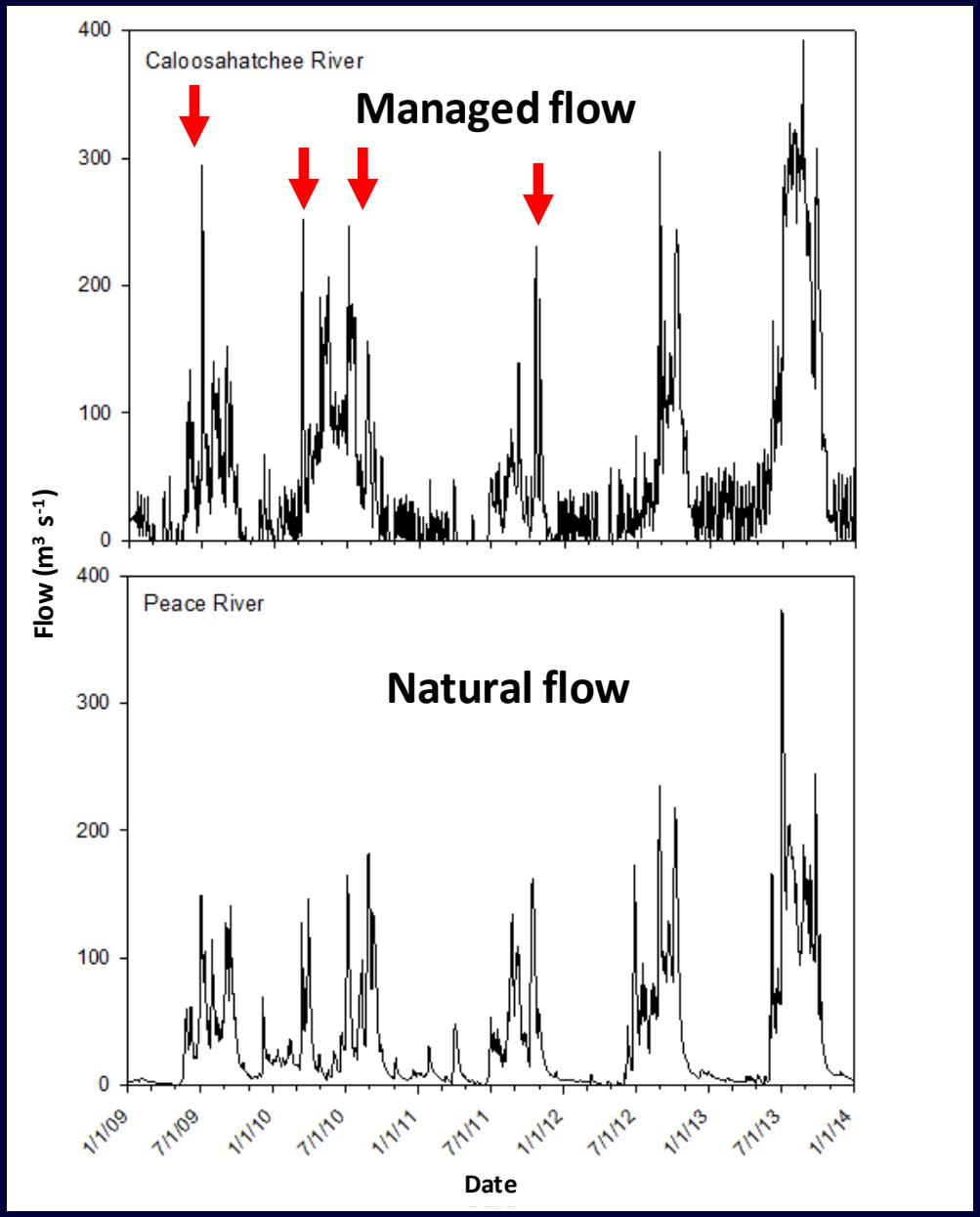

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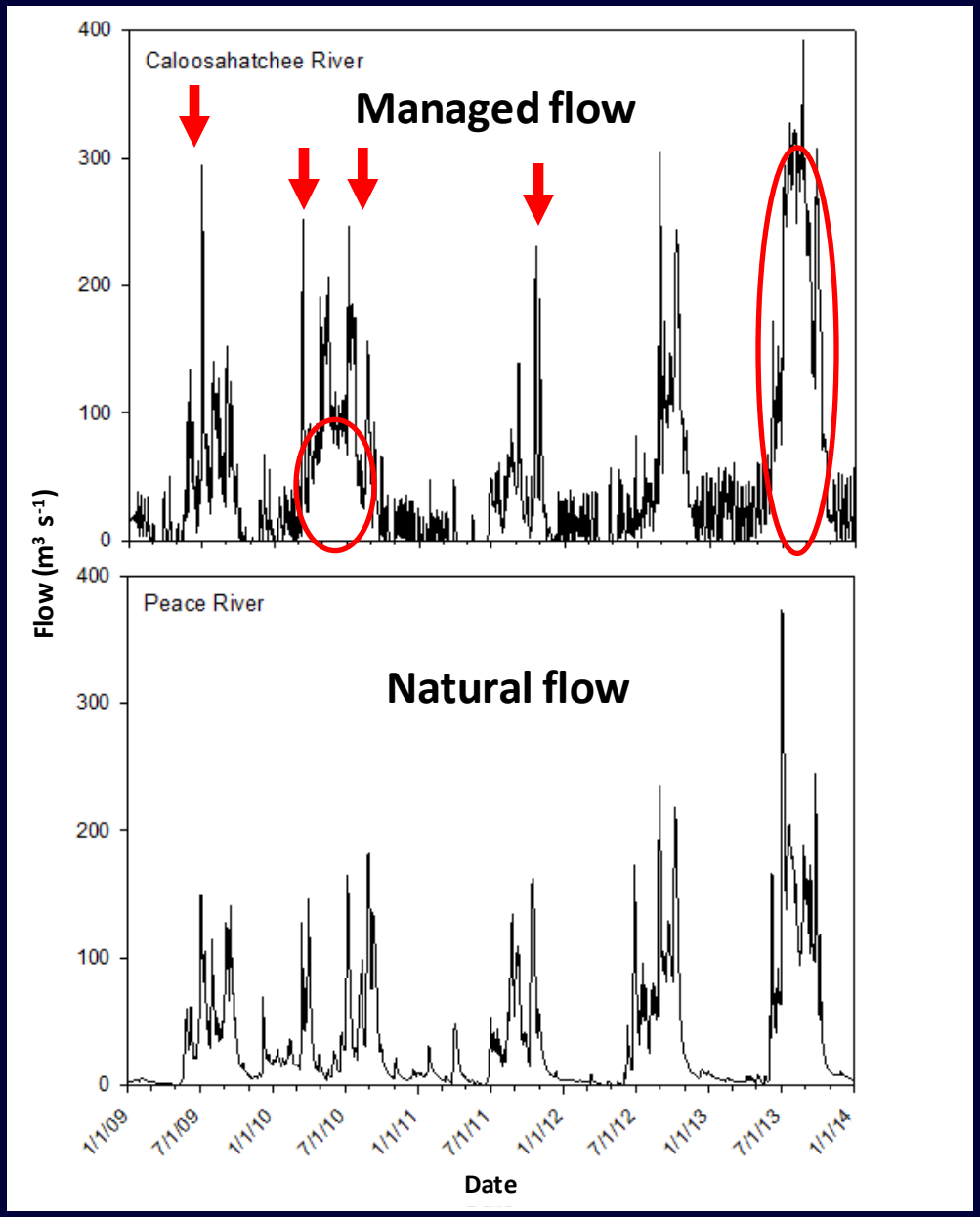
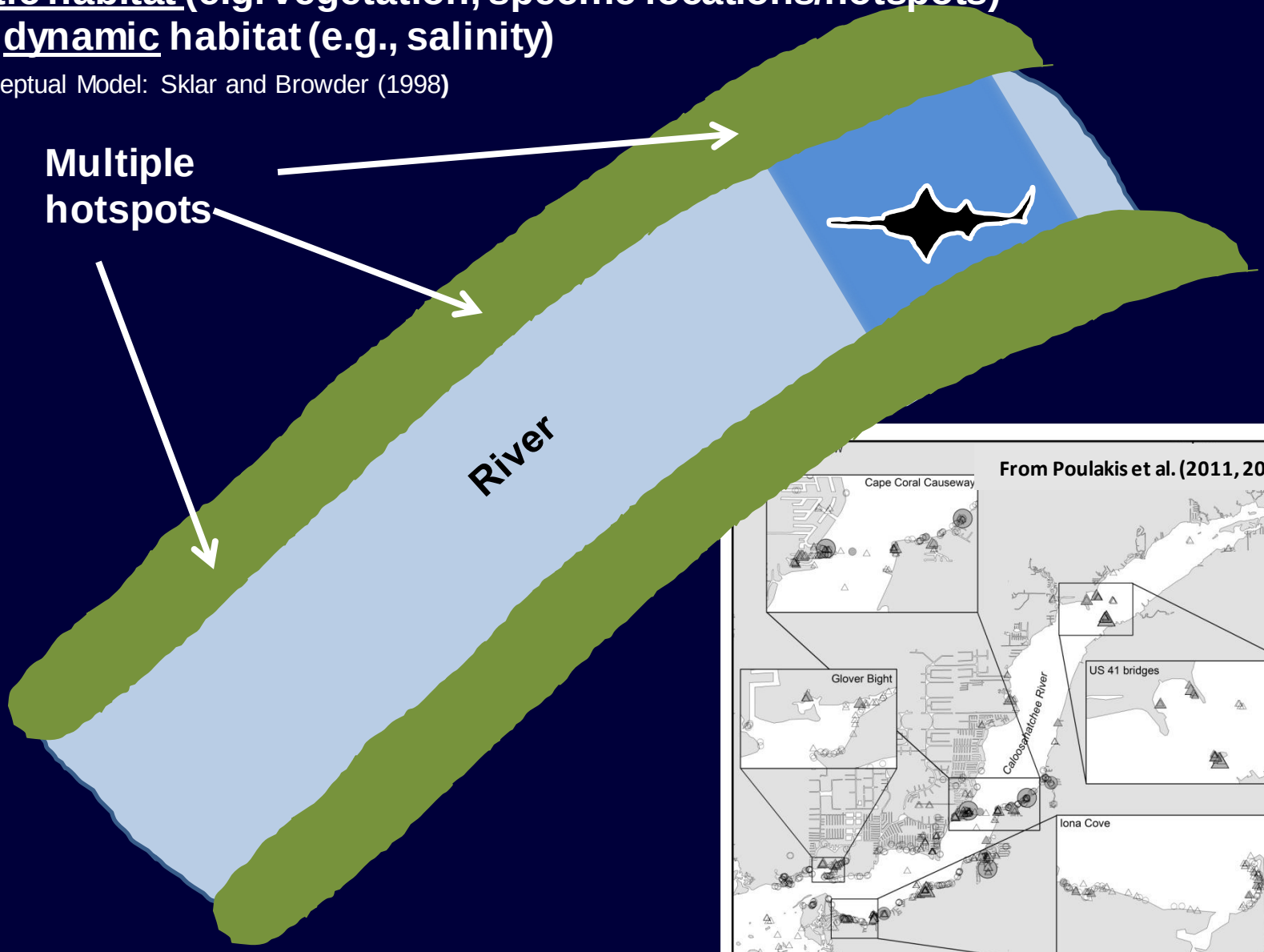
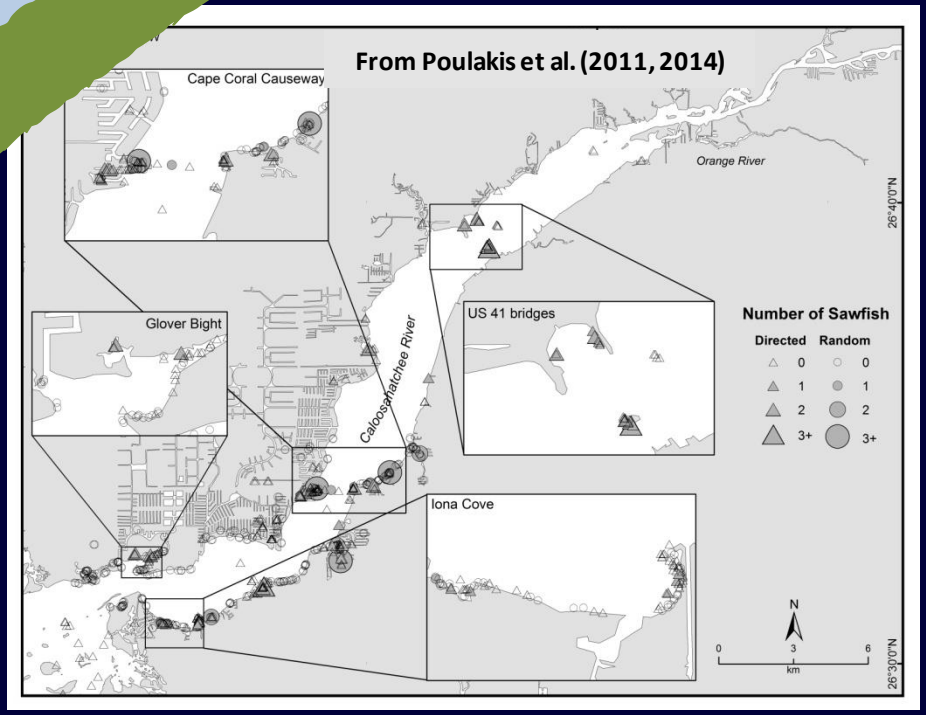


Caloosahatchee River

Movement response that favors:
<u>static habitat</u> (e.g. vegetation; specific locations/hotspots)
Vs. <u>dynamic</u> habitat (e.g., salinity)

Conceptual Model: Sklar and Browder (1998)

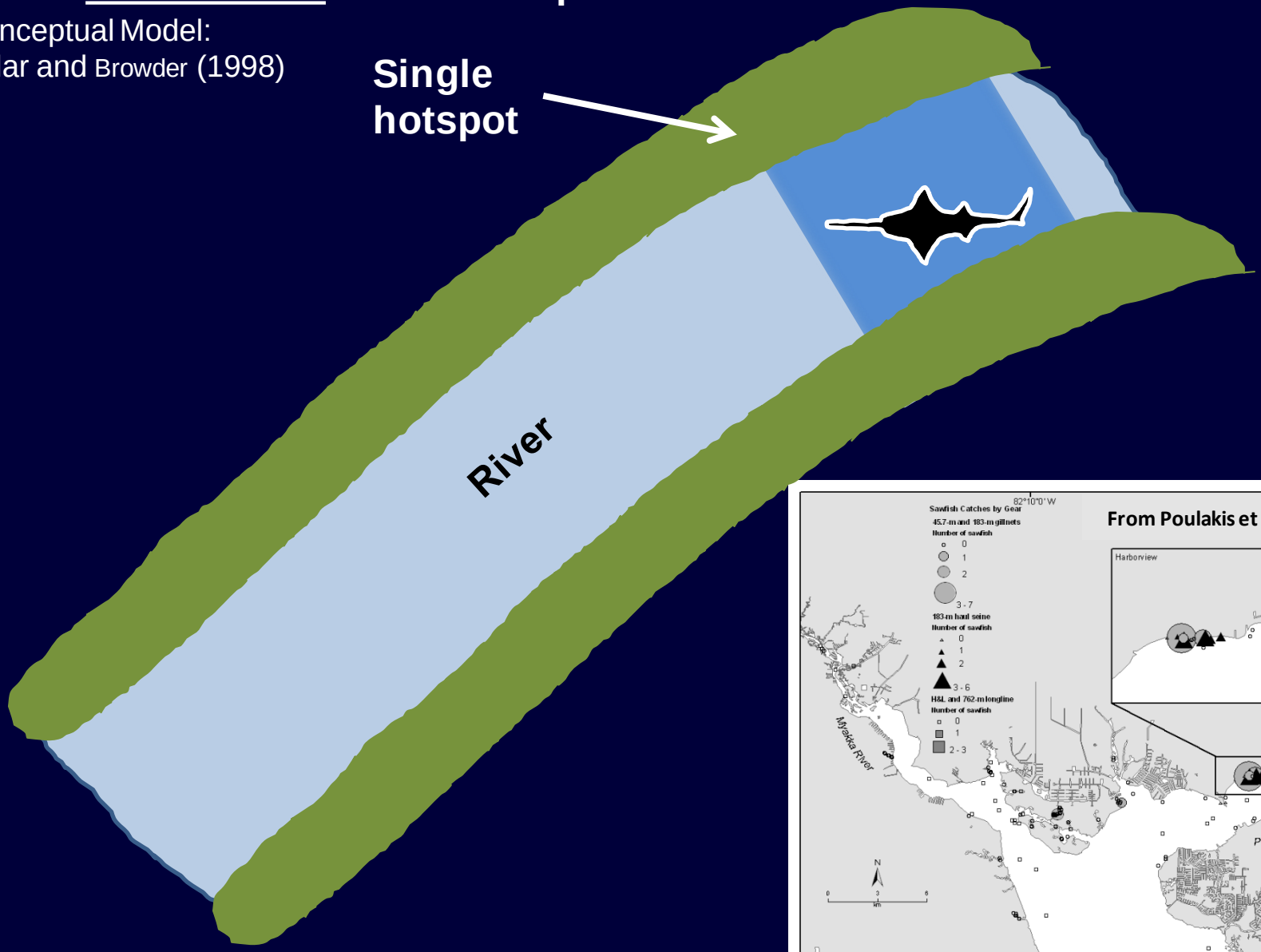


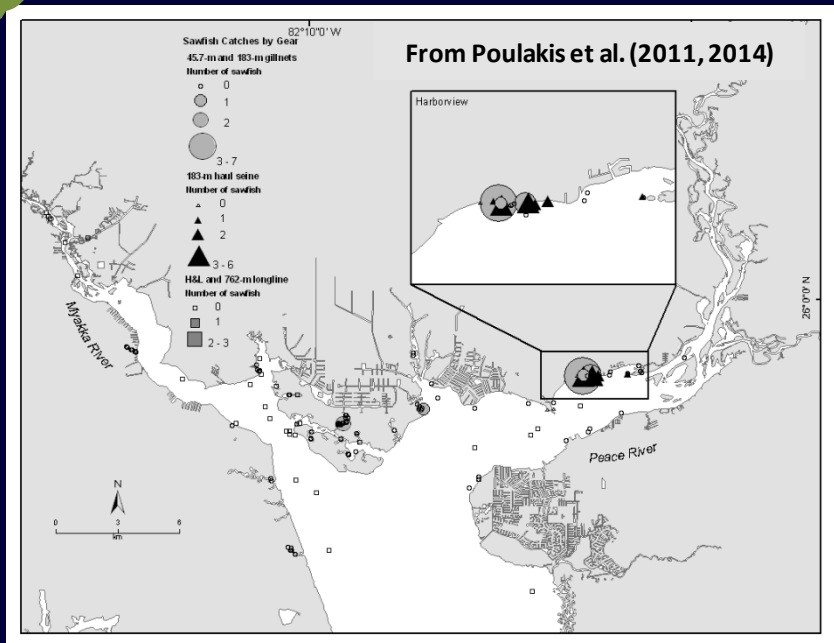


Peace River

Movement response that favors static habitat at ONE hotspot

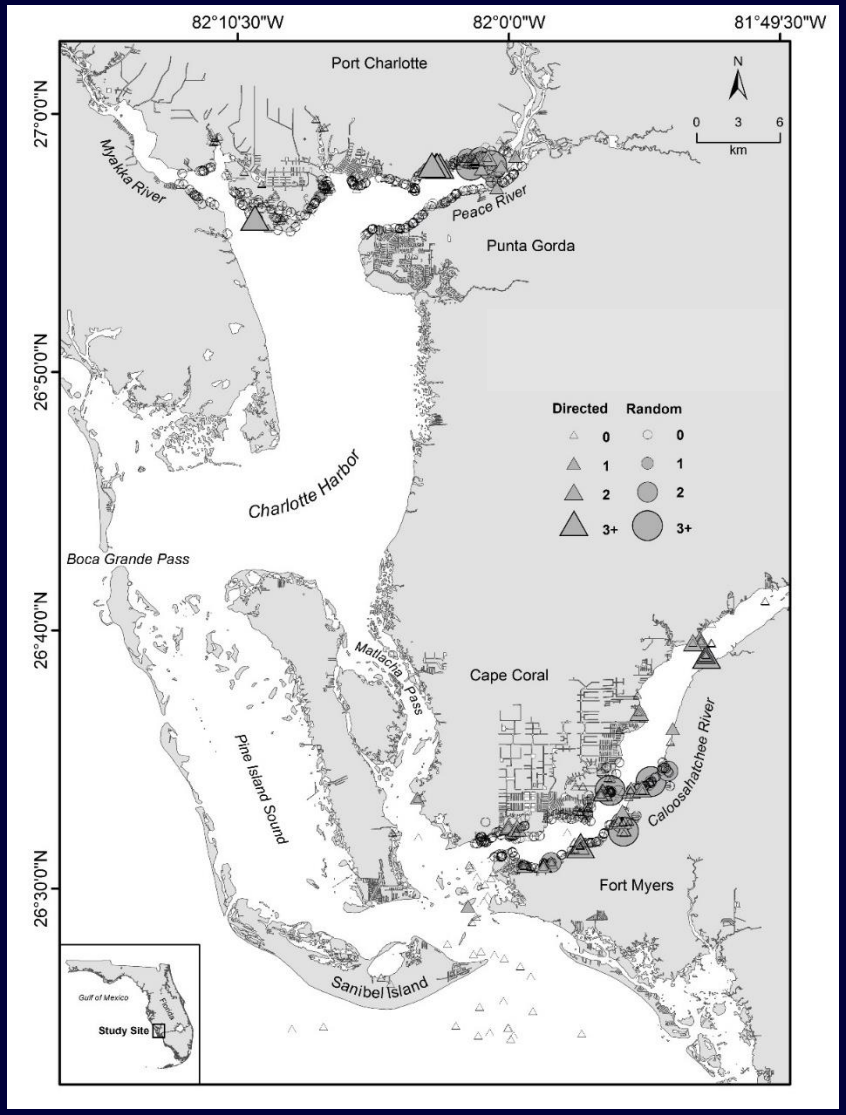
Conceptual Model:
Sklar and Browder (1998)





Summary

- Differences in river use related to:
  - Managed flow
  - River geomorphology
  - Hotspots
- Hotspot significance



Thank you!

FWC Charlotte Harbor Field Lab

Next sawfish talk - Fine-scale movements with Cecily Huston!