

Reef Fish AP Meeting

Gag Research Review

Overview

- SSC received presentations in September 2023
 - *Reproductive Resilience in the Protogynous Gag Grouper* – Dr. Sue Lowerre-Barbieri
 - *Effects of Recreational Catch and Release Angling on the Survival of Gag, and Gear and Strategies Designed to Reduce Barotrauma* – Dr. Angela Collins
 - *Age-specific Mortality of Gag from Red Tide on the West Florida Shelf* – Dr. Dave Chagaris
 - *Discard Mortality of Gag on the West Florida Shelf* – Ms. Beverly Saul

Overview

- SSC guided by Council goals for gag
 - Reduce fishing mortality on male gag
 - Constrain future harvests to the ACL
 - Increase the probability of rebuilding the stock
 - Avoid increasing discards
 - Reduce vulnerability of gag during spawning to increase spawning success

Reproductive Resilience in the Protogynous Gag Grouper

- Dr. Sue Lowerre-Barbieri, Florida Fish and Wildlife Conservation Commission

Reproductive Resilience in the Protogynous Gag Grouper

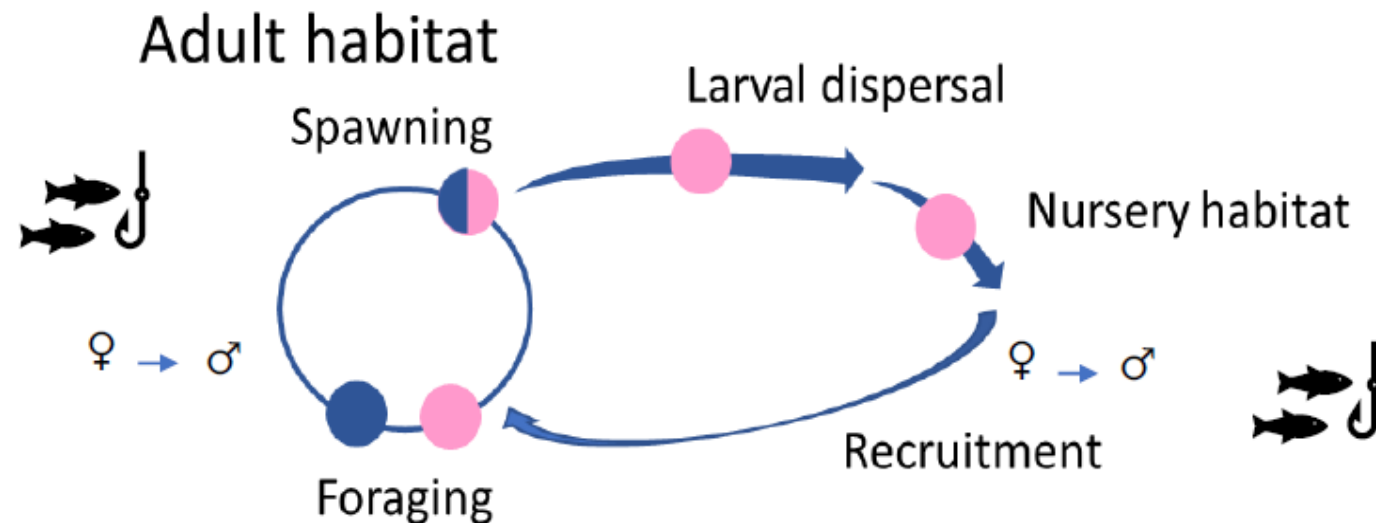
- Reproductive resilience: ability of a population to maintain the reproductive success needed to result in long-term population stability
 - While enduring disturbances such as climate change and fishing
- Fish have varied and complex reproductive strategies
- Many competitive and environmental variables can affect reproductive success

Reproductive Resilience in the Protogynous Gag Grouper

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Reproductive Resilience in the Protogynous Gag Grouper

- Gag:
 - Start life as female, transition to male later in life (protogynous)
 - Only deeper waters (>40m, 130') have both males and females
 - Only females in waters shallower than 40m
 - Need to know how, when, and why fish move

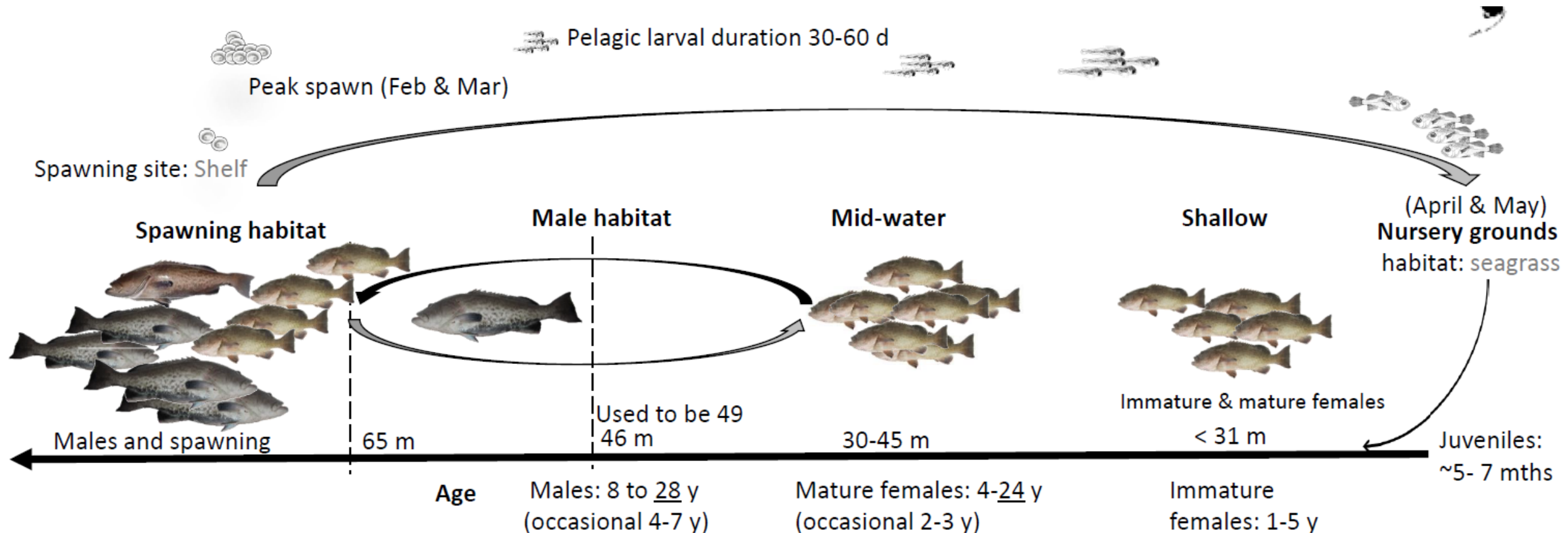


Reproductive Resilience in the Protogynous Gag Grouper

- Other knowns about gag:
 - Spend 30 – 50 days as larvae
 - Put on weight from fall through mid-winter ahead of and during spawn
 - Females found throughout spatial and depth range; males only deeper than 40m
 - Sex change from female to male occurs on spawning grounds in deep water
 - Spawning reserves may increase male sex ratios
 - Increased ratio may be constrained to reserves
- Ongoing work:
 - Steamboat Lumps, Sticky Grounds, Tarpon Springs
 - Hook and line and video
 - Graduate student research & a new study focused on sex change, movement, catchability, & connectivity

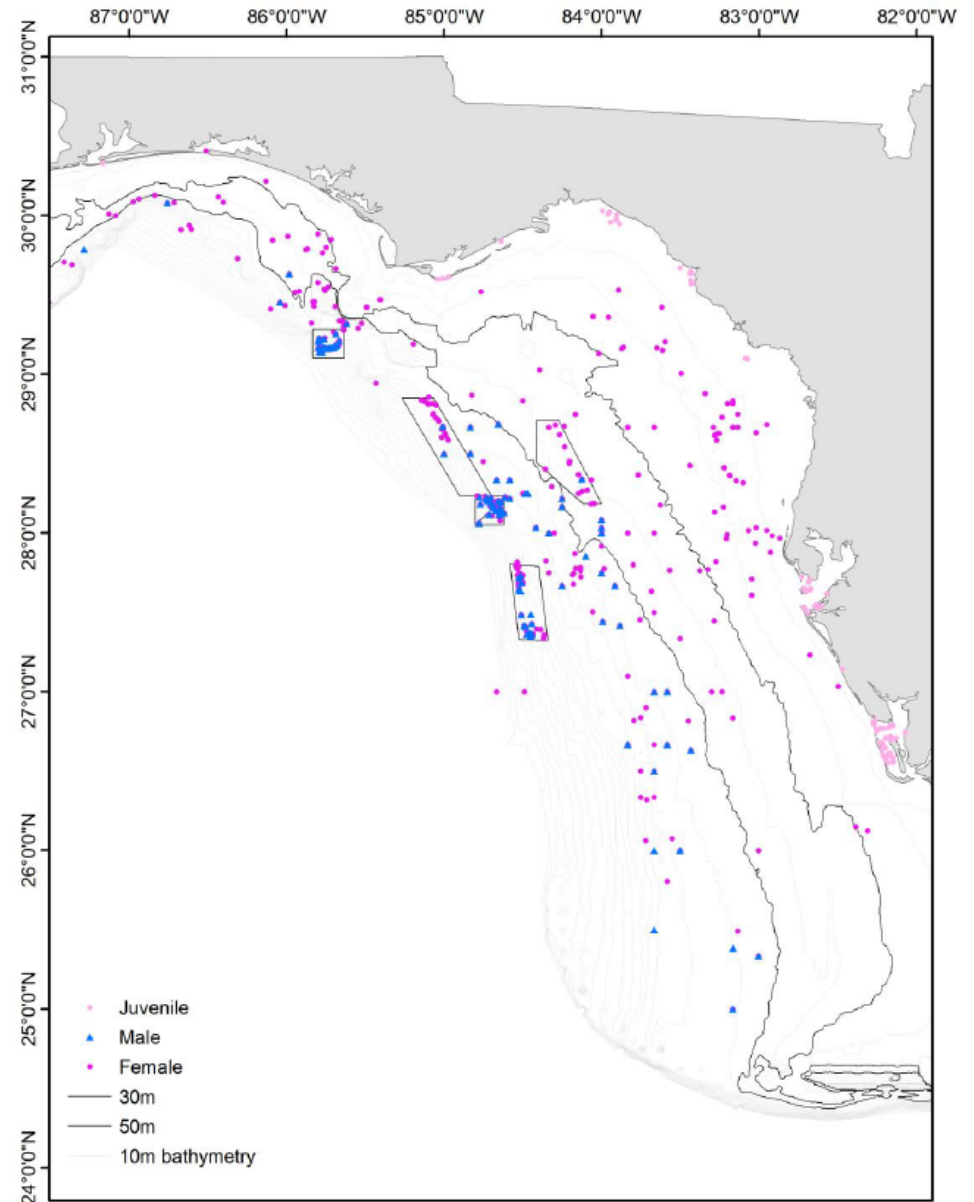
Reproductive Resilience in the Protogynous Gag Grouper

- Conceptual Model:



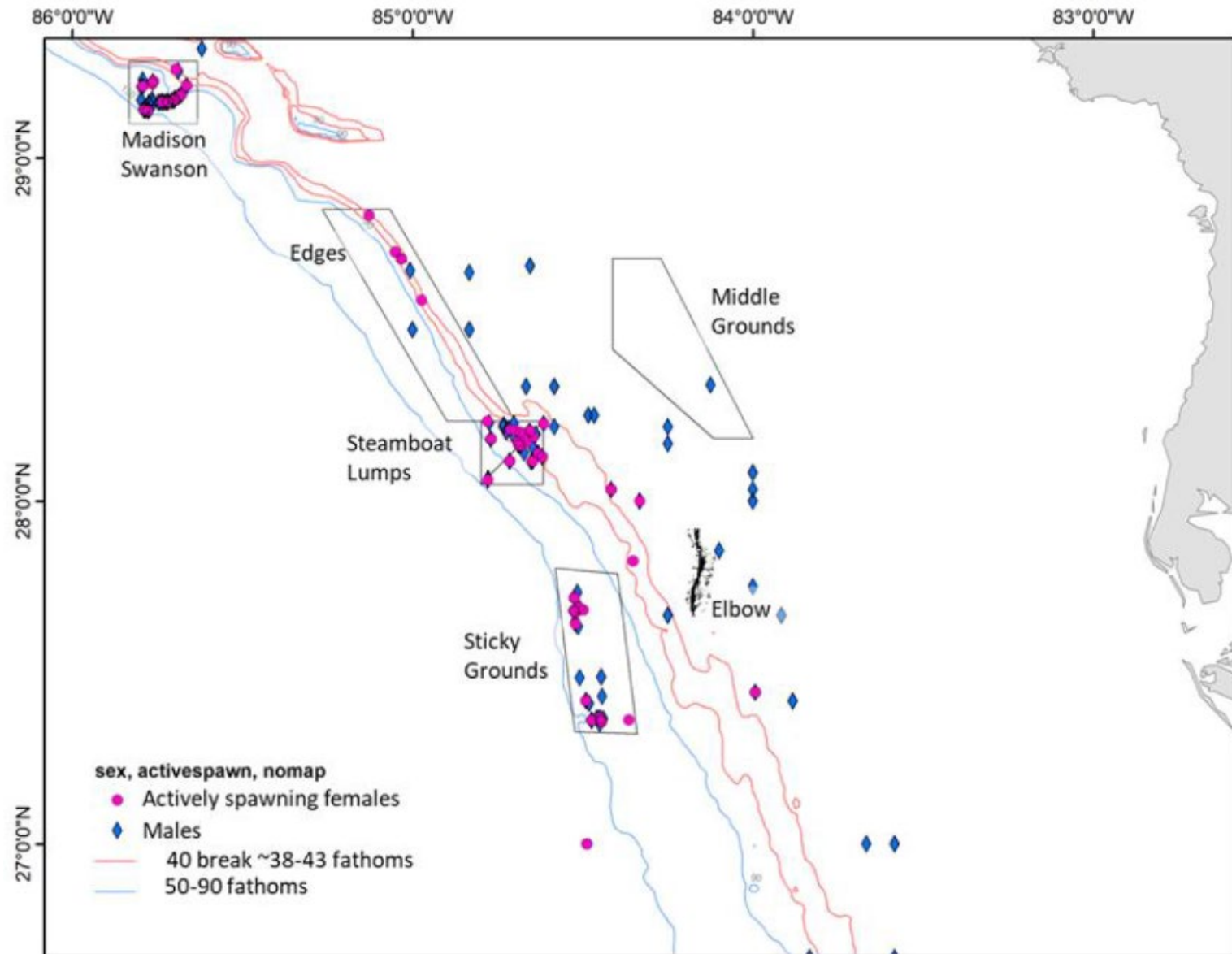
Reproductive Resilience in the Protogynous Gag Grouper

- Sex-specific habitat use:
 - Nursery habitat: seagrass and estuaries
 - Immature females only < 20 m
 - Spawning females found 65 – 138 m
 - Most males > 50 m
- Could intense fishing effort in shallow, nearshore waters be limiting spawning population recruitment?
 - E.g., red drum and escapement?



Reproductive Resilience in the Protogynous Gag Grouper

- Spawning happens along the shelf
- Spawning from Feb 1 – Apr 15
- Females can migrate to spawn, but...
- Skipped spawning observed 32% – 41% of the time
- Females in deeper water more likely to spawn

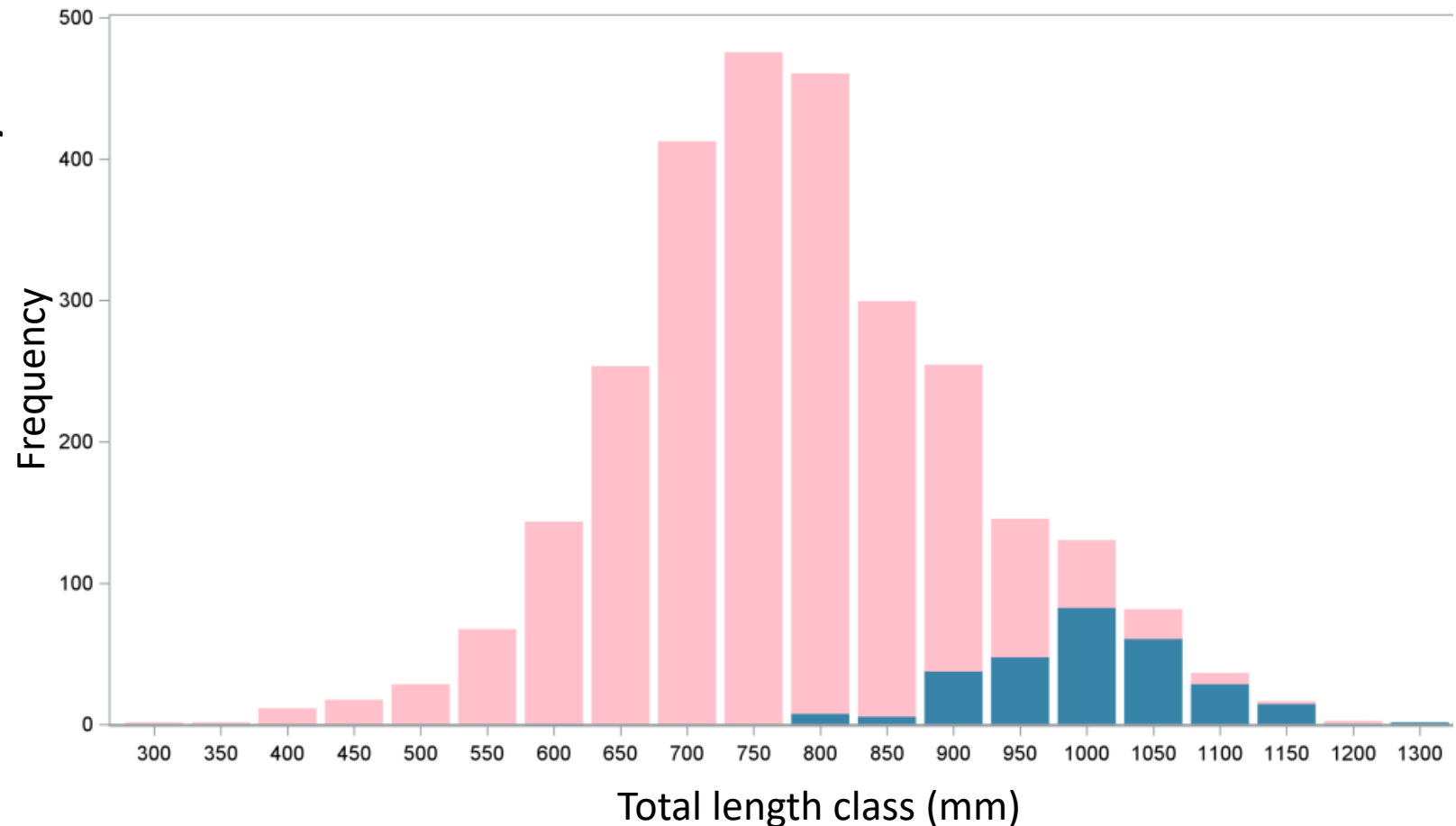


Reproductive Resilience in the Protogynous Gag Grouper

- Measuring sex ratios is difficult, expensive, and time consuming
- Mature individuals of both sexes only occur on spawning grounds
- Female recruitment to the spawning population will affect sex ratios
 - When there is a strong year class
 - If there is skip spawning and variable participation in spawning migrations
- Sex ratios variable inside and outside reserves
 - Steamboat Lumps, 4.7%; MadSwan, 4.9%; Edges, 0%; Sticky Grounds, 6.3%
 - Age at which 50% of gag are male 12.3 y with MPAs, 10.4 without
 - Current sex ratio under 2%
- Don't form harems; competition between males may play a role with gag

Reproductive Resilience in the Protogynous Gag Grouper

- Gag length and weight:
- Males >>> females
- Today's males smaller
- Largest recent male was 40 lb from MadSwan



Reproductive Resilience in the Protogynous Gag Grouper

- Spawning Aggregations:
- Aggs of 12 – 18 fish
- Smaller aggs than previously thought
- Not enough evidence of large spawning aggs
- BUT, saw 42 on Steamboat in Apr 2023

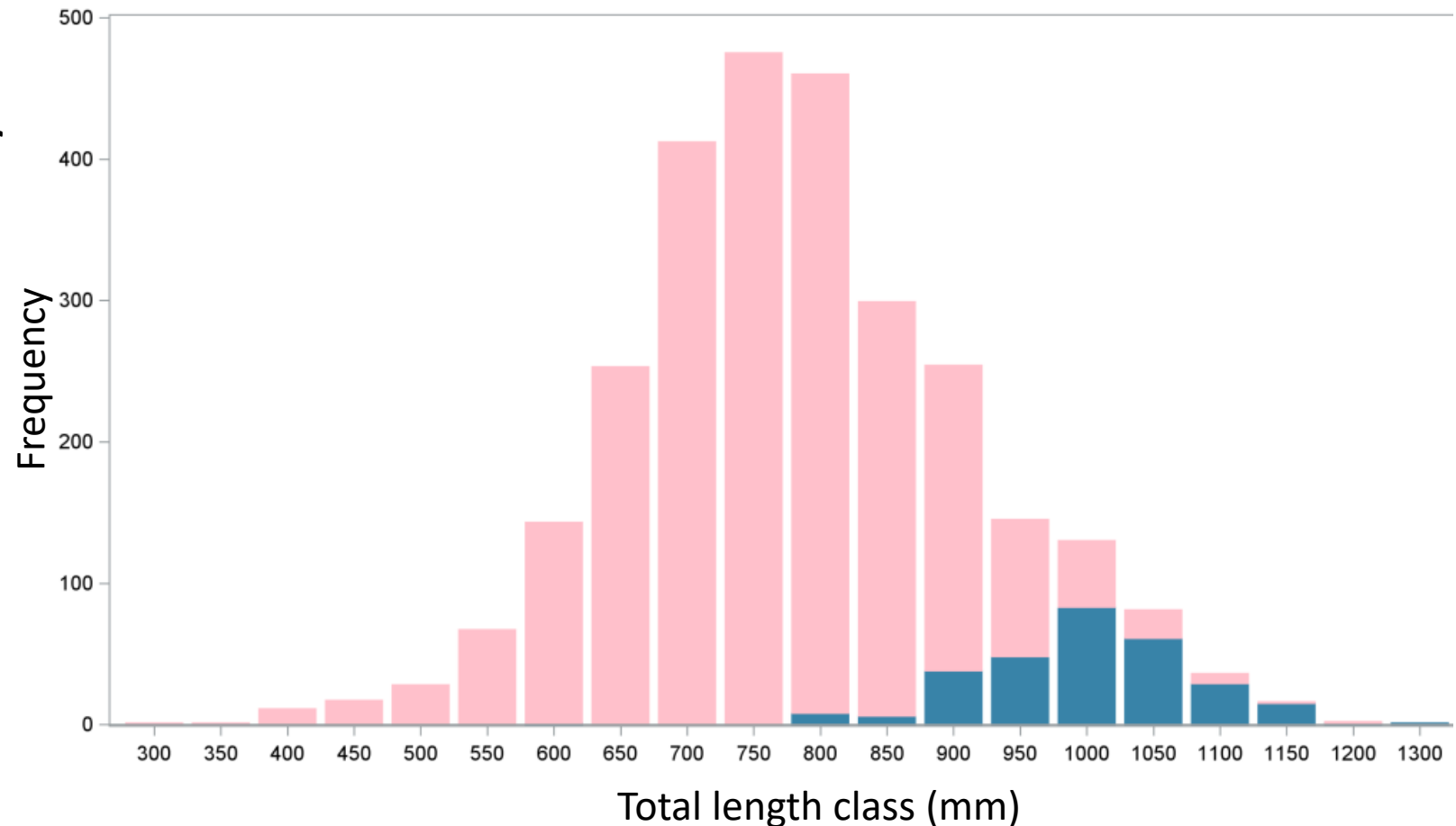


Reproductive Resilience in the Protogynous Gag Grouper

- Sexual transitions:
 - Few observed
 - Males not needed to spurn transition; sex ratio not a driver
 - Shallow-water transitionals smaller than deeper water ones
 - Size and age of gag sex change is dependent on the relative size of others in the social group
- Ongoing work:
 - Using ROVs and hook and line in pre-spawning months (Nov-Jan) & spawning months (Feb-March) to assess density
 - Using dart tags and acoustics to track movement
 - 10% total recapture, evidence of site fidelity

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Effects of Recreational Catch and Release Angling on the Survival of Gag Grouper on the West Florida Shelf

- Dr. Angela Collins, University of Florida

Effects of Recreational Catch and Release Angling on the Survival of Gag Grouper on the West Florida Shelf

- Regulations are effective only if fish survive release
- Accuracy of release mortality estimates questioned
 - Short term studies
 - Rely on tag/recapture data
 - Laboratory studies do not always mimic what is happening in the field
- Cooperative research with fishermen
 - Used acoustic tags to track fate of released gag
 - Evaluated effects of venting, descending, which were only applied when needed

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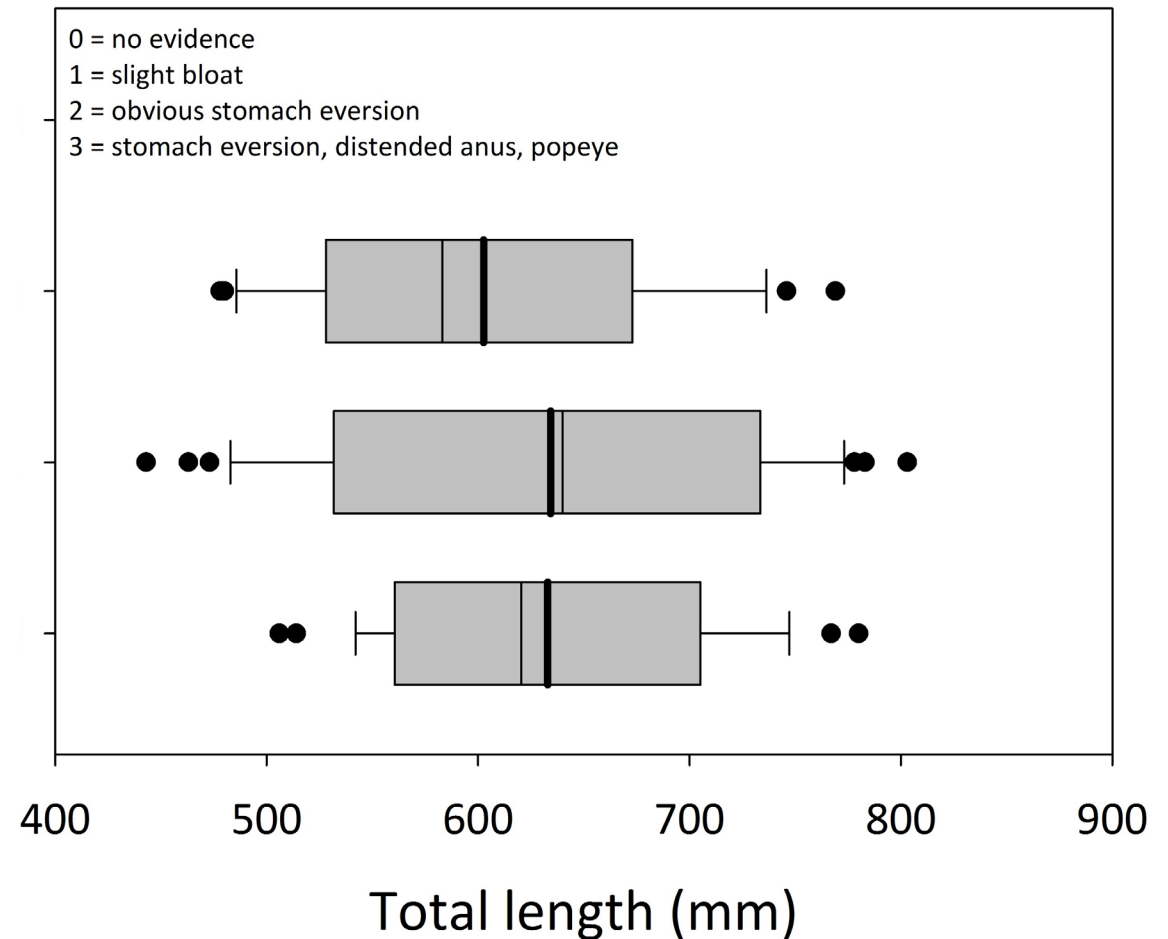
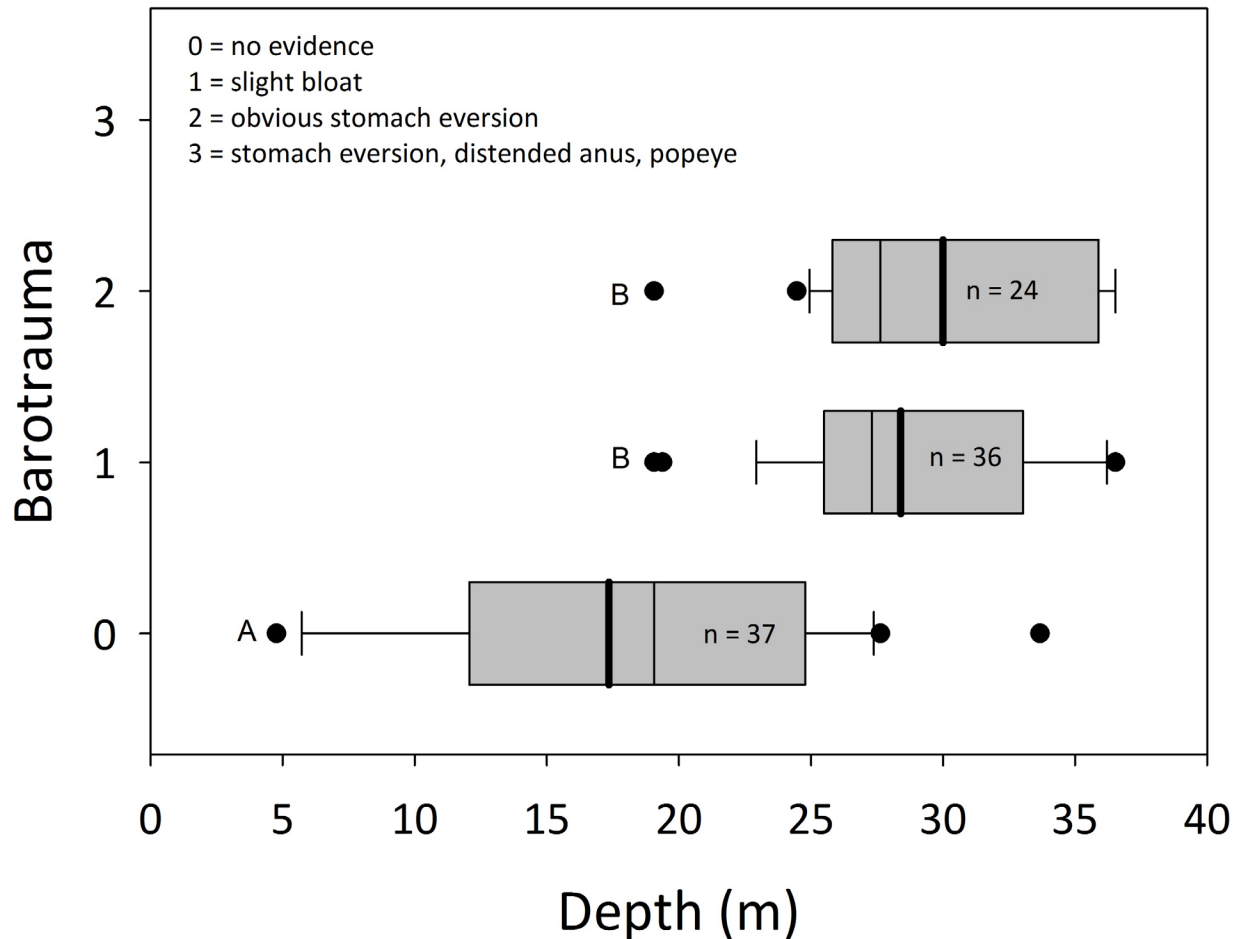


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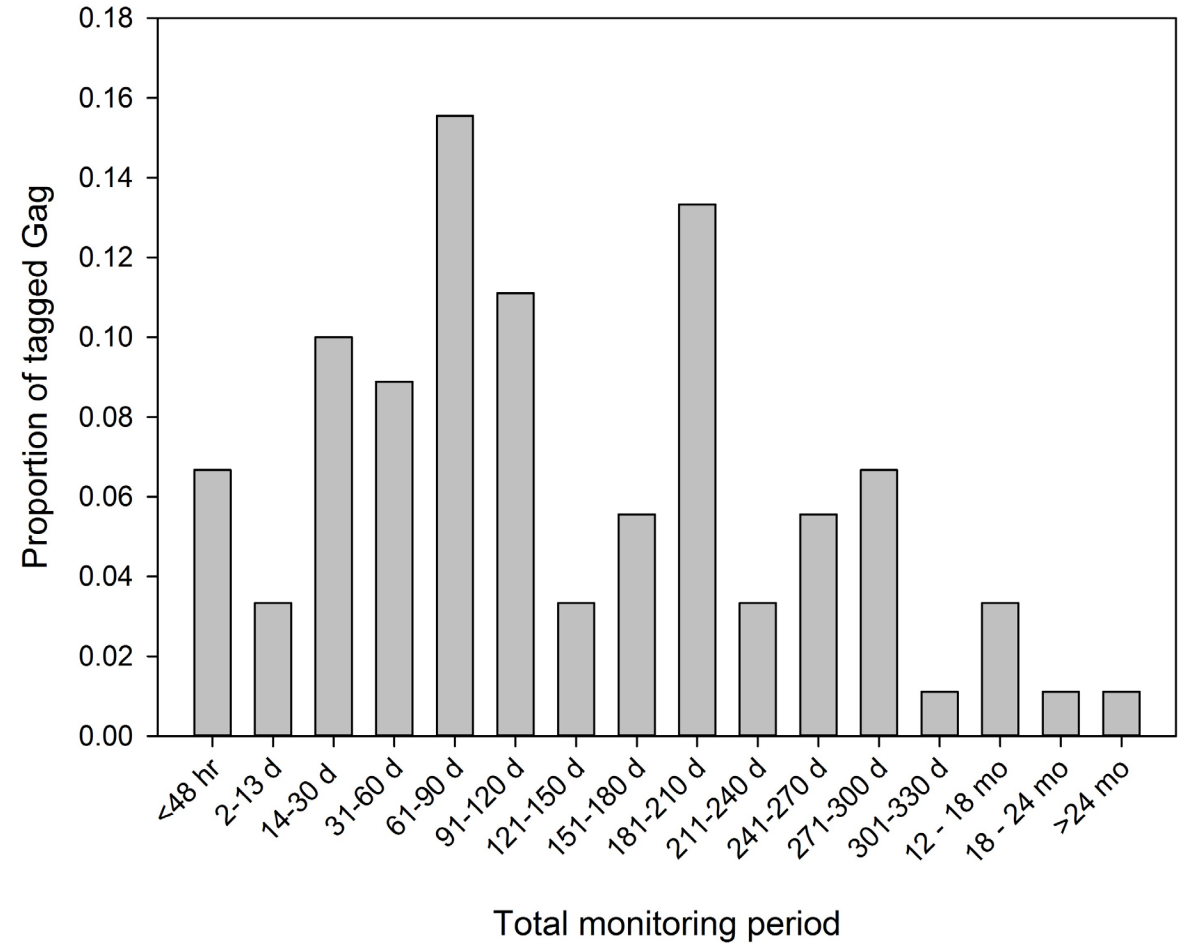
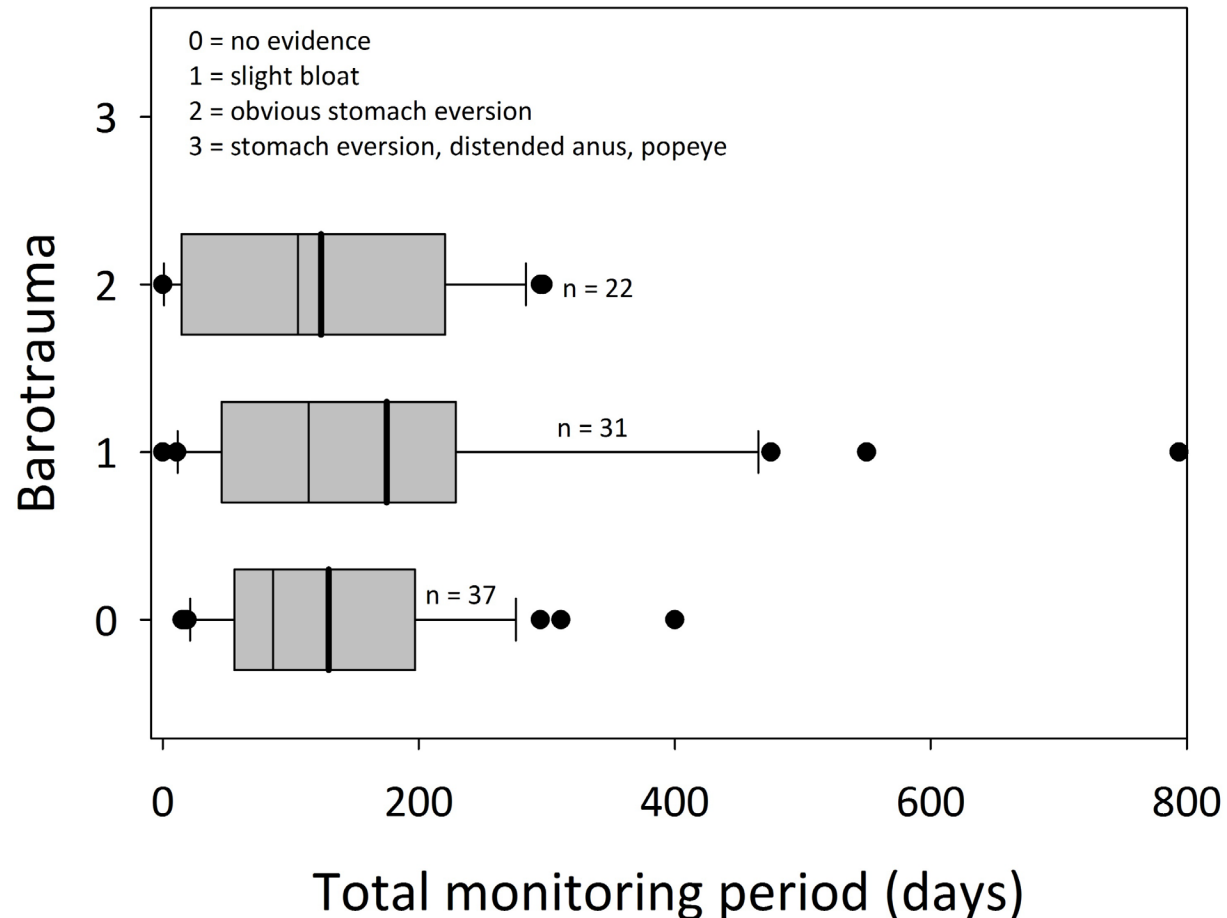
Effects of Recreational Catch and Release Angling on the Survival of Gag Grouper on the West Florida Shelf

- Barotrauma: increased with depth; no relationship to total length



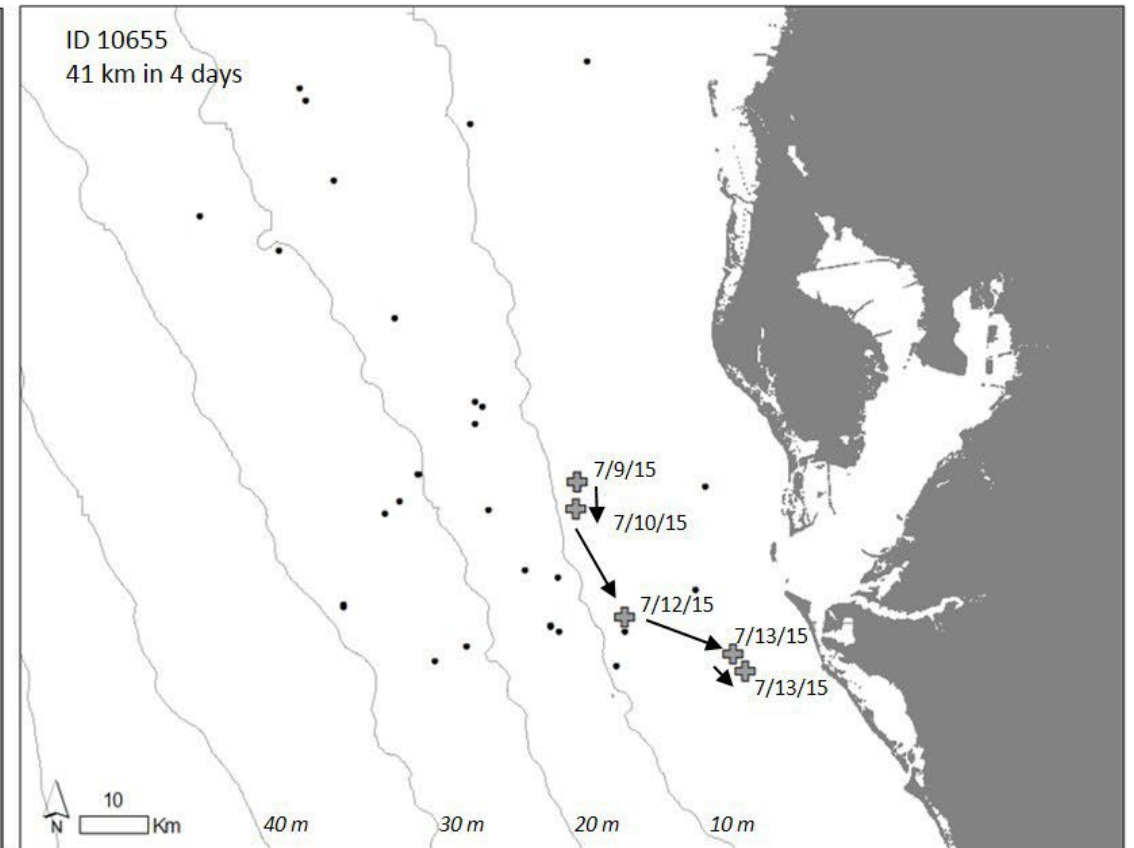
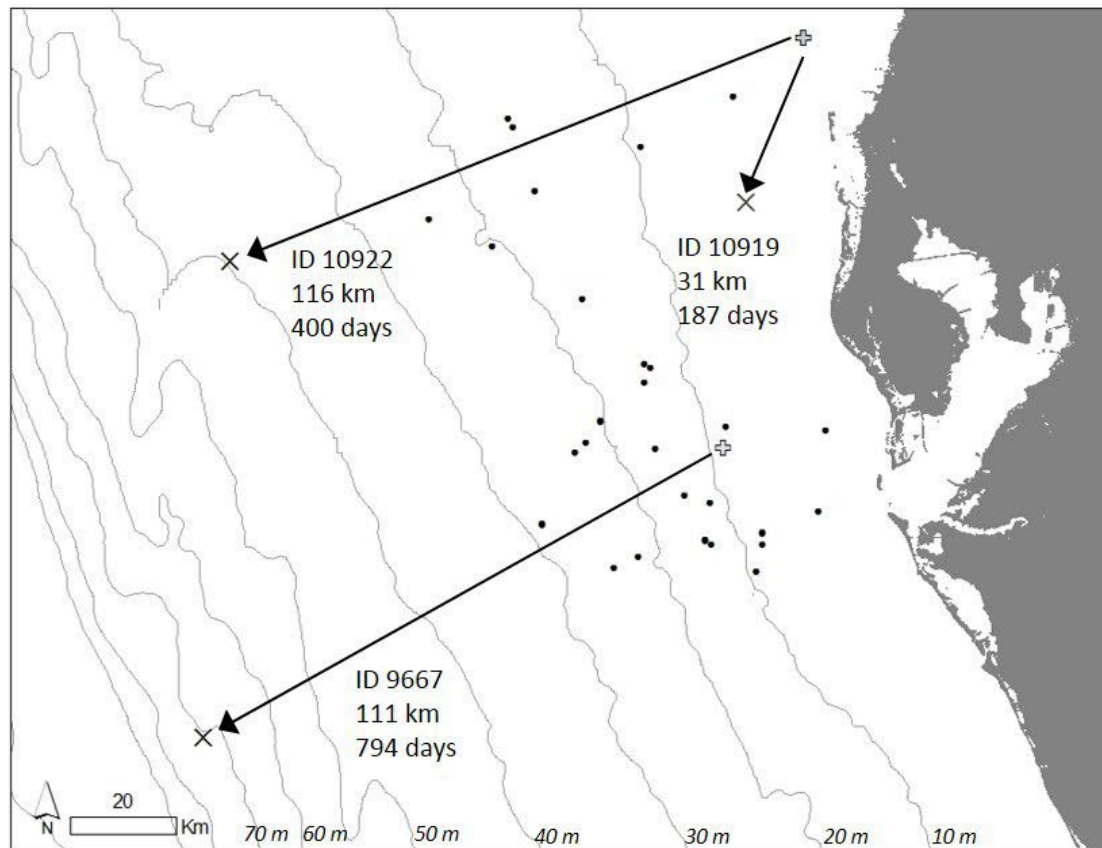
Effects of Recreational Catch and Release Angling on the Survival of Gag Grouper on the West Florida Shelf

- Barotrauma: over total monitoring period



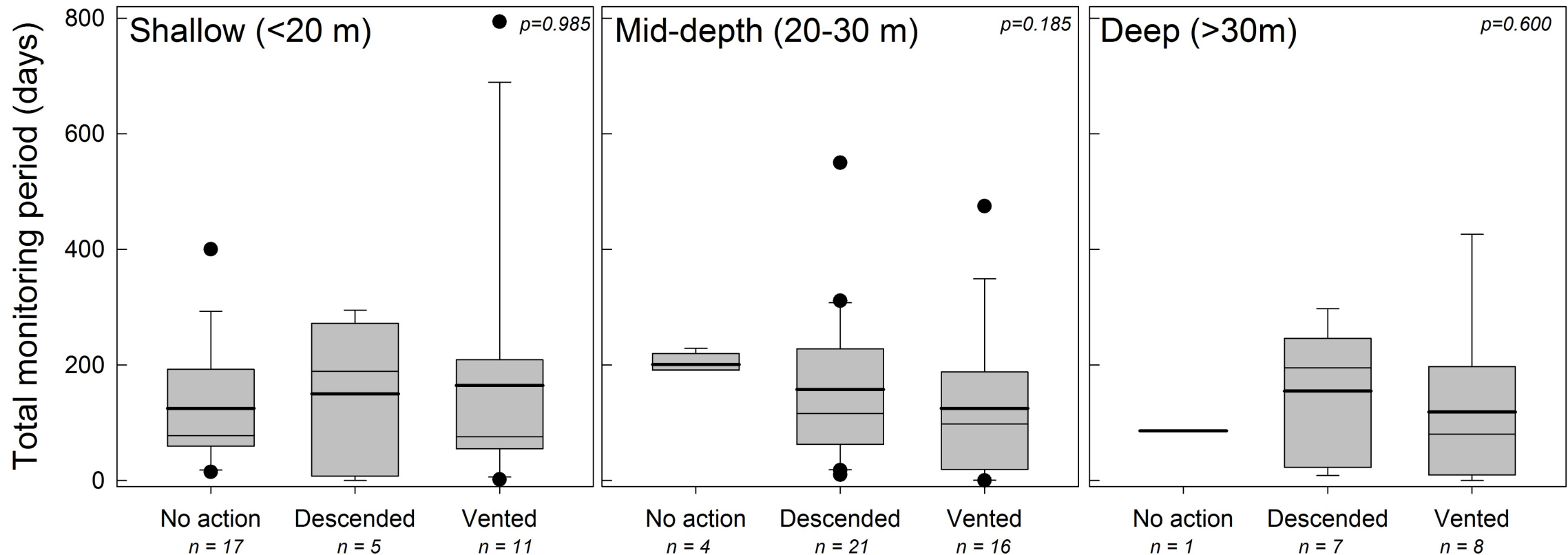
Effects of Recreational Catch and Release Angling on the Survival of Gag Grouper on the West Florida Shelf

- Site fidelity: Movement ranged from 0 km to 116 km
 - Most fish moved very little; Time at large ranged from 10 days to 794 days



Effects of Recreational Catch and Release Angling on the Survival of Gag Grouper on the West Florida Shelf

- Comparison of release methods by depth, by experienced anglers
- Little to no movement in first few hours



Effects of Recreational Catch and Release Angling on the Survival of Gag Grouper on the West Florida Shelf

- Acute mortality of gag after C&R was < 10% inside 40 m
- Recaptures support tag retention and acoustic data
- Site fidelity of weeks - months for tagged fish (size range 17 - 32 inches TL)
- Inside 40 m (100 ft), both release methods are effective for Gag, if done properly

An update on the West Florida Shelf ecosystem model and red tide mortality estimation

- Dr. David Chagaris, University of Florida

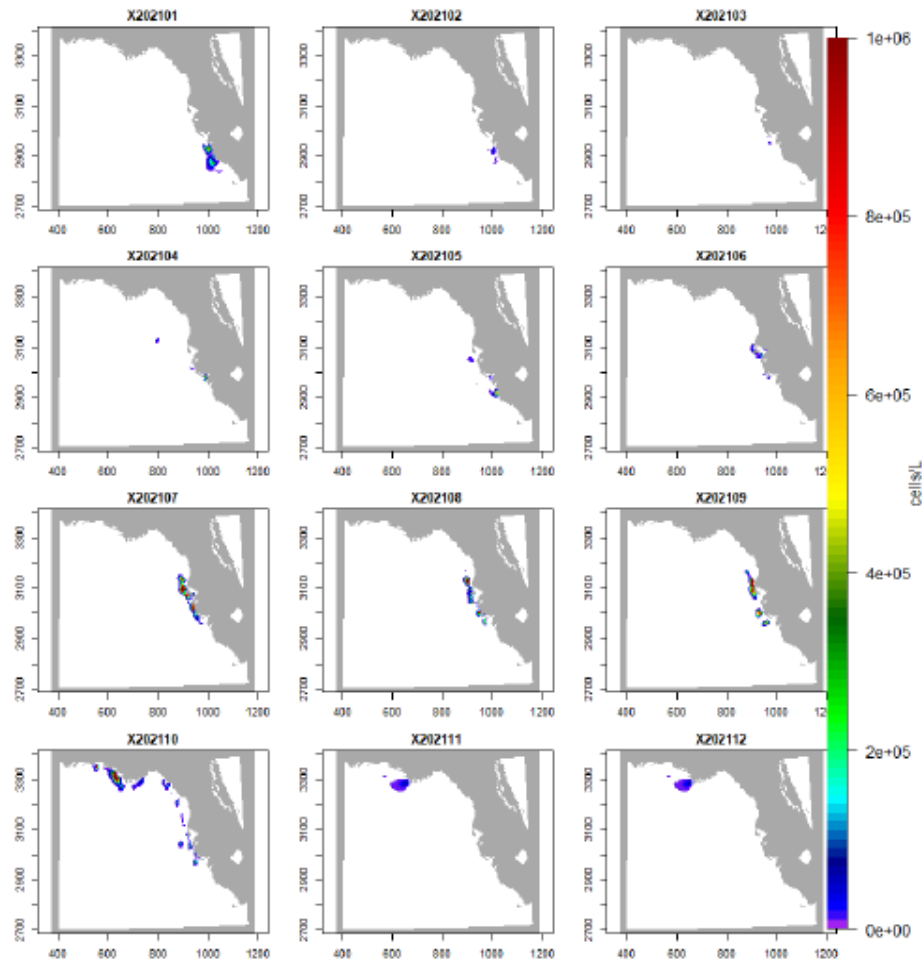
An update on the West Florida Shelf ecosystem model and red tide mortality estimation

West Florida Red Tide: 2021

Piney Point wastewater dump “fed” red tide bloom around Tampa Bay

The 2021 red tide ended in October

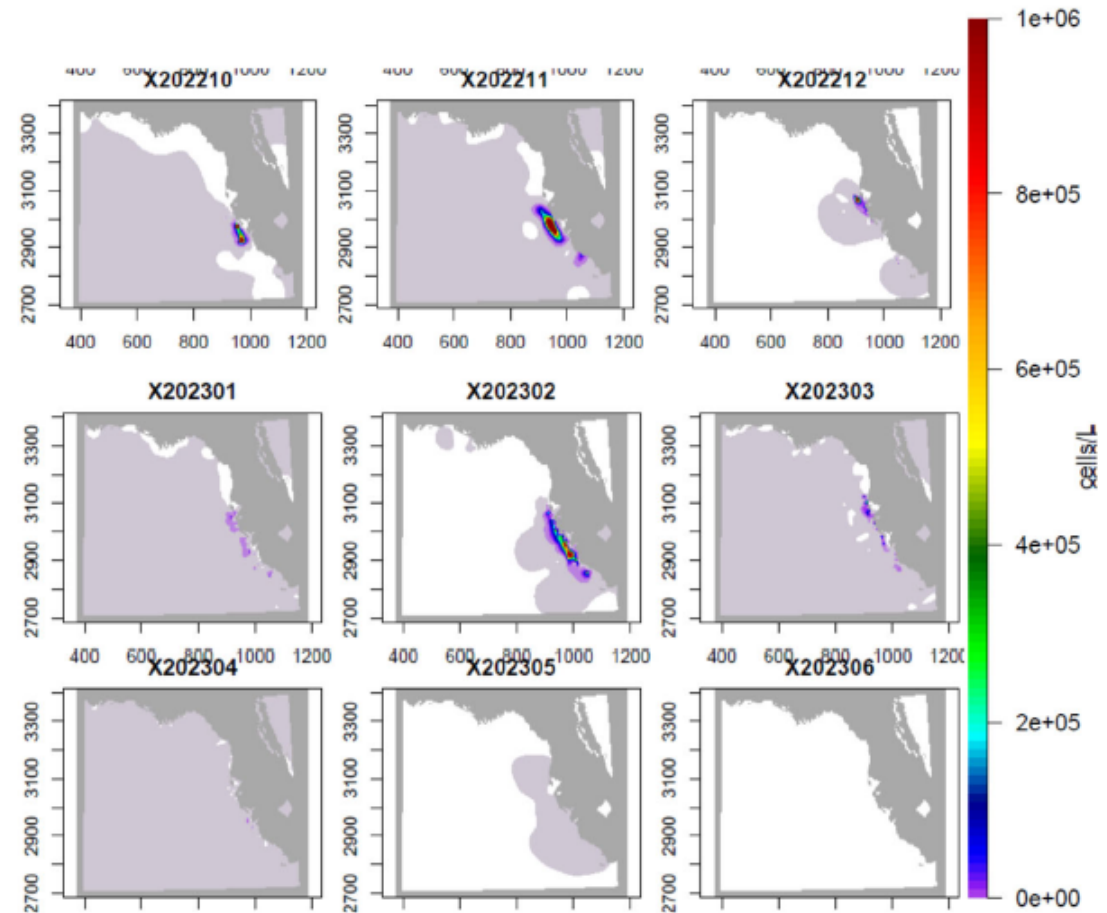
Red tide mortality index was last updated for November 2021 SSC meeting, with data through October 2021



An update on the West Florida Shelf ecosystem model and red tide mortality estimation

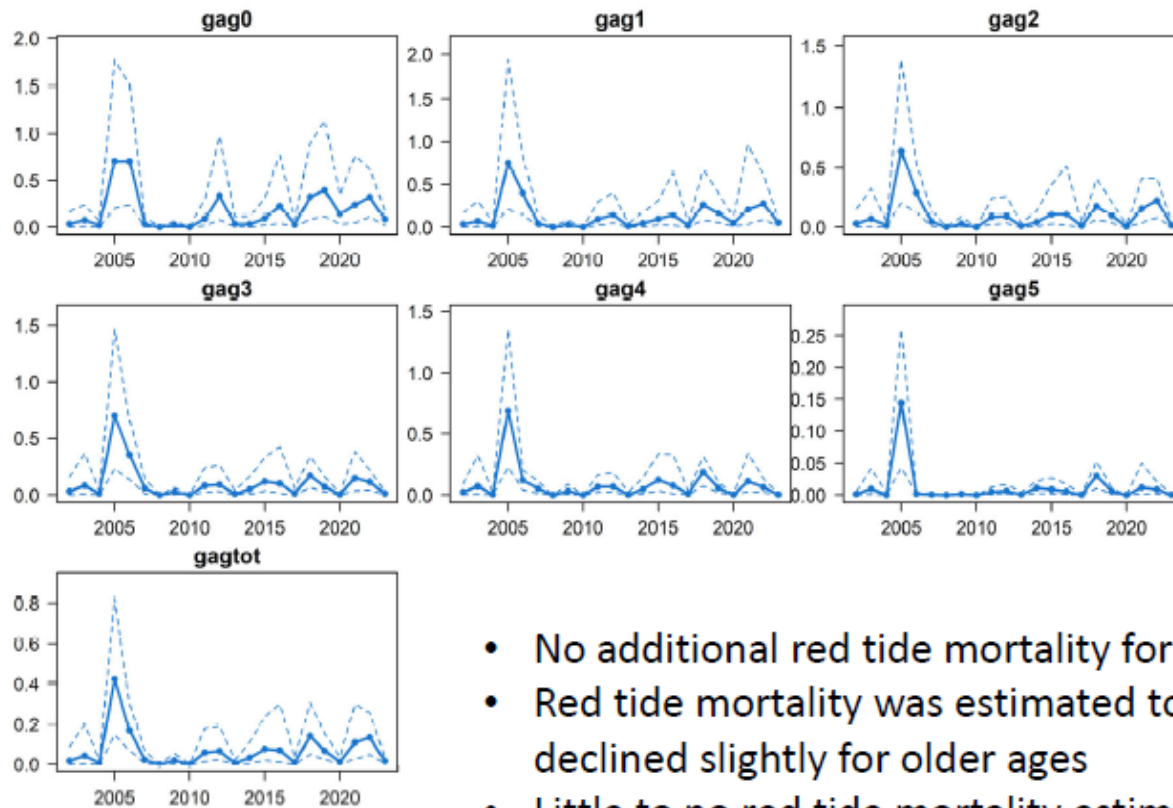
West Florida Red Tide: 2022-2023

- In 2022, a bloom formed off Lee County after Hurricane Ian
- Expanded along SW FL and became more severe in November
- Lingered through Feb-Mar 2023
- Restricted to nearshore areas of SW Florida
- No red tide since March 2023



An update on the West Florida Shelf ecosystem model and red tide mortality estimation

Red Tide Mortality on Gag Grouper Jan 2002- June 2023



Year	age-0 mean	combined ages mean
2005	0.707	0.424
2006	0.706	0.168
2012	0.338	0.067
2016	0.228	0.070
2018	0.328	0.140
2019	0.395	0.068
2020	0.141	0.013
2021	0.242	0.109
2022	0.324	0.133
to June 2023	0.084	0.017

- No additional red tide mortality for 2021 after the November SSC meeting
- Red tide mortality was estimated to be higher in 2022 than 2021 ages 0-2, but declined slightly for older ages
- Little to no red tide mortality estimated for 2023

Gag Discard Mortality

- Ms. Beverly Sauls, Florida Fish and Wildlife Conservation Commission

Gag Discard Mortality

- State Reef Fish Survey
 - Private boat effort and catch
 - Implemented in Gulf in 2015
 - Also collects information on:
 - Artificial reef use
 - Areas fished
 - Release methods (new in 2022)
- For-Hire At-Sea Observer Program
 - Fishery observers ride along on headboat and charter trips
 - Implemented in Gulf in 2009
 - Provides:
 - Species and size composition of discards
 - Capture, handling and release methods
 - Release condition
 - Fate of discards



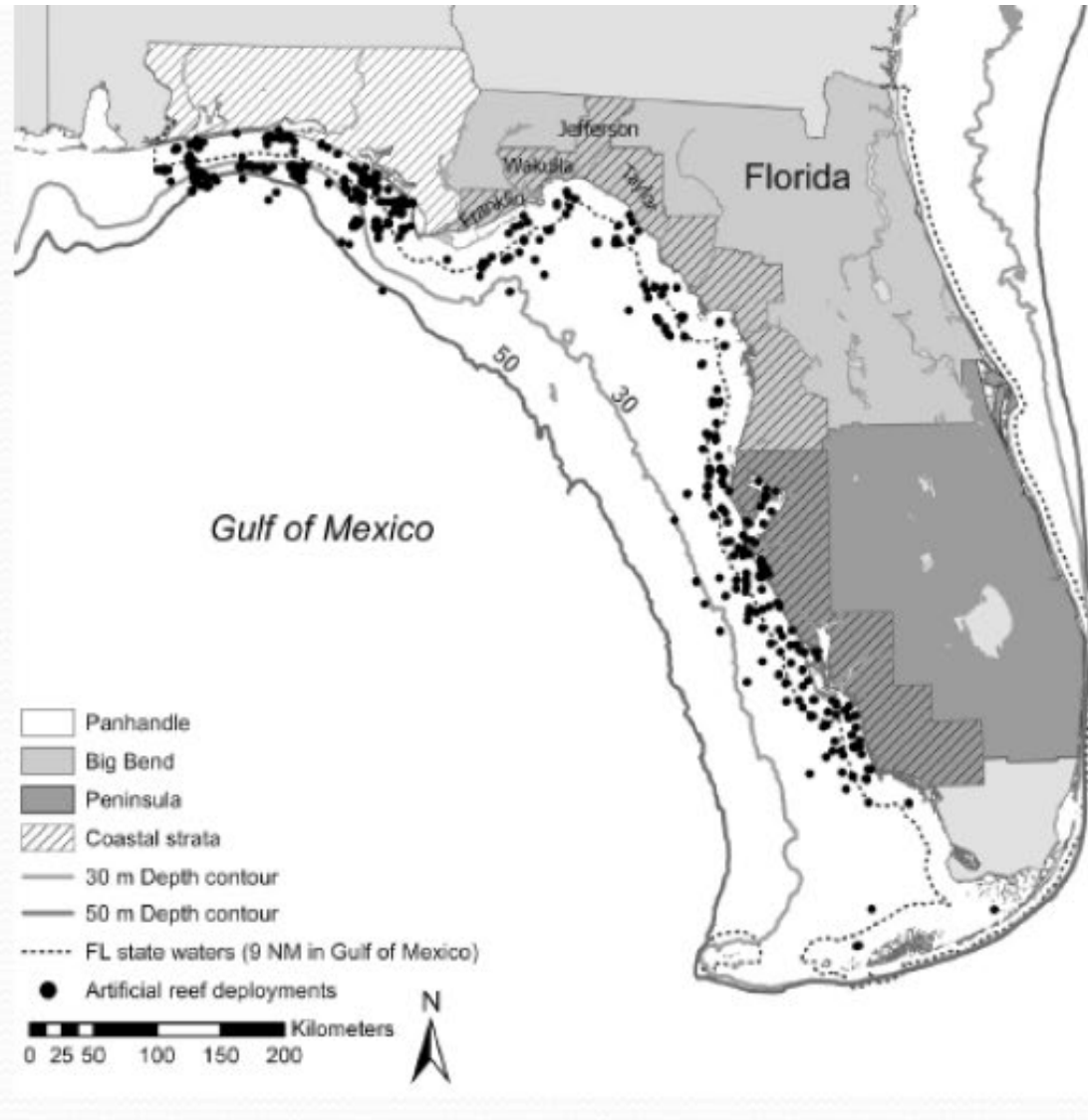
Gag Discard Mortality

- Venting tool and/or fish descender device
 - Required in Gulf EEZ in 2022
 - Required in FL in 2023
- Return 'Em Right, ongoing since 2022
 - Training and free gear distributed to 11,349 offshore anglers in first year
 - 41% of private boat anglers have a descender device on board (2022)
 - From state reef fish surveys in FL, AL, MS
 - Expanded for-hire observer coverage
 - Methods adopted in AL and MS
 - Supplemented on Gulf coast of FL
 - Continue monitoring impacts over time
- Data inputs for SEDARs
 - Magnitude, size composition of discards
 - Where, when and how fish are caught and released
 - Fate of discarded fish



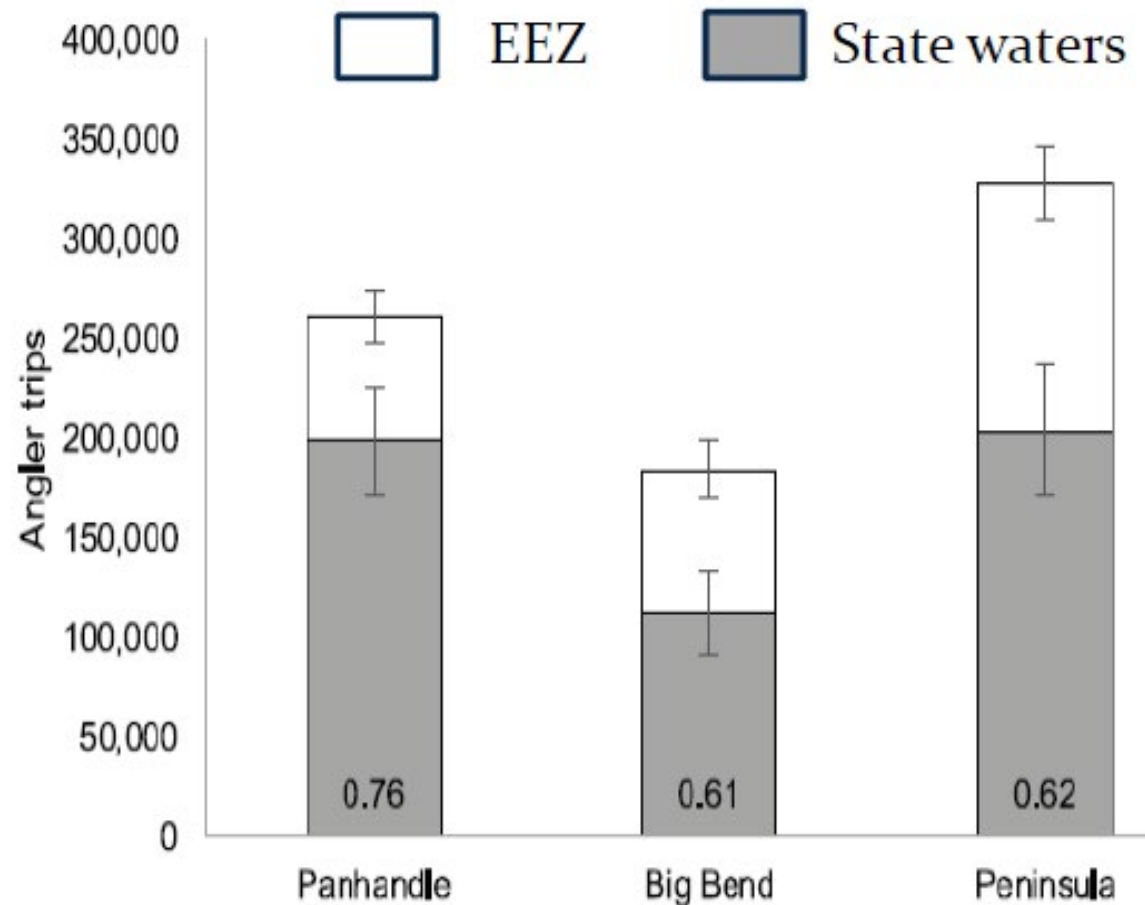
Gag Discard Mortality

- Anglers target reef fishes on natural hard-bottom and artificial reefs
 - Black dots show artificial reefs deployed by FWC as of 2018
- Distance to deep water varies regionally
 - 30 and 50m depth contours
- FL state territorial seas boundary 10 statute miles from shore
 - Dotted line



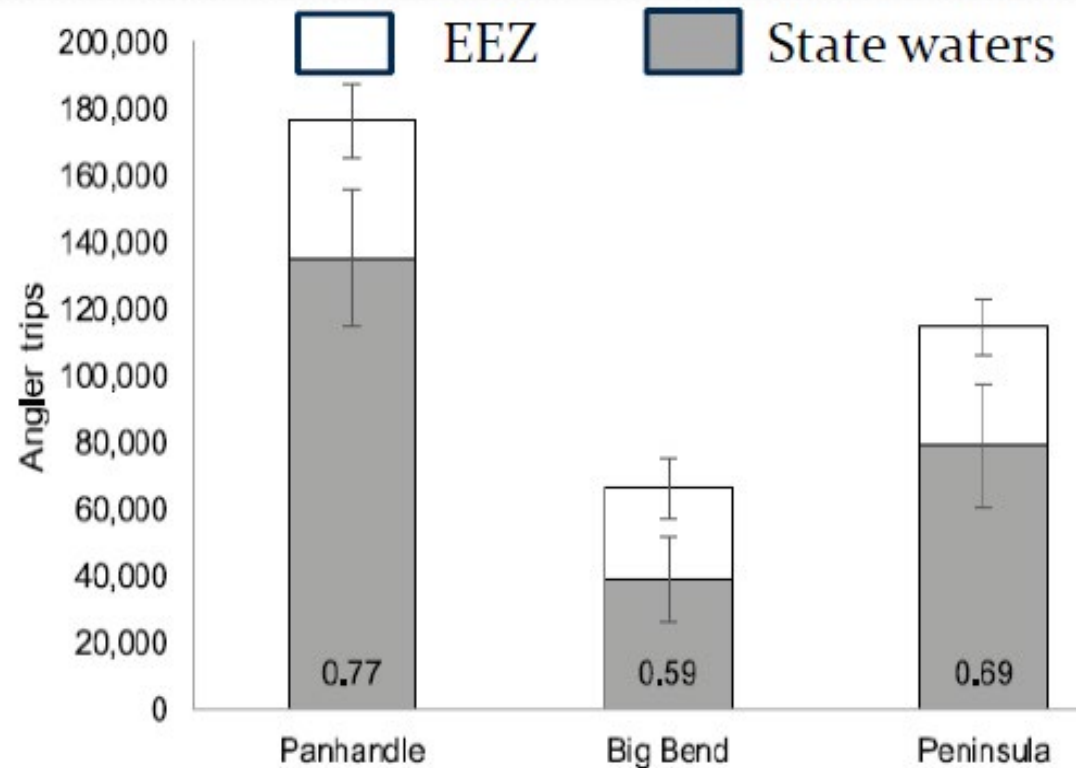
Gag Discard Mortality

- Highest effort off the western Peninsula.
 - Large population
 - Less seasonal
- Majority of trips fish in state waters
 - Panhandle 76%
 - Big Bend 61%
 - Peninsula 62%



Gag Discard Mortality

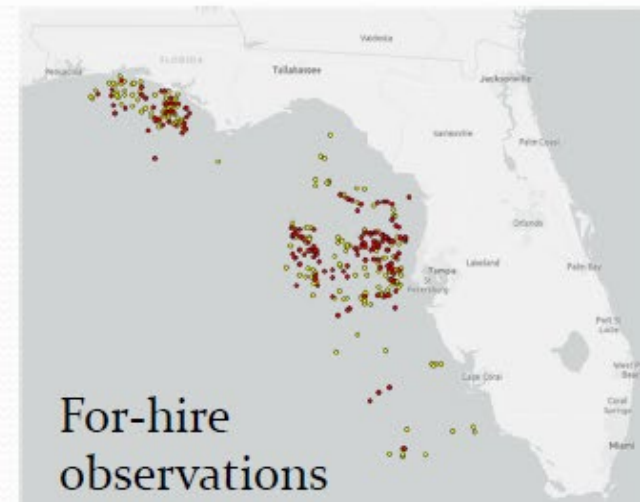
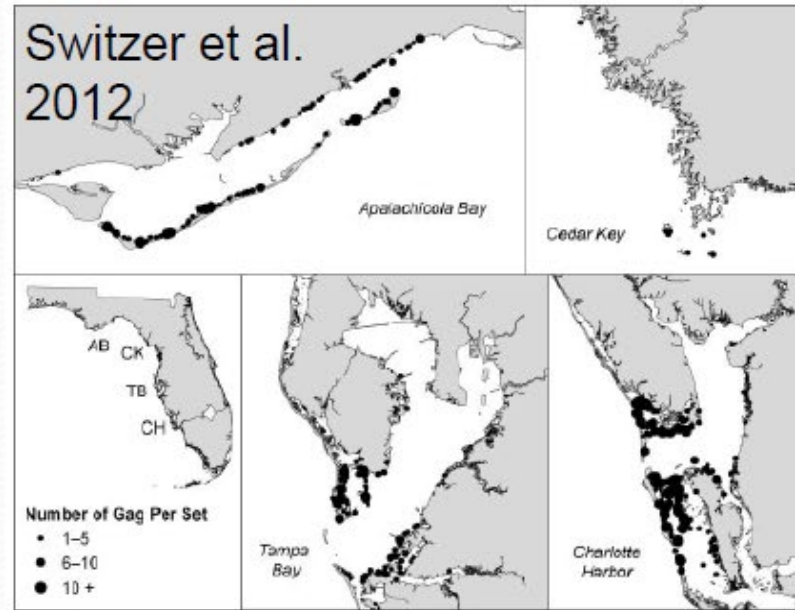
- 46% of reef fish trips utilized artificial reefs.
- 50% of all artificial reef trips were in the Panhandle.
- Majority of artificial reef trips took place in State waters
 - Panhandle 77%
 - Big Bend 59%
 - Peninsula 69%



Gag Discard Mortality

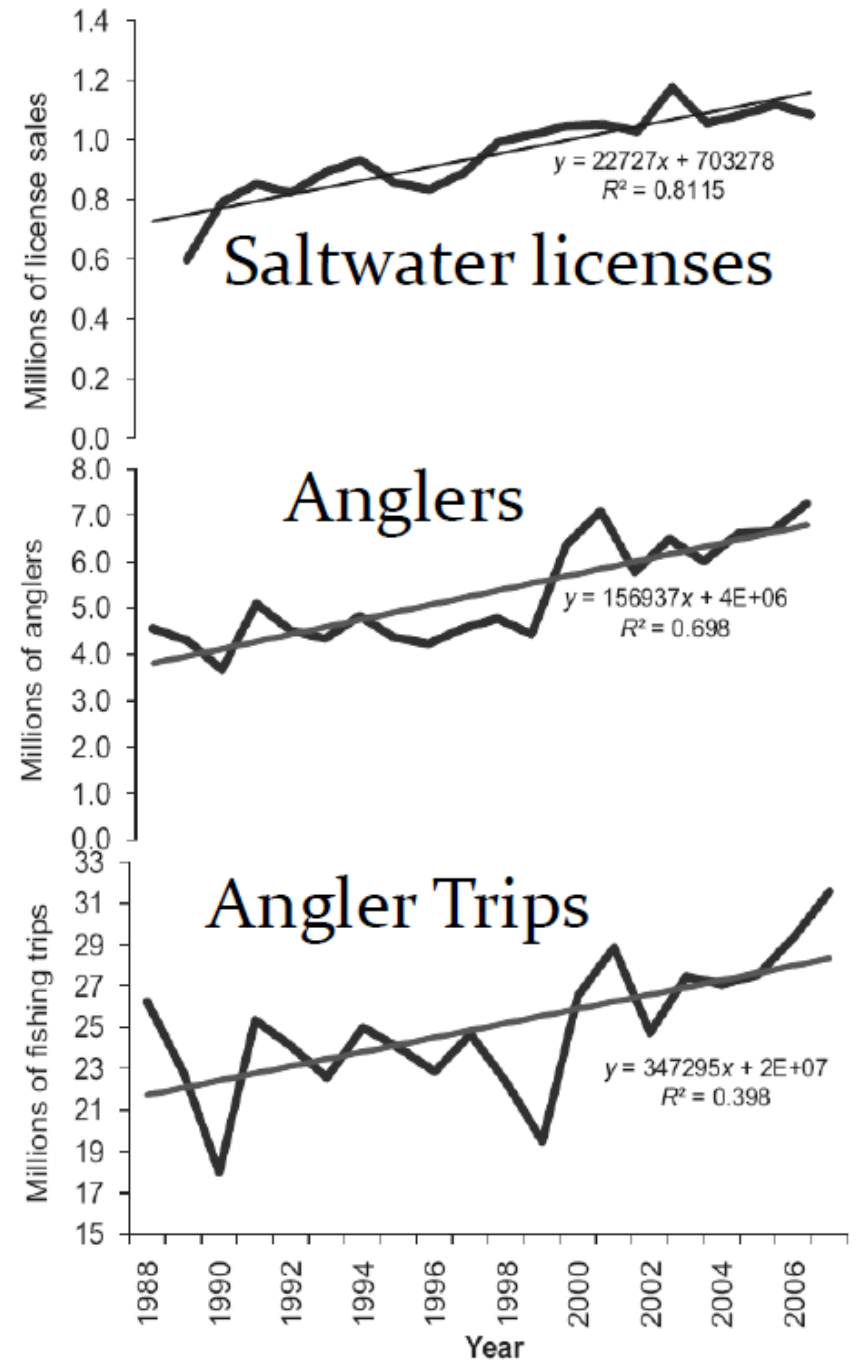
Gag are vulnerable to fishing pressure throughout their life history.

- Juveniles recruit to high salinity seagrass habitat in eastern Gulf
 - Recreational catch-and-release
- Sub-adults and females associate with nearshore natural hard-bottom habitat
 - Recreationally targeted
- Males and spawning females found farther offshore
 - Commercially and recreationally targeted



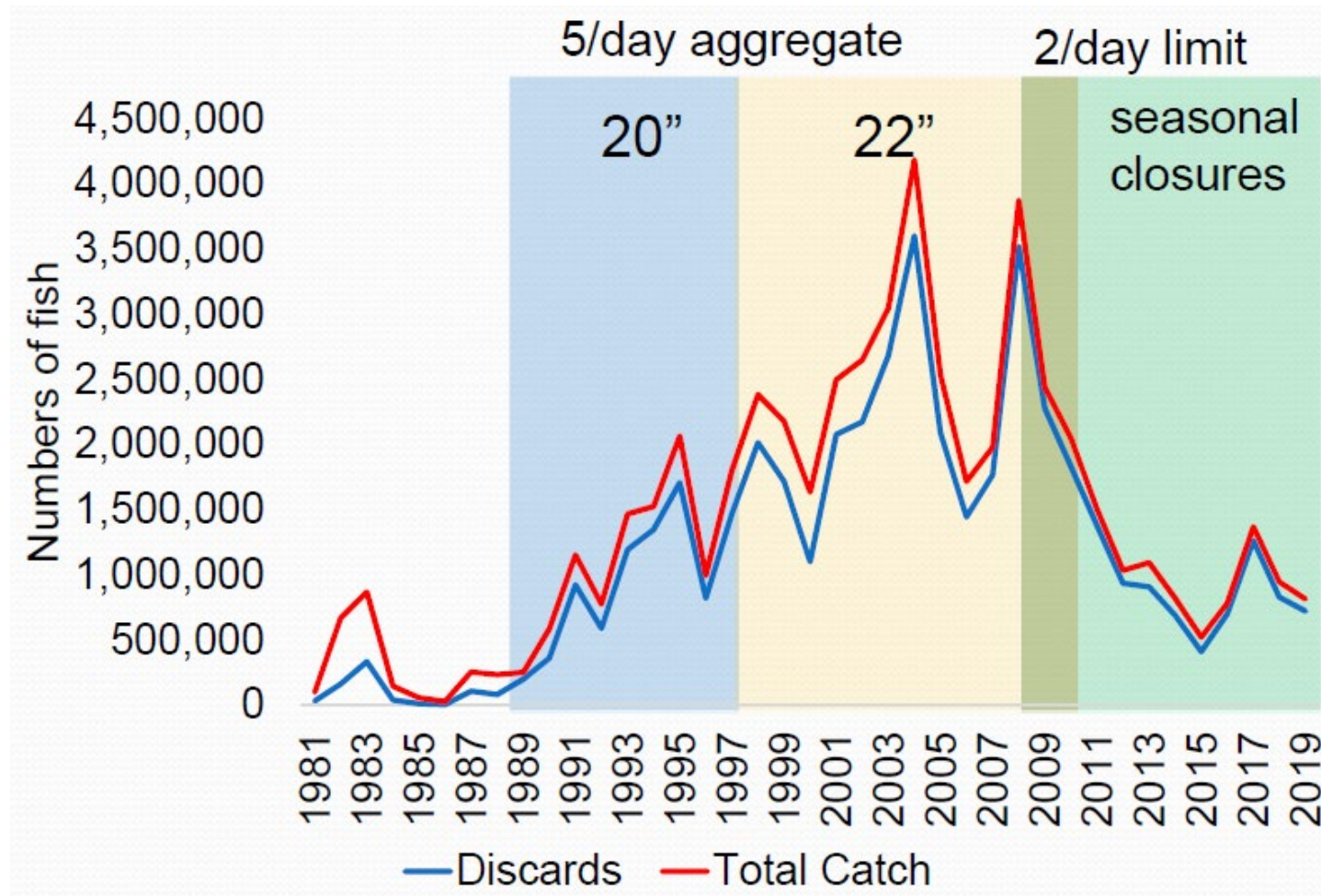
Gag Discard Mortality

- Rec effort increasing over time
- Hanson and Sauls 2011



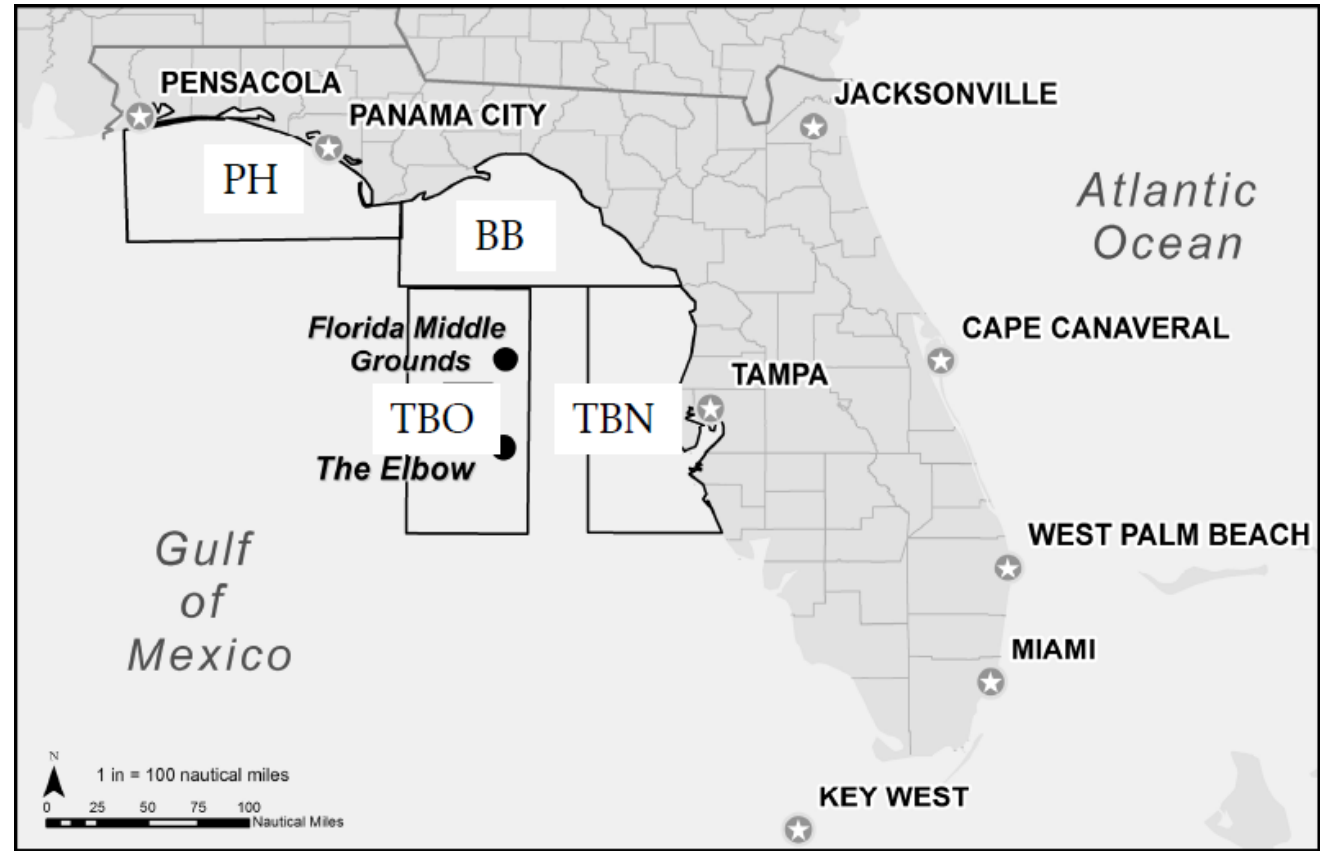
Gag Discard Mortality

- Discards a main component of rec catch, per SRFs (SEDAR 72 2022)



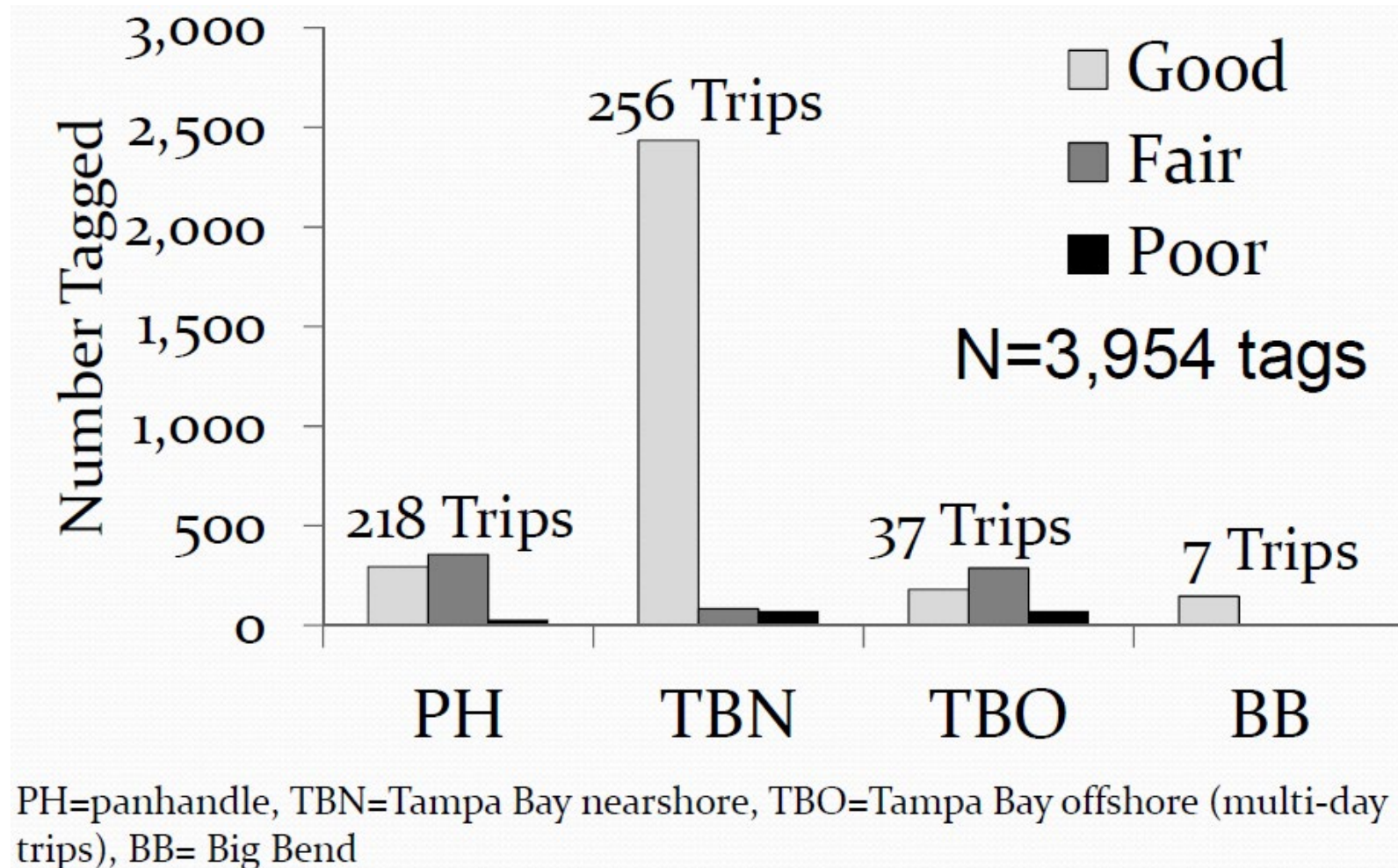
Gag Discard Mortality

- Fishery-dependent discard mortality study:
 - June 2009 – Dec 2012, WFL
 - > 160 for-hire vessels selected year-round to carry FWC observer
 - Observe fish as they are caught
 - Discards marked with dart tags
 - FWC tag return hotline with reward for returns



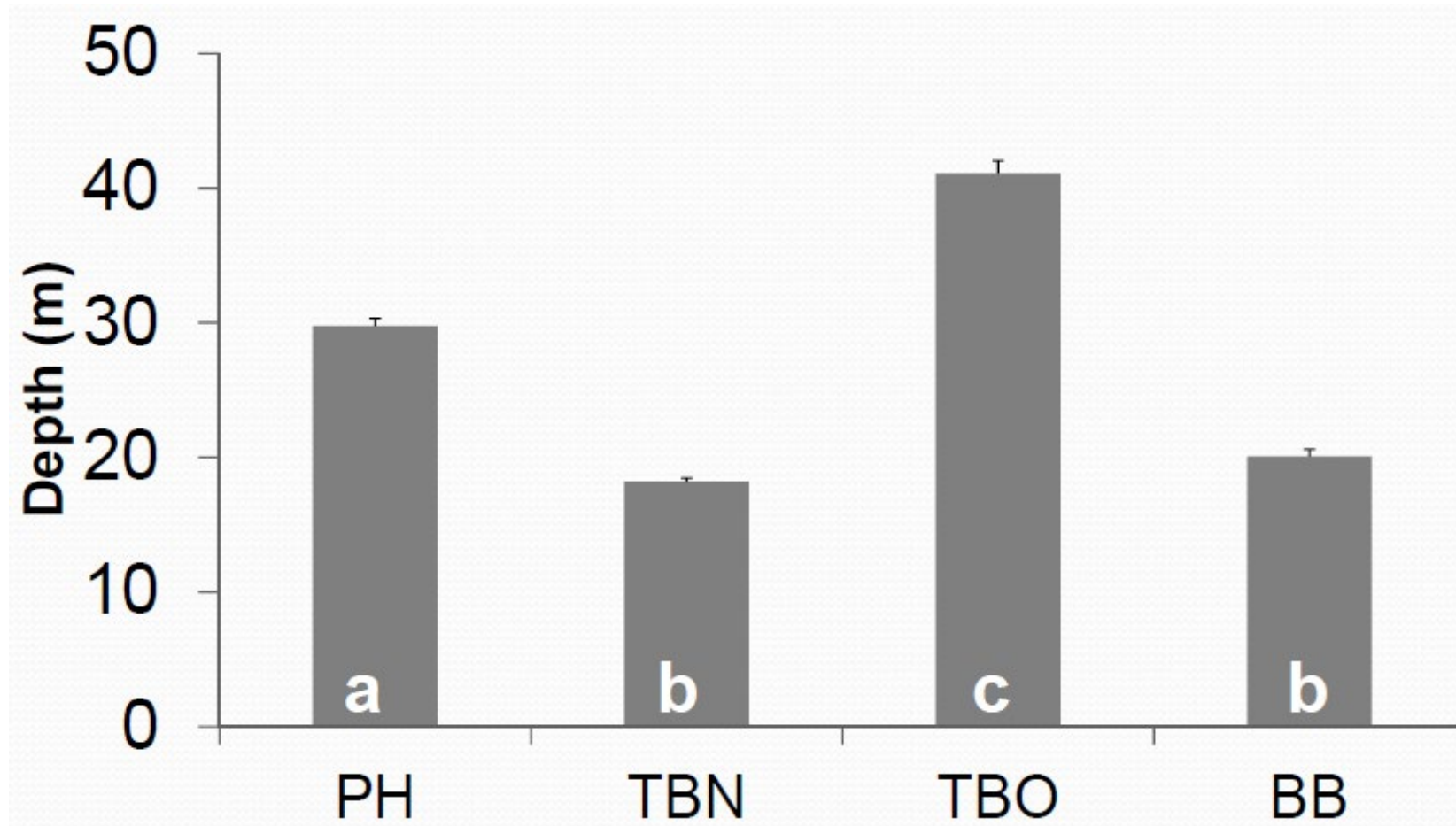
Gag Discard Mortality

- Observed discards:



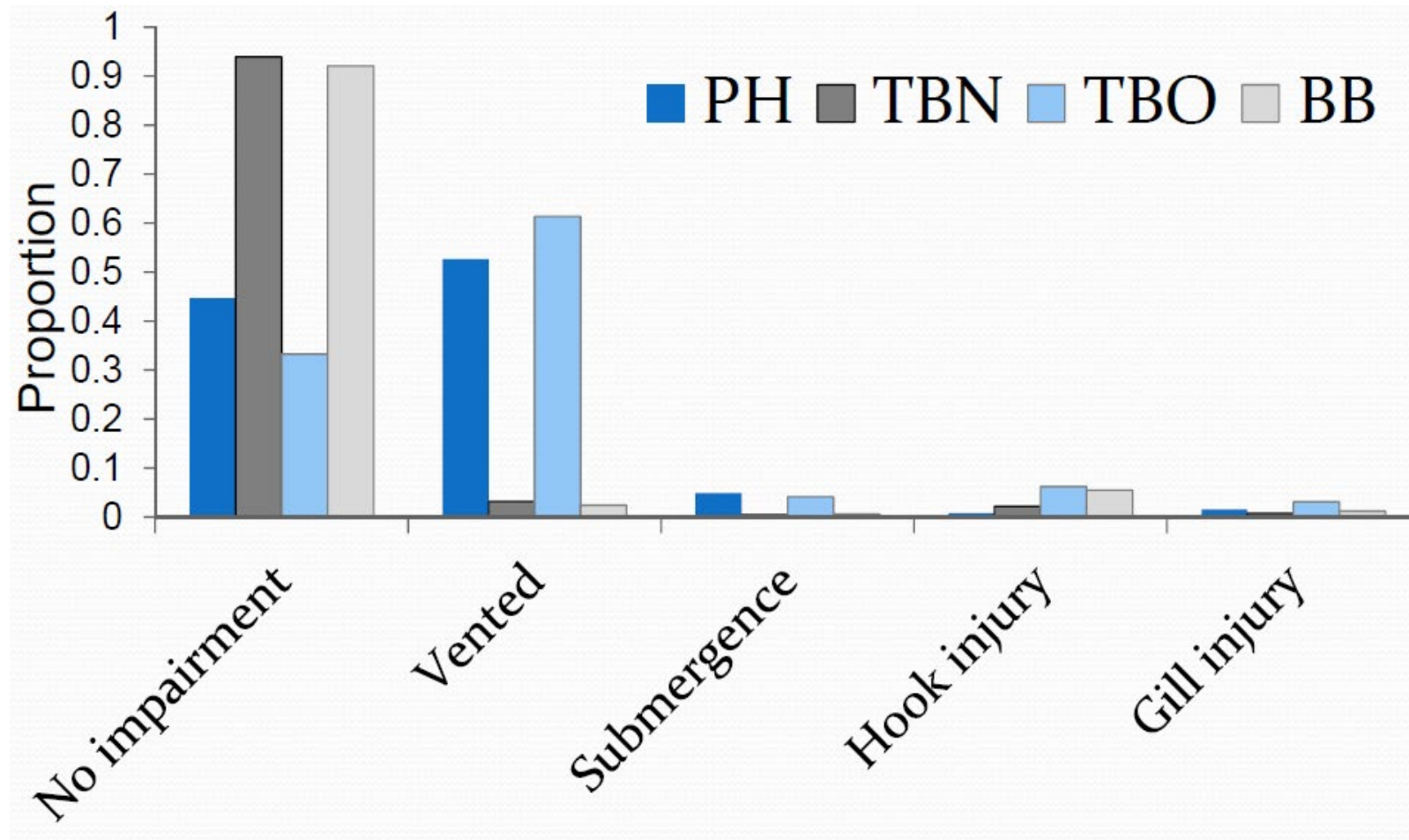
Gag Discard Mortality

- Mean depth of capture:



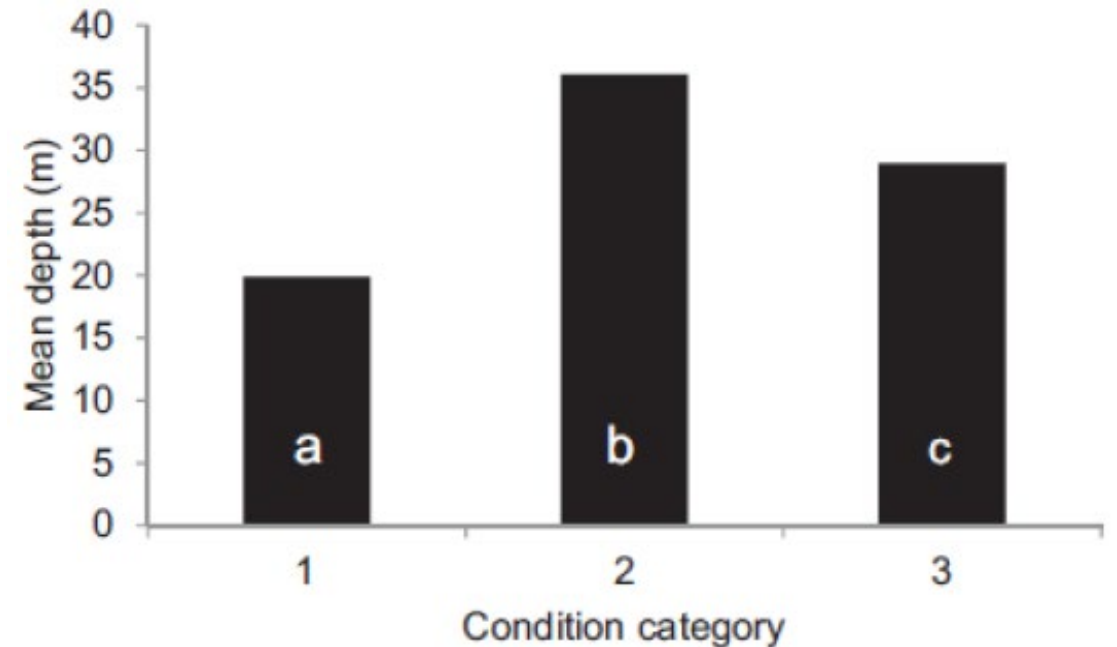
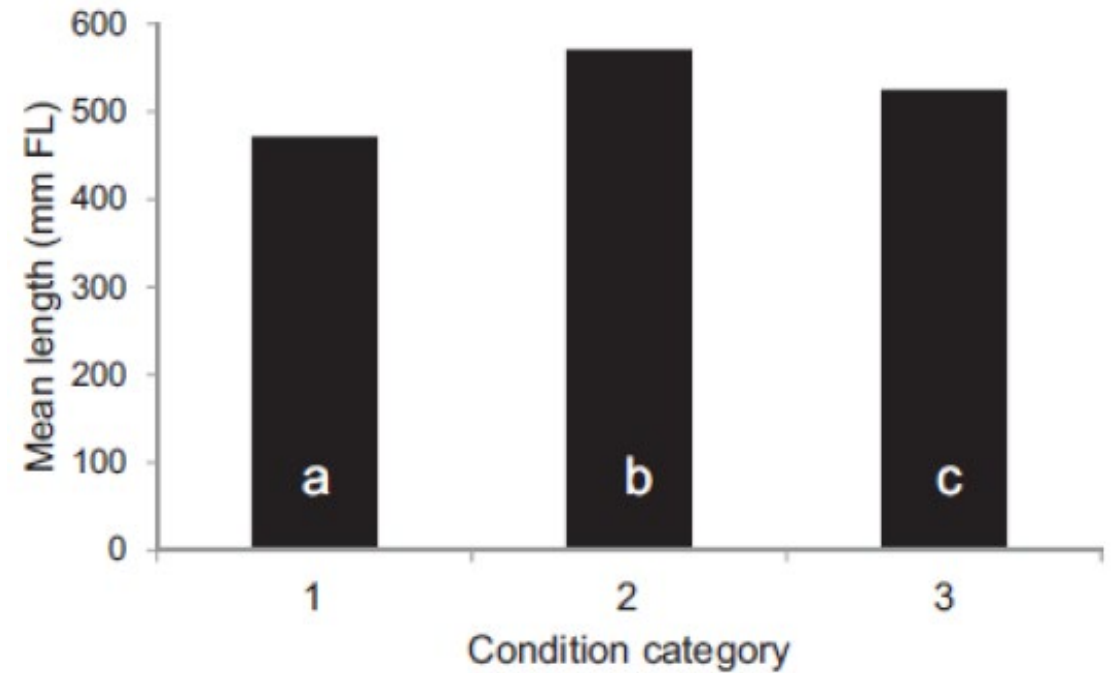
Gag Discard Mortality

- Discard impairment:



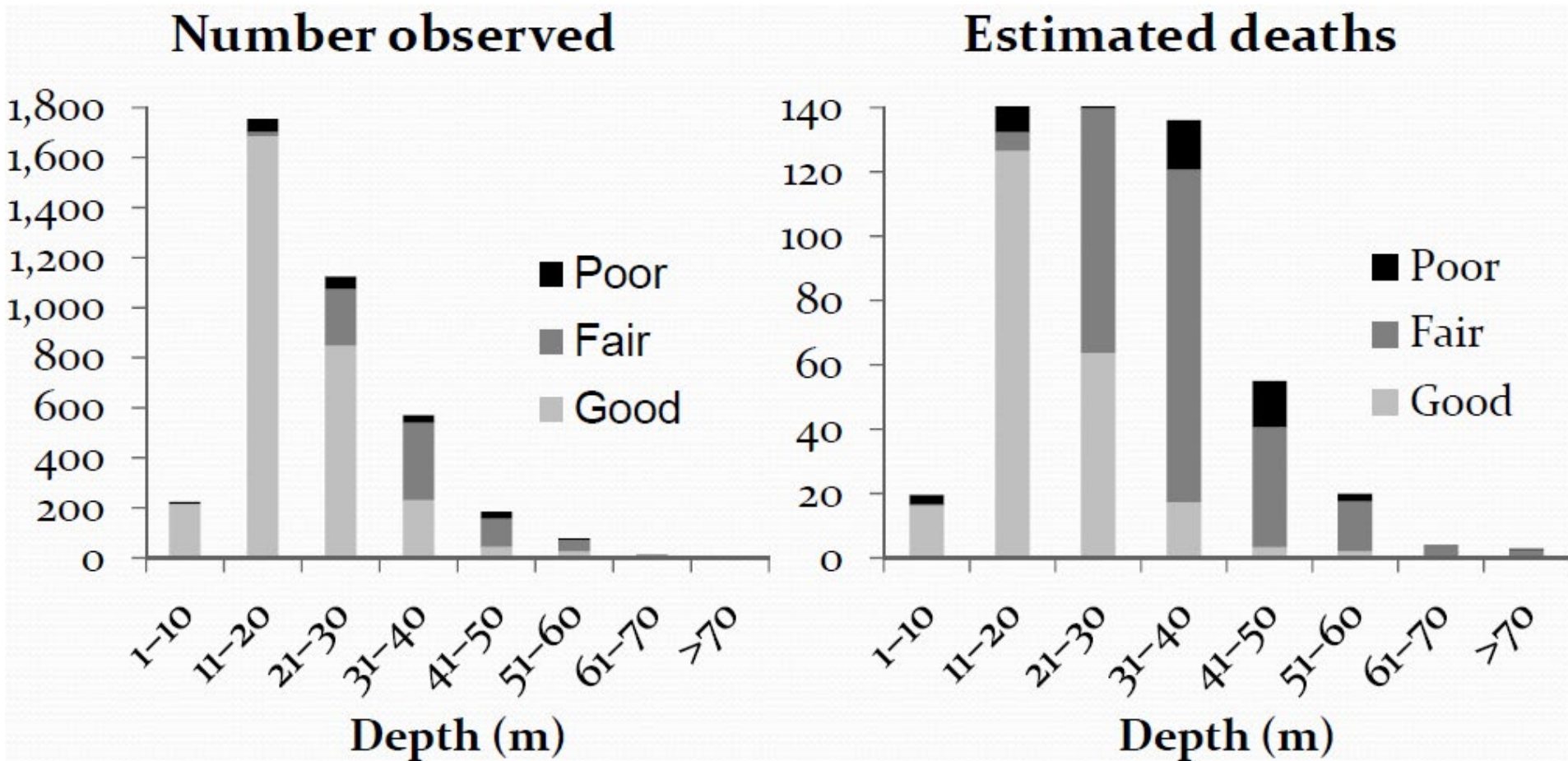
Gag Discard Mortality

- Gag released in good condition were generally smaller and caught nearer to shore



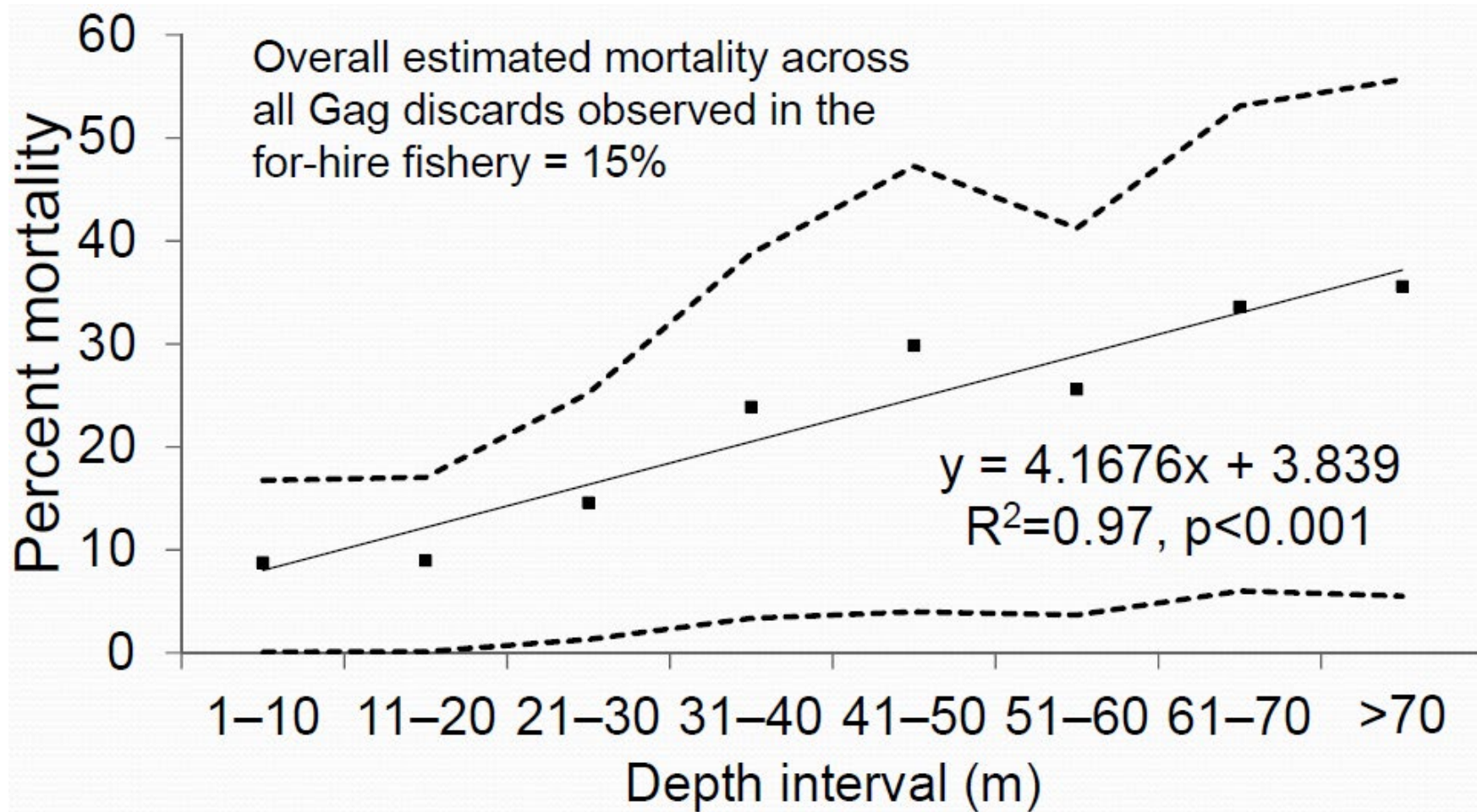
Gag Discard Mortality

- Depth-dependent discard mortality:



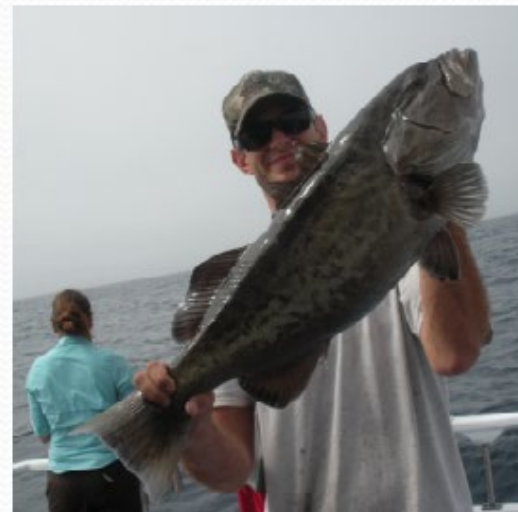
Gag Discard Mortality

- Depth-dependent discard mortality:



Gag Discard Mortality - conclusions

- Majority of gags:
 - Caught in <30m
 - Submerged without venting
 - Released in good condition
- For gags not released in good condition:
 - Caught in deeper depths
 - More frequently vented
- Discard mortality increased significantly with depth
 - Overall discard mortality lower than previous estimate from SEDAR 10



Gag Discard Mortality – future work

- SRFS and for-hire at-sea observer programs granted recurring state funding in 2020
- Continued long-term monitoring allows us to:
 - Evaluate impacts of changes in fishing regulations
 - Increased harvest restrictions on gag
 - Longer red snapper seasons in state and federal waters
 - Increased use of descender devices
 - Provide additional data and analyses for assessments
 - Potentially update mark-recapture model to evaluate conservation benefits of increased descender device use
 - Continue researching differences between SRFS and MRIP and understand sources of bias

SSC Recommendations: