01/17/24

FLORIDA SEA GRANT'S 2024 SYMPOSIUM: SPOTLIGHTING UF'S ROLE

Session V
Sustainable Fisheries

Brittany Hall-Scharf
FSG Extension Agent
UF/IFAS Hernando County Extension

#FSGsymp24
@FloridaSeaGrant

NMFS-Sea Grant Population and ecosystem dynamics graduate fellowship

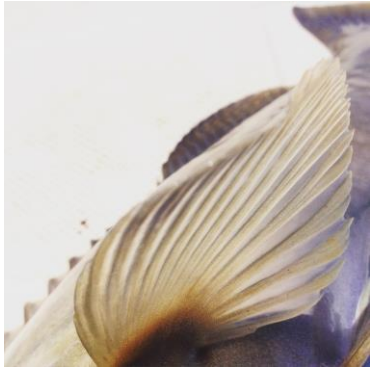
Ed Camp
Assistant Profession, Fisheries and Aquaculture Governance
School of Forest, Fisheries, and Geomatics Sciences, UF Gainesville

PHD STUDENT STORY

- Nick Fisch
- NMFS SG Population and Ecosystem Dynamics Fellowship
  - NOAA workforce development & stronger stakeholder connections
  - Improve fisheries management

MISSION: BECOME EXCEPTIONAL

- Nick began with great skills…
- …but had loftier goals
  - Improve federal fisheries mgmt.
  - Extend communication to public



WHY THE POP DY FELLOWSHIP?

- It's always money…but much less so this time
- Direct collaboration with NOAA NMFS scientists
- Collaboration with SG affiliates on Extension

WHAT DID NICK WORK ON?

- The Achilles heel of modern stock assessment—catch composition likelihoods

FISHERIES ➡ LIKELIHOODS

- Fisheries are most ecologically and economically valuable when they are sustainably managed
- Main fishery mgmt. tool is stock assessment
  - SA is NOT counting, it's balancing a blind bank account
  - SA rely on catch, specifically catch composition data
  - Problem: composition data tough to statistically fit
- Right distribution ➔ better assessments ➔ better fisheries mgmt. advice ➔ more sustainable (ecol. & econ) fisheries.

WHAT DID NICK DO?

- Collaborate with NMFS scientists in NC, HI
- Attend national & international conferences
- Produce novel, cutting edge, usable research

WHAT DID NICK DO?

- Collaborate with NMFS scientists in NC, HI
- Attend national & international conferences
- Produce novel, cutting edge, usable research
  - 3 peer reviewed papers in top fisheries journals
  - 3 EDIS (Extension outreach) publications
  - Invited speaker at two top international conferences

OUTCOMES

- Improved fisheries stock assessment models
- Helped me develop better Extension tools to teach principles of fisheries science to those impacted by it most

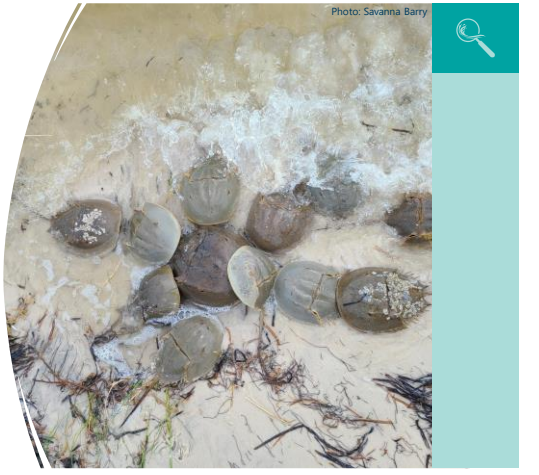
- Nick recruited by NMFS while still a student
- Recruited by Canada's government (DFO)

ACKNOWLEDGEMENTS

- Nick's co-advisor Dr. Robert Ahrens (NMFS HI)
- UF Preeminence Doctoral Fellowship
- Florida Sea Grant leadership and staff for Pop Dy Fellowship support and guidance

Data-poor, resource rich

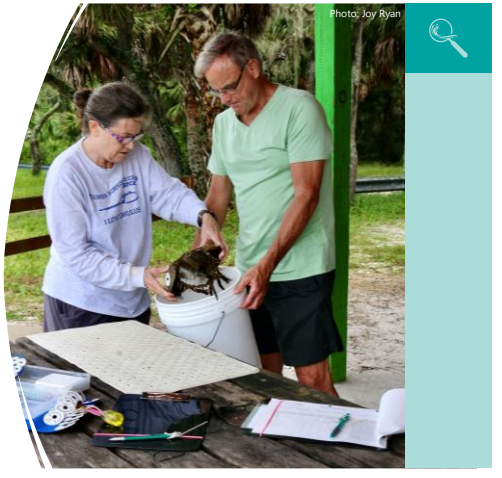
- Horseshoe crabs are valuable
- In Florida, public report data were scarce/poor quality
- Insufficient for federally mandated stock assessments
- Managers need population estimates…
- …meaning they need more and better data



Volunteer scientists

- 2015: FWC-UF Biology citizen science pilot program
- 2016: Florida Sea Grant joins effort and Florida Horseshoe Crab Watch is founded

FLORIDA HORSESHOE CRAB WATCH
Linked with Limulus



Florida Horseshoe Crab Watch

FLORIDA HORSESHOE CRAB WATCH
Linked with Limulus

- Survey and tagging program
- Detailed training
  - In person
  - Virtual
- Central database

Outputs

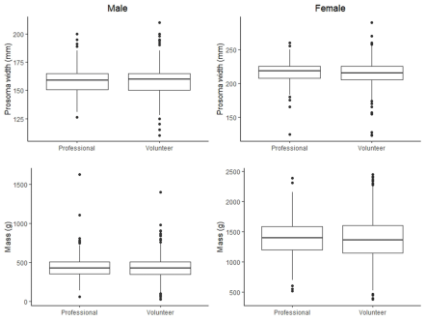
2016 to 2023

- **1,331** individual volunteers
- **3,692** surveys
- **221,848** crabs counted
- **12,991** crabs tagged
- **898** tag reports
- **18,561** volunteer hours
- **9,218** on-site educational contacts
- **20** active county programs
- **6** scouting/past active counties

Map: FWC

Side-by-side Study

- **Findings:** Volunteer data are high quality!
- Incorporation of volunteer data in:
  - Biological studies
  - Population estimates
  - Movement/spatial studies



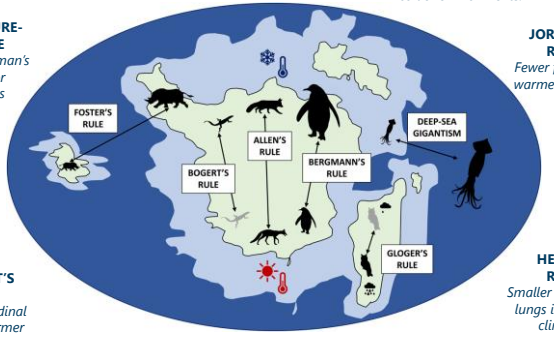
Heres, B, Crowley, C, Barry, S and Brockmann, H. 2021. Using Citizen Science to Track Population Trends in the American Horseshoe Crab (*Limulus polyphemus*) in Florida. Citizen Science: Theory and Practice, 6: 19, pp. 1–12. DOI: https://doi.org/10.5334/cstp.385

Ecogeographic "rules"

CONVERSE BERGMAN'S RULE
Smaller body sizes in colder environments.

TEMPERATURE-SIZE RULE
Same as Bergman's rule but for ectotherms

JORDAN'S RULE
Fewer fin rays in warmer climates



RAPOPORT'S RULE
Smaller latitudinal ranges in warmer climates

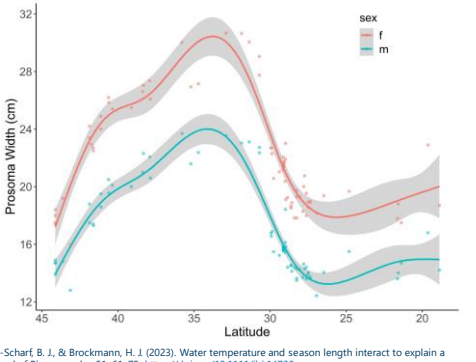
HESSE'S RULE
Smaller hearts and lungs in warmer climates

Goldenberg et al. 2022 *Oikos*

Horseshoe crabs are largest in the center of their range

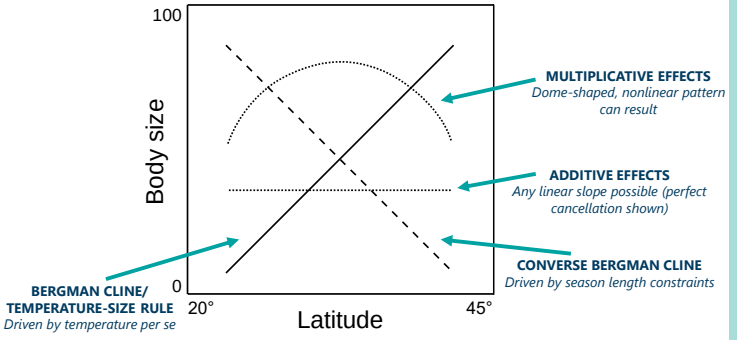
Georgia, USA

Yucatán, Mexico



Barry, S. C., Smith, M. D., Heres, B., Thomas, T. M., Hall-Scharf, B. J., & Brockmann, H. J. (2023). Water temperature and season length interact to explain a rare non-linear ecogeographic cline in body size. *Journal of Biogeography*. 51, 61–75. https://doi.org/10.1111/jbi.14730

Layering ecogeographic "rules"

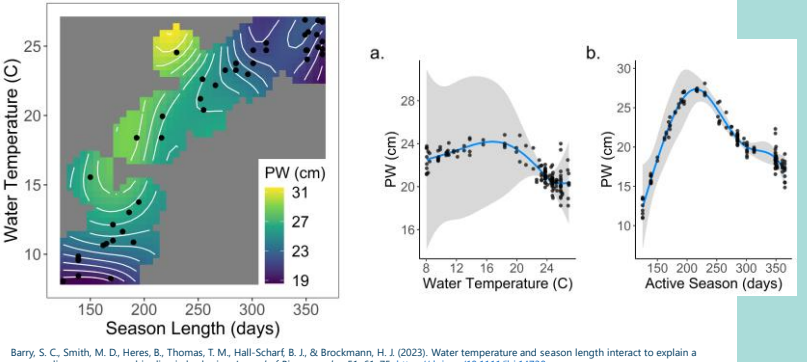


Blanckenhorn & Demont 2004 *Integrative and Comparative Biology*

Methods

- **Body size data (prosoma width, cm)**
  - Literature review supplemented with original data
    - ~50,000 individual horseshoe crab measurements
    - **10,182 measurements from Florida Horseshoe Crab Watch!**
    - 144 observations of mean body size from 71 locations (n_{female} = 73, n_{male} = 71)
- **Environmental data**
  - Public sources (NOAA & Mexican government)
    - Mean annual water temperature (C)
    - Season length (days)
      - population-specific
      - derived from water temperature
    - Salinity
    - Tidal range (m)

Temperature *per se* has a stronger influence at low latitudes, while **season length effects** dominate at higher latitudes.



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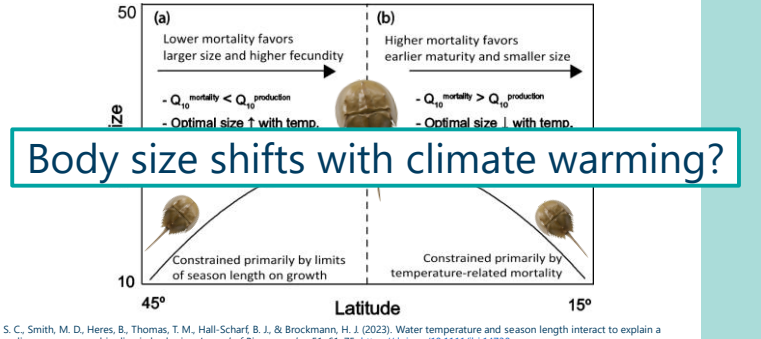
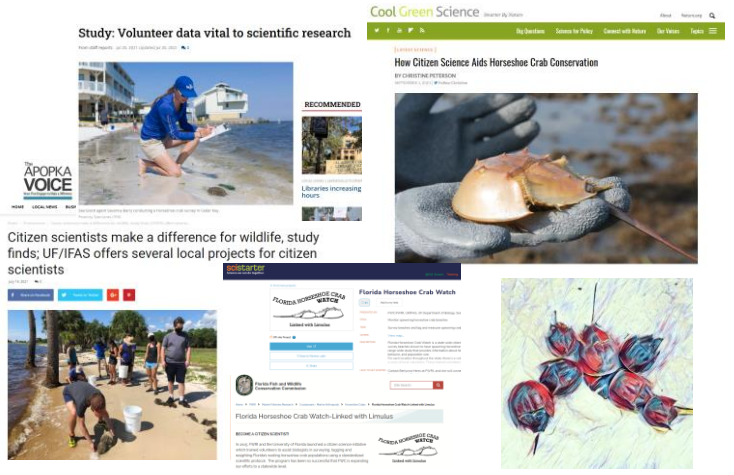
Temperature-mediated **trade-offs between mortality, growth, & fecundity** predicted by optimal resource allocation models



Body size shifts with climate warming?

Barry, S. C., Smith, M. D., Heres, B., Thomas, T. M., Hall-Scharf, B. J., & Brockmann, H. J. (2023). Water temperature and season length interact to explain a rare non-linear ecogeographic cline in body size. *Journal of Biogeography*. 51, 61–75. https://doi.org/10.1111/jbi.14730



Acknowledgments

- **Many dedicated volunteers!**
- Tiffany Black (FWC-FWRI, Cedar Key), Annie Roddenberry and Chad Truxall (Marine Discovery Center, New Smyrna Beach) and Ryan Gandy (FWC-FWRI, St. Petersburg), instrumental in getting Florida Horseshoe Crab Watch started.
- Florida Horseshoe Crab Watch site coordinators:
  - Holly Abeels, Ana Zangroniz, Shelly Krueger, Victor Blanco, Brittany Hall-Scharf, Armando Ubeda, Rick O'Connor, Mike Sipos, Kate Rose, **all of UF/IFAS, Florida Sea Grant**
  - Emily Colson, Andrea Lazzari, Kirk Fusco, Emily Surmont, Burt Golub, Woody Woodworth, Rosalyn Kilcollins, Melissa Landis, Madelyn Hightower, Ryan Jones, Holly Rolls, Tess Sailor-Tynes, Jessy Wayles, Sandra Baker-Hilton, Kathy Mason, Samantha Easterling, and Samantha Arner
- Funding & Supporters:
  - Florida Fish and Wildlife Conservation Commission, American Museum of Natural History's Lerner-Gray Grants for Marine Research, National Science Foundation, Interjurisdictional Fisheries Management Act, U.S. Department of Commerce, Florida Park Service/FDEP, USFWS

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RETURN 'EM RIGHT
Earn Another Fight

Nancy Montes
Post Doctoral Associate
Florida Sea Grant

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Project Summary

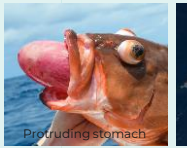
Goals

- **Reduce mortality** from barotrauma and release of reef fish.
- Improve angler experiences with **release gear**.

We provide the **training** and **gear** to anglers in the Gulf of Mexico to improve the survival of reef fish and benefit the health of the fishery.

Barotrauma
As fish are reeled up from deep water, **gases expand in the body cavity**, often displacing the organs and leaving the **fish severely bloated.**

Symptoms


Protruding stomach


Fish floating on surface


Bulging eyes


Protruding intestines

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How it works...

The basics:
Started in May 2022

Marketing & Communication
- Social platforms
- Ambassadors
- In-person events
- Word of mouth

Return 'Em Right Website
- Unaffiliated
- Own branding
- Clear and concise

Training (~15 min)
- Clear and concise
- Mix of light text and short videos
- Scientific sources of information
- Interactive questions

Participant Analytics
- Record entries
- Training date
- Duration of training
- Shipping information
- Shipping date

Program Evaluation
- At least 6 months with devices
- Satisfaction with information and devices
- Device use
- Issues with devices/information
- Experiences with barotrauma

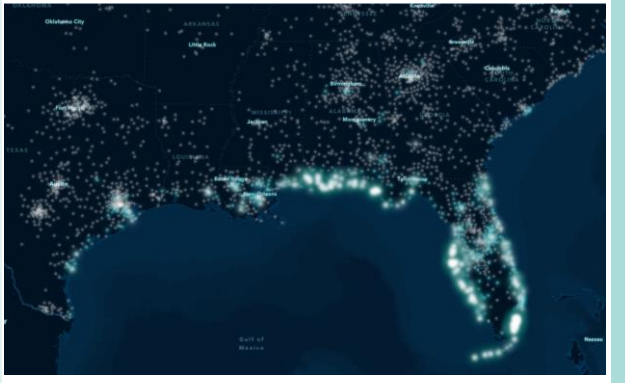
Training survey
- Right after training
- Impression of training
- Detect any issues

4.9 stars out of 5
n=15,114

Since May 2022

Target Marketing

Anglers reef fishing in the Gulf of Mexico



Training
29,713
Completions

Fish descending devices
28,689
Distributed

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Knowledge Transfer

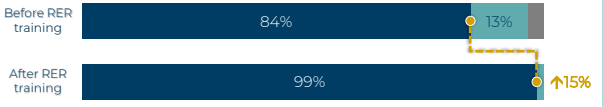
Follow-up surveys

- At lest 6 months with devices
- Satisfaction with information and devices
- Device use
- Issues with devices

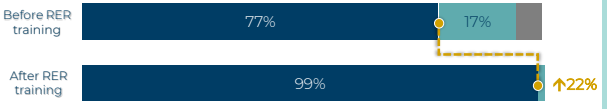
SeaQualizer

SeaYaLater

DO YOU KNOW WHAT BAROTRAUMA IS?



HOW TO DETECT BAROTRAUMA IN THE FISH YOU CATCH?



n=1,555

Yes No Unsure

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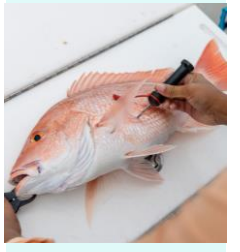
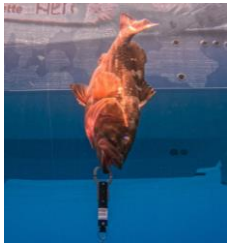
Tool Use Training

HOW OFTED DID YOU USE...

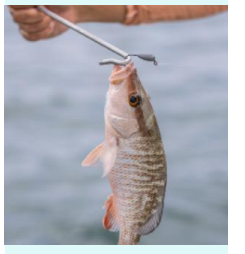
Venting tools



Descending devices OR



Dehooking tools



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Prevalence of Use

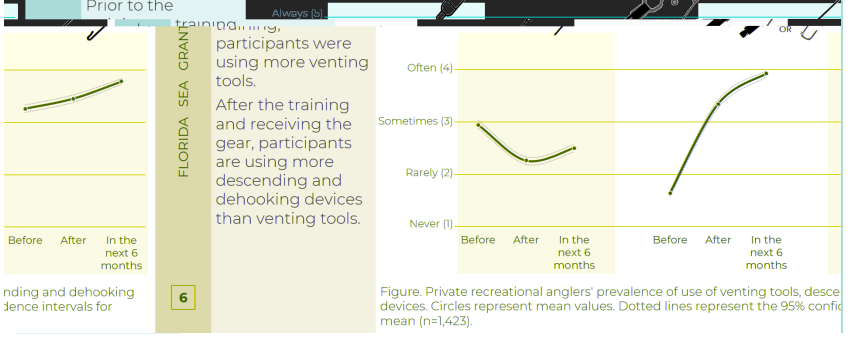
HOW OFTED DID YOU USE...

Prevalence of use

Venting tools Descending devices Dehooking tools

Prior to the training, participants were using more venting tools.

After the training and receiving the gear, participants are using more descending and dehooking devices than venting tools.



nding and dehooking dence intervals for

Figure. Private recreational anglers' prevalence of use of venting tools, desce devices. Circles represent mean values. Dotted lines represent the 95% confi mean (n=1,423).

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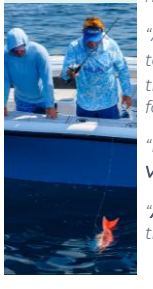
Participant Comments...

RETURN 'EM RIGHT
Earn Another Fight



"*Great program* that *really helps* our *fishing community*"
Russ D., Florida

"*Great educational program* which *I have shared* with every Groundfish head boat I fish upon!!!."
Kenneth Y., New York

"A *fantastic program* top to bottom. I got 5 of my fellow boat owners to register, take the class and use the devices. *They work great*, and thanks to your team for providing this to us anglers. *It makes it easy* for us to do our part."
Riley R., Florida

"Public education a lot of my friends *didn't know how to properly vent* a fish."
Jeff S., Florida

"*A fantastic and free program* that has *significantly affected* the way I catch and release fish."
Chris A., Florida

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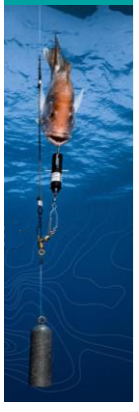
Next Steps...



- Develop and improve education materials.
- Distribute the remaining fish descending devices (current funding goal -> 40K devices).
- Continue monitoring and documenting adoption of best release practices.
- Continue providing opportunities to foster a lasting community of engaged anglers that support best release practices.
- Geographical expansion of the Return 'Em Right program to the Atlantic and West coasts.

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Acknowledgements

CORE PARTNERS

Sea Grant FLORIDA

UF UNIVERSITY of FLORIDA

NOAA

GULF STATES MARINE FISHERIES COMMISSION

ORGANIZATIONAL PARTNERS

GULF OF MEXICO FISHERY MANAGEMENT COUNCIL

ATLANTIC STATES MARINE FISHERIES COMMISSION

GULF STATES MARINE FISHERIES COMMISSION

MISSISSIPPI-ALABAMA SEA GRANT CONSORTIUM

LOUISIANA DEPARTMENT OF WILDLIFE & FISHERIES

AMERICAN SPORTFISHING ASSOCIATION

COASTAL CONSERVATION ASSOCIATION

MISSISSIPPI STATE UNIVERSITY EXTENSION

Sea Grant Louisiana

Sea Grant Mississippi-Alabama

Sea Grant Texas

AUBURN UNIVERSITY

MEDIA PARTNERS

FLORIDA SPORTSMAN

SaltWater SPORTSMAN

SPORT FISHING

TEXAS SPORTFISHING

INDUSTRY PARTNERS

SEA-MALIZER

FISHRULES fish without fear

FISHBRAIN

Captain Rob's FISH SAVER DESCENDING DEVICES

Boston Products

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RETURN 'EM RIGHT

Earn Another Fight!

RETURN 'EM RIGHT

GET FREE GEAR

Join the Community!

#ReturnEmRight
#EarnAnotherFight

Thanks

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Developing optimal release strategies for the Goliath grouper relevant to recreational fisheries in Florida

Presenting author: Angela Collins

Assistant Extension Scientist, UF/IFAS School of Forestry, Fisheries and Geomatic Sciences & Florida Sea Grant

Co-authors: Clark Morgan, Michael Sipos, Ana Zangroniz and Matt Ajemian

PROJECT OVERVIEW

RELEVANCE AND NEED

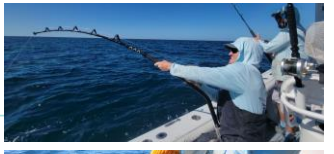
- Increased C&R of Goliath grouper across Florida
- Reef fish suffer from barotrauma. Regulations direct mitigation
- Goliath are not easily accommodated by traditional techniques (venting/descending)

STAKEHOLDERS

- Recreational anglers, recreational divers
- Fisheries managers

RESEARCH PLAN & OBJECTIVES

- Acoustic telemetry to assess behavior of vented and descended fish (*Clark Morgan, PhD Candidate)
- Cooperative research with anglers to test release methods, develop realistic recommendations
- Formal Advisory Panel (research, regulatory and recreational reps)
- Dissemination of best practices



Angler guidance

FINDINGS & IMPACTS

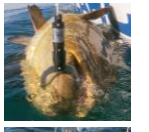
Telemetry enhances understanding of behavior, habitat connectivity and site selection

Minimizing impact of C&R and increasing health of population has economic implications (Shideler and Pierce 2016, WTP)

Angler satisfaction – being able to take an action and having confidence in the relevance of that action

Venting

Seaqualizer (*Colossal)



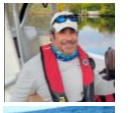
@Seapos Stringer Sinker

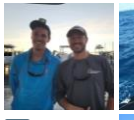
ACKNOWLEDGEMENTS

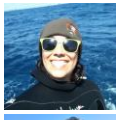
PROJECT TEAM: Matt Ajemian, Clark Morgan, Michael Sipos, Ana Zangroniz, Lauren Brewster, Mike McCallister, Laurent Cherubin

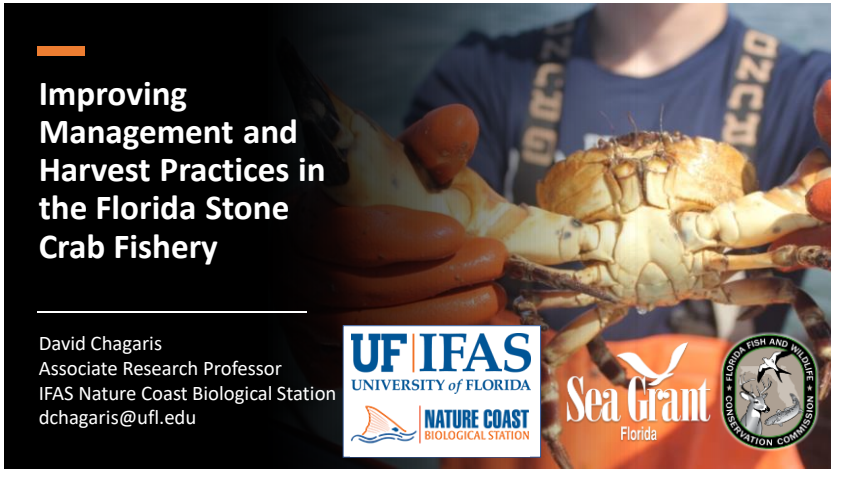
ADVISORY PANEL: South Atlantic Fishery Management Council *Judd Curtis, Julia Byrd, Meg Withers*, Gulf of Mexico Fishery Management Council *Emily Muehlstein*, Florida Fish and Wildlife Conservation Commission *Luiz Barbieri, Derek Cox*, Return Em Right *Nick Haddad*, Ocean First Institute *Chris Malinowski*, and GG experts *Chris Koenig, Don DeMaria*

PARTNERSHIPS : Return Em Right, SeaQualizer, Capt. Jason Stock *Full Send,* Capt. Tim Simos *Goliath Guru*









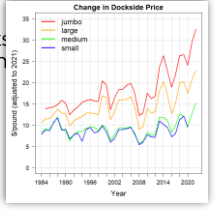
Background and Rationale

Stone crabs have the 2nd highest commercial docksid
Florida and 8th highest in the Gulf of Mexico.

Landings have been volatile and declining in recent y

Stock assessments have determined that overfishing
occurring, but stock status remains unknown and ref
points do not exist.

Prices have continued to increase, which keeps profits
high despite historically low catch rates. Basic econon
studies are lacking.



Goals and Objectives

The overall goal of our project is to improve our ability to assess the Florida stone crab population and fishery performance and provide management advice to insure long-term sustainability of the fishery.

Objectives:

1. Develop new population models to determine the health of the stock
2. Provide a basic understanding of price and market dynamics in the fishery
3. Engage with Florida stone crabbers to identify stakeholder supported management initiatives

Research Plan

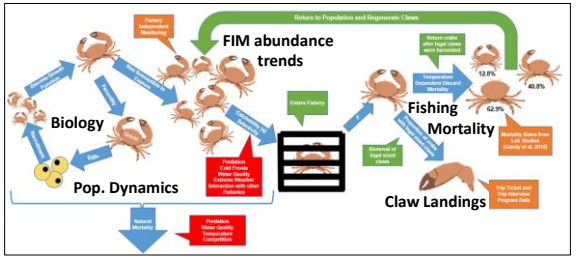
Population Models | **Economic Analyses** | **Stakeholder Engagement**

A New Population Model for Florida Stone Crab

This model seeks to integrate new data on stone crab biology, temperature-dependent release mortality, and trends from fisheries-independent monitoring.

Overcomes the challenge of accounting for claw landings separate from crab mortality.

Monthly timestep allows us to explore seasonal closures as management options.



Overall Goal: Assess condition of the stock and produce reference points and management advice

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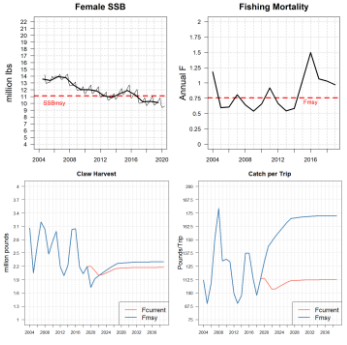
A New Population Model for Florida Stone Crab



Model results indicate the stock is experiencing overfishing (F/Fmsy > 1) and the population is below the target (B/Bmsy < 1).

F_{MSY} projections (~25% reduction in effort):

Landings will initially decline, but recover to higher levels after year 3 and average catch rates will increase by 52%

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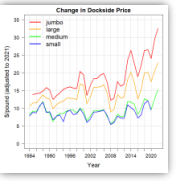
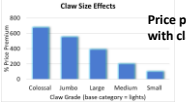
Economic Analyses

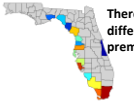
Over time, the decline in harvest has had only a limited impact on revenue (adjusted for inflation) as prices have increased. The data suggest that demand for Florida stone crab claws is strong.



Hedonic model of dockside prices described how claw "attributes" influence price



Price premiums vary with claw size.



There are regional differences in price premiums.

Price premiums vary across years and sometimes within a season.

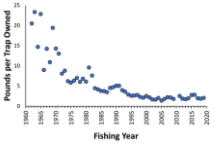
Sustainable Fisheries By Chagaris

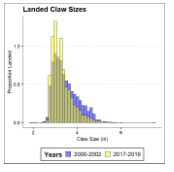
Three ways to increase profitability

1. Increase the stock size
2. Reduce cost (since revenues are mostly independent of landings)
   - Better yield per trap, fewer traps, shorter trips, less bycatch
3. Land more large claws

BUT, this can only be achieved if higher profits do not attract more effort to the fishery.

With better managed stocks, there could be more opportunities to diversify and reach other markets.





Stakeholder Outreach & Engagement

Goals: Incorporate input from stone crabbers into research questions and models; demonstrate impacts of policy options; promote best fishery practices.

Mail-in Survey
- 30-question survey mailed to all stone crab endorsement holders (~1200, 10% response rate)

Regional Workshops

June 2021 – Scoping Workshops
- Crystal River, Naples, and Marathon

June 2022 – Management Options & Visioning Workshops
- Crystal River, Punta Gorda

Stakeholder Outreach & Engagement

2021 Workshops

Identified region-specific drivers of the fishery (environmental, economic, management).

Discussed perceptions towards recent (2020) management changes

Download the Full Workshop Report at https://original-ufdc.uflib.ufl.edu//IR00011730/00001

Timeline activity to describe how the stone crab fishery has changed over time

2022 Workshops

Blue World – Green World Visioning Activity

Download the Full Workshop Report at http://ufdc.ufl.edu/IR00011910/00001

The Ideal Stone Crab Fishery…
- ✓ Greater stability in catch and markets
- ✓ Higher profitability
- ✓ Decisions made on reliable data and science
- ✓ Enforce existing regs
- ✓ Favorable environmental conditions
- ✓ Trust and cooperation with scientists and managers

Impacts

Scientific Products: 1 peer reviewed article, and one more currently in revision.

Outreach: We held a total of 5 workshops, reaching around 75 stone crabbers.

Awards: Liam Kehoe awarded Best Thesis in Fisheries and Aquatic Sciences Program and the overall IFAS Award of Excellence for Graduate Research Best Thesis in Human Systems!

Collaborations: New opportunities for cooperative research.

Questions?

Next Steps

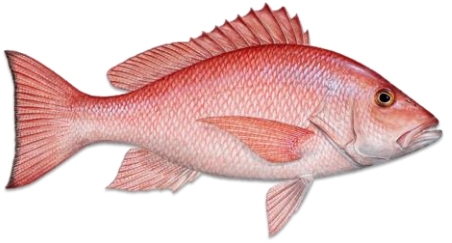
Continue to improve the model - growth, claw regeneration, and environmental effects.

Have the model peer reviewed and published.

Develop regional models.

Continue working with managers (FWC DMFM) to define reference points and refine trap reduction targets, size limits, and seasons.

Estimation of US Atlantic Red Snapper Abundance



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TEXAS A&M UNIVERSITY CORPUS CHRISTI NOAA GEORGIA

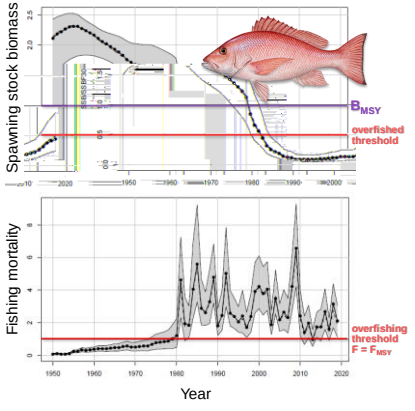
Study Team

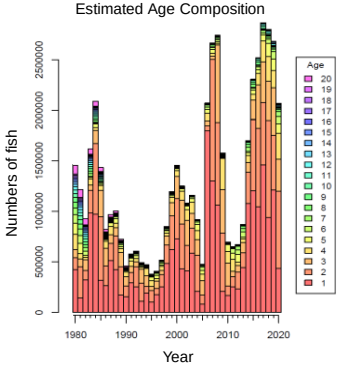
Will Patterson, Joe Tarnecki, Sam Ricketts, Miaya Glabach, Dave Chagaris, Liam Kehoe, Dave Portnoy, Chris Hollenbeck, Allison Monroe, Kat Lanoue

Jeff Buckel, Paul Ruderhausen, Nathan Hostetter, Krishna Pacifici, Dan Gwinn, Viviane Zulian, Bev Sauls, Dominique Lazarre, Ted Switzer

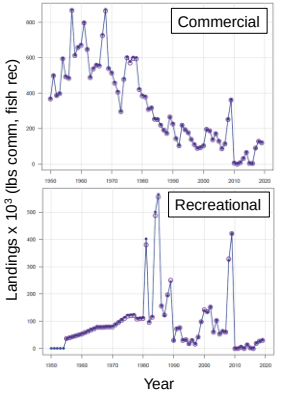
Nate Bacheler, Kyle Shertzer, Eric Anderson, Chris Taylor, Matt Damiano, Wally Bubley, Dawn Glasgow, Dawn Franco

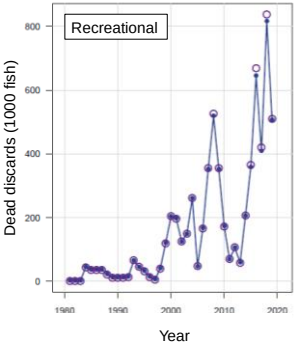
Atlantic Red Snapper Population Trends and Management





Atlantic Red Snapper Landings and Discards





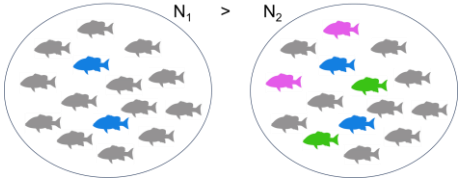
South Atlantic Red Snapper Research Program Study Objectives

1) **Estimate the distribution and density of red snapper across the US Atlantic shelf from North Carolina through the Florida Keys with ROVs in unknown or unconsolidated habitats**

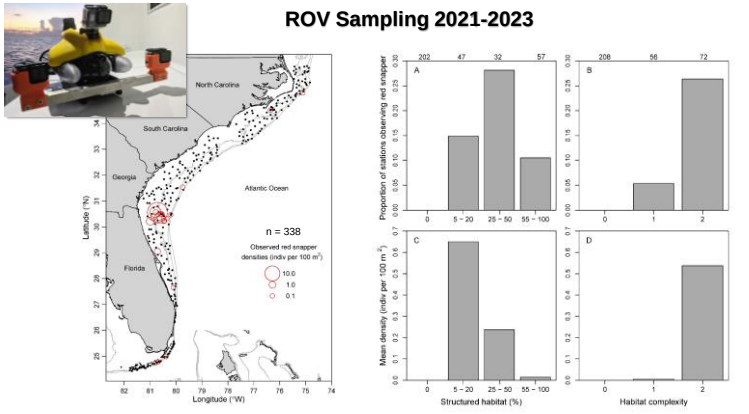
2) **Develop a hierarchical Bayesian integrated abundance model to estimate age-2+ red snapper population size based on Southeast Reef Fish Survey trap-camera and ROV survey data**

3) **Conduct genetic close-kin mark recapture (CKMR) analysis to estimate age-2+ red snapper population size**

4) **Integrate/reconcile study results with the Atlantic red snapper stock assessment model**

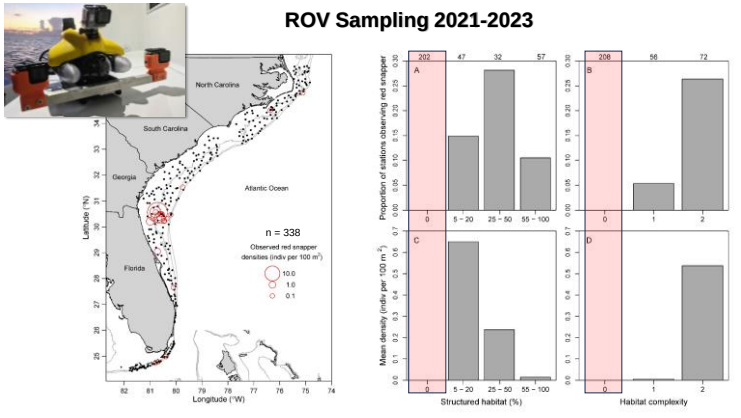


ROV Sampling 2021-2023



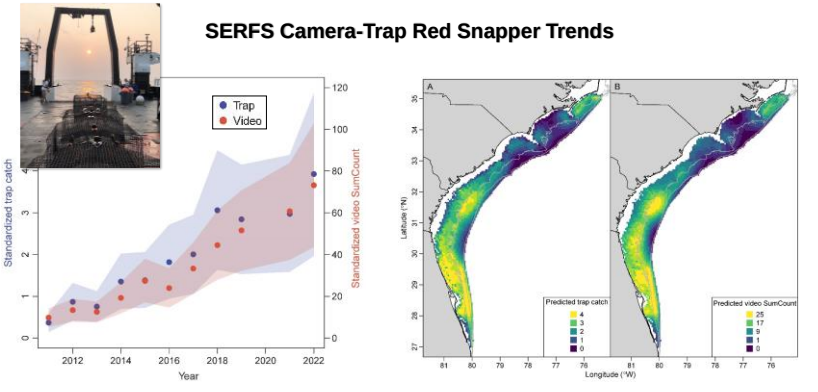
Bacheler et al. (in review)

ROV Sampling 2021-2023



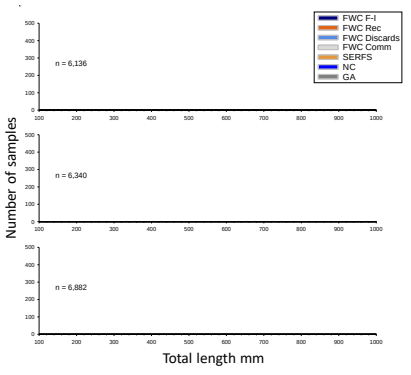
Bacheler et al. (in review)

SERFS Camera-Trap Red Snapper Trends



Bacheler et al. (in review)

Fin Clip Sampling and Genomic Analyses



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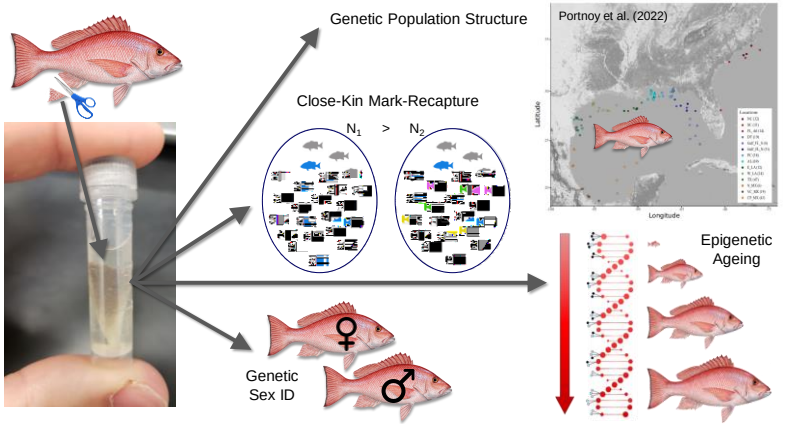
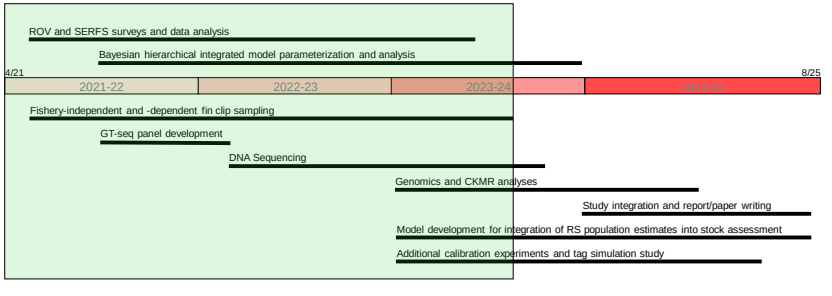
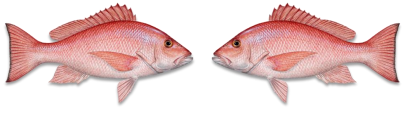


Timeline of Study Components





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Paul Johnson
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Greg Sosnow
Derek Brown
Chris Gaffney
Wade Fickling
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