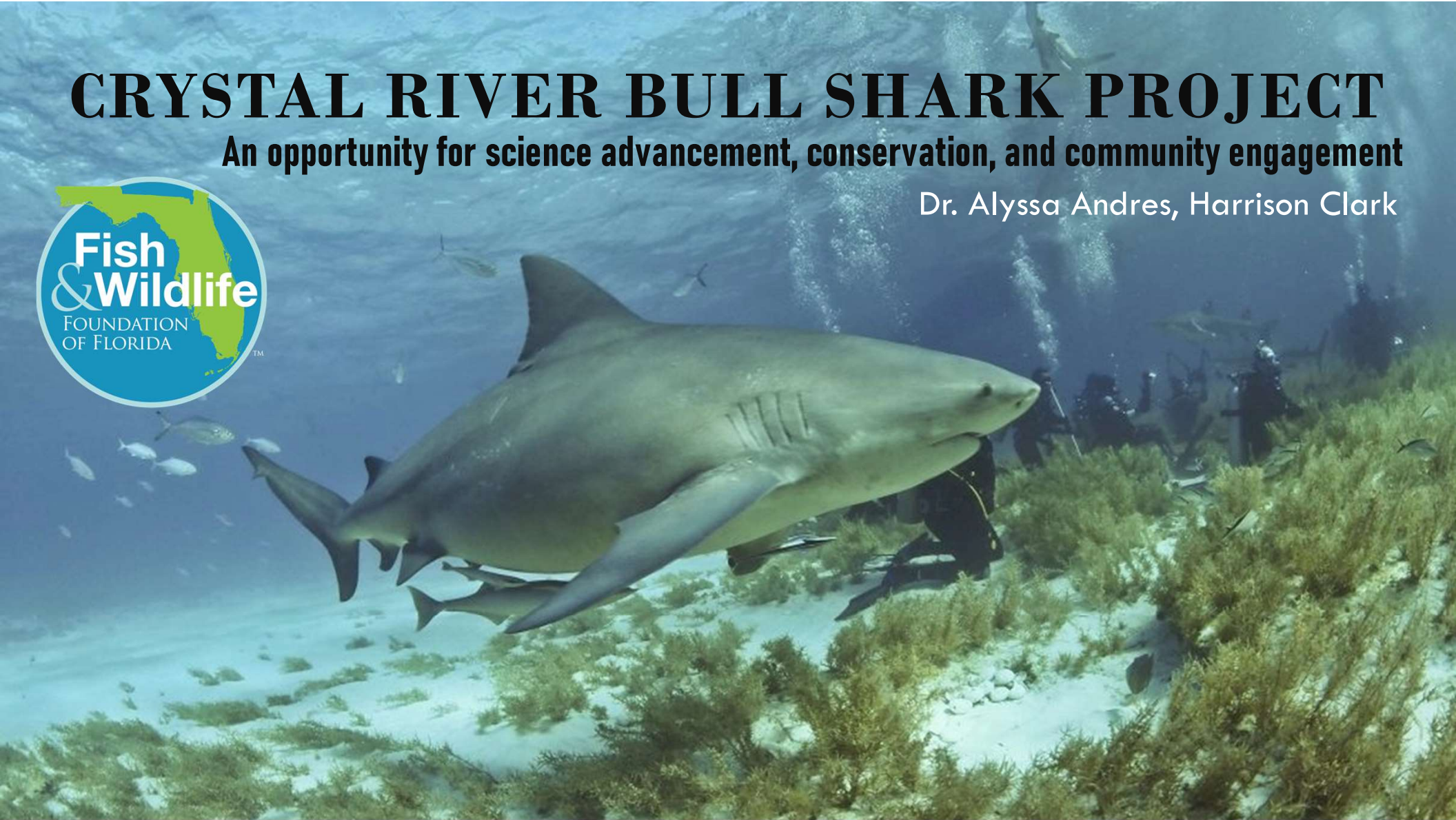


# CRYSTAL RIVER BULL SHARK PROJECT

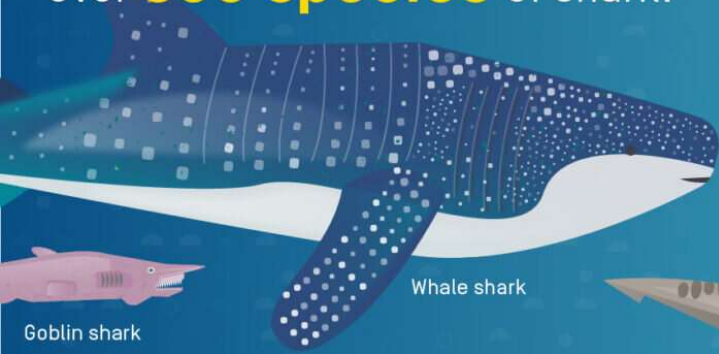
**An opportunity for science advancement, conservation, and community engagement**

Dr. Alyssa Andres, Harrison Clark



Across the world's oceans, there are over **500 species** of shark.

They have inhabited our oceans for over **400 million years.**



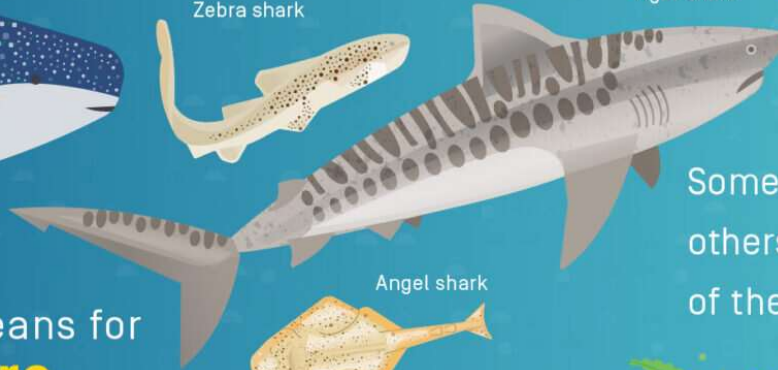
Whale shark

Goblin shark

Zebra shark



Tiger shark



Angel shark



Catshark



Blue shark



Scalloped hammerhead



Epaulette shark



Basking shark



Bonnethead



Some are **top predators**, others are the **clean-up crew** of the ocean.



Their diverse roles are part of a balance needed for **healthy oceans.**



# BULL SHARKS

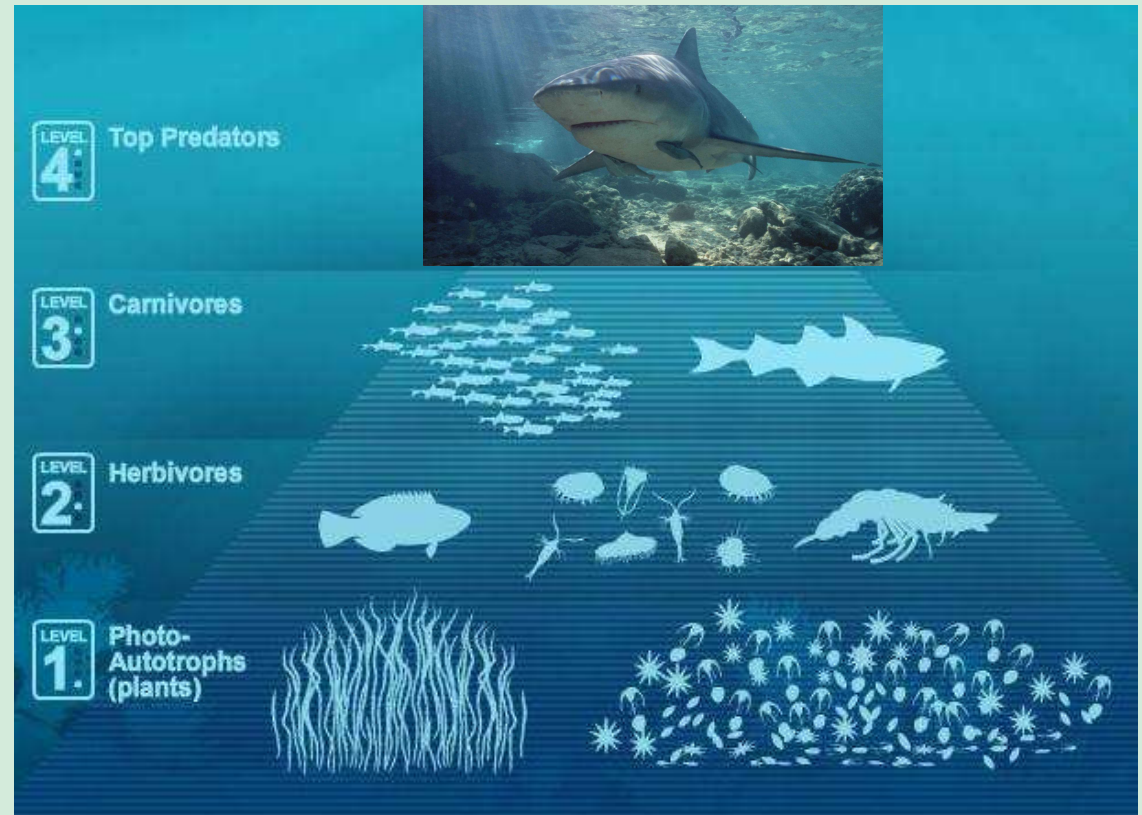
*Help maintain balance of marine life*

Nutrient shuttlers

Regulate species:

- Abundance
- Distribution
- Diversity
- Population health

\*Help maintain healthy habitat\*



# BULL SHARKS

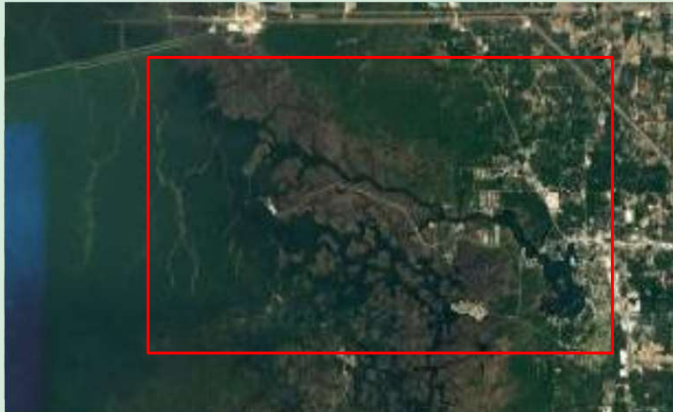
Coastal species

Thrive in both saltwater and  
freshwater

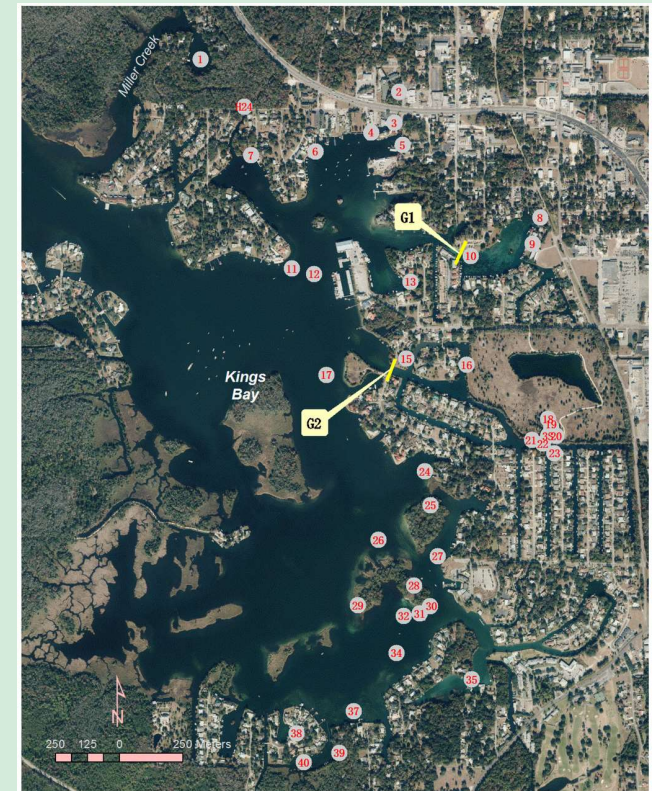
Use coastal estuaries as  
nurseries for young



# KING'S BAY/CRYSTAL RIVER



- Springs = 99% of freshwater in Kings Bay
- Constant  $\sim 72^{\circ}\text{F}$ 
  - Low salinity, relatively stable temps in bay year round
- Thermal refuge



(Chen, 2014)

# KING'S BAY/CRYSTAL RIVER



# BULLS IN CR



# KING'S BAY/CRYSTAL RIVER



# CRYSTAL RIVER BULL SHARK PROJECT GOALS

## 1) Identify bull shark use of CR/KB and determine if CR/KB is a nursery

- 1) *Population mostly composed of Neonates (newborns), Young-of-the-Year (YOY), Juveniles, (all stages present)*
- 2) *Neonate/YOY/Juvenile use nursery to a significantly higher degree than surrounding coastal habitat (remain for months up to years at a time)*
- 3) *Return/use of location year after year*



# CRYSTAL RIVER BULL SHARK PROJECT GOALS


- 1) Identify bull shark use of CR/KB and determine if CR/KB is a nursery
- 2) Identify shark relationship to springs and potential thermal refuge
- 3) Identify environmental tolerances, where sharks are coming from, and contributors to the population
- 4) Engage community, stakeholders, next generation of scientists in ecological research shark and springs conservation



# HOW WE DO IT

## 3-part project





### We Need Your Help!

If you see or catch a bull shark in Crystal River/Kings Bay report it!  
*Details and link to report, on back.*

For more info on shark identification and safe handling practices visit:

<https://myfwc.com/fishing/saltwater/recreational/sharks/>  
<https://www.fisheries.noaa.gov/new-england-mid-atlantic-atlantic-highly-migratory-species/fishing-instructions-and-resources-volunteers>  
<https://tpwd.texas.gov/regulations/outdoor-annual/fishing/saltwater-fishing/catch-and-release-techniques-for-sharks>  
<https://haveyourways.com/update/catch-and-release-shark-angling-test-practices-to-save-our-sharks/>

**Contact Details**

+1 860 448 2693  
crystalriverbullsharks@gmail.com

### What to Report?

Link to google form:  
[https://docs.google.com/forms/d/1O1s1e1FAPQ25fudgUa8BL9W\\_H0J9P9qA7y8B0P8Vvg243mrv\\_Emcorac\\_1Dw/viewform?usp=sfml](https://docs.google.com/forms/d/1O1s1e1FAPQ25fudgUa8BL9W_H0J9P9qA7y8B0P8Vvg243mrv_Emcorac_1Dw/viewform?usp=sfml)


- Location:** GPS coordinates or general location of capture
- Date and time of capture**
- Shark length:** Measure from the tip of the nose to the longest tip of the tail (estimates will still be helpful)
- Umbilical scar.**  
This scar is the shark's belly button and identifies a newborn.  
Tell us if you see it!
- Sex of the shark**

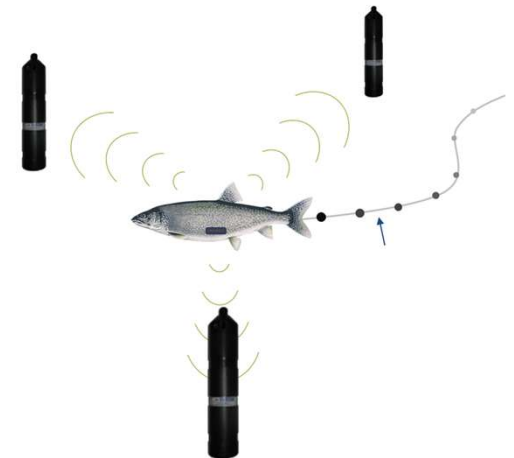
**Shark Anatomy**

Male Female

### CRYSTAL RIVER BULL SHARK PROJECT

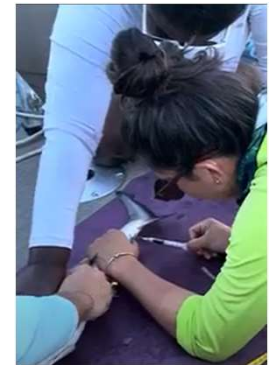
### CITIZEN SHARK SCIENCE PROGRAM





# PART 1: FISHERIES INDEPENDENT SURVEYS

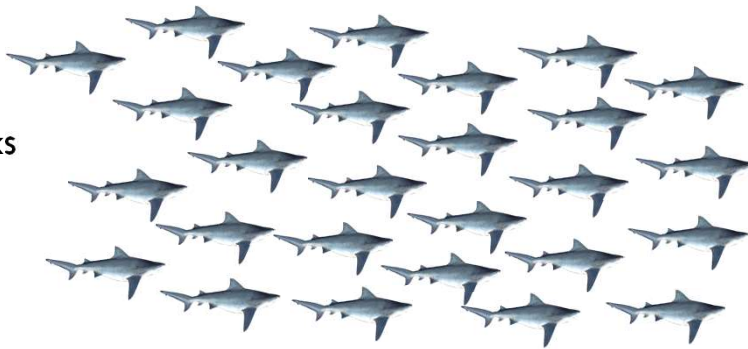
- Rod and reel/handlines
- Lengths, weights, sex, stage
- Location, environmental data
- Tissue sampling
- Mark-recapture tagging
- Release sharks in good condition



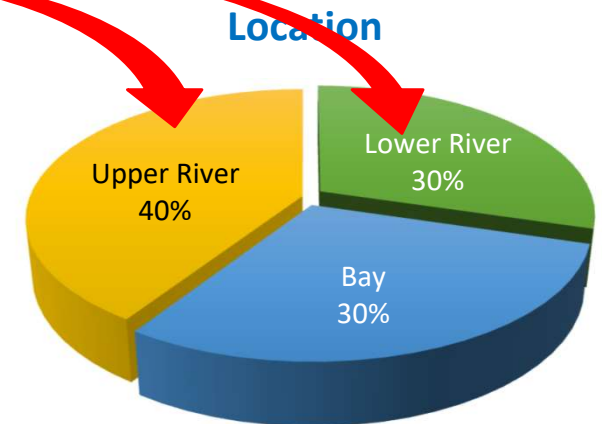
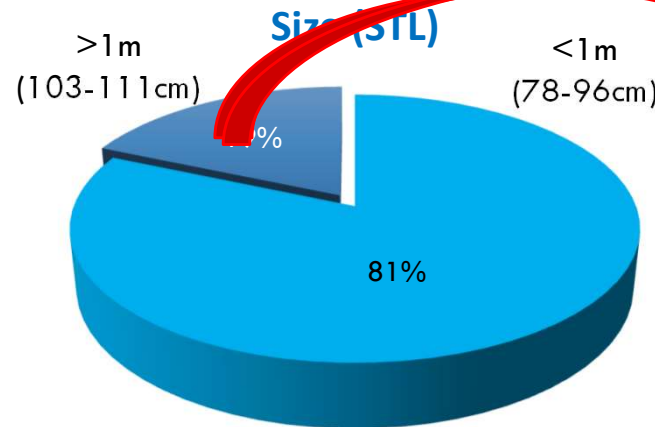
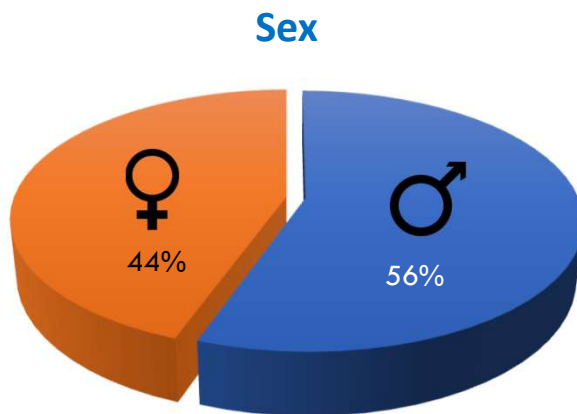
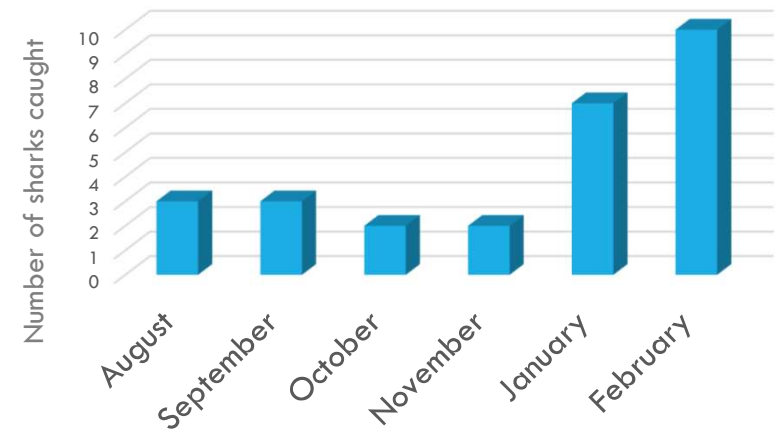


# PRELIMINARY SURVEY RESULTS

**27** Total Bull Sharks  
Captured  
YOY + *Juveniles*



**10** days  
fishing effort



## PART 2: CITIZEN SCIENCE — CROWDSOURCED DATA



# PART 2: CITIZEN SCIENCE — CROWDSOURCED DATA



## We Need Your Help!

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<https://www.fisheries.noaa.gov/new-england-mid-atlantic-atlantic-highly-migratory-species/tagging-instructions-and-resources-volunteers>

<https://tpwd.texas.gov/regulations/outdoor-annual/fishing/saltwater-fishing/catch-and-release-techniques-for-sharks>

<https://saveourseas.com/update/catch-and-release-shark-angling-best-practices-to-save-our-sharks/>

### Contact Details

+1 860 449 2693

[crystalriverbullsharks@gmail.com](mailto:crystalriverbullsharks@gmail.com)

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Link to google form:

[https://docs.google.com/forms/u/0/d/e/1FAIpQLSfudqtUH86L9W\\_hGUiPXqA7byKBoPRYXqD4WmwSmcoroc\\_UVw/viewform?pli=1](https://docs.google.com/forms/u/0/d/e/1FAIpQLSfudqtUH86L9W_hGUiPXqA7byKBoPRYXqD4WmwSmcoroc_UVw/viewform?pli=1)

- 1 **Location:** GPS coordinates or general location of capture
- 2 **Date and time of capture**
- 3 **Shark length:** Measure from the tip of the nose to the longest tip of the tail (estimates will still be helpful!)

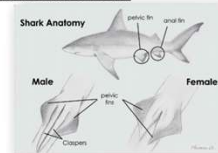


Photo: George Burgess

- 4 **Umbilical scar:** This scar is the shark's belly button and identifies a newborn. Tell us if you see it!



- 5 **Sex of the shark**



## CRYSTAL RIVER BULL SHARK PROJECT

## CITIZEN SHARK SCIENCE PROGRAM



Photo: Albert Kok - enwiki, CC BY-SA 4.0

# CITIZEN SCIENCE — AN EXAMPLE!



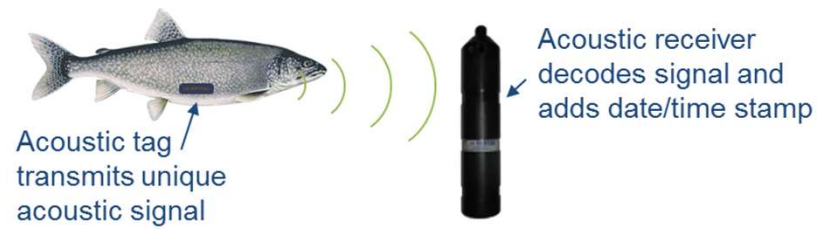
## Citizen science report notes:

*“Photos of two bull sharks caught in Kings Bay provided – (caught in the bay zone, near Pete’s pier in front of Buzzard Island). Both pictured sharks caught **Dec. 14<sup>th</sup>** (caught within 10 mins of each other)*

*Also said they caught 3 bull sharks while commercial lady fishing near King Spring, sharks chased ladyfish as they were being reeled in. location and biometric data reported in the form”*

*\*Location, date/time, biometric data provided\**

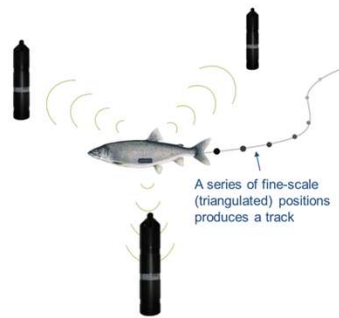
## PART 3: ACOUSTIC MONITORING



# PART 3: ACOUSTIC MONITORING

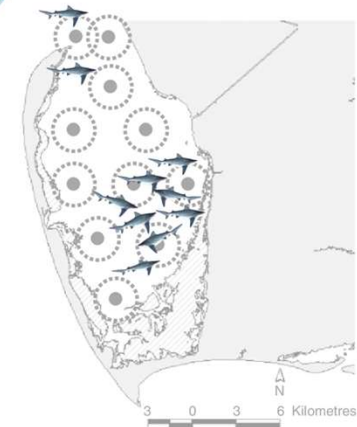


## MOVEMENT



## ABUNDANCE

How many sharks are using a given area at a given time?

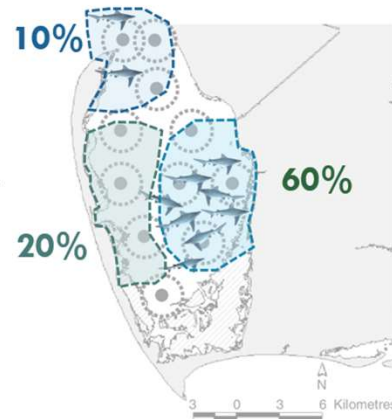


## WATERWAY USE

Where are they spending time in their habitats?

Can we delineate locations of greatest importance?

How do different life stages use locations differently?



Day/Night



Water Quality



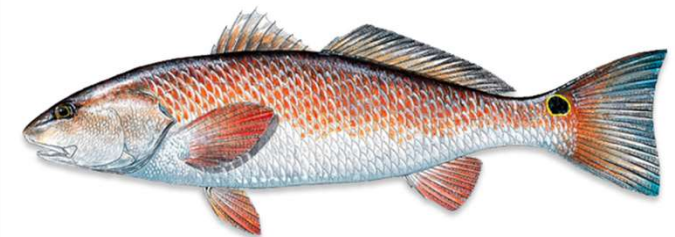
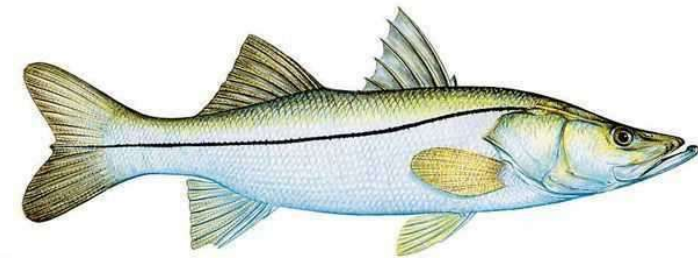
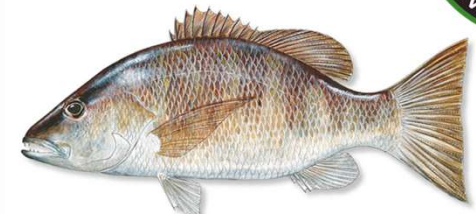
Seasons



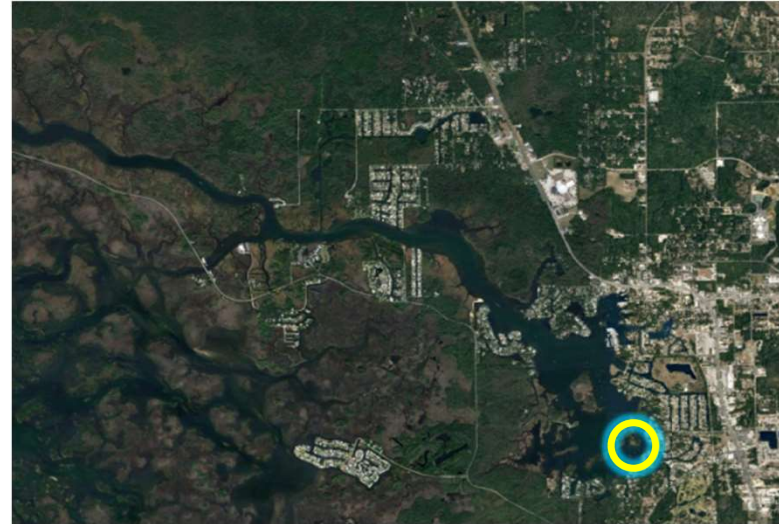
Water Flow



# ACOUSTIC MONITORING

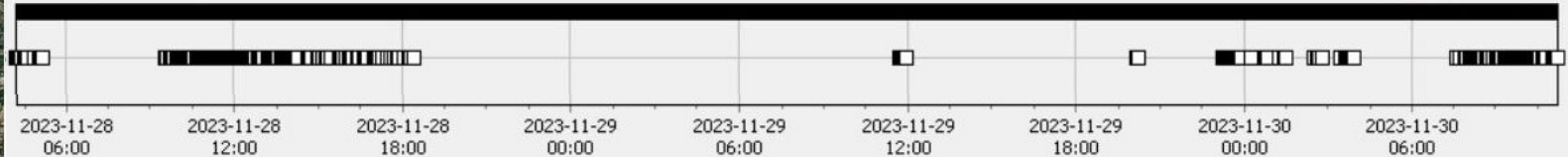


# PRELIMINARY DATA: *THERMAL REFUGE*



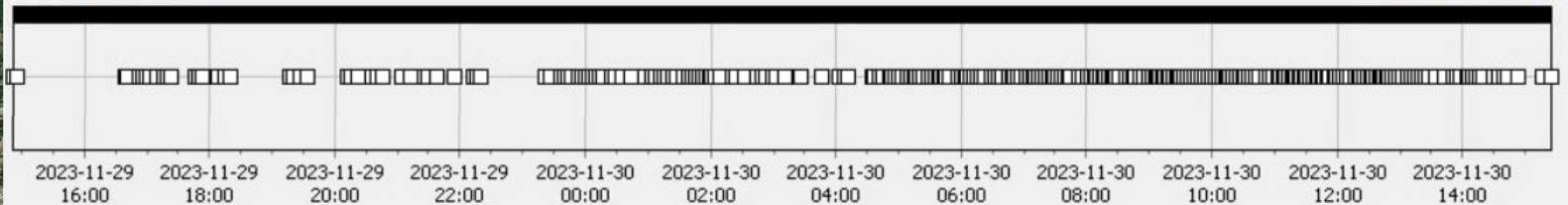
Showing 230 detections

☐ Day/Night Shading

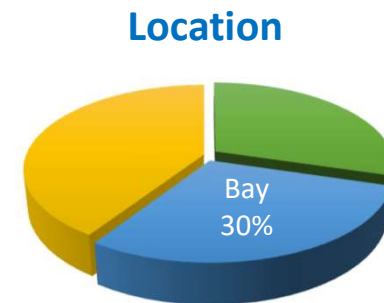
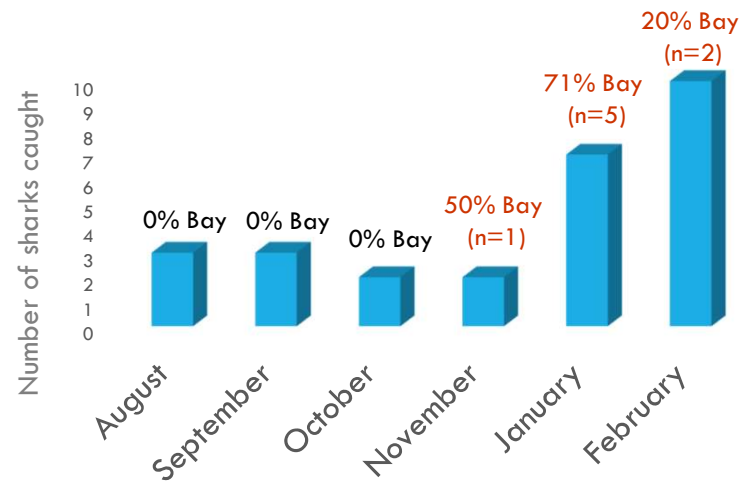


Showing 272 detections

☐ Day/Night Shading



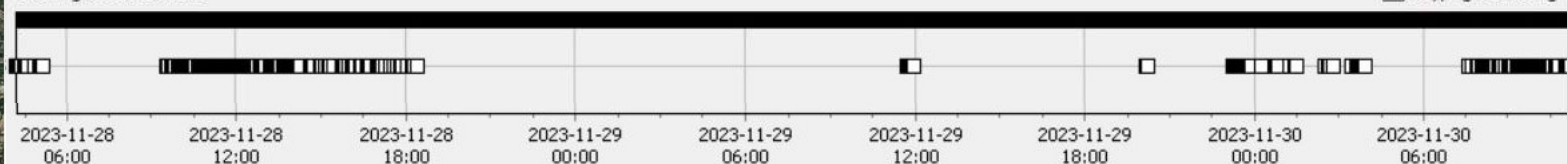
# PRELIMINARY DATA: *THERMAL REFUGE*



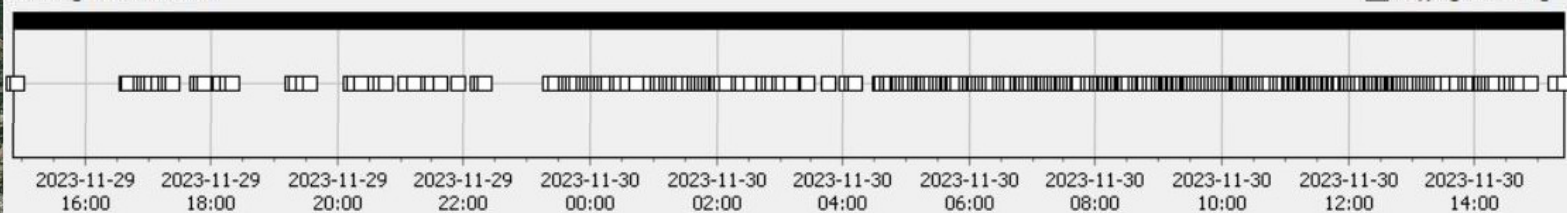
100% winter  
7/8 total in Jan/Feb



Showing 230 detections



Showing 272 detections



# HOW RESEARCH CAN BE USED

## Research can inform:

- *Species and springs management*
- *Species and springs conservation*
- *Mitigation of human/shark interaction.*
- *Used in educational and research training efforts, grade 6-undergrad training*



# PARTNERS AND SUPPORT

PROTECT FLORIDA SPRINGS TAG  
GRANTS



Harrison Clark  
Jerilyn Clark  
Jasmin Graham  
Rick Clark  
Layne Clark  
Abbi Johnson  
Alex Famglietti  
Molly Stevens  
Heidi Martinez  
Stephanie Perez  
Iliza Aguiar  
Isabella Pino

