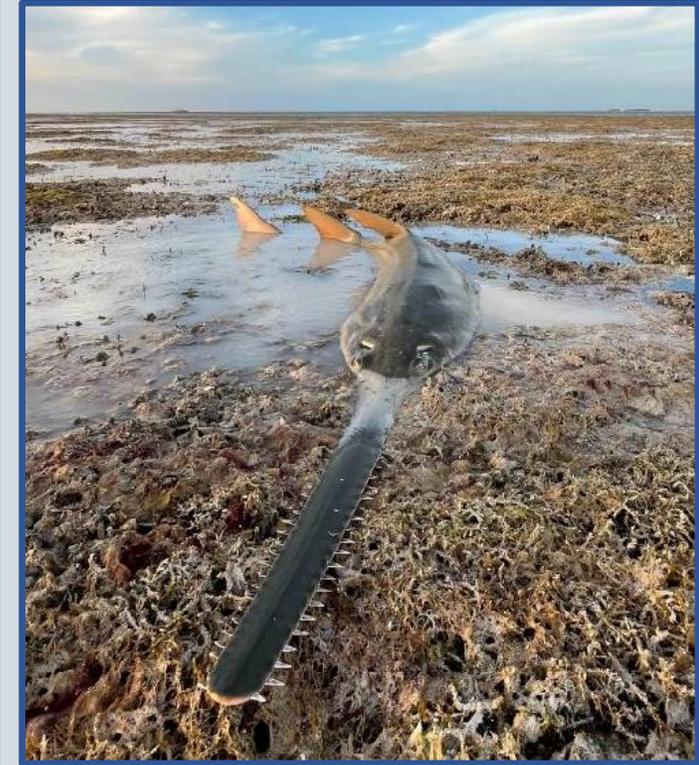


Overview of FWC's Smalltooth Sawfish Research and Monitoring Program



Gregg R. Poulakis, Ph.D.

Fish and Wildlife Research Institute

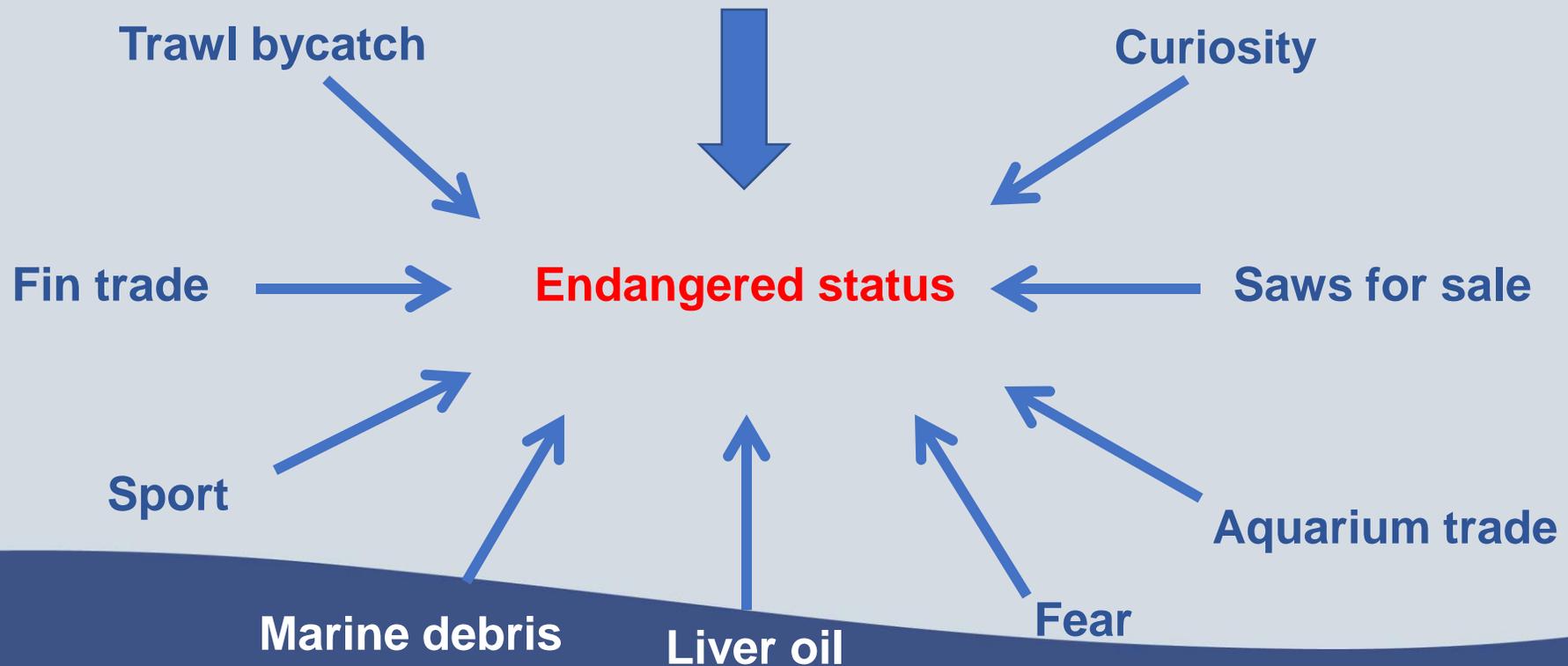


Florida Fish and Wildlife Conservation Commission

Sawfish population declines



Gill net bycatch



Life History

MacArthur and Wilson (1967)

r-selection

- unstable habitat
- unstable environment
- high mortality
- smaller size
- early maturity
- many young
- broadcast spawning
- 'sustainable' fisheries

K-selection

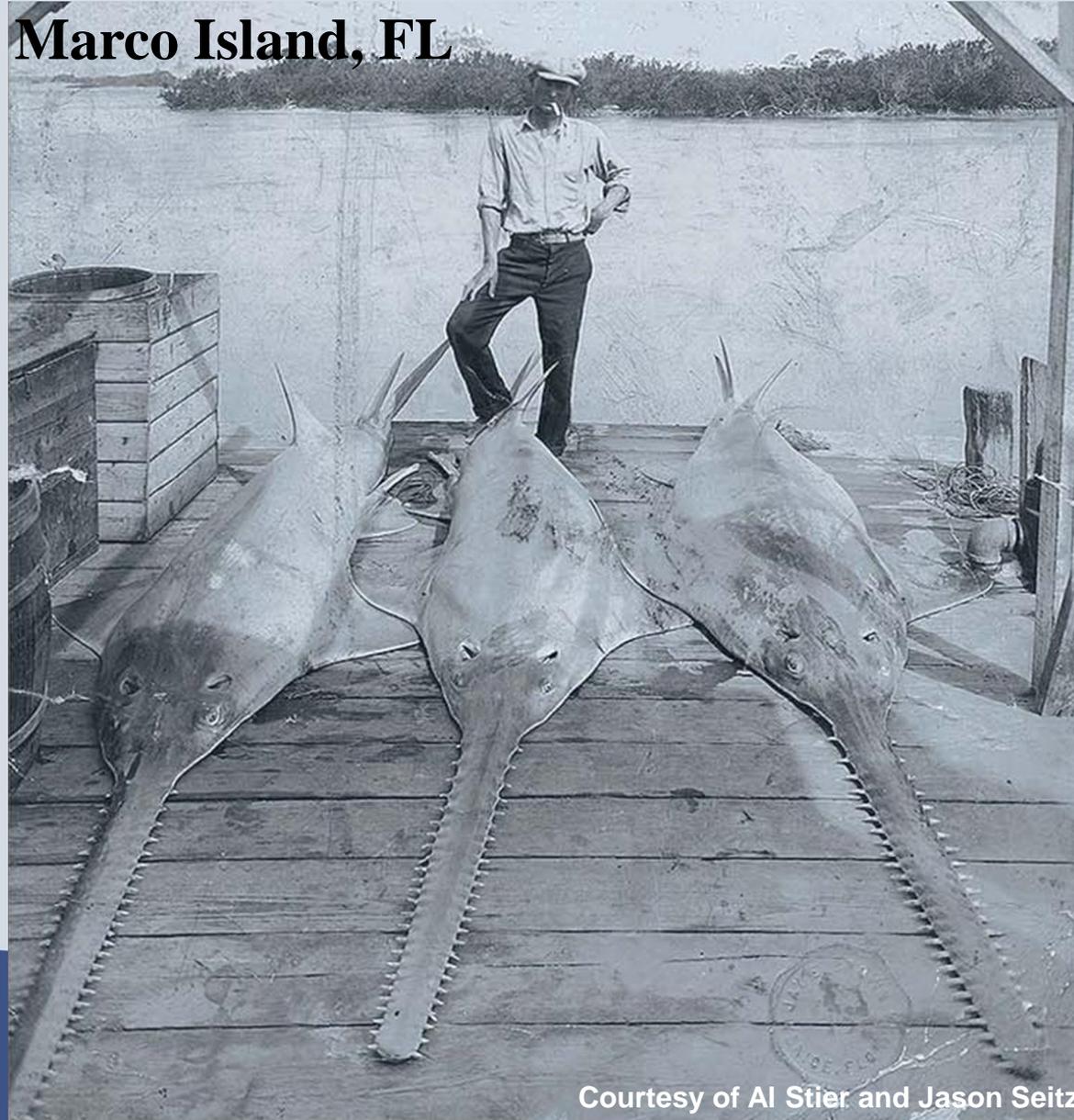
- stable habitat
- stable environment
- low mortality
- larger size
- late maturity
- few young
- live-bearing
- easily overfished

sawfish



Commercial fisheries

Marco Island, FL



Courtesy of Al Stier and Jason Seitz



Recreational fisheries



Courtesy of Gulf Stream II



Recreational fisheries

Indian River Lagoon, FL



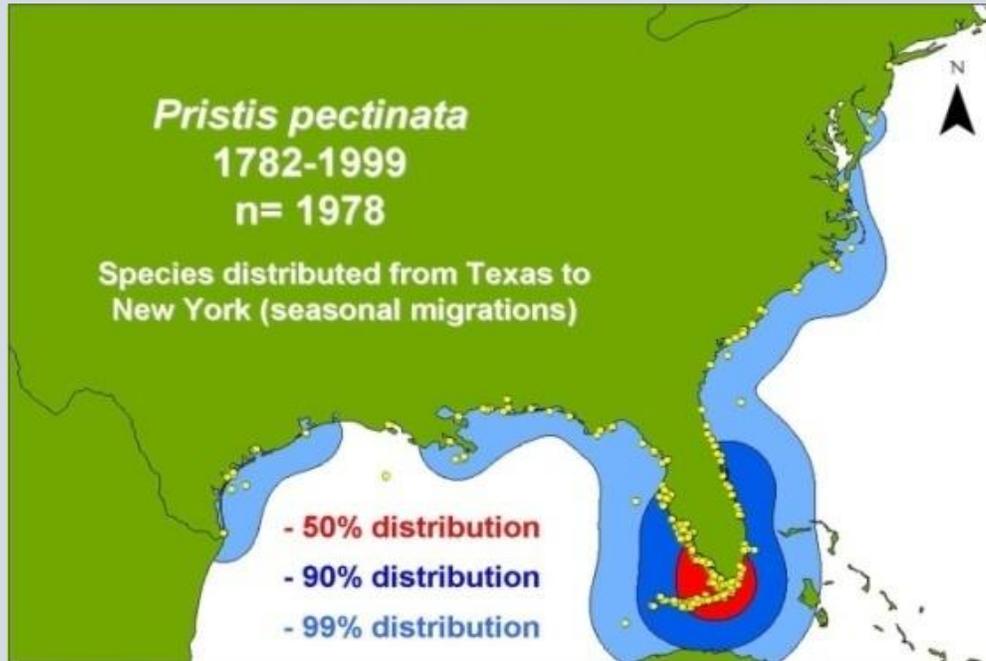
Sawfish biology

- **Smalltooth sawfish (*Pristis pectinata*), 1 of 5 species found globally**
- **Only species found in Florida**
- **Born live at about 2.5 feet long, including the saw**
- **Largest on record at just over 16 feet**
- **Juveniles use nursery habitats in south Florida estuaries including Charlotte Harbor, the Ten Thousand Islands, Everglades National Park, and St. Lucie River**
- **Adults are found statewide, mainly in deeper nearshore waters in South Florida**
- **The rostrum, or saw, is used mainly for feeding and defense**

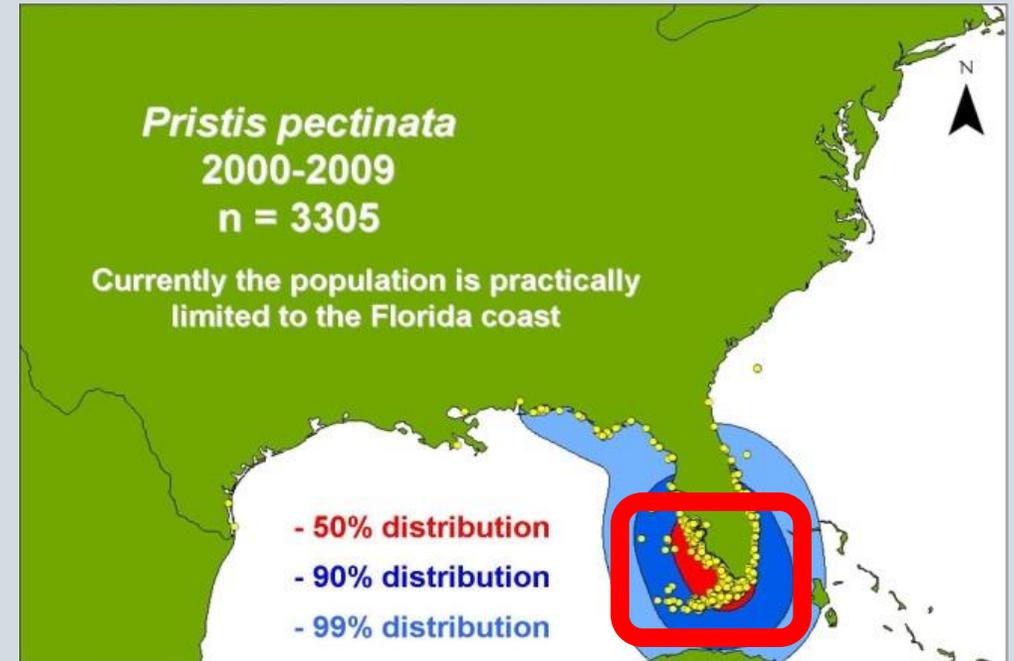


Distribution

- Historical range = warm water on both sides of the Atlantic Ocean
- Current distribution limited to mainly to their core range in south Florida



Historical U.S. distribution

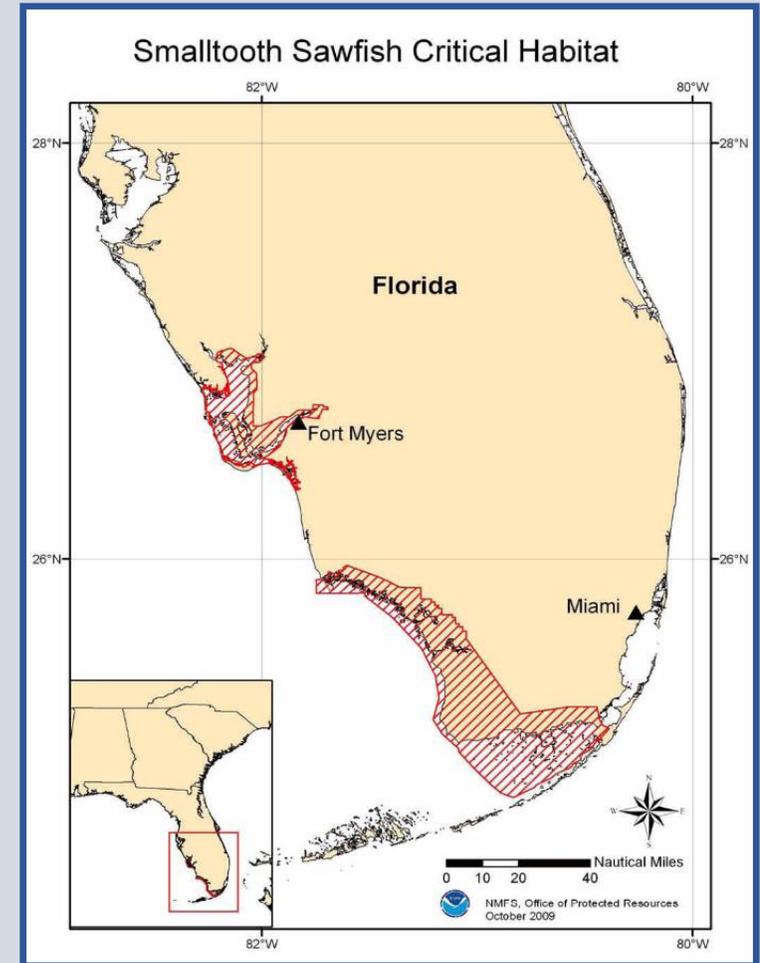


Current distribution



What's been done to help the species?

- **1992:** Protected from harvest in Florida
- **2003:** “Endangered”; U.S. Endangered Species Act
- **2004:** FWC began studying the species in Charlotte Harbor
- **2007:** CITES Appendix I (Protection from international trade)
- **2009:** NMFS Recovery Plan published; **Smalltooth Sawfish Recovery Implementation Team (SSRIT)** formed; & juvenile critical habitat designated



From Norton et al. (2012)



What is FWC's role in conservation and recovery?

Florida Fish and Wildlife Conservation Commission



Fish and Wildlife Research Institute



Marine Fisheries Research



Fisheries-Independent Monitoring



Charlotte Harbor Field Laboratory



Sawfish Research Program

- Led by Dr. Gregg Poulakis

Florida State University

Florida Guides Association

NOAA-NMFS

Havenworth Coastal Conservation

Smalltooth Sawfish Recovery Implementation Team (SSRIT)

Everglades National Park

Shark Advocates International

U.S Army Corp of Engineers



What is FWC's role in conservation and recovery?

- Prior to 2004, virtually nothing was known about the species. We started what became the hotline in late 1990s, which set us up well for scientific sampling)
- Because sawfish live in state waters, FWC developed a Sawfish Research Program
 - 2004–2025: Funded almost exclusively by NOAA-NMFS through their Cooperation with the States Program; Section 6 of the Endangered Species Act
 - As part of the SSRIT, FWC has become the primary source of research, monitoring, and public encounter data for the species



What does the Sawfish Research Program do?

5 core aspects of FWC's Sawfish Research Program

Hotline

- Signage
- Outreach
- Training
- Database
- Safe handling

Sampling

- Proven methods
- Databases
- Permitting
- Strict procedures
- Custom mitigation projects

Acoustics

- >300 tags
- >100 receivers
- Maintenance
- Data sharing
- Custom mitigation projects
- Data management

Necropsies

- On call
- Statewide
- FWRI ↔ LE
- Sample processing
- Training
- Database

Outreach

- Fishing groups
- Festivals
- Students
- Social media
- Radio/TV
- Consultations

and **much more!**



U.S. Sawfish Recovery Hotline

Public reporting mechanism

- Dedicated phone number and email
- Public funneled to us from SSRIT and SCS
- We developed and manage online database
- ~500 reports per year
- Influences sampling effort; locates carcasses for necropsy
- Used to designate juvenile critical habitat

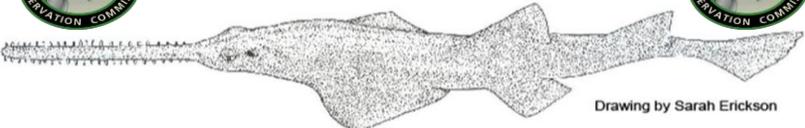
(Norton et al. 2012)

- More!





Sawfish Hotline



Drawing by Sarah Erickson

HAVE YOU SEEN THIS FISH?

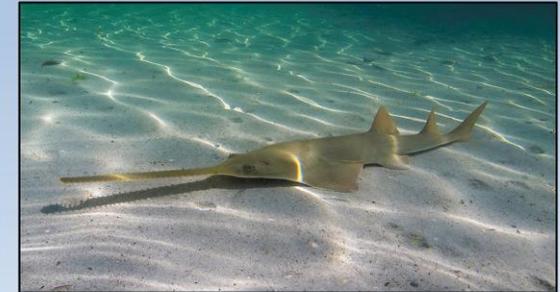
We would like information on your captures/observations of sawfish in Florida.

- 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!

Sawfish Are Endangered Respect • Release • Report

Sawfish are protected by State and Federal laws:
It is illegal to harm, harvest, or handle sawfish



You Can Help Save Smalltooth Sawfish

Angler Guidance:

- ▶ Release sawfish immediately
- ▶ Never lift from the water or drag ashore
- ▶ Do not use gaffs or ropes to secure
- ▶ Cut the line as close to the hook as possible

Diver Guidance:

- ▶ Keep your distance
- ▶ Avoid disturbing sawfish
- ▶ Do not chase or pursue
- ▶ Never feed or touch

Share Information About Your Encounter

1-844-4SAWFISH

www.SawfishRecovery.org

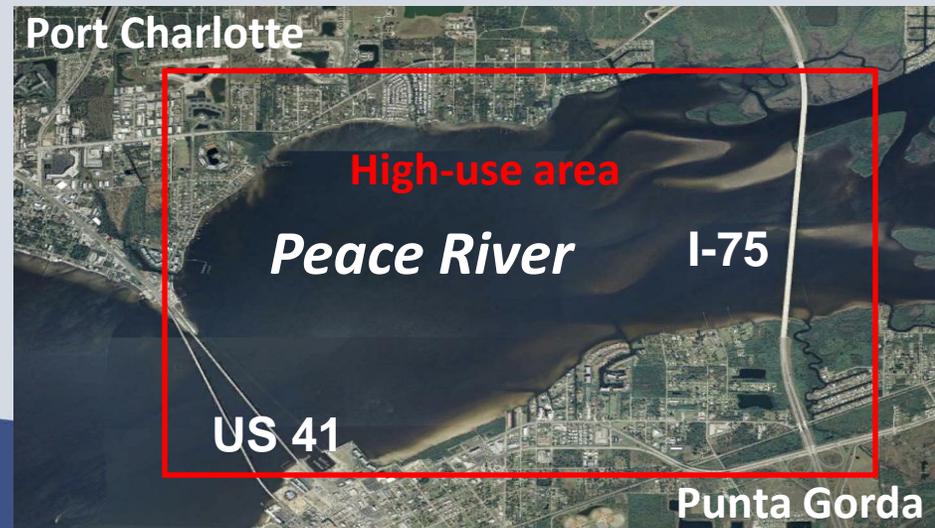
The information you provide helps scientists track sawfish recovery



Research and monitoring

Field work!

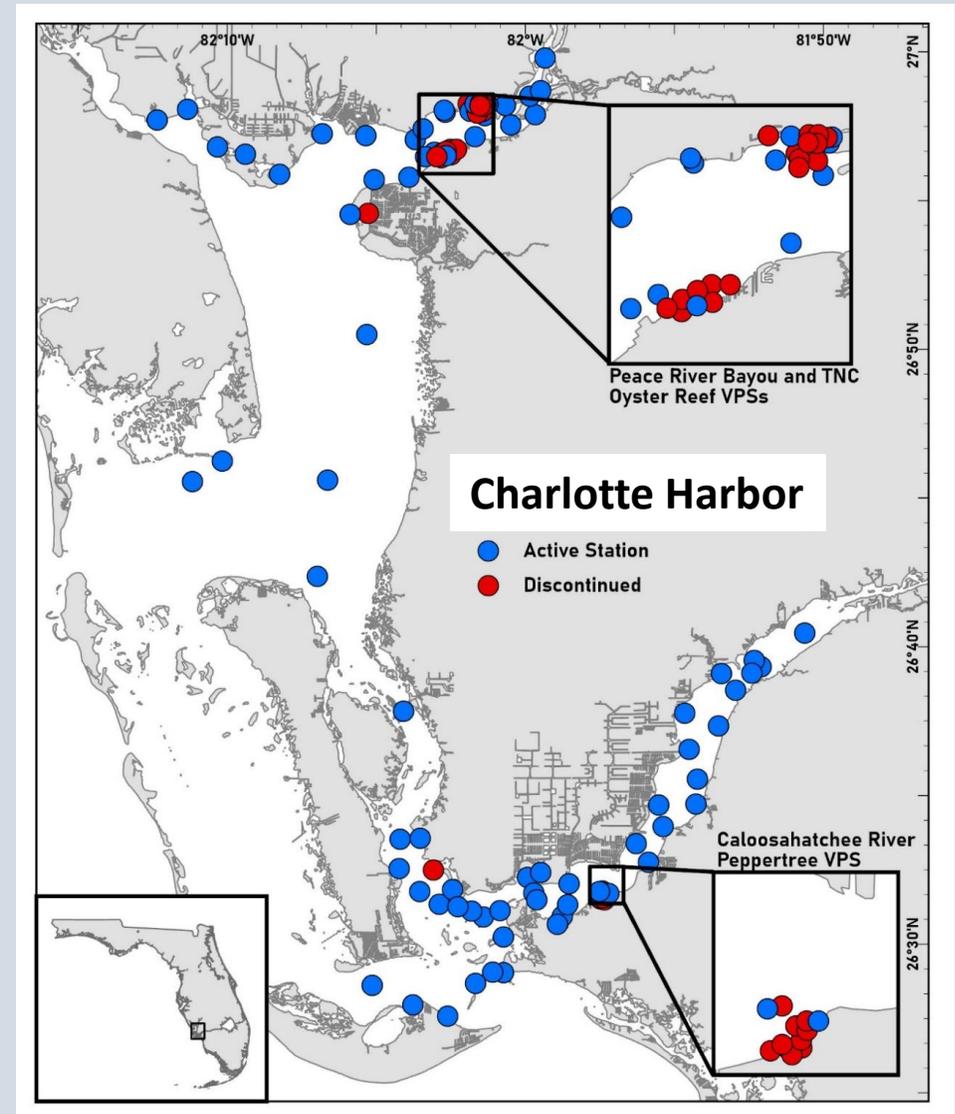
- Random and directed sampling
- Captured and released >800 sawfish
- All life stages found in state waters
- Identified high-use areas for small juveniles
- High-use areas used by management
- Data needed for Recovery Plan Action Items
- More!



Technological applications

Acoustic monitoring

- >100 acoustic receivers in Charlotte Harbor
- Fine-scale Positioning System arrays
- All stations visited quarterly
- Detections from sawfish and >20 other species (e.g., tarpon, red drum, cobia, amberjack)
- Collaborations from data sharing (iTAG & FACT)
- Coast switching
- More!



Carcass recovery & Necropsies

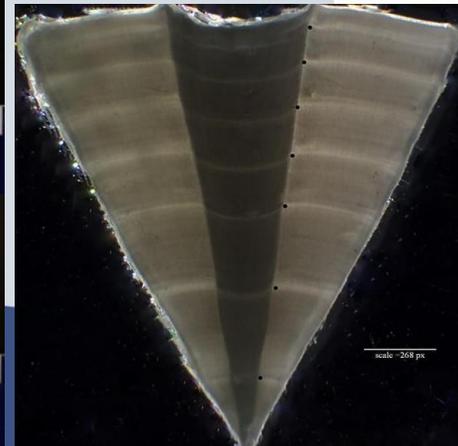
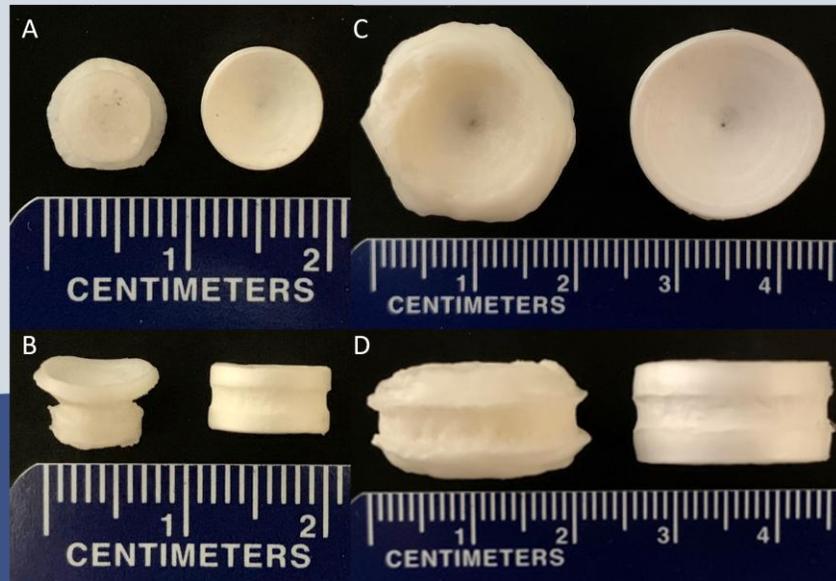
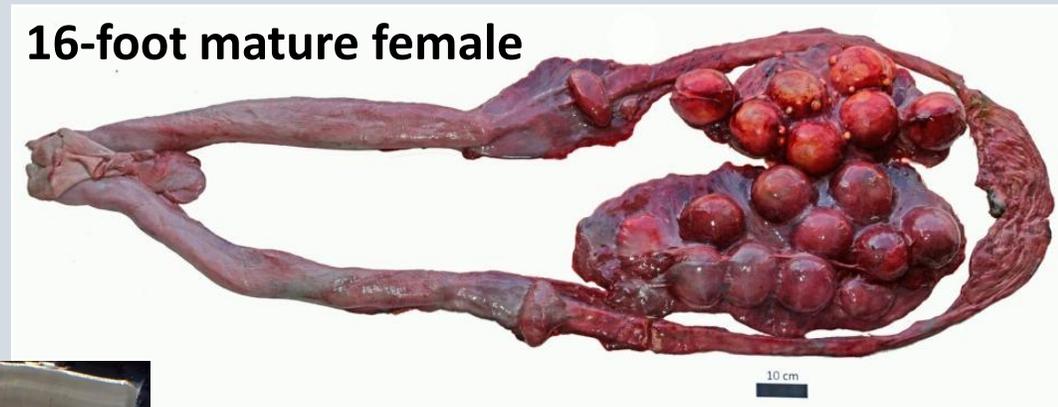
Rare sample collection

- Reproduction and maturity
- Age and growth
- Pathology
- Parasites
- Mortality (e.g., “Recaptures”)
- Data needed for Recovery Plan Action Items
- More!

14-foot immature female



16-foot mature female

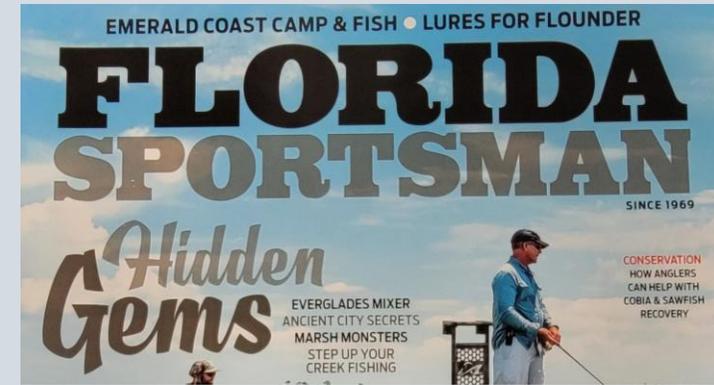


13-foot mature male



Outreach

- Hotline
- Signage
- Talks
- Students
- Print media
- Social media
- TV
- More!



Sawfish Staging Comeback?

Scientists 'cautiously optimistic' Florida's smalltooth sawfish are rebounding

BY NATALIE VAN HOOSE

Reports of smalltooth sawfish are on the rise, igniting hopes that the iconic Florida species is making a comeback 20 years after it was listed as endangered.

Sawfish have returned to the Indian River Lagoon after vanishing from the waterway more than four decades ago. They are also consistently spotted in

Southwest Florida, their core range, and occasionally reported in the northern Gulf of Mexico, said Gregg Poulakis, a fish biologist with the Florida Fish and Wildlife Conservation Commission.

Once common, smalltooth sawfish suffered dramatic declines in the 20th century. Coastal development imperiled sawfish habitat, and their protrud-

26 AUGUST / SEPTEMBER 2023 www.FLORIDASPORTSMAN.com

Sawfish Are Endangered Respect • Release • Report

Sawfish are protected by State and Federal laws: It is illegal to harm, harvest, or handle sawfish



You Can Help Save Smalltooth Sawfish

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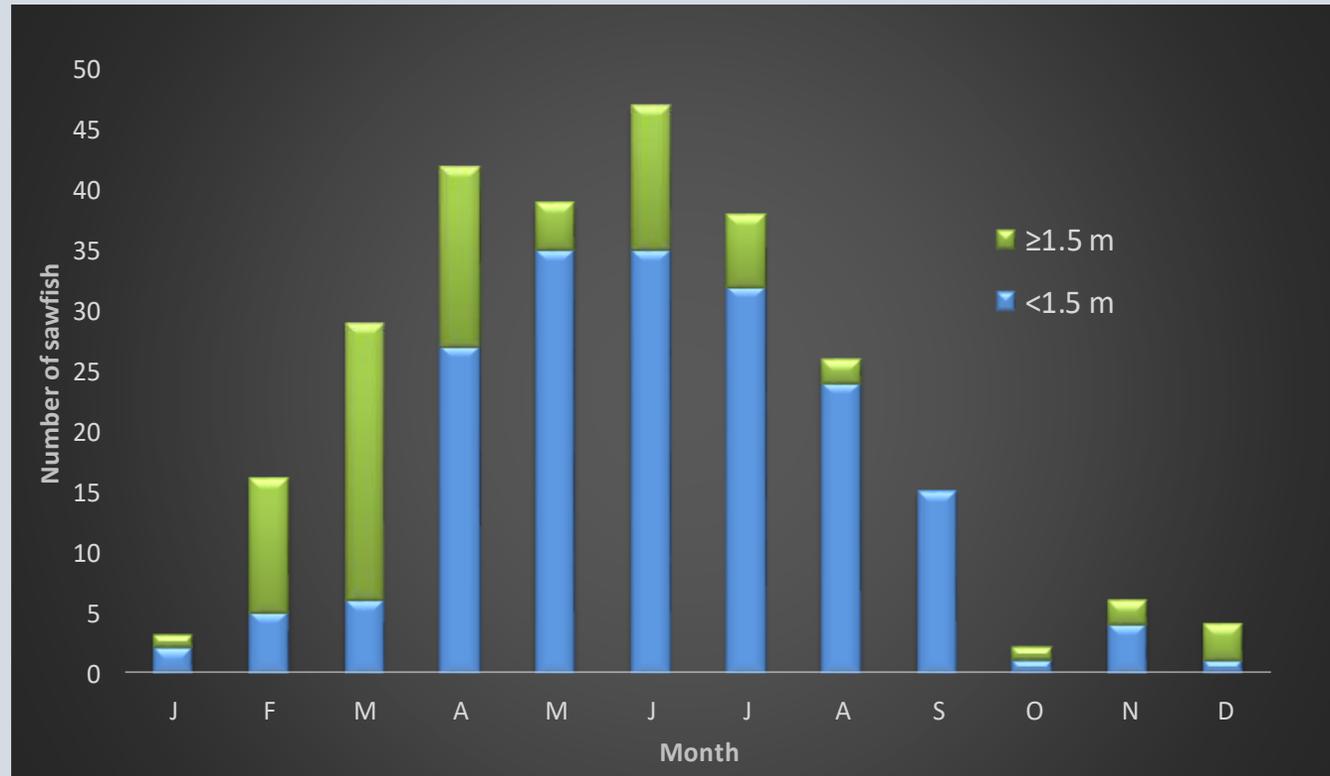
Share Information About Your Encounter

1-844-4SAWFISH
www.SawfishRecovery.org

The information you provide helps scientists track sawfish recovery



Seasonality



- Range = 2.5–7 feet = 1–3 years old; Scharer et al. (2012)
- >700 small juveniles captured, tagged, and released
- Born alive in spring
- <5 feet (1.5 m) = young-of-the-year (YOY)



Rostral sheath (Nov–July)



Photo by G. R. Poulakis

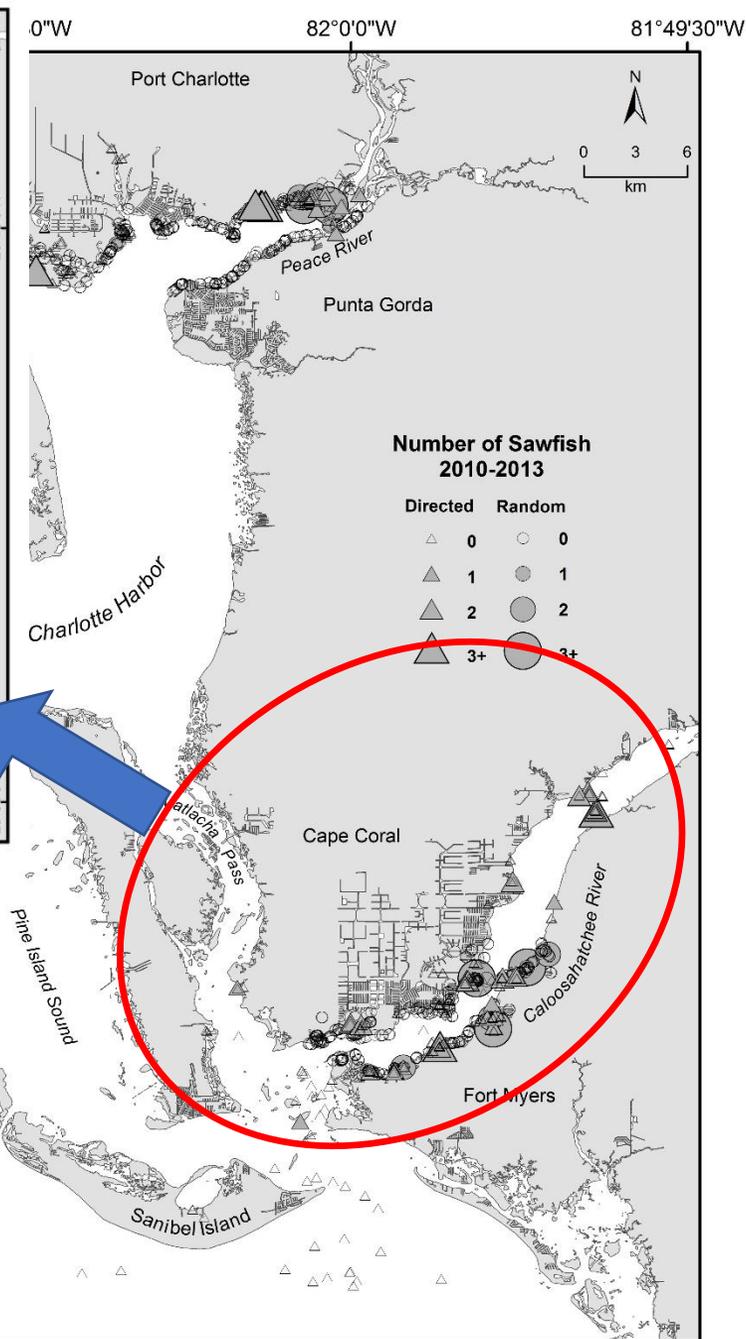
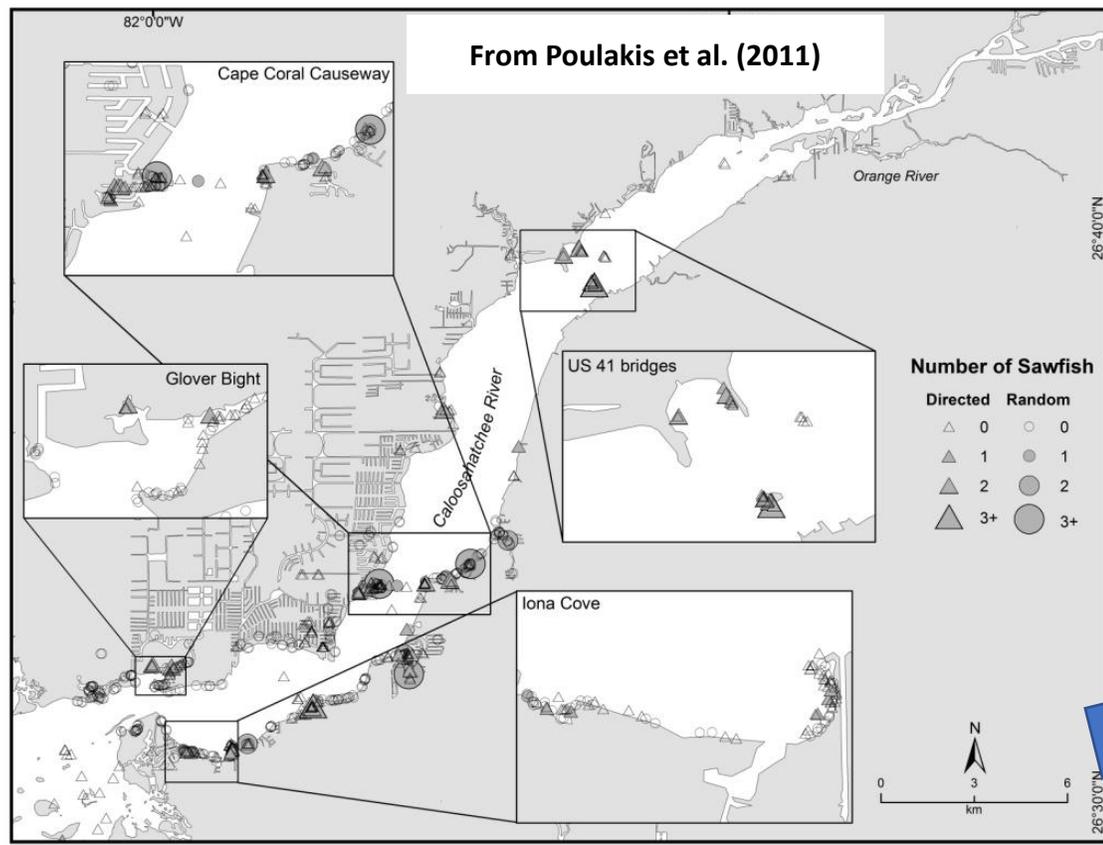


Photo by G. R. Poulakis



Size at birth = 581–812 mm (~2.5 feet)



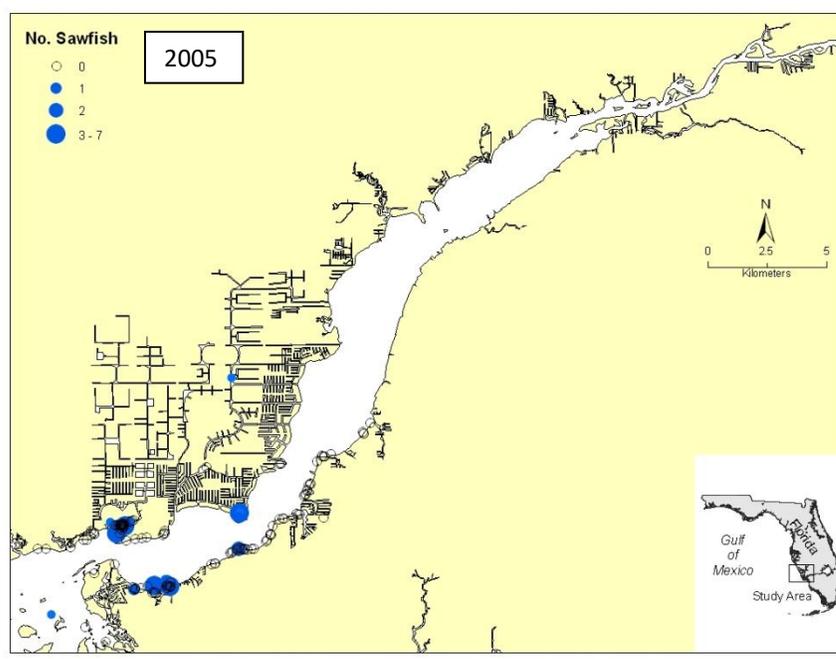


Caloosahatchee River

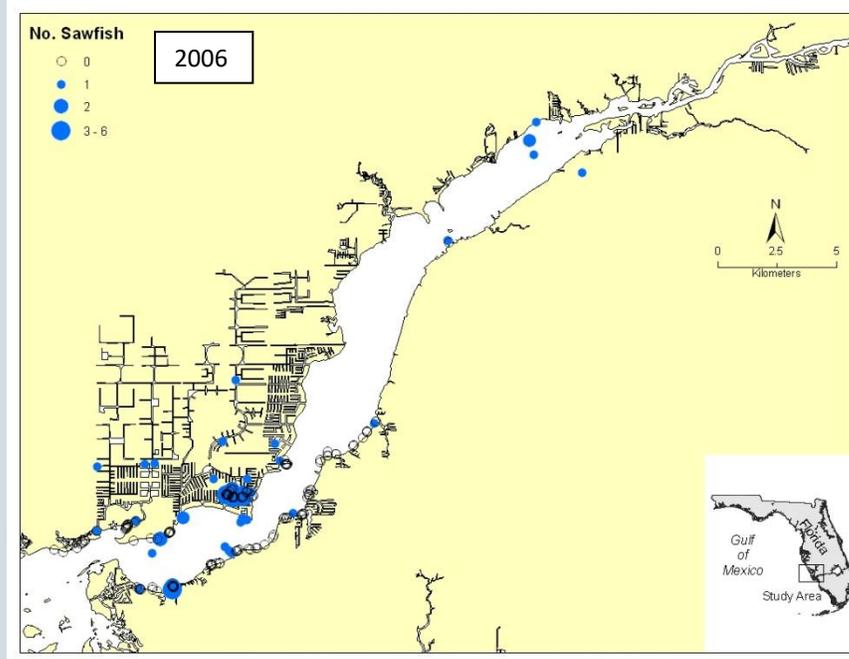
- Regulated flow
 - U.S. Army Corps of Engineers/SFWMD
- Multiple nursery hotspots



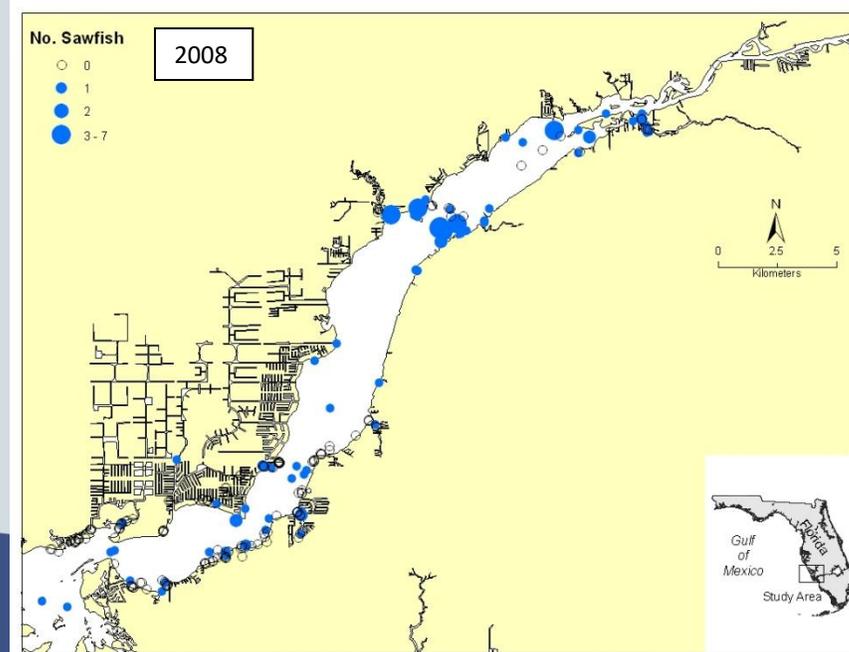
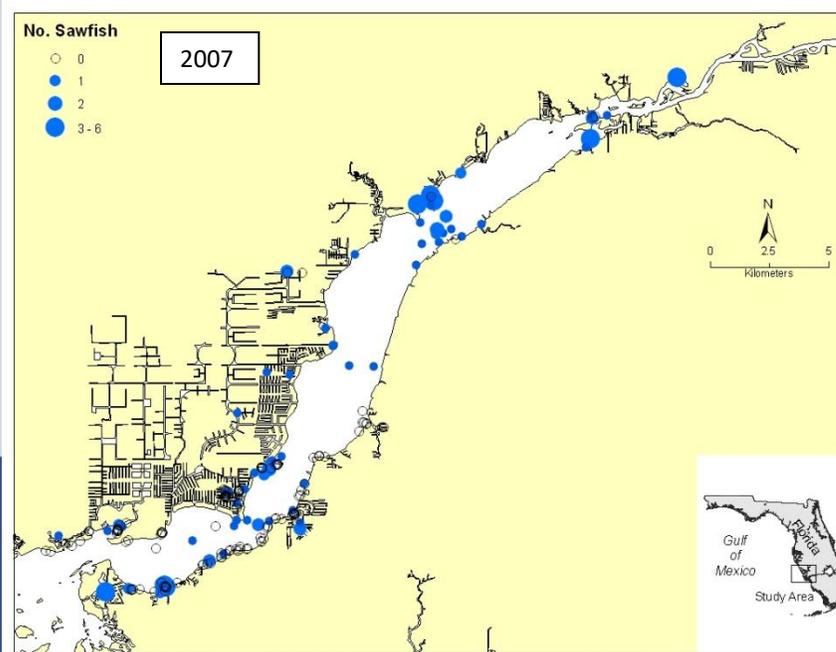
U.S. Sawfish Recovery Database and research



Wet years ↑

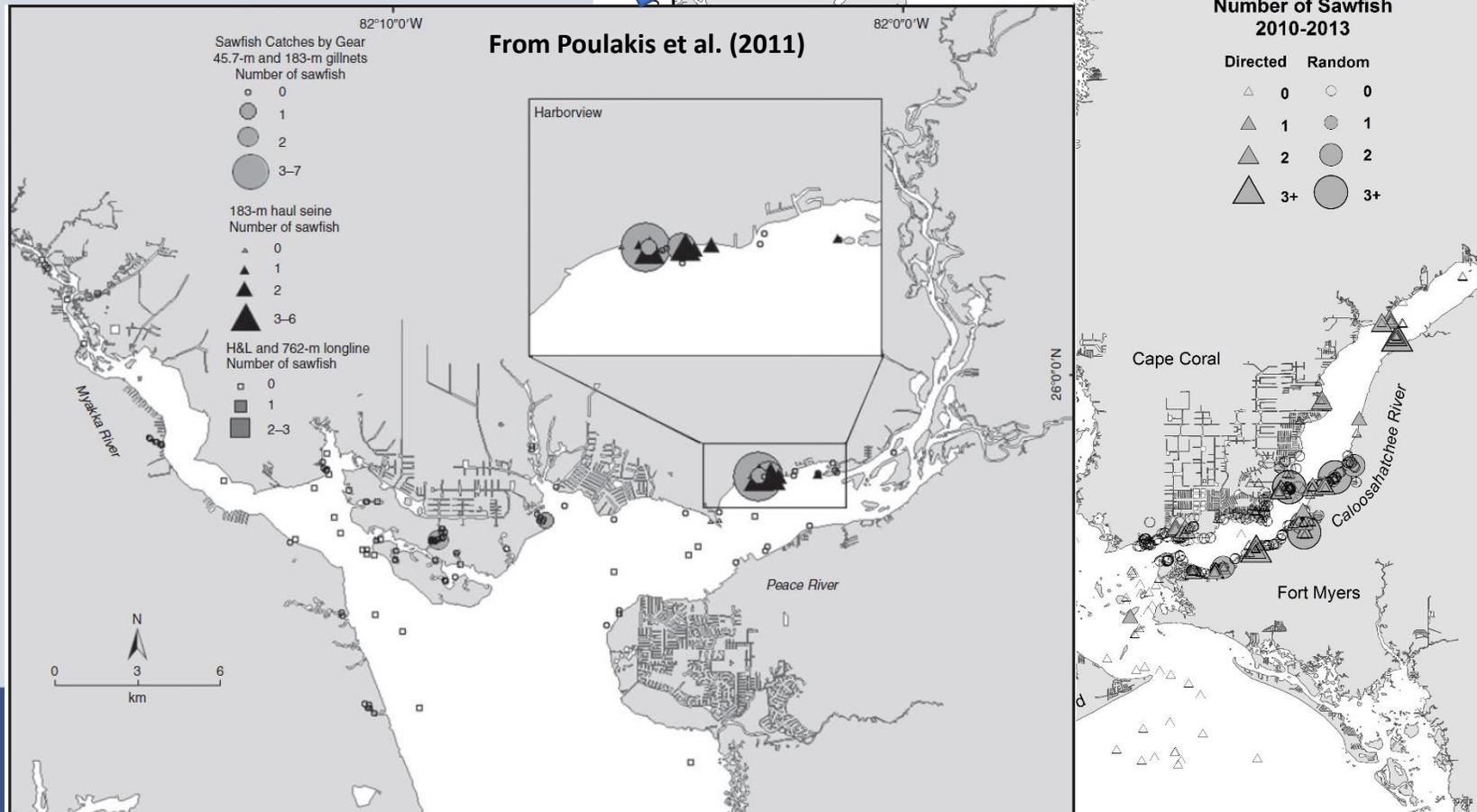
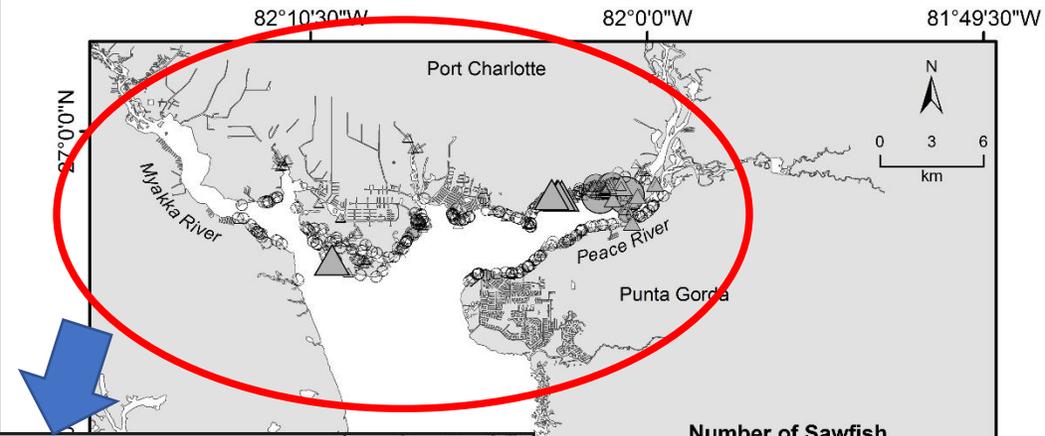


↓ Dry years

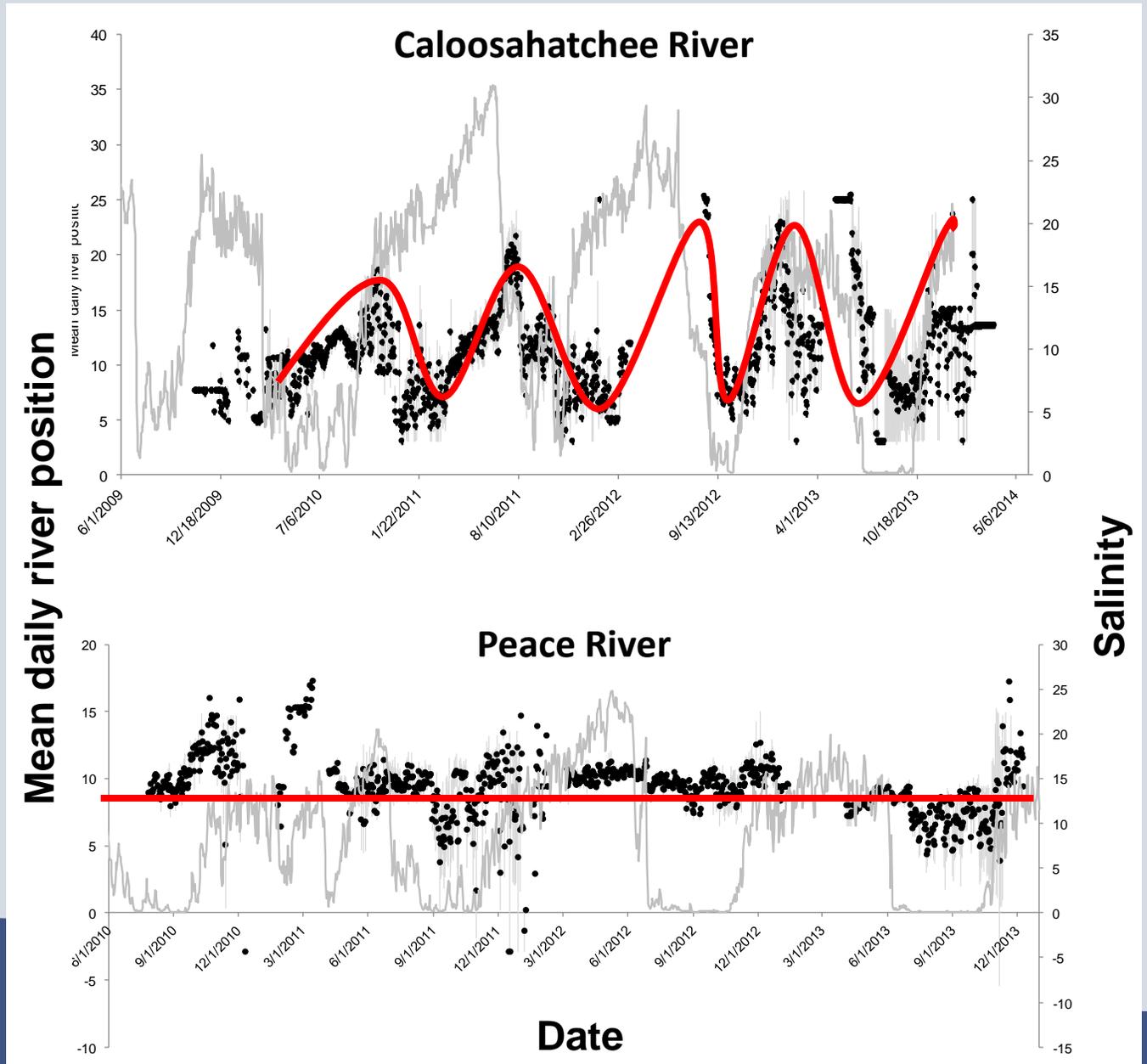


Peace River

- Natural flow
- One nursery hotspot
- Natural habitat

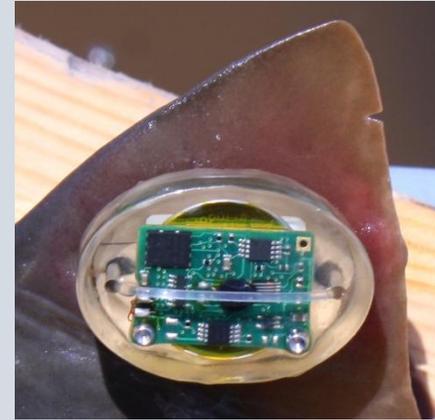


All juveniles vs. Salinity



Accelerometers

Useful for:



Connecting location studies to behavior and physiology (e.g., feeding)

Answer questions such as:

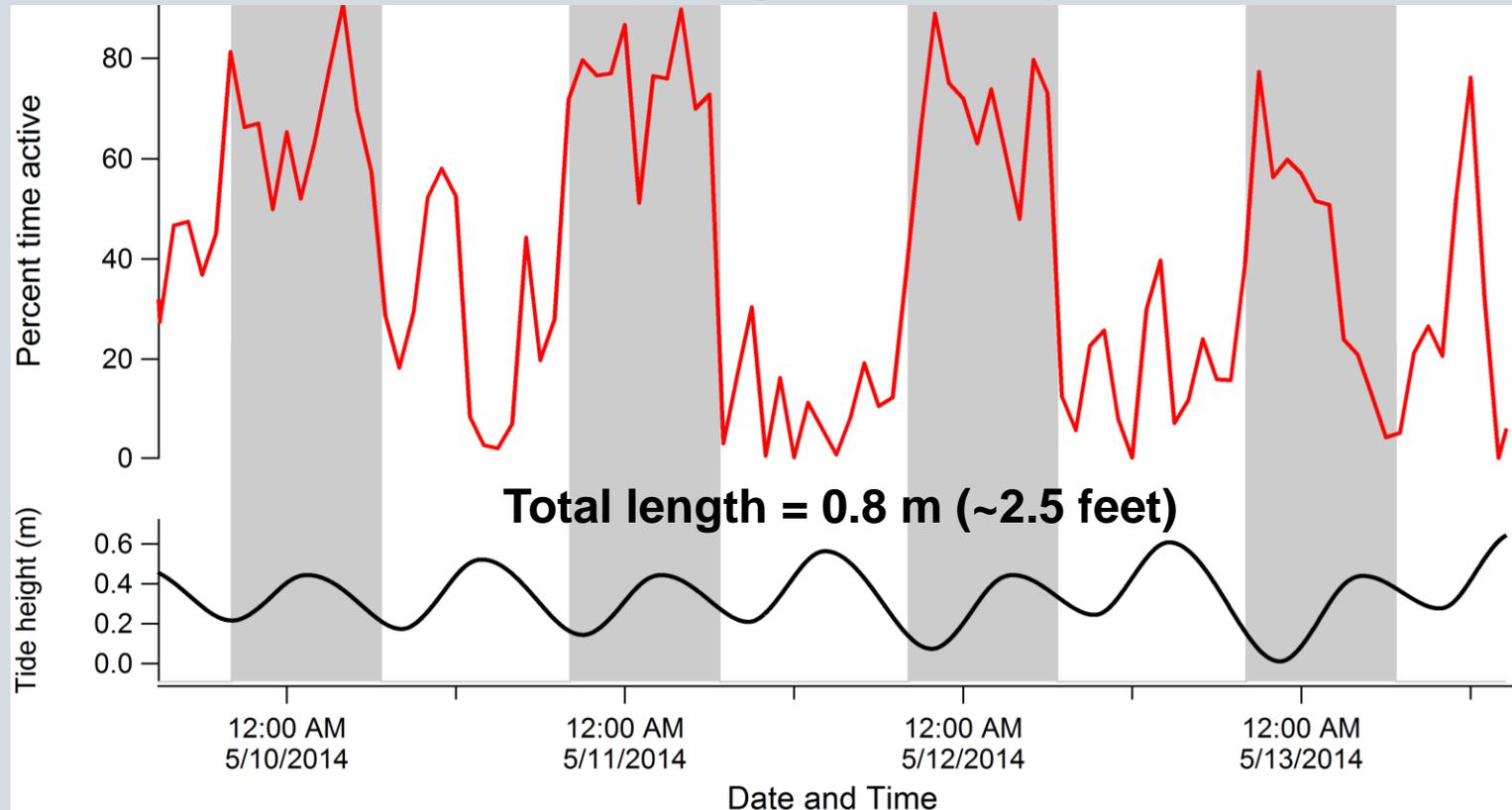
- When and where are animals most active?
- When and where do they rest?
- When and where do they feed?



Accelerometers

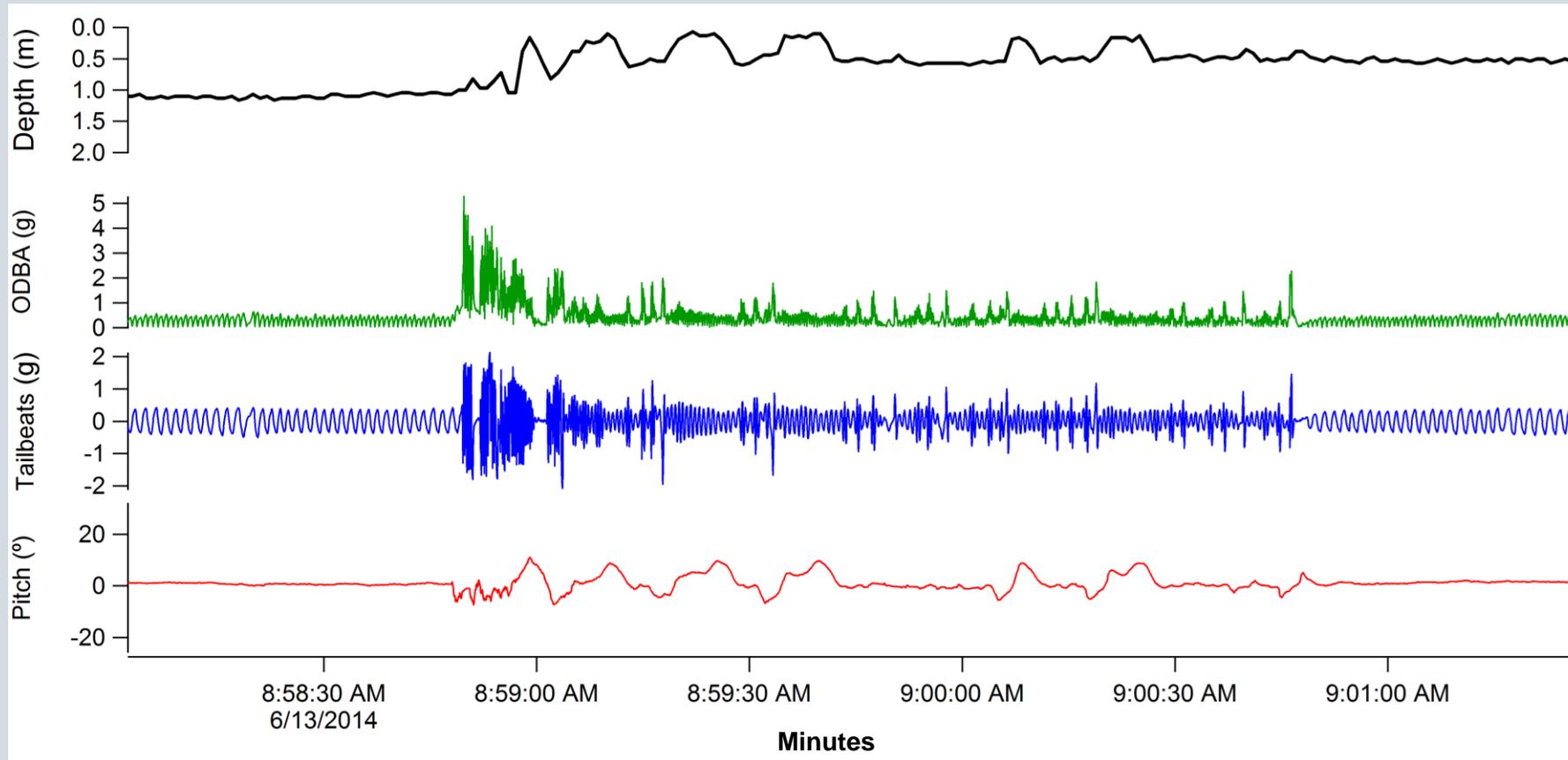
Connecting movement studies to behavior and physiology:

Day-night activity



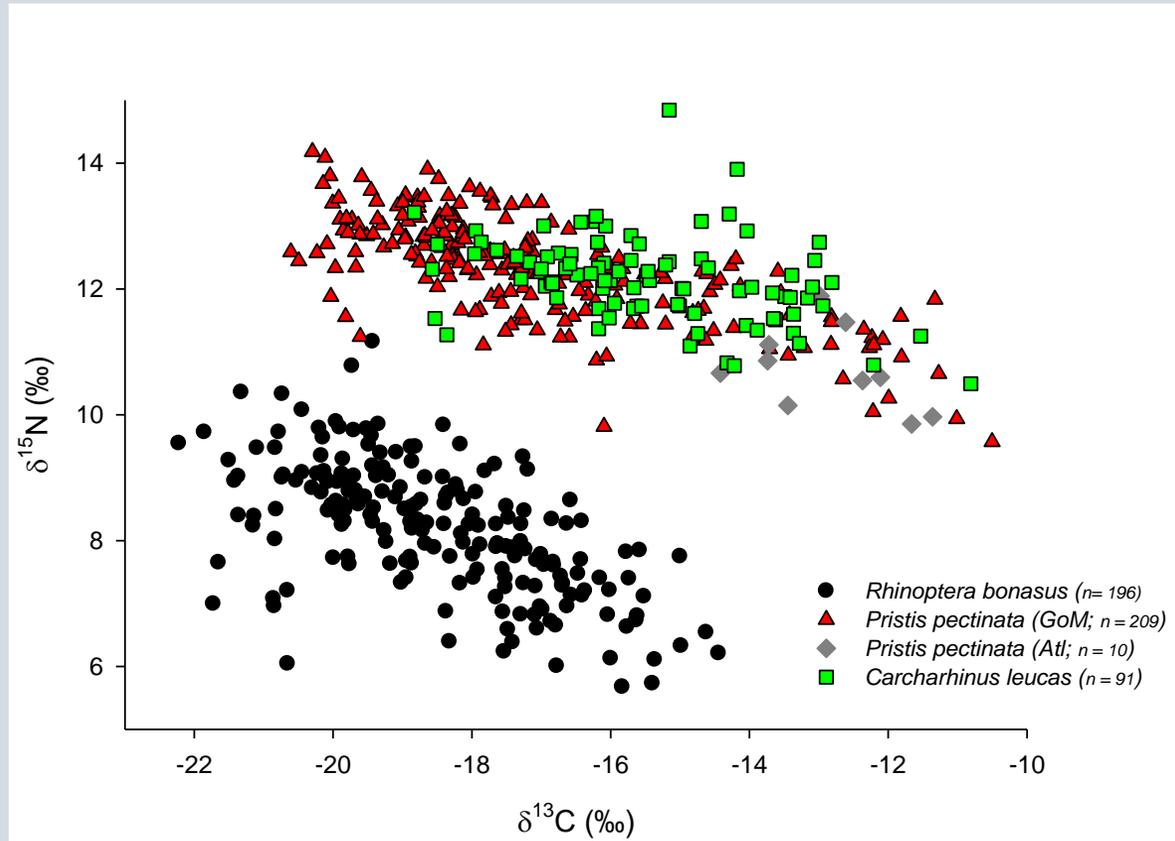
Accelerometers

Connecting location studies to behavior and physiology:
Feeding behavior?!



Stable isotopes

Nitrogen vs. Carbon



- Rays separate from **bull sharks** and **sawfish**
- Sawfish = fish eaters



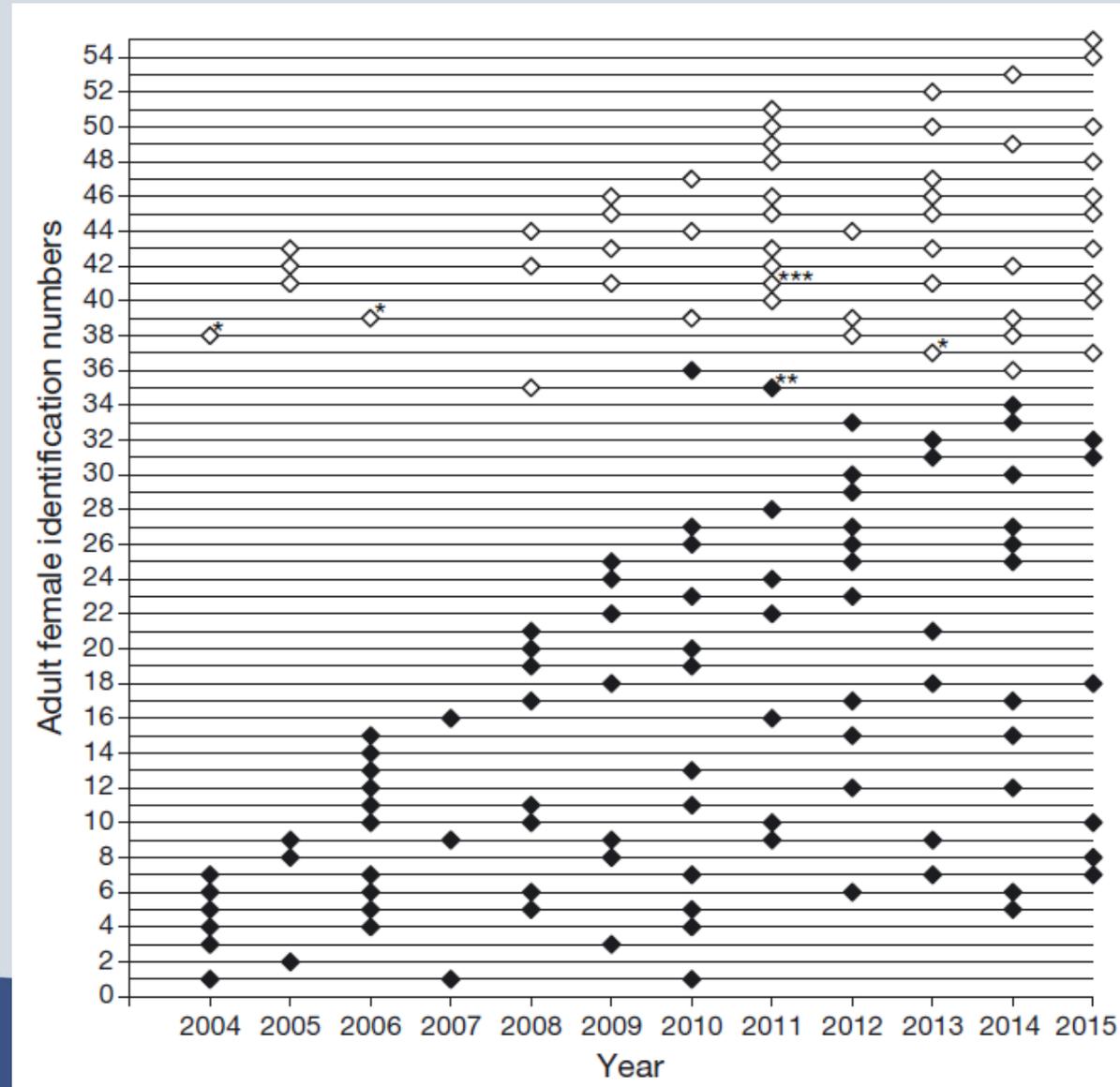
Stony Brook University

The State University of New York

University of Windsor
thinking forward



Insights into behavior and reproduction



From Feldheim et al. (2017)



Novel findings

A nursery re-establishing in the southern Indian River Lagoon (IRL)

- Evermann and Bean (1898) showed a healthy population in the IRL
- Locally extinct by the 1970s
- 12 small juveniles tagged since 2020 (41 total)
- Documented an adult female giving birth to 2 pups in 2022
- Acoustic data coming in...
- A nursery has re-established in the St. Lucie River
- Collaborative effort with researchers and anglers in the area
- Gil McRae: “Conservation success story”



Unprecedented sawfish mortalities in 2024

(Context: 75 necropsies over 20 years; 43 in 2024)



Photo credits: Everglades National Park, Advantage Air, FWC, Roni Rom, Lanier Whitton, Alan Williams

Abnormal fish behavior observed in the Keys

- **Dec 2023:** Bonefish & Tarpon Trust & Lower Keys Guides Association notified FWC of “spinning fish”
- **Jan 2024:**
 - Multi-agency Working Group formed to investigate
 - First distressed sawfish reported
- **April 2024:** Sawfish rescue attempted
- Spinning behavior primarily observed in nearshore waters in middle, lower Keys through June 2024
- >80 species reported but no large-scale fish kills
- **56 large sawfish (10–15’) mortalities confirmed**



Working Group continues investigation

- Working Group conducted **>20 sampling events** (water, fish, benthic samples collected)
 - >300 water and >300 fish samples processed
- Investigated but **unlikely** to be the cause:
 - Low dissolved oxygen, temperature, or pH
 - Pollutants or man-made chemicals
 - Fish diseases caused by bacteria, viruses, or parasites
 - Red tide (brevetoxin produced by *Karenia brevis*)
- While the cause remains unknown, the Working Group continues to investigate the role of other harmful algae and their associated toxins



Marine Debris and Other Anthropogenic Effects on the Smalltooth Sawfish



Smalltooth Sawfish (*Pristis pectinata*)

- Rostrum typically with 22-30 teeth on each side
- Feeding and defense



Photos by FWC

- Susceptible to entanglement!

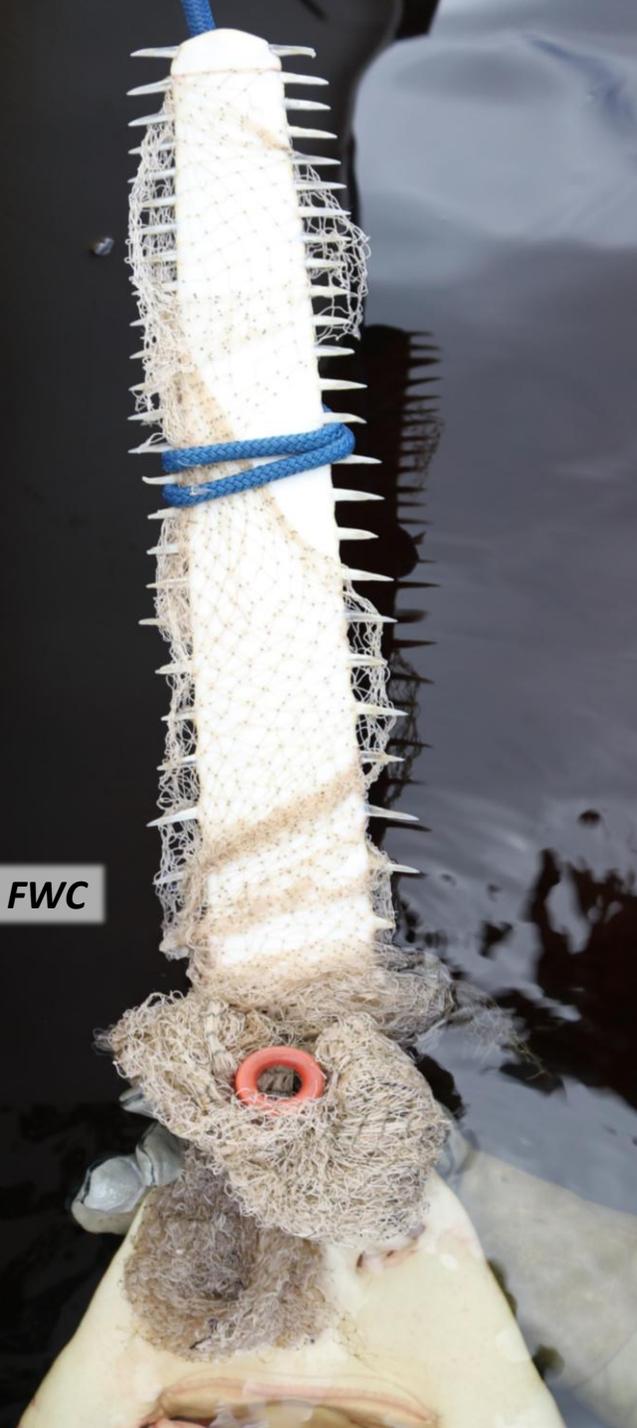


Photo by Bill Sperry

Historical Marine Debris Issues



Available online at www.sciencedirect.com



Marine Pollution Bulletin 52 (2006) 1533–1540

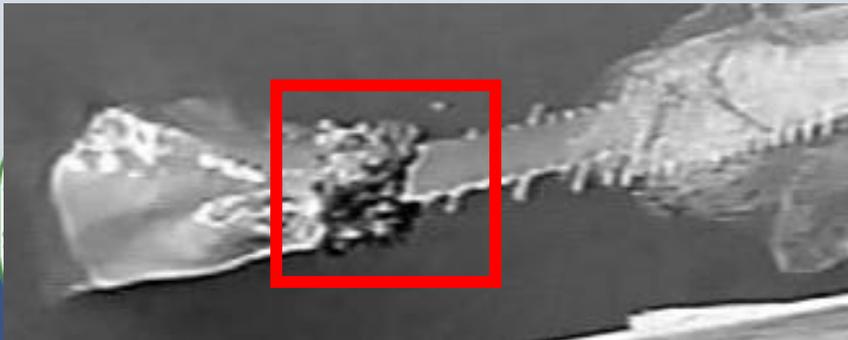
MARINE
POLLUTION
BULLETIN
www.elsevier.com/locate/marpolbul

Note

Anthropogenic effects on the smalltooth sawfish (*Pristis pectinata*)
in the United States

Jason C. Seitz^{a,*}, Gregg R. Poulakis^{b,c}

- Jan. 1999–Nov. 2005
- 50 reported entangled, injured or dead



Photos by FWC



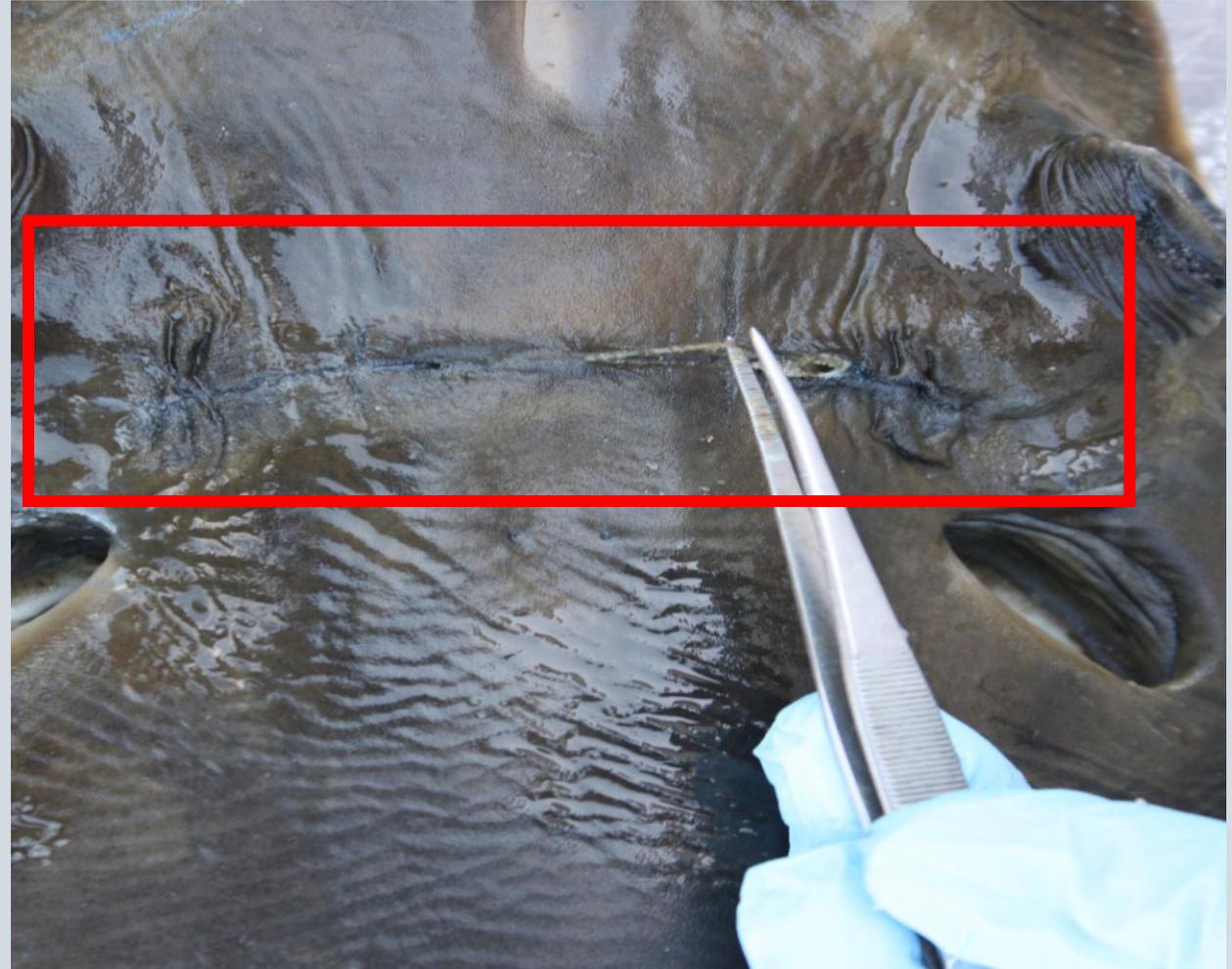
Photo by FWC

Before



After



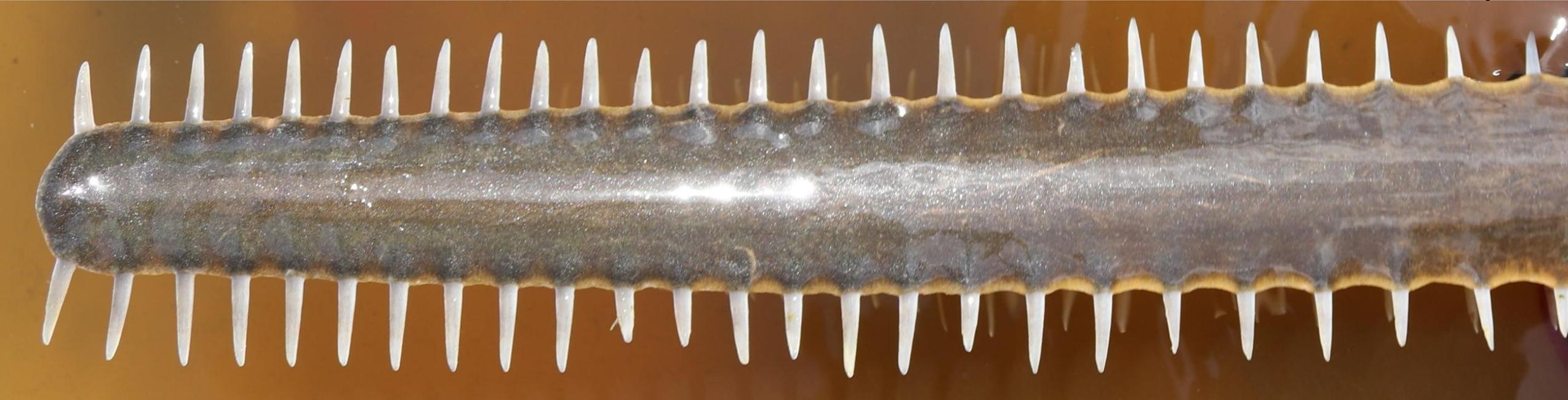


Photos by FWC





Photos by FWC





Photos by FWC



Photo by Frank Lee



Photo by FWC



Photo by Dennis Junk



Courtesy of Ryan Lehman

Other Anthropogenic Effects

Injured rostra and rostrum-less fish



Current Marine Debris Issues

- Jan 2017-Dec 2021
 - 2,857 encounter reports
 - 176 reported entangled, injured or dead (6.2%)



Photo by Jessica Boyd



Photo by Lisa Christiansen



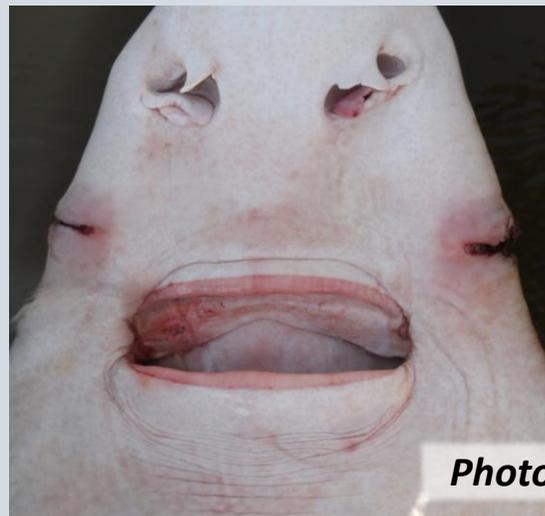
Photo by Tonya D'Ascanio



Photo by H. M. Ross



Photo by Sandra Shumaker



Photos by FWC



Photos by FWC



Photo by Bentley



Photo by Ron Schaefer

Miscellaneous Debris

Dog toy

Photo by Trish De



Onion bag



Photo by Brian Smith

Unknown plastic ring

Photo by Toni Robertson



Photo by John Straehle



Photo by Kristopher Perry



Photo by Kyle Eberwein



Photo by Jason Bihari



Photo by Doug Bartow



Photo by Doug Bartow





Photo by Kristopher Perry



Photo by Kristopher Perry



Ball Bungee with piece of tarp

Sawfish and Ball Bungees

- Boat lift canopies
- Since 2018, at least 19 sawfish have been captured or reported to the hotline with ball bungees

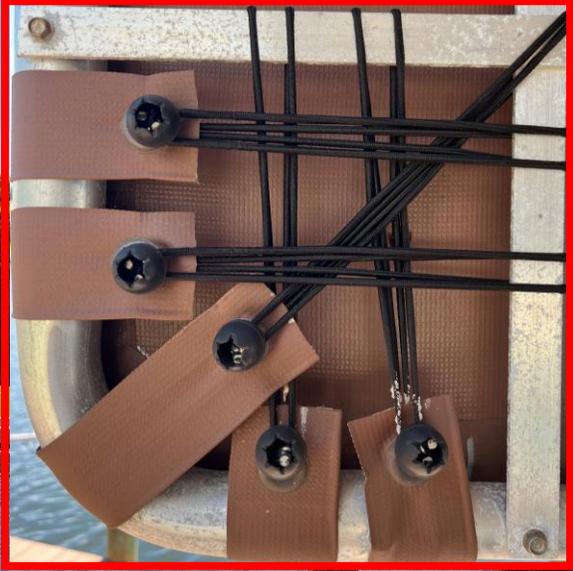


Photos by FWC



Photo by Chris Presley





Bungee Cord Mortality

- First one we know died with a ball bungee
- 6-foot female
- Fresh
- Gill function impaired



Photos by FWC



Ball Bungees Continued...

- 3 sawfish caught with distinct notches from bungees (including one with bungee still on head)
- Ongoing problem, esp. in Cape Coral and Fort Myers



Photos by FWC

Solutions

Sawfish Are Endangered

Respect • Release • Report

Sawfish are protected by State and Federal laws:
It is illegal to harm, harvest, or handle sawfish



You Can Help Save Smalltooth Sawfish

Angler Guidance:

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Share Information About Your Encounter

1-844-4SAWFISH

www.SawfishRecovery.org

The information you provide helps scientists track sawfish recovery

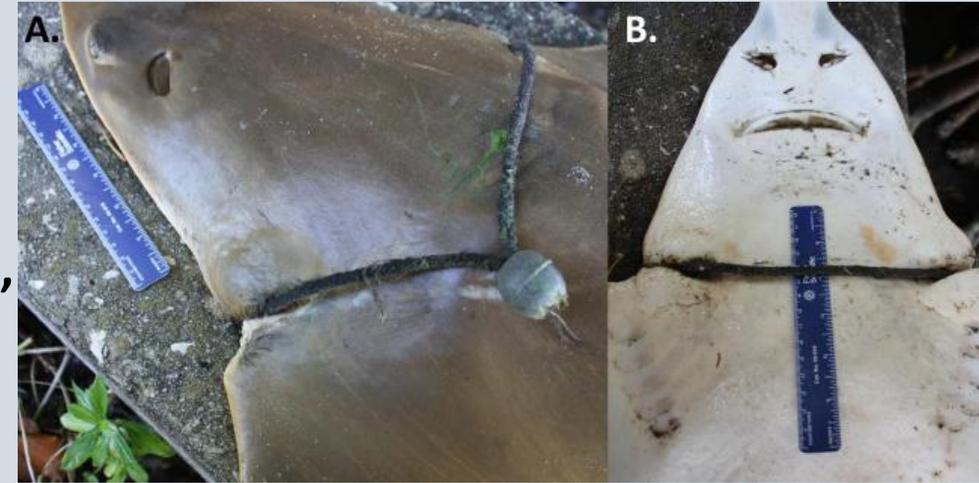
- Precautions to take when removing canopy (e.g., hurricane approaching):
 - Cut loop of ball bungee
 - Cape Coral Newsletter
 - Future outreach and awareness
 - Not a localized issue
- Remove fishing gear before release
- Unwrap fishing line around rostrum
- No abandoned fishing gear
- Dispose of garbage appropriately



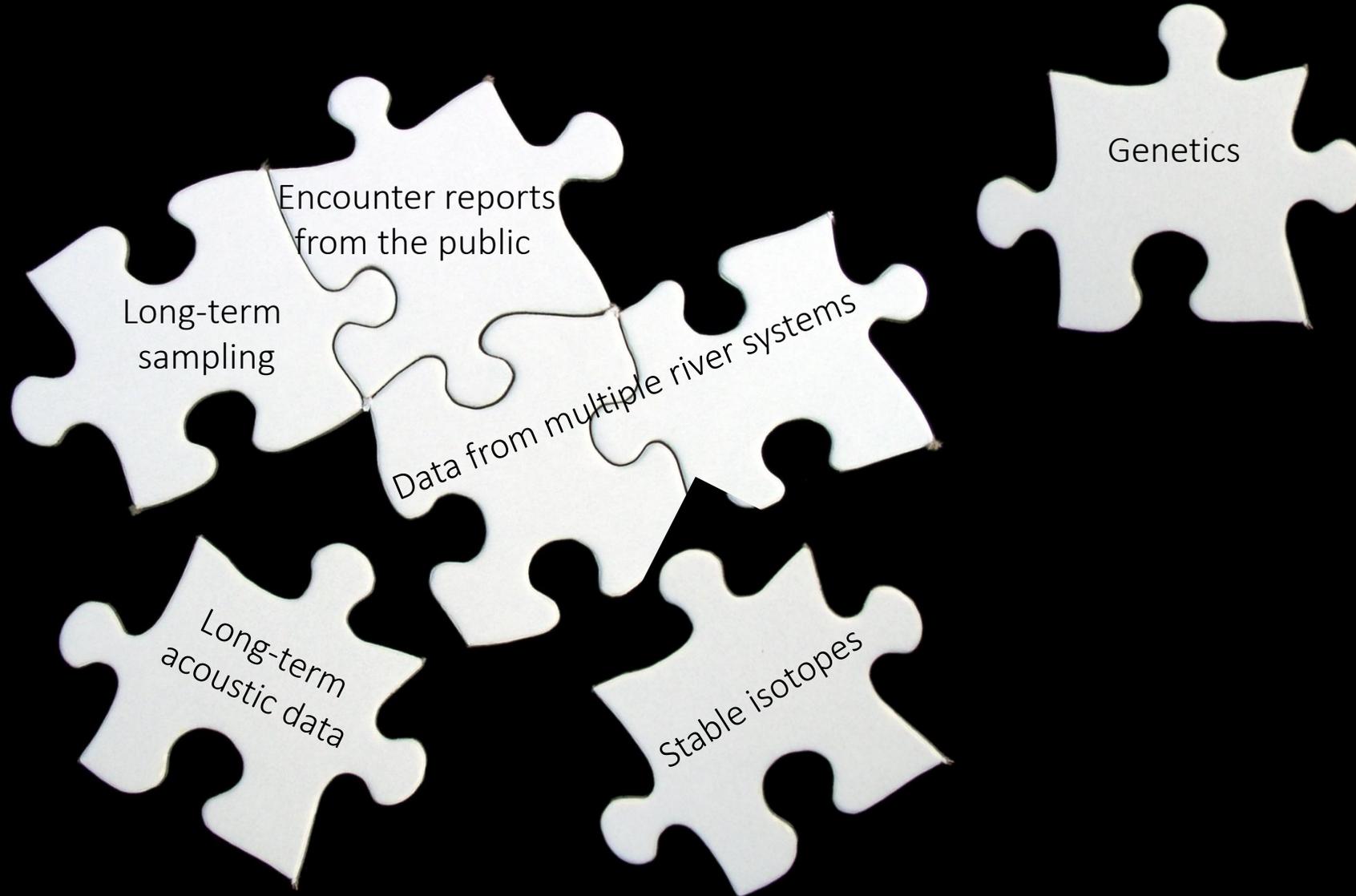
Photo by Chris Shinouskis

Moving forward

- Ongoing threats: fisheries bycatch, habitat loss, poaching
- Marine debris: Ball bungee cords →
- Consultations: Custom mitigation projects (e.g., oyster restoration, bubble nets, marina expansions)
- Consultations: 100' yacht stranded from Hurricane Ian ↘
- Permitting and expertise for non-targeted state fisheries sampling



We've started to piece together some of the conservation and recovery puzzle...



Acknowledgements

- NOAA/NMFS for funding research
- Citizens reporting sawfish encounters
- FWC Charlotte Harbor Field Lab

Share information about your encounters!
Encourage others to report!

Call: 1-844-4SAWFISH

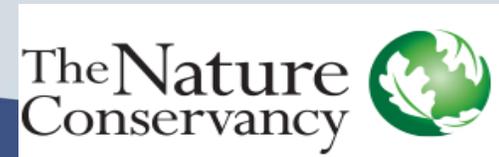
Email: Sawfish@MyFWC.com

www.SawfishRecovery.org



What is FWC's role in conservation and recovery?

Collaboration!



Questions?

