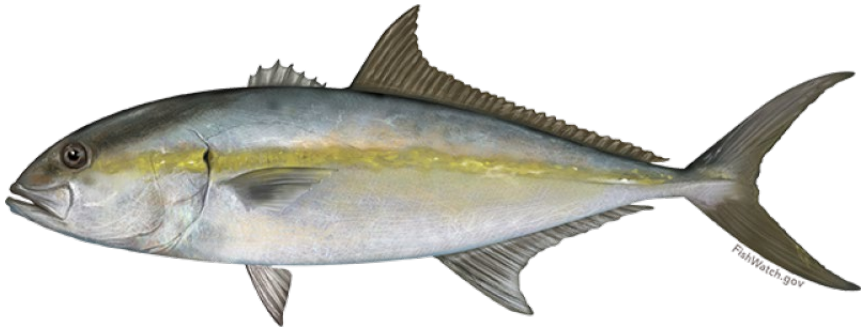


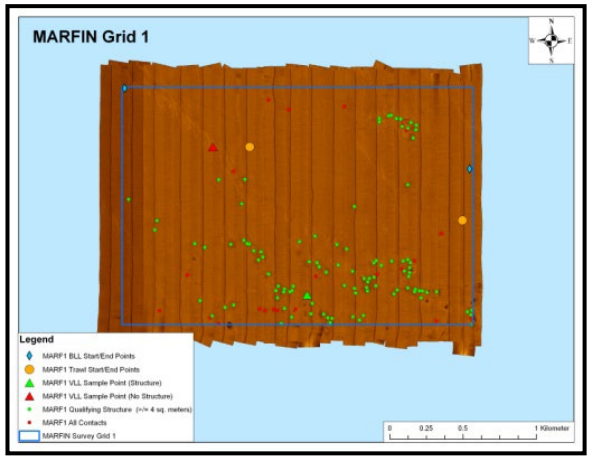
Greater Amberjack Abundance, Distribution, and Movement in U.S. Waters in the South Atlantic and Gulf of Mexico

S. Powers, M. Albins, K. Boswell, J. Buckel, M. Catalano, G. Chiu, M. Dance, M. Drymon, J. Hoenig, S. Midway, S. Murawski, N. Phillips, J. Rooker, E. Saillant, S. Scyphers, L. Stokes, G. Stunz, T. Switzer, D. Wells

Background: motivation for the study

- Reef fish management in SE US has been contentious
- Disagreements regarding stock status and catch levels
- Caused public to question scientific basis for management decisions
- In response, US Congress funded three large-scale studies to…
  - Fill critical knowledge gaps
  - Use latest technologies to estimate absolute abundance (independent of current age-structured stock assessment approach)
- These included:
  - Red Snapper (Gulf of America, Stunz et al)
  - Red Snapper (South Atlantic, Patterson et al)
  - Greater Amberjack (Gulf and South Atlantic US, Powers et al)
    - Current project
    - Began in 2021

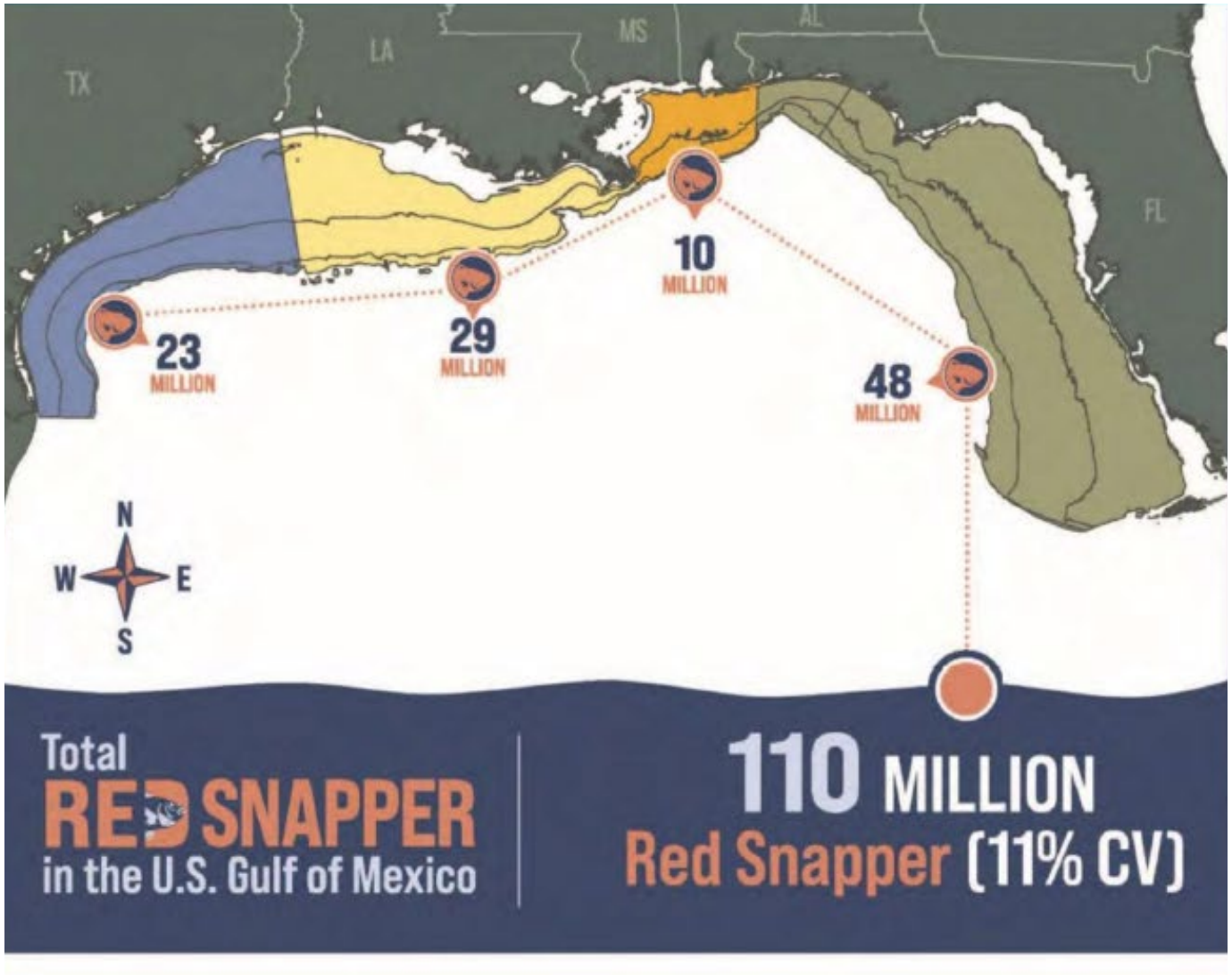
Why an absolute abundance estimate?

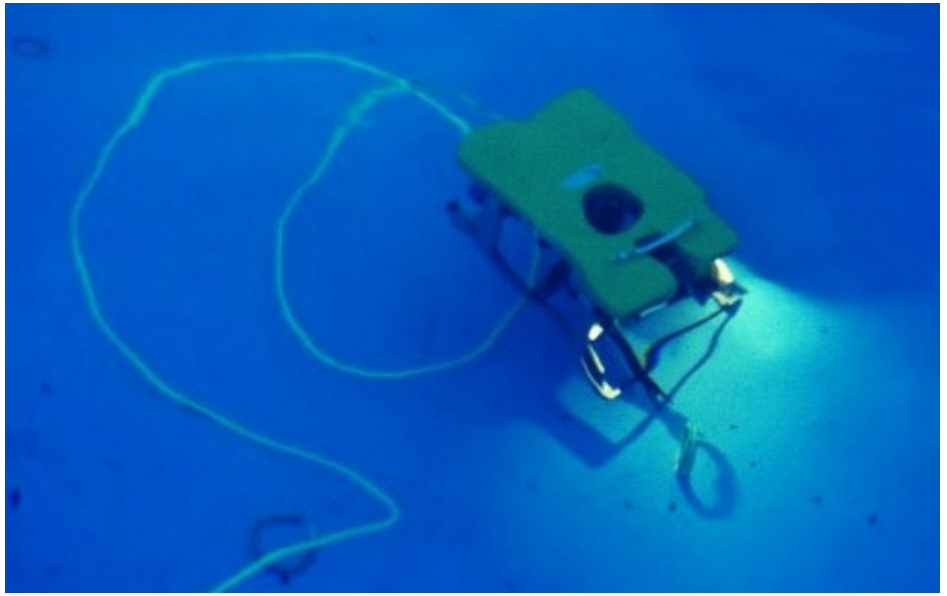




- Most fisheries are managed based on recorded catch. In fact, most stock assessment models are based on the assumptions that you know catch with great certainty and you know the length (or preferable age composition of the catch)
- An alternative is to have sufficient scientific surveys to construct a fisheries-independent estimate of abundance
- Most data rich assessments have some of both, although catch information still dominates

Great Red Snapper Count (GRSC)





What we learned from GRSC





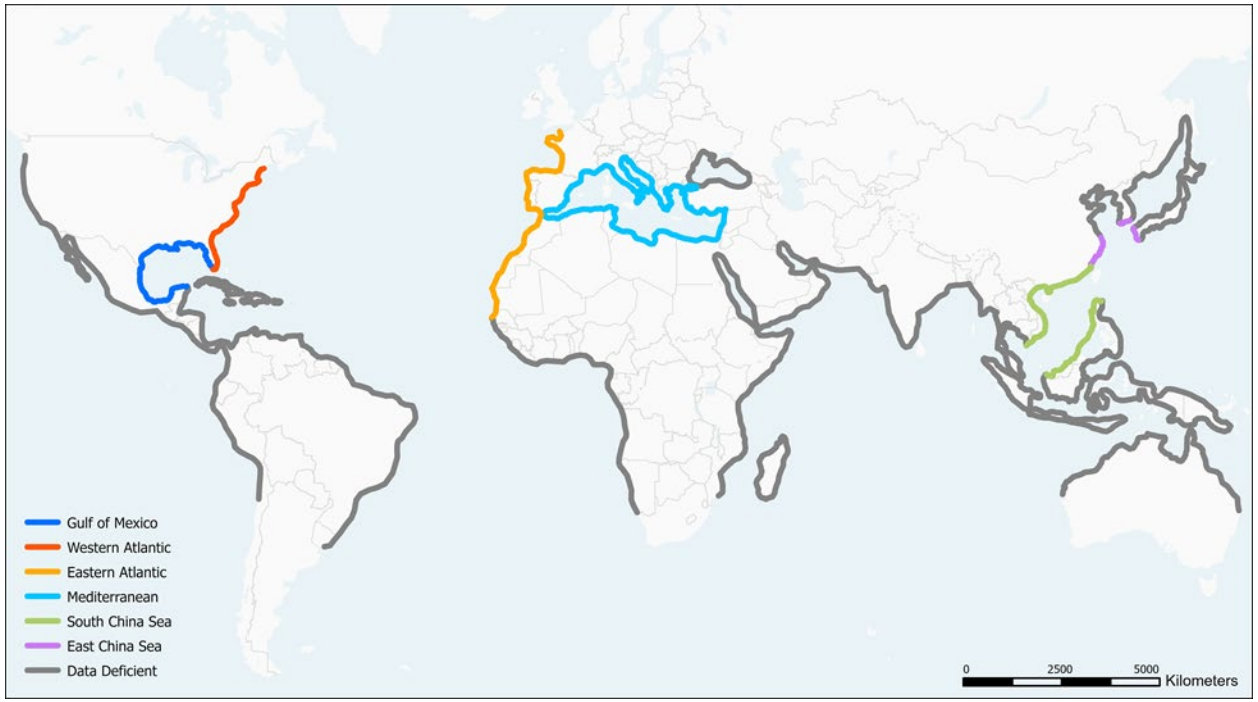
- 2.5 times as many age 2+ red snapper in Gulf then current NMFS stock assessment predicts
- Why?
  - The GRSC estimated total population not just what was exploited by the fishery
  - How can we use it for management advice?
- What have we learned in GRSC that can inform Greater Amberjack Count
  - Complete engagement with statistics team throughout process
  - Understand gear performance and efficiency
  - Greater involvement of NMFS with the goal of reconciling stock assessments
  - Better habitat maps

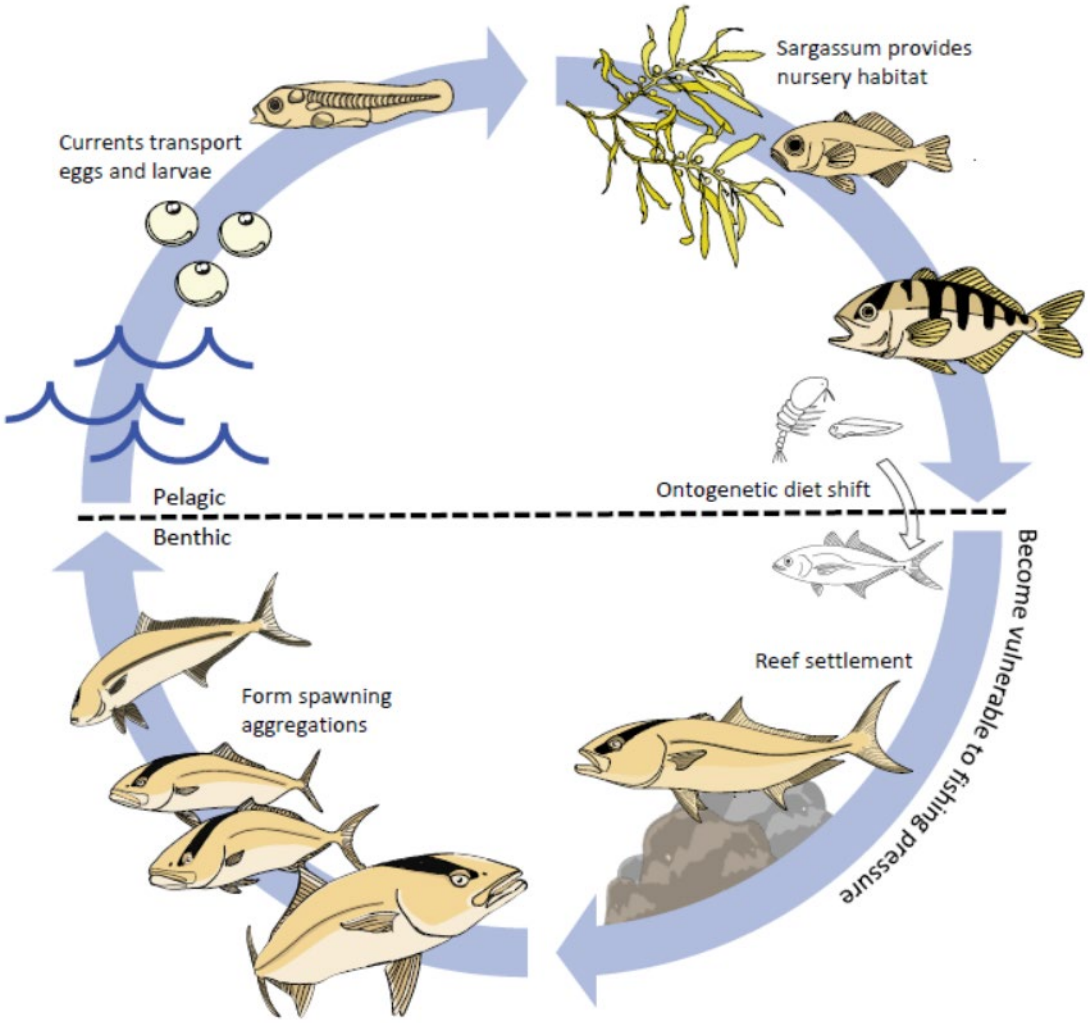
GAJ Count

- Builds on successes and lessons-learned from GRSC
- Overarching goals:
  - Provide independent estimate of GAJ absolute abundance in US GoA and SA using fisheries independent sampling
  - Expand general biological knowledge (spatial ecology, movement, connectivity, growth, mortality, etc.) of GAJ to inform management decision-making and to address key assumptions of abundance estimate

Background: Greater Amberjack Life History

- Reported max age: 17
- Rapid growth until age 9-10
- Review by Shultz et al. 2025 (Ch. 2)





Background: Current stock status

- Two stocks
  - Gulf of America (GoA)
  - South Atlantic (SA)
- GoA
  - Most recent assessment (2021 SEDAR 70) found that stock was overfished and undergoing overfishing
  - Recent catch data (2023) indicate stock no longer undergoing overfishing
- SA
  - Most recent assessment (2020 SEDAR 59) found stock was not overfished or undergoing overfishing
  - Recent catch data also indicate stock is not undergoing overfishing

GoA, 2021 SEDAR 70

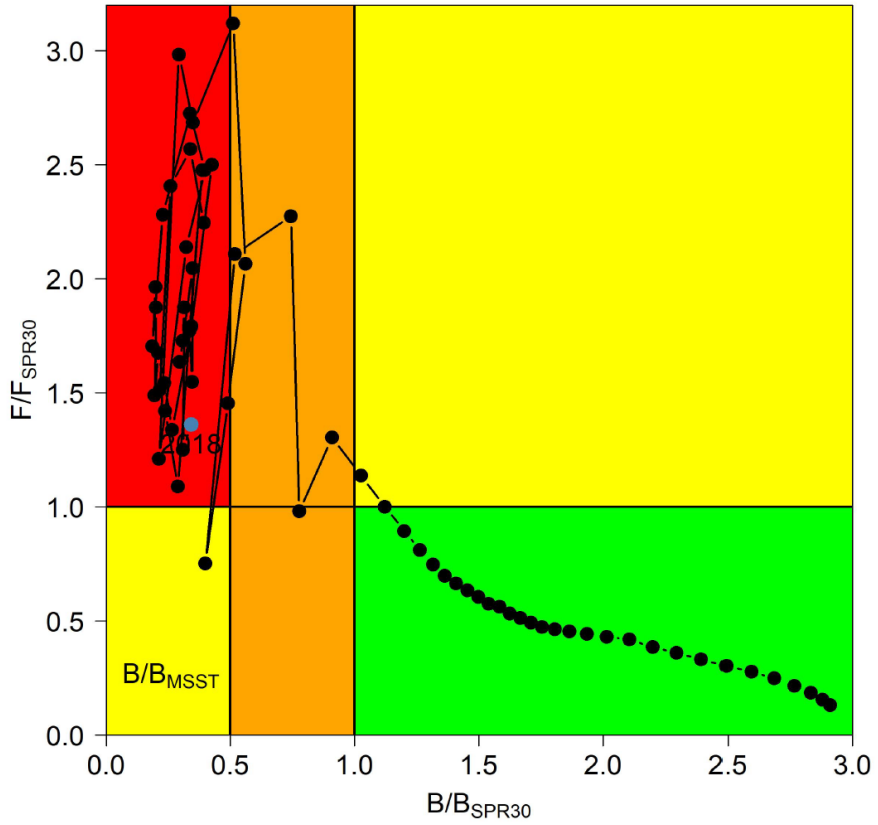


Figure 68. Kobe plot illustrating the trajectory of stock status. The orange coloring indicates regions where the stock is below the biomass target but above the biomass threshold (MSST = 0.5 x SSB$_{SPR30\%}$). The 2018 terminal year stock status is indicated by the gray dot. See **Table 24** *for specifics on the years above F/F$_{SPR30}$=1 and below B/B$_{MSST}$<0.5.*

Table 12 Continued. Predicted biomass (metric tons), spawning stock biomass (SSB, metric tons), abundance (1000s of fish), age-0 recruits (1000s of fish), and SSB ratio (SSB/SSB$_0$) for Gulf of Mexico Greater Amberjack.

Year	Biomass	SSB	Abundance	Recruits	SSB/SSB$_0$
1987	9,503	3,639	3,832	1,565	0.153
1988	6,851	2,495	2,259	5,912	0.105
1989	6,019	2,086	3,800	2,944	0.088
1990	5,827	1,513	3,157	962	0.064
1991	7,314	2,298	2,307	1,610	0.097
1992	6,624	2,826	1,951	1,240	0.119
1993	5,088	2,408	1,530	1,579	0.101
1994	3,807	1,621	1,481	1,190	0.068
1995	3,464	1,327	1,341	870	0.056
1996	3,591	1,413	1,168	1,533	0.060
1997	3,501	1,433	1,360	1,992	0.060
1998	3,626	1,391	1,694	1,243	0.059
1999	4,223	1,495	1,554	3,675	0.063
2000	4,883	1,662	2,612	4,267	0.070
2001	6,194	1,896	3,509	2,294	0.080
2002	7,753	2,440	3,102	1,727	0.103
2003	7,974	3,032	2,506	2,289	0.128
2004	6,537	2,801	2,308	1,284	0.118
2005	5,628	2,413	1,797	1,628	0.102
2006	4,556	1,841	1,643	2,683	0.078
2007	4,217	1,538	2,103	2,357	0.065
2008	5,049	1,685	2,310	2,643	0.071
2009	5,942	2,060	2,565	1,878	0.087
2010	6,951	2,757	2,395	1,323	0.116
2011	5,803	2,394	1,809	2,099	0.101
2012	5,560	2,463	1,975	2,135	0.104
2013	5,633	2,475	2,113	1,665	0.104
2014	5,267	2,113	1,904	2,272	0.089
2015	5,386	2,197	2,132	1,053	0.093
2016	5,330	2,238	1,667	1,020	0.094
2017	4,847	2,199	1,372	1,244	0.093
2018	4,850	2,432	1,385	1,813	0.103

SA, 2020 SEDAR 59

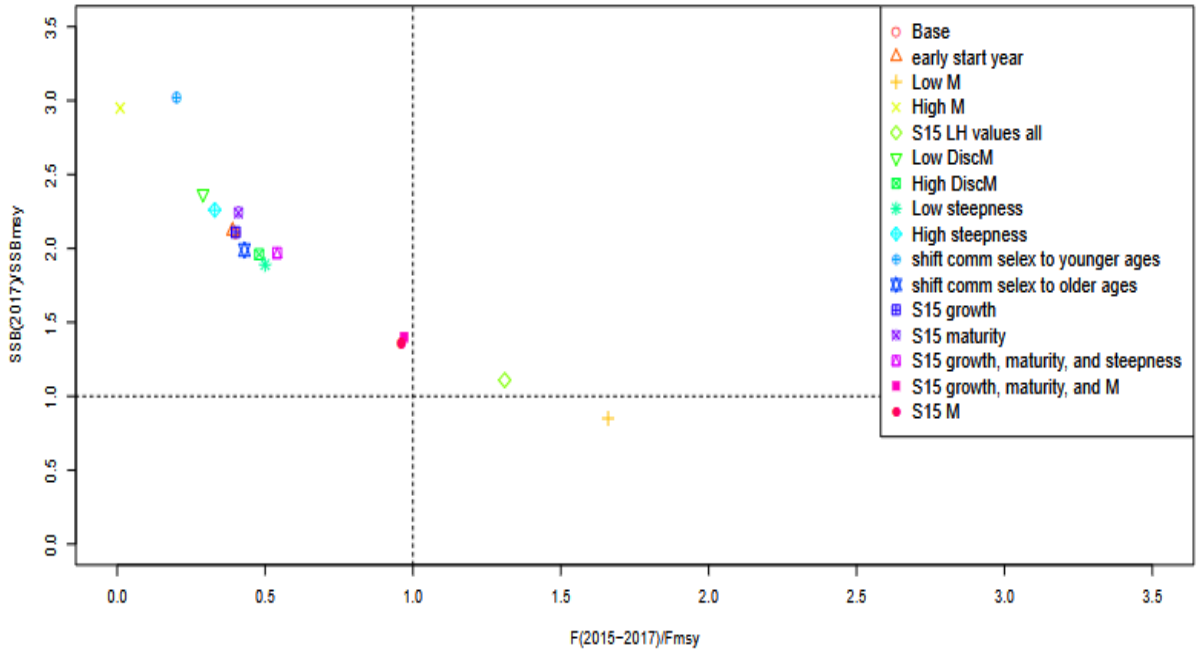


Table 6. Estimated total abundance at age (1000 fish) at start of year.

Year	1	2	3	4	5	6	7	8	9	10	Total
1980	1401.81	613.63	324.18	178.68	104.28	63.26	39.15	24.72	15.76	28.53	2793.99
1981	1401.81	599.32	327.86	182.87	107.09	64.99	40.22	25.39	16.19	29.31	2795.06
1982	1400.84	603.48	303.09	166.10	97.77	59.50	36.84	23.26	14.83	26.84	2732.54
1983	1398.66	606.65	324.67	172.59	99.86	61.06	37.91	23.94	15.27	27.63	2768.23
1984	1401.64	612.87	331.95	191.46	108.02	64.97	40.52	25.67	16.37	29.63	2823.10
1985	1404.59	603.55	332.18	191.75	116.83	68.48	42.01	26.73	17.10	30.97	2834.19
1986	1405.38	605.47	323.39	187.86	114.66	72.59	43.40	27.16	17.46	31.71	2829.07
1987	1402.81	548.74	307.68	163.51	98.32	62.19	40.16	24.49	15.48	28.31	2691.68
1988	1395.90	587.86	290.93	163.96	85.98	53.18	34.29	22.59	13.92	25.13	2673.73
1989	1391.06	602.97	299.95	143.25	78.73	42.41	26.73	17.58	11.70	20.43	2634.81
1990	1609.75	602.54	308.20	145.65	65.84	37.00	20.31	13.06	8.68	16.01	2827.04
1991	1712.31	684.49	262.76	105.07	42.75	19.51	11.16	6.25	4.06	7.75	2856.11
1992	1530.62	715.00	353.15	114.50	34.80	14.00	6.50	3.79	2.15	4.09	2778.61
1993	1297.42	642.42	363.69	148.01	35.65	10.68	4.37	2.07	1.22	2.03	2507.55
1994	1080.29	550.47	340.22	177.83	61.52	14.90	4.55	1.90	0.91	1.44	2234.02
1995	985.41	466.67	288.06	164.73	74.75	26.09	6.44	2.00	0.84	1.05	2016.05
1996	690.46	421.69	251.56	150.34	77.12	35.48	12.62	3.18	1.00	0.96	1644.39
1997	674.93	284.15	215.57	120.12	65.57	34.21	16.04	5.82	1.48	0.92	1418.82
1998	1315.89	291.59	154.72	115.77	58.73	32.58	17.32	8.28	3.04	1.26	1999.19
1999	1305.32	568.36	157.82	82.59	56.96	29.41	16.62	9.02	4.36	2.28	2232.75
2000	1184.76	550.68	289.99	75.64	36.74	25.83	13.59	7.84	4.29	3.19	2192.56
2001	2116.92	506.04	293.55	152.27	37.43	18.57	13.30	7.14	4.16	4.01	3153.41
2002	1035.96	917.48	259.74	144.08	70.94	17.83	9.02	6.59	3.57	4.13	2469.36
2003	807.16	441.18	480.01	132.67	70.37	35.47	9.09	4.69	3.46	4.09	1988.19
2004	887.85	338.20	233.03	253.99	69.25	37.77	19.41	5.07	2.64	4.30	1851.52
2005	782.42	378.32	183.96	129.82	138.70	38.85	21.60	11.32	2.99	4.13	1692.12
2006	1897.35	332.65	206.92	103.43	71.37	78.29	22.35	12.68	6.71	4.27	2736.02
2007	1740.63	816.14	166.47	99.31	49.35	35.08	39.24	11.43	6.55	5.73	2969.92
2008	1768.64	750.03	425.51	85.80	50.28	25.69	18.61	21.24	6.25	6.78	3158.84
2009	1253.02	733.95	392.11	218.87	42.84	25.76	13.41	9.92	11.43	7.08	2708.39
2010	1444.55	523.73	389.81	208.42	113.64	22.84	14.00	7.44	5.55	10.47	2740.45
2011	1157.35	617.77	270.01	194.63	100.47	56.17	11.51	7.20	3.86	8.40	2427.36
2012	2091.73	500.10	339.34	152.85	107.51	56.96	32.46	6.78	4.28	7.38	3299.41
2013	1601.74	903.67	266.45	181.64	80.04	57.82	31.23	18.16	3.83	6.65	3151.24
2014	2395.87	687.09	486.85	146.31	98.40	44.59	32.84	18.09	10.62	6.20	3926.85
2015	1815.80	1017.07	365.55	260.23	76.70	53.00	24.48	18.39	10.24	9.61	3651.06
2016	1383.63	749.95	529.40	189.36	134.47	40.84	28.77	13.56	10.29	11.21	3091.48
2017	1138.59	564.39	387.99	271.84	97.43	71.34	22.09	15.88	7.56	12.11	2589.21
2018	1401.47	463.43	296.75	205.67	144.73	53.50	39.94	12.62	9.16	11.46	2638.74

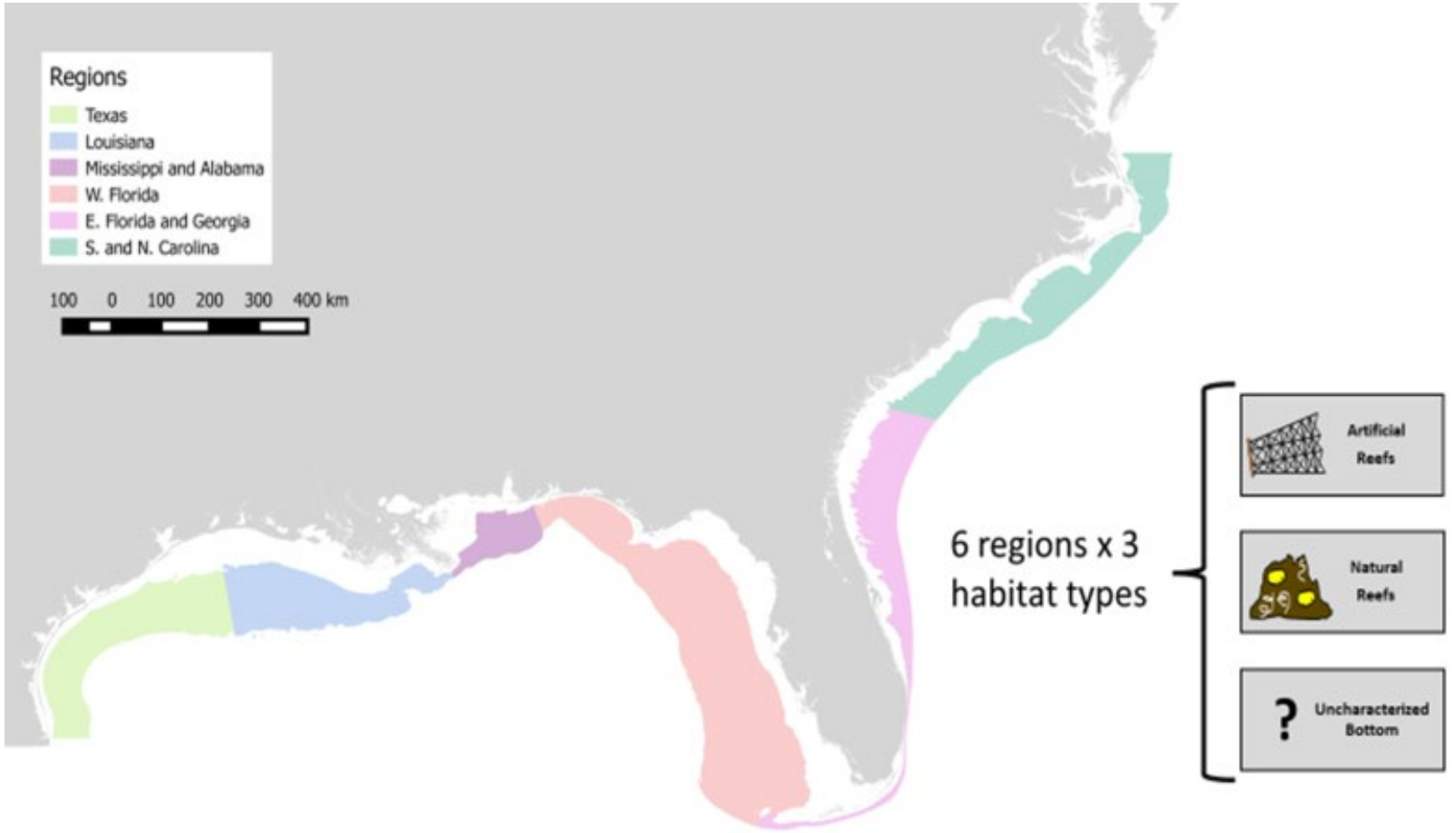
Project challenges

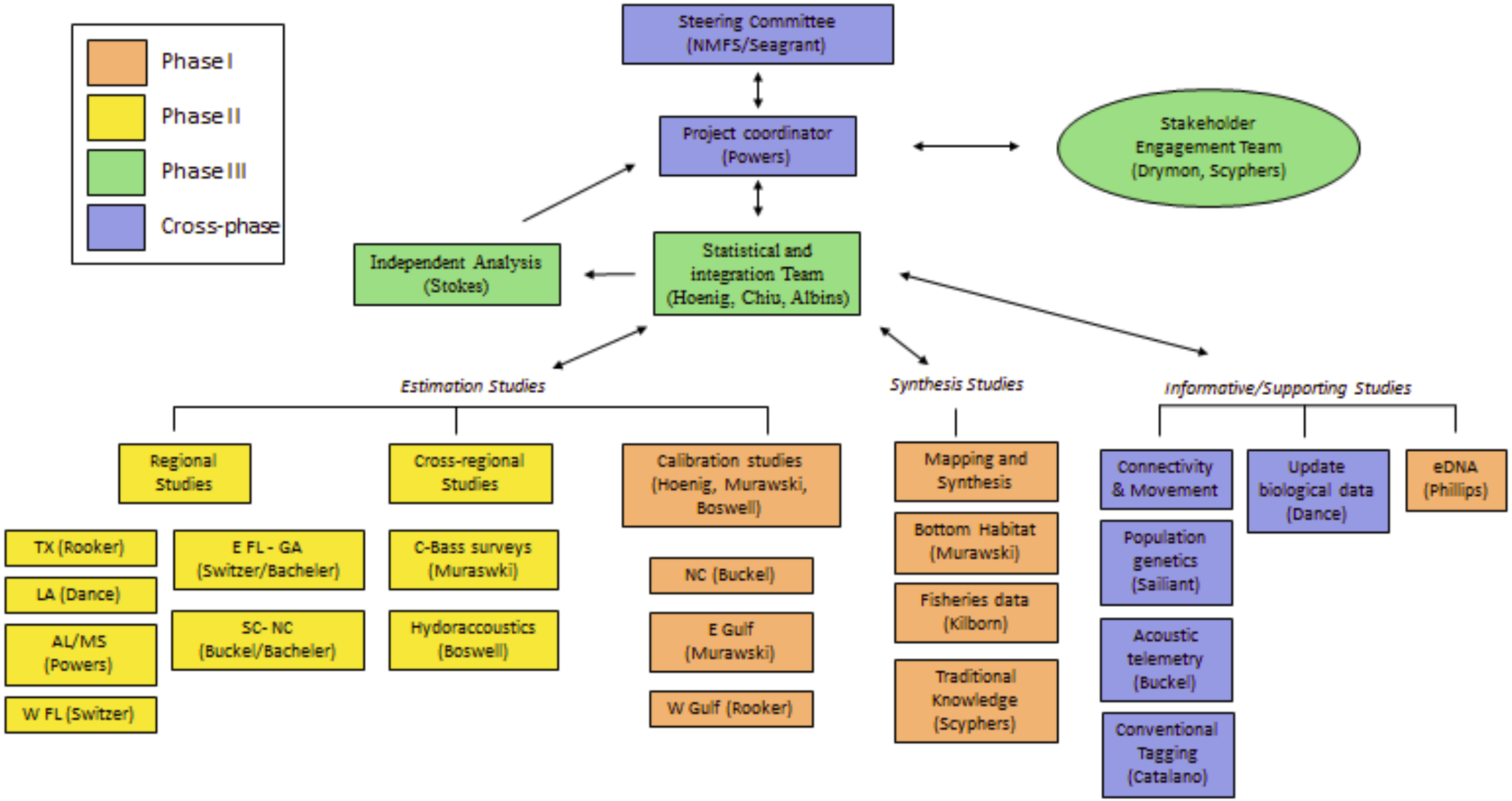
- Major challenges (primarily for abundance estimation)
  - Lack of comprehensive habitat maps
  - Species identification
  - Regional and depth-based differences in water clarity and nepheloid layer
  - Differences in gear efficiency across habitat types (expansive low-relief natural habitat vs small-footprint, high-relief, artificial habitats)
  - Additivity of abundance estimate across regions, habitats, and gears
  - Understanding effective sampling area of gears
- Proposed methods to overcome these
  - Leverage existing and supplemental habitat mapping
  - Unifying gear: active acoustics
  - eDNA
  - Gear calibration studies (Bayesian model converts ratios and counts to common currency)
  - Using VPS data to estimate small-scale fish movement

Project objectives

1. Synthesize existing bottom habitat observations
2. Synthesize existing abundance data - catch data and stakeholder knowledge
3. Comprehensive study to estimate regional, habitat-specific absolute abundance using video and active acoustics
4. Determine movement and connectivity using acoustic telemetry, conventional tagging, and genetic markers
5. Assess efficacy of eDNA to determine presence/relative abundance of GAJ and related species
6. Update biological information across study region
7. Engage in outreach to facilitate stakeholder input and communicate results

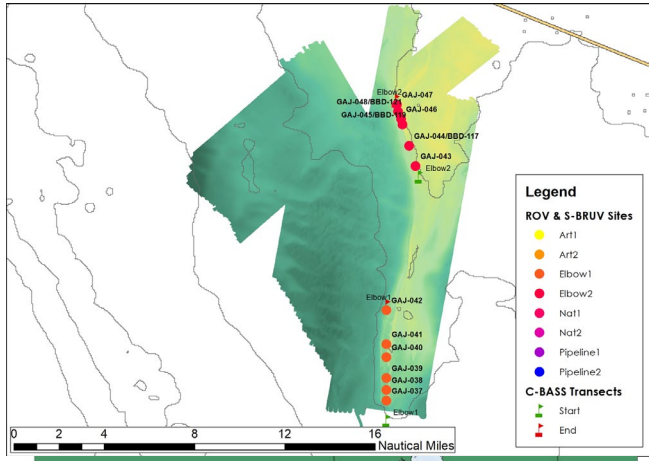
Regional approach

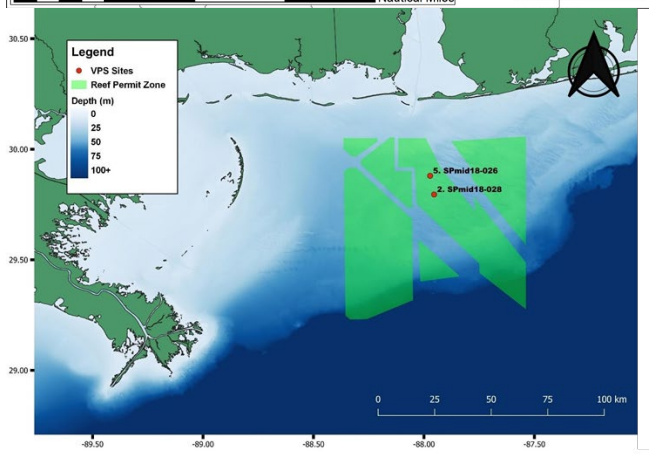


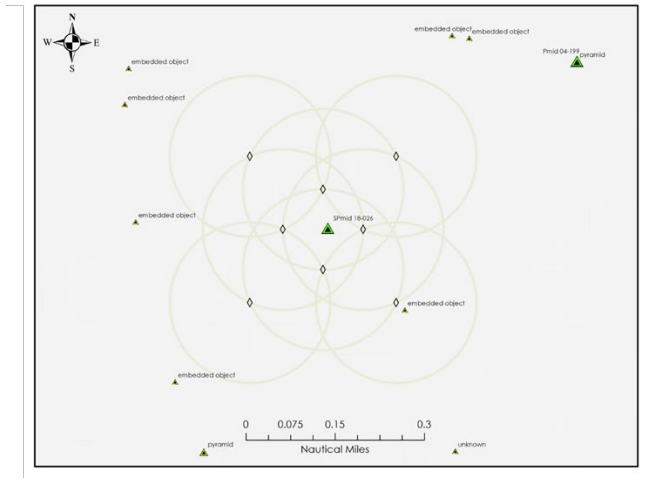

Phase I
Phase II
Phase III
Cross-phase
Steering Committee (NMFS/Seagrant)
Project coordinator (Powers)
Stakeholder Engagement Team (Drymon, Scyphers)
Independent Analysis (Stokes)
Statistical and integration Team (Hoenig, Chiu, Albins)
Estimation Studies
Synthesis Studies
Informative/Supporting Studies
Regional Studies
Cross-regional Studies
Calibration studies (Hoenig, Murawski, Boswell)
Mapping and Synthesis
Connectivity & Movement
Update biological data (Dance)
eDNA (Phillips)
TX (Rooker)
LA (Dance)
AL/MS (Powers)
W FL (Switzer)
E FL - GA (Switzer/Bacheler)
SC- NC (Buckel/Bacheler)
C-Bass surveys (Muraswki)
Hydroraccoustics (Boswell)
NC (Buckel)
E Gulf (Murawski)
W Gulf (Rooker)
Bottom Habitat (Murawski)
Fisheries data (Kilborn)
Traditional Knowledge (Scyphers)
Population genetics (Sailiant)
Acoustic telemetry (Buckel)
Conventional Tagging (Catalano)

Three calibration studies (Ch. 9)

- Florida (May 4-10, 2022)
  - Always-on acoustics of limited value
  - Need to compare different acoustic freq.
  - Need ground-truth
- Alabama (Aug. 21-Sept. 2, 2022)
  - Incorporated two acoustic survey test patterns
  - Incorporated multiple acoustic freq.
  - Incorporated VPS + visual tags for ground truth (Mark-recap abund. est.)
  - Generally weak relationships among gears
  - Need more gear comparisons at wider range of habitat types
- Alabama (Mar. 30-Apr. 24, 2024)
  - Used best acoustic survey pattern and freq. from prev. calib.
  - Incorportated VPS + visual tags for ground truth (Mark-recap abund. est.)
  - Allocated 50% effort to two VPS array sites and 50% effort to variety of habitat types (large, small, artificial, natural, etc.)
  - Incorporated camera-corrected acoustic counts in analysis

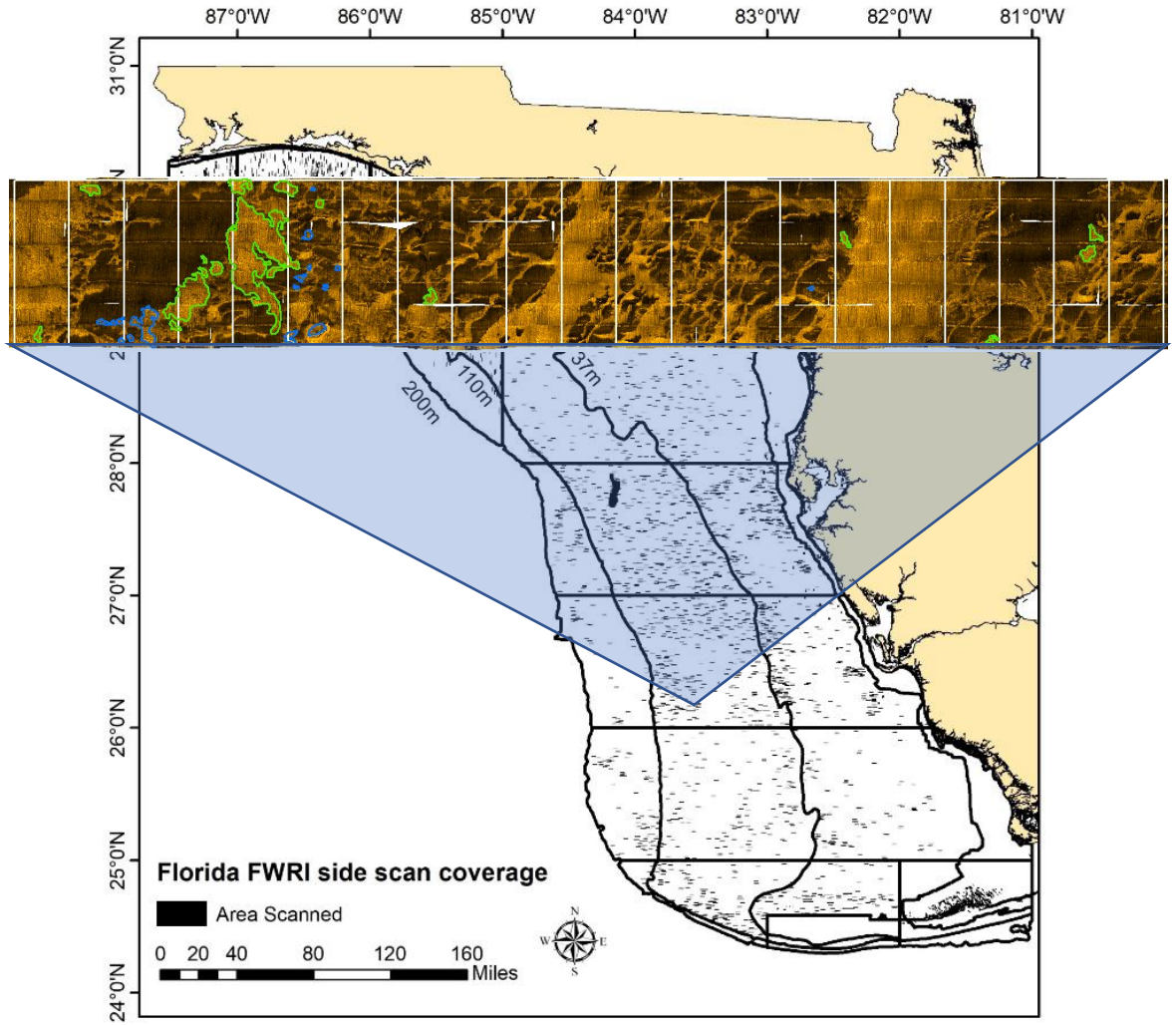






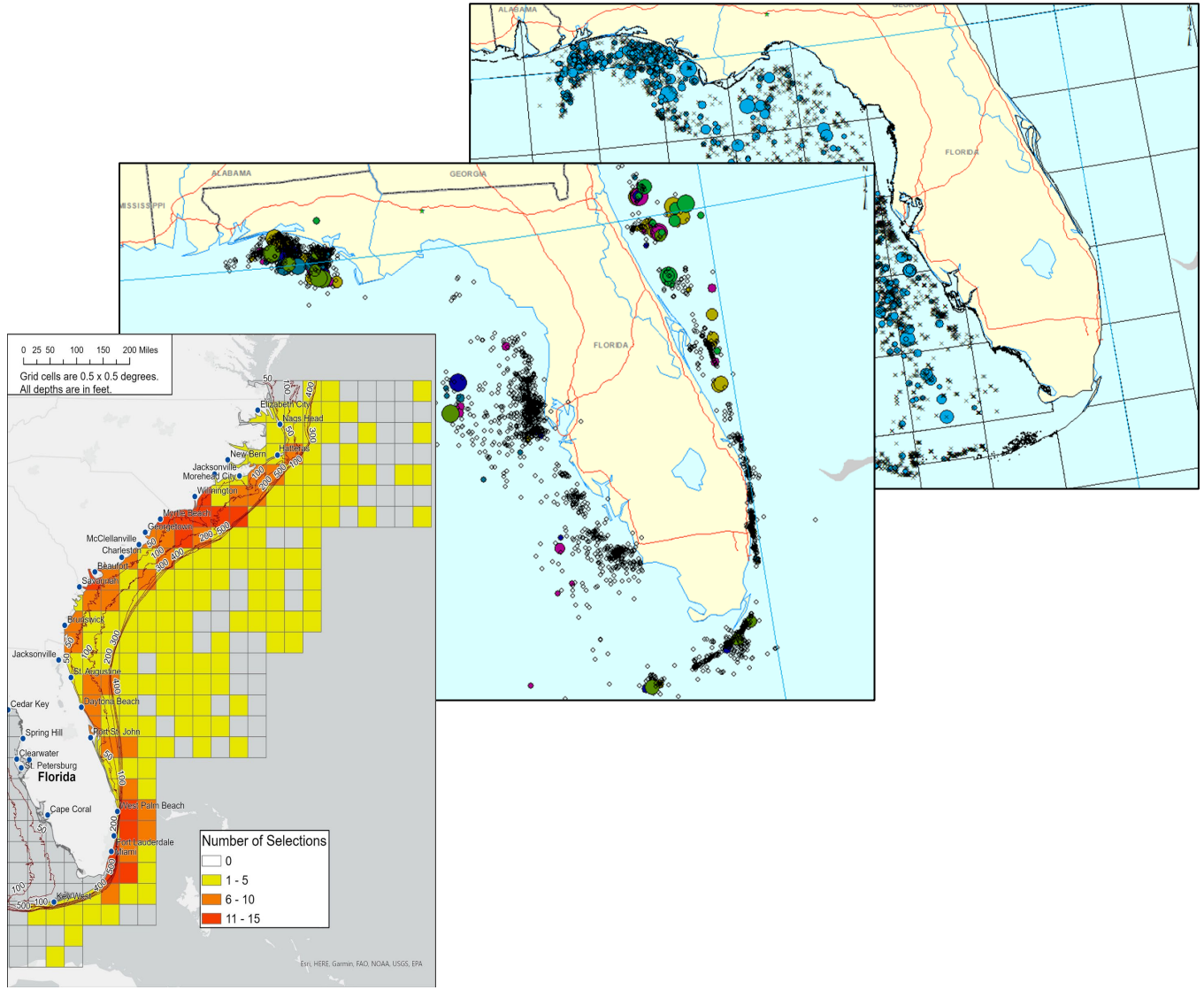
Objective 1: Synthesize habitat data

- No existing comprehensive maps for entire region
- Existing sources of habitat data
  - Regional
  - Partial coverage
  - Variable resolution
- Compile best habitat data available for each region
- Conduct limited supplemental habitat mapping in regions where necessary (SA)
- Inform sampling design, and ultimately, provide basis for extrapolation of density estimates to absolute abundance
- Note: abundance estimates should be viewed in context of limited habitat information (some high CVs due to uncertainty in habitat location/extent)



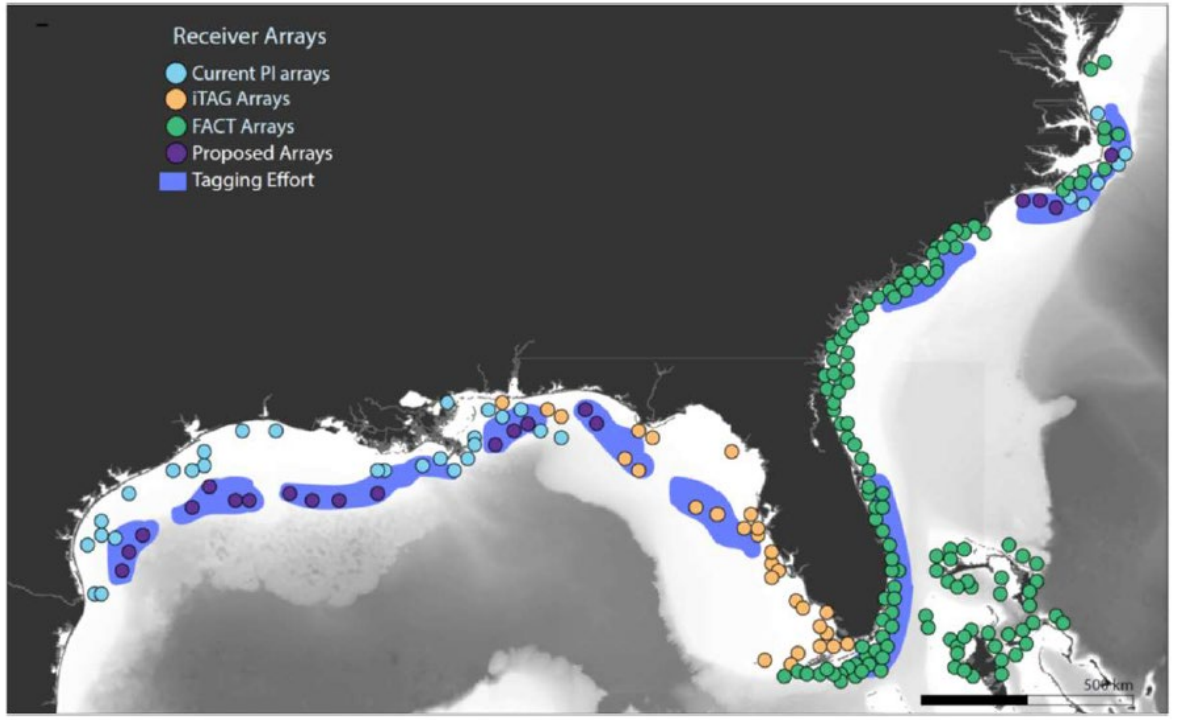
Objective 2: Synthesize abundance data

- Existing fishery dependent and fishery independent catch data
- Existing stakeholder knowledge (LEK)
- Inform expectations in terms of presence/absence, relative abundance and variance
- Can be used to create efficient sample designs
  - Sample more where abundance and variance are high
  - Sample less where these are low



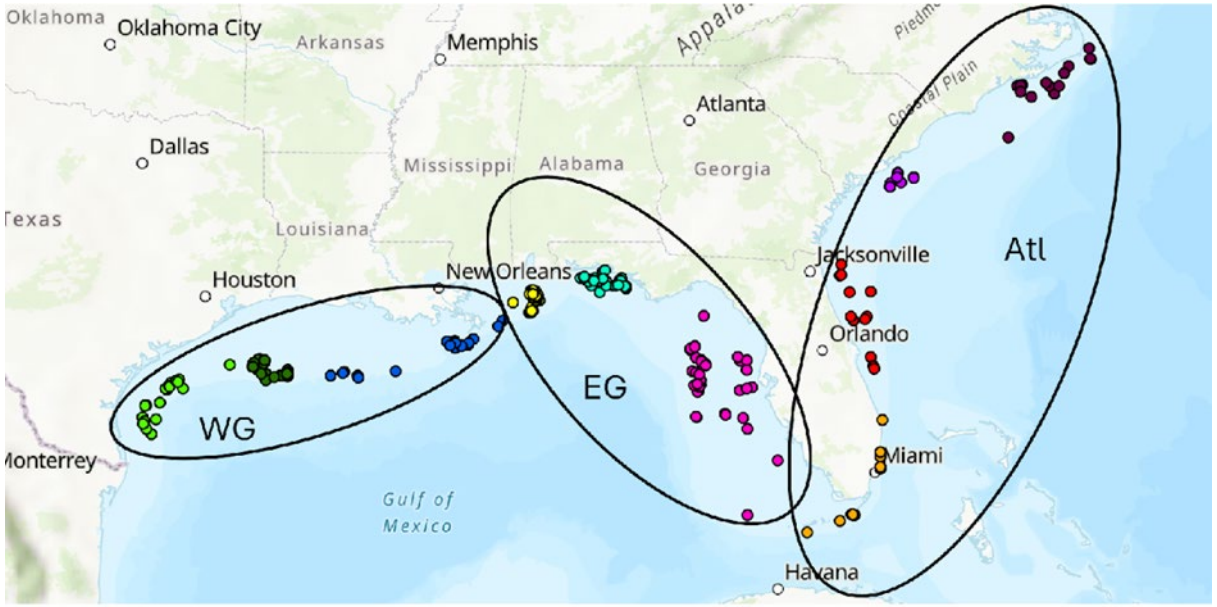
Objective 4: Movement, connectivity, & mortality

- GoM and SA managed as separate, non-mixing stocks, but little known about migratory behavior and population connectivity
- Combined strategy:
  - Internal acoustic tags + extensive receiver array
  - High-reward external tags
  - Population genetics
- Opportunity for angler engagement



Population genomics: methods (Ch. 3)

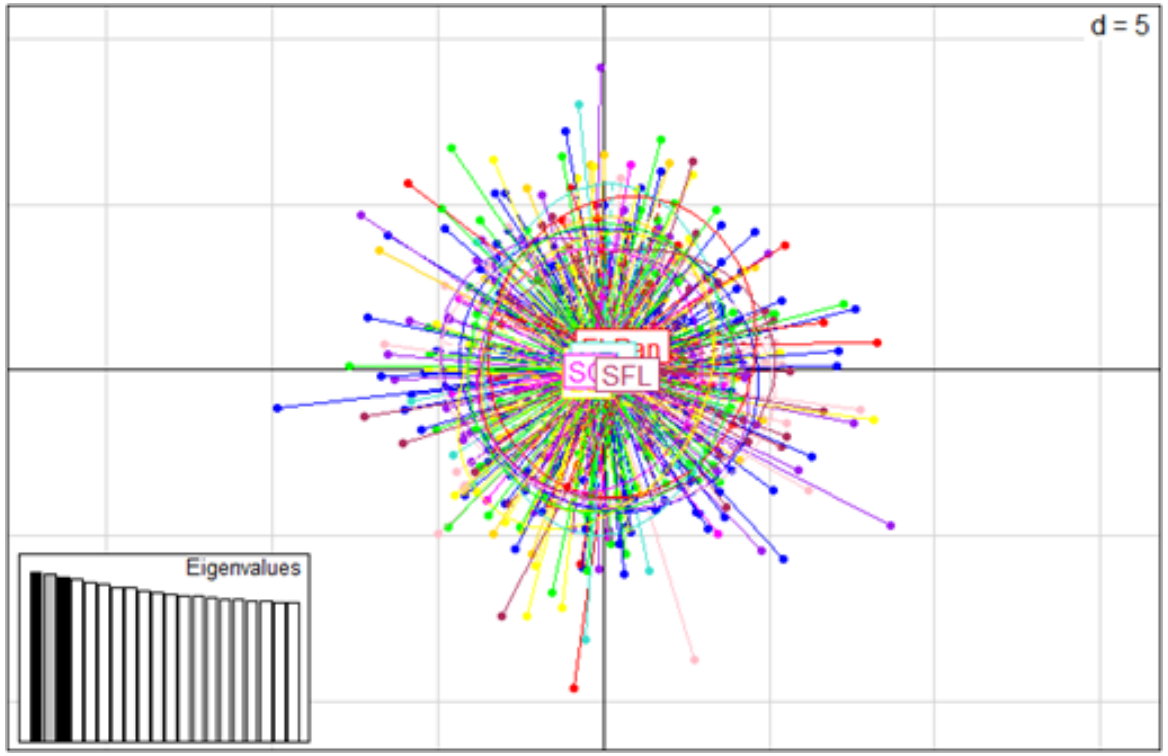
- Previous pop gen studies limited by incomplete geographic sampling and small number of markers
- Current study aimed to address these limitations through comprehensive spatial sampling and genome scans involving thousands of SNP markers

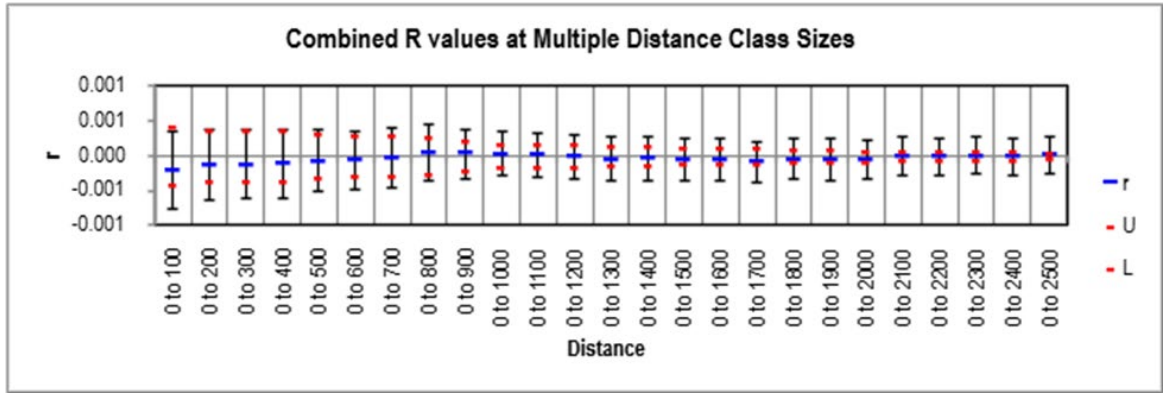


Sampling region	2021	2022	2023
North Carolina	7	128	19
South Carolina	-	3	32
Southeast Florida	-	45	57
Southwest Florida	-	88	48
Alabama	15	100	106
Louisiana	-	74	15
Texas-Galv	-	75	-
Texas-CC	-	49	53

Population genomics: results (Ch. 3)

- No evidence of divergence between GoA and SA stocks or other subdivisions within US waters
- This unexpected result could indicate recent/ongoing mixing of previously divergent units
- Could be examined further using higher density genome scans and analysis of identity-by-descent
- Future work should include southern GoA and Caribbean samples to assess their degree of connectivity with US stocks





Exploitation: methods (Ch. 5)

- Tagging took place from May 2022 to March 2024
- Tagging numbers (dart only/dart+acoustic)
  - ATL: 157/139, EGOM: 285/121, WGOM: 212/183
  - EGOM and WGOM border at Mississippi River Mouth
  - 50% double dart-tagged

Regional Total Dart Tagging Numbers and Tag Returns:

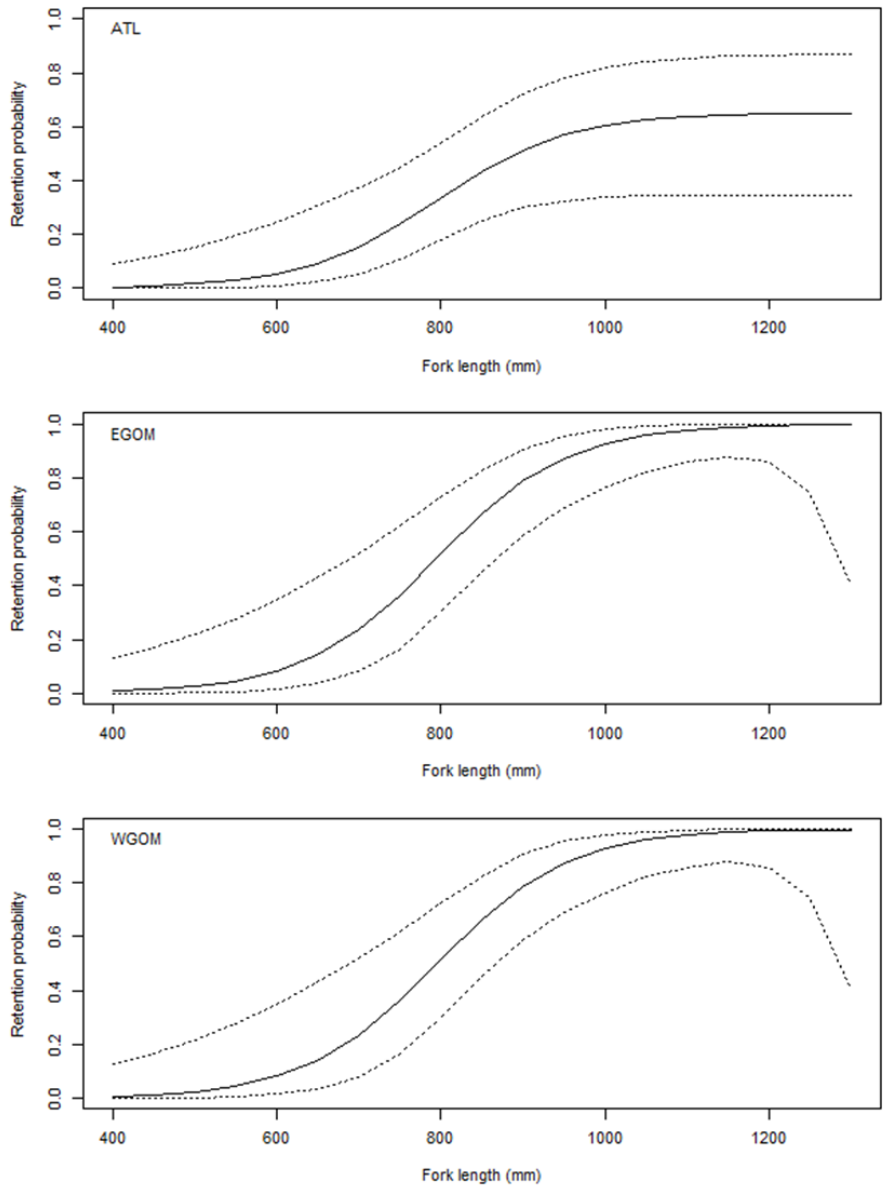
Region	Number Dart-Tagged	ATL Tag Returns	EGOM Tag Returns	WGOM Tag Returns
ATL	296	40		
EGOM	406		75	1
WGOM	395			61

Eastern Louisiana Recaps



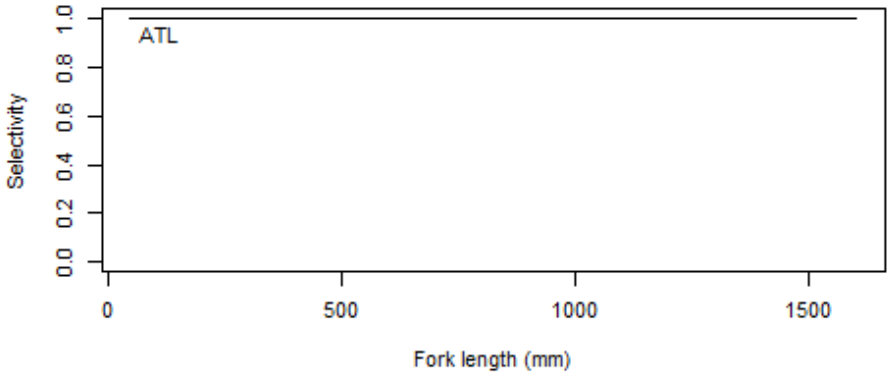
Exploitation: results (Ch. 5)

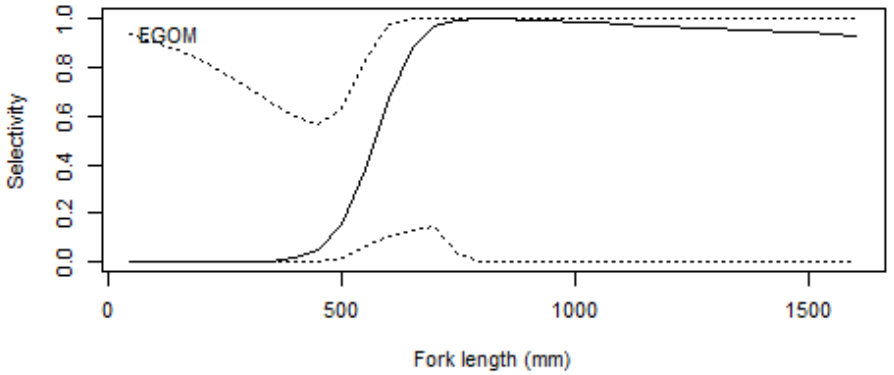
- Sigmoidal length-based retention probability consistent with length limits

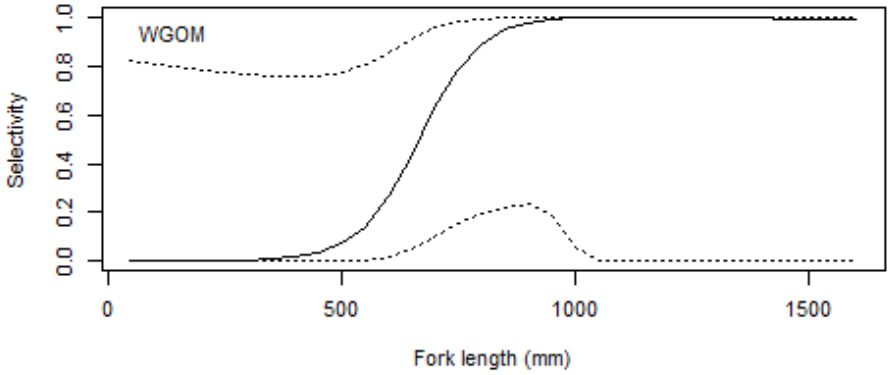


Exploitation: results (Ch. 5)

- Sigmoidal length-based retention probability consistent with length limits
- Relatively flat and uncertain length-based vulnerability to capture

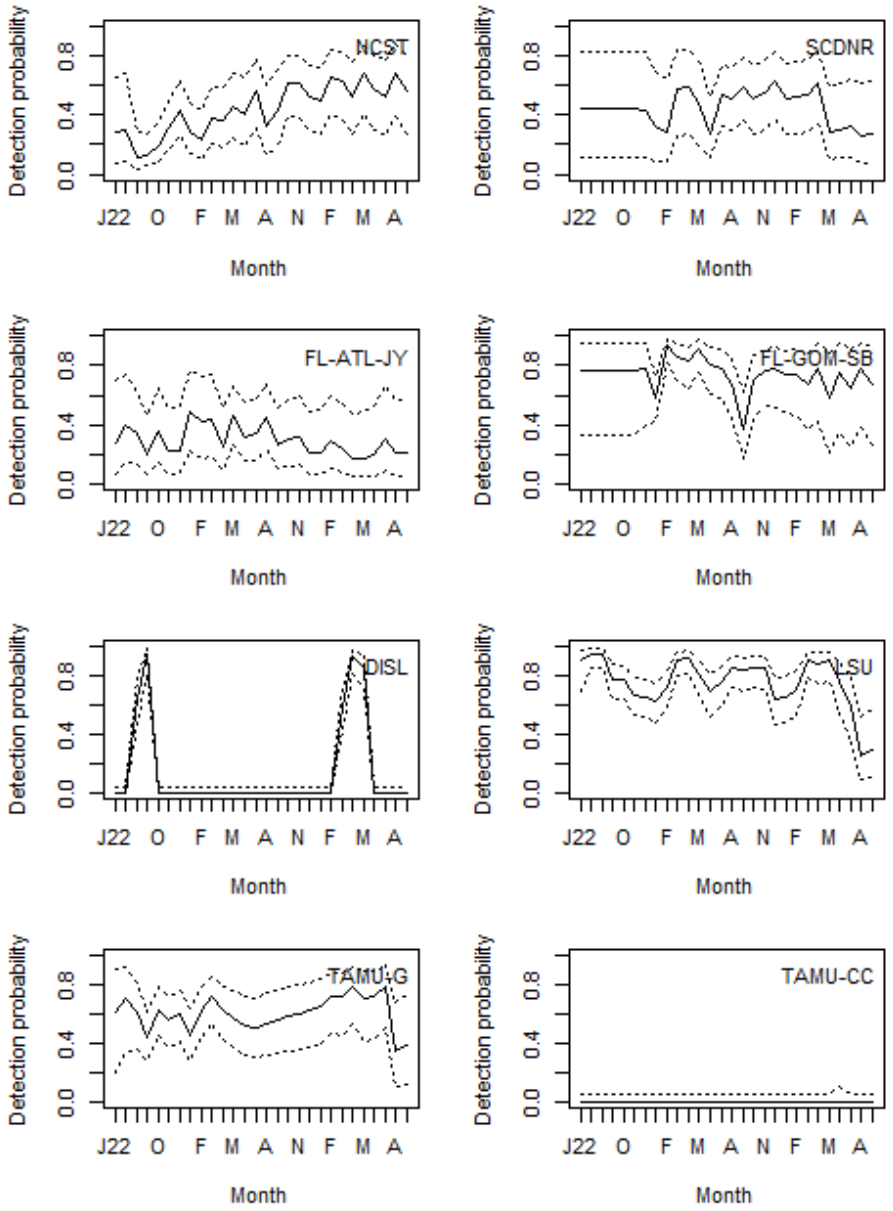






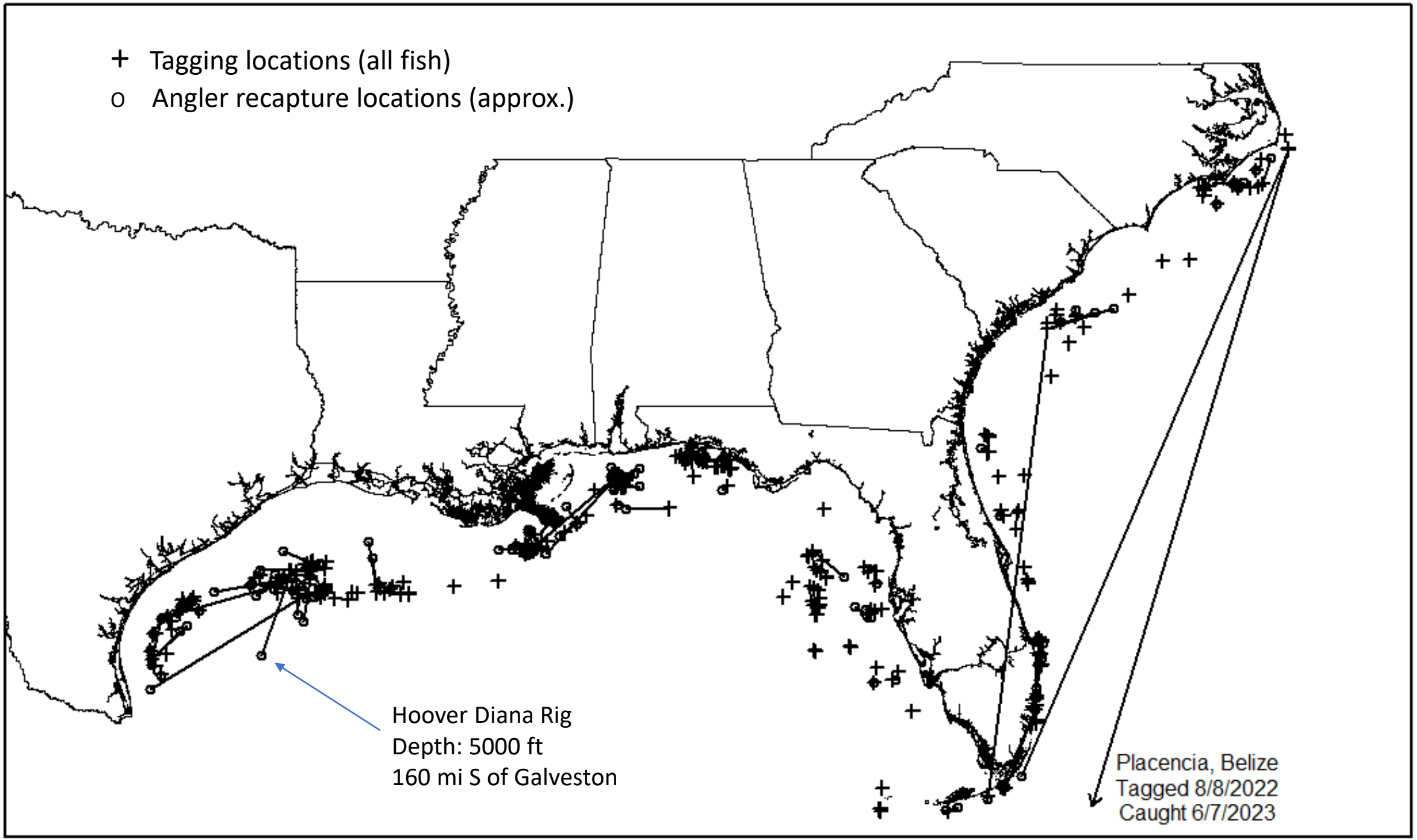
Exploitation: results (Ch. 5)

- Sigmoidal length-based retention probability consistent with length limits
- Relatively flat and uncertain length-based vulnerability to capture
- Highly variable crew-specific acoustic detection probability



Exploitation: results (Ch. 5)

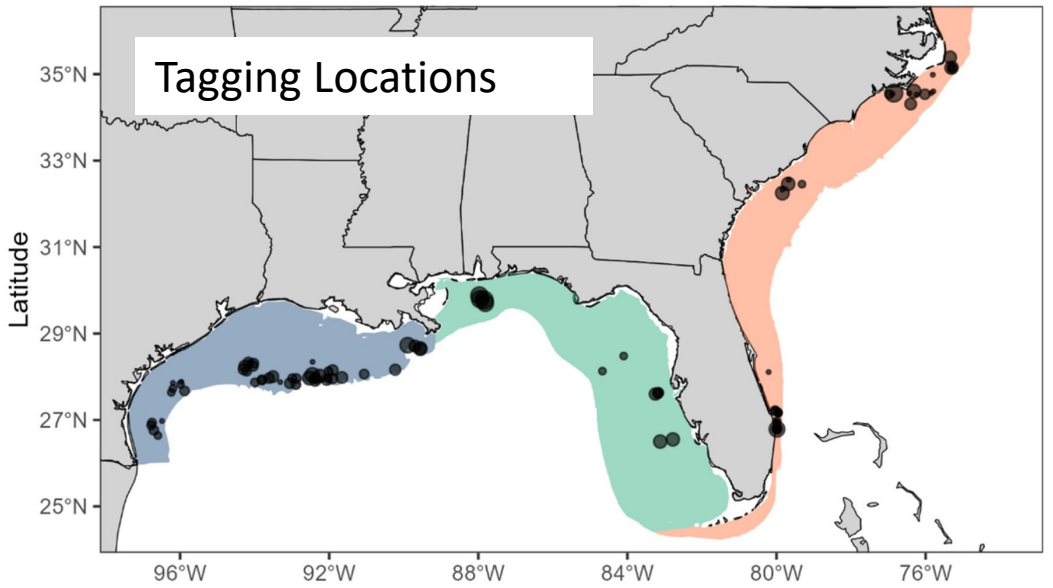
- Exploitation rates lower than SEDAR estimates
  - ATL: 0.08 vs. 0.19, GOM: 0.08 (E) and 0.19 (W) vs. 0.28
  - (harvest plus dead discards)
- ***Apparent*** natural mortality estimate is high, likely due to emigration
  - 0.81 yr^{-1} (+/- 0.06) vs. 0.30 yr^{-1}
- Tag shedding rates were modest
  - Initial: 0.03 (+/- 0.03), Chronic monthly: 0.04 (+/- 0.04)
- Model-based acoustic tagging mortality similar to external estimates
  - 0.20 (+/- 0.20)

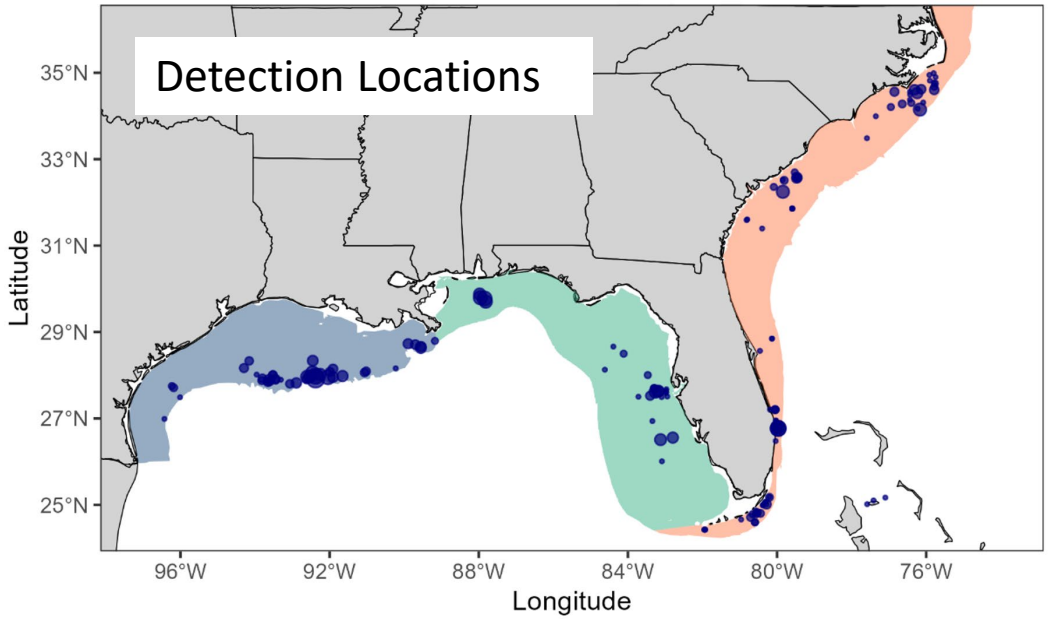

+ Tagging locations (all fish)
o Angler recapture locations (approx.)
Hoover Diana Rig
Depth: 5000 ft
160 mi S of Galveston
Placencia, Belize
Tagged 8/8/2022
Caught 6/7/2023

Movement ecology: spatial coverage (Ch. 6)

- 372 GAJ tagged for present project
- 126 tagged GAJ included from other ongoing projects
- Detected at 197 unique sites

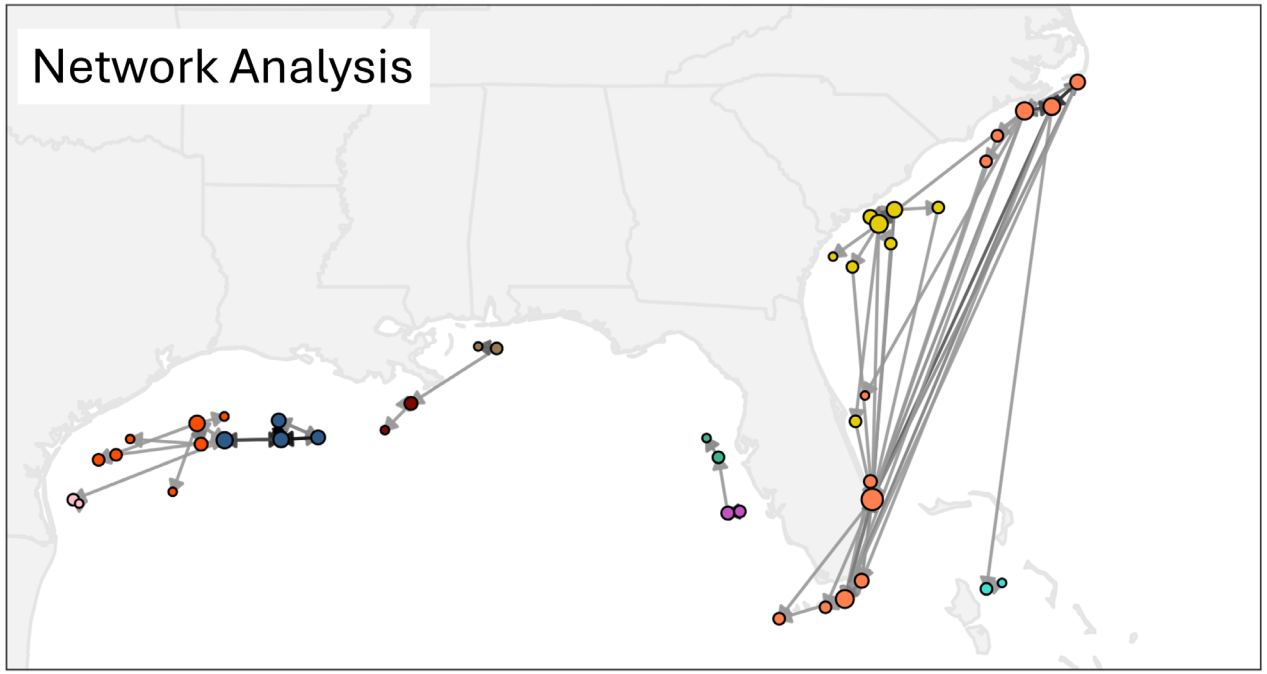
Region/ State	*N Tagged*	*N Detected*	*N Detections*	*Mean Days Detected*
Atlantic	149	82	1632780	53.2
E Gulf	123	98	3609482	64.3
W Gulf	226	139	3711163	162.5
Total	**498**	**319**	**8953425**	**104.4**



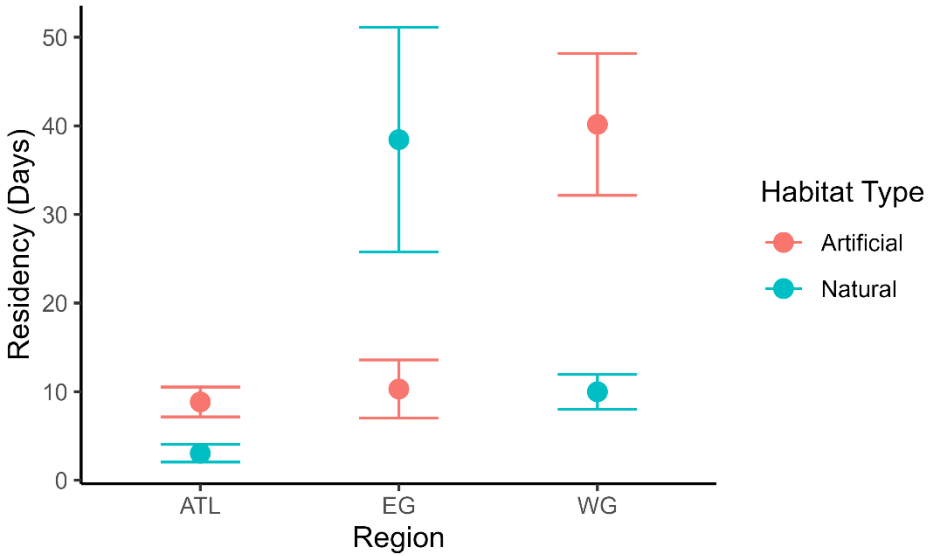


Movement ecology: results (Ch. 6)

- Distinct patterns distinguish Gulf from Atlantic
- Atlantic:
  - High connectivity, seasonal migration (winter/spring)
  - Large movements entirely southward, no return migration
  - Across intl. borders (Bermuda, Belize)
- Gulf:
  - Shorter movements, longer residency periods
  - Lower connectivity, movements primarily within-state
- One movement E Gulf –W Gulf
- No movement between ATL and Gulf
- Movement across regions peaked during winter/spring coinciding with reproduction

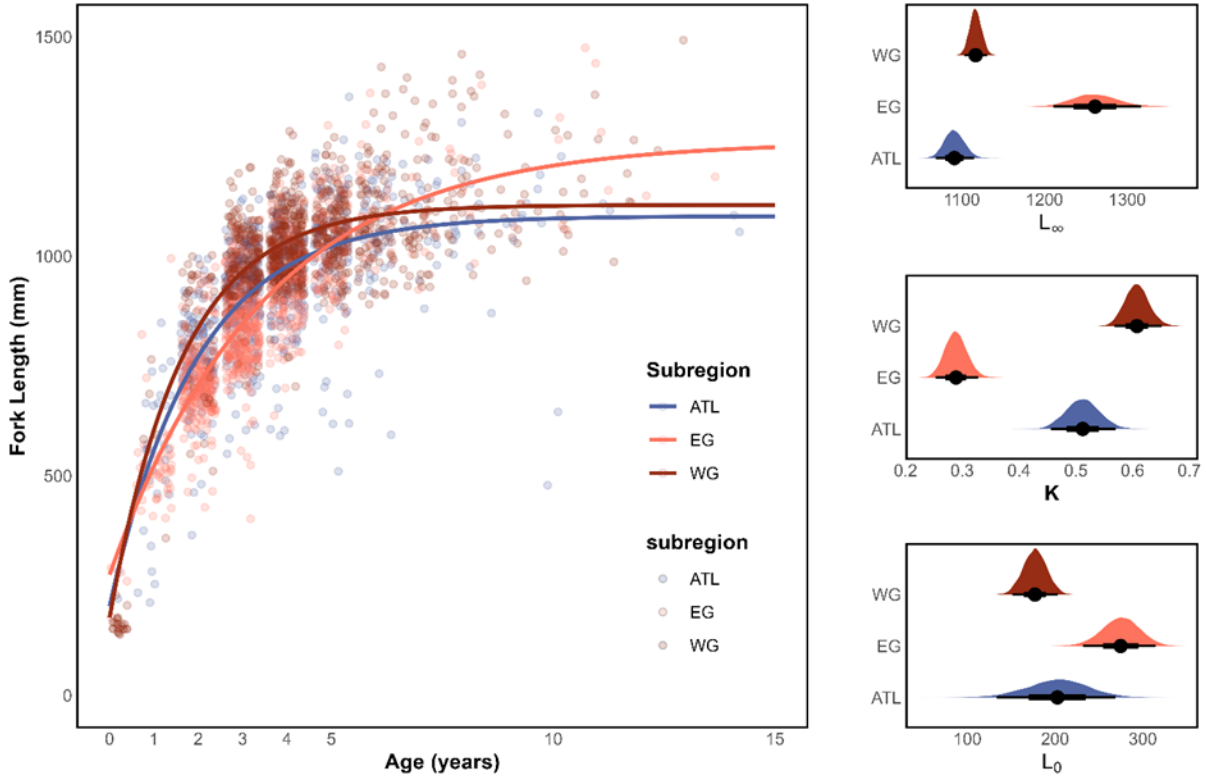


Region	Mean Distance (km)	Max Distance (km)
Atlantic	377.8	2433.0
E Gulf	24.2	192.8
W Gulf	35.3	322.4



Objective 6: Update biological information (Ch. 7)

- Recent stock assessments recommended expanded demographic sampling of GAJ
- Age and growth information from W-GoM has been extremely limited
- Used fishery dependent and independent collections to update biological information and refine age-length keys
- Observed growth differences support stock delineation between GoA and SA



Objective 7: Stakeholder engagement

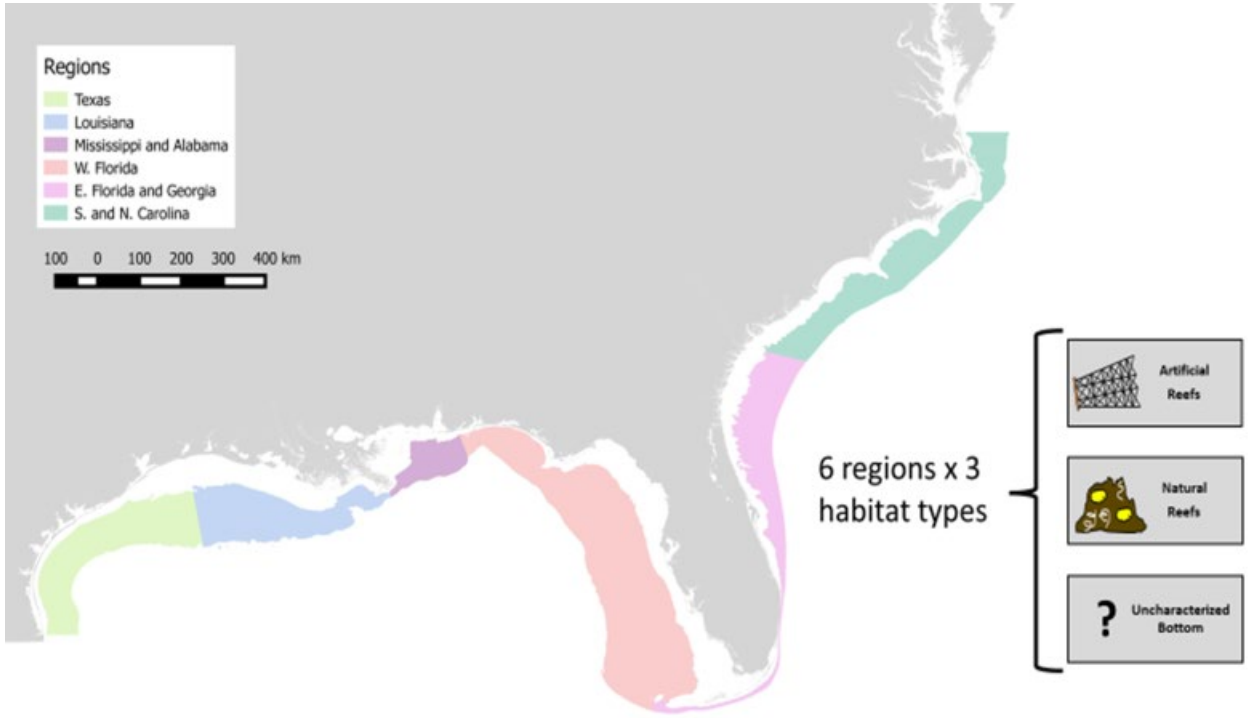
- Working closely with established groups (e.g., GAJ Visioning Team, Sea Grant Reef Fish Extension Collaborative, etc.) to facilitate communication and cooperation with stakeholders
- Start-to-finish:
  - GAJ Visioning Team collected stakeholder input – used to formulate goals of RFP – Funded research is responsive to priorities of RFP
  - Incorporation of LEK in study design
  - Active engagement with for-hire fishing sector to provide platforms for scientific sampling
  - Dependent on commercial and recreational anglers for high-reward conventional tag returns
  - Dedicated effort to communicate results broadly at conclusion of study

Objective 3: Estimate absolute abundance

- Sample design and framework (Ch. 10)
- Abundance sampling methods (Ch. 11)
- Results (Ch. 11)

Sample design and framework (Ch. 10)

- Sample design for each region based on stratified two-stage random sampling
- Probability sample designs executed independently in each region (W GoA, AL/MS, W FL, SA)
- Stratified by region, depth, habitat type

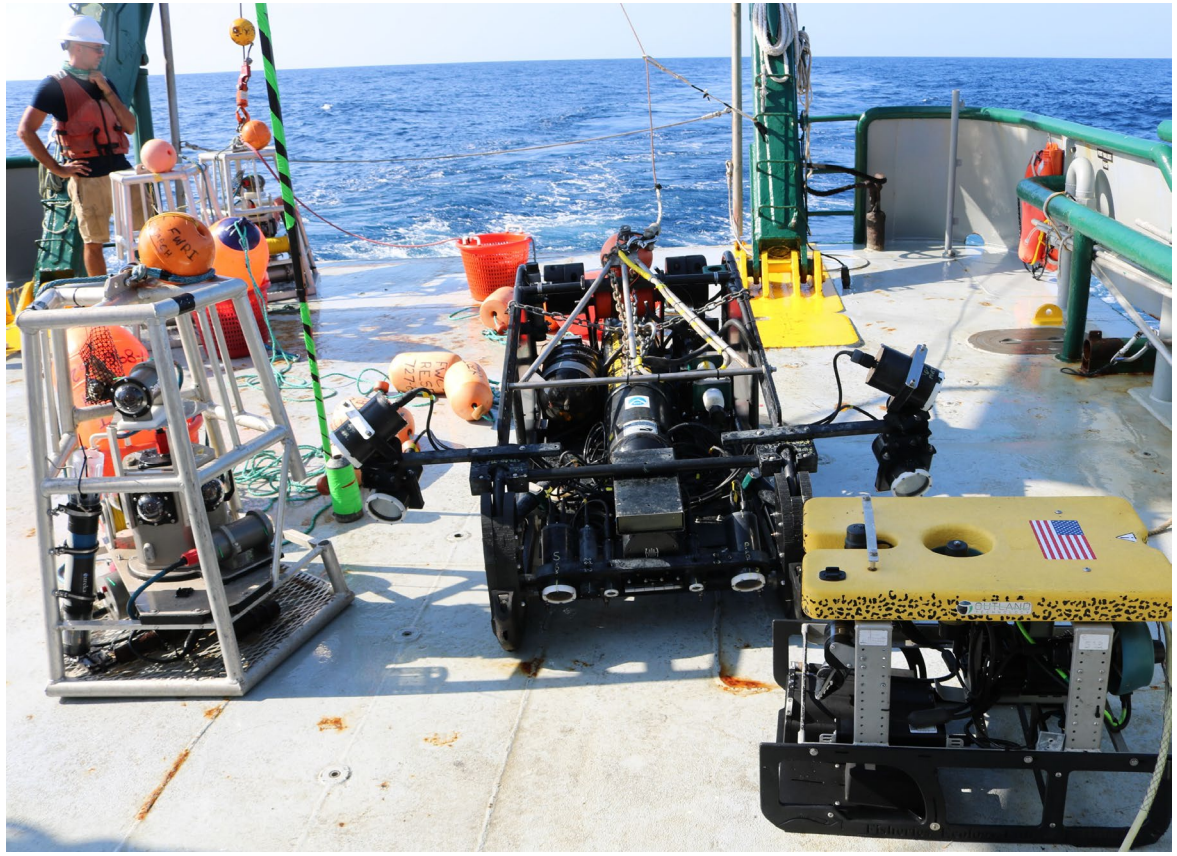


Abundance sampling methods (Ch. 11)

- Absolute abundance estimates require observations of both fish ***count*** and effective ***area*** sampled in order to estimate stratum-specific density
- Camera-only approach:
  - Count: GAJ MaxN (avoids double counting)
  - Area: estimate effective sampling area (ESA) of camera gears based on best information available for each gear
- Camera-corrected active acoustics approach:
  - Active acoustics provides ***count*** of large-bodied, water-column fishes (LBWCF) in a known ***area*** or volume of water
  - Use cameras to estimate ratio of GAJ to LBWC fish and use this ratio to correct acoustic count
- Specific type of video is habitat- and region-specific due to advantages of each gear type
  - E.g. towed cameras effective for sampling large swathes of low-relief habitat, ROV effective for sampling high-relief artificial habitat

Video

- Vertical drop cameras
  - All habitats
  - Western Gulf
- ROV mounted cameras
  - Artificial and Natural reefs
  - Mississippi and Alabama
- Baited stationary cameras (BRUVs)
  - Artificial and Natural reefs
  - West Florida and South Atlantic
- Towed cameras
  - Uncharacterized bottom
  - MS, AL, WFL, and SA
- Camera gears used either calibrated stereo video or paired lasers to collect size data

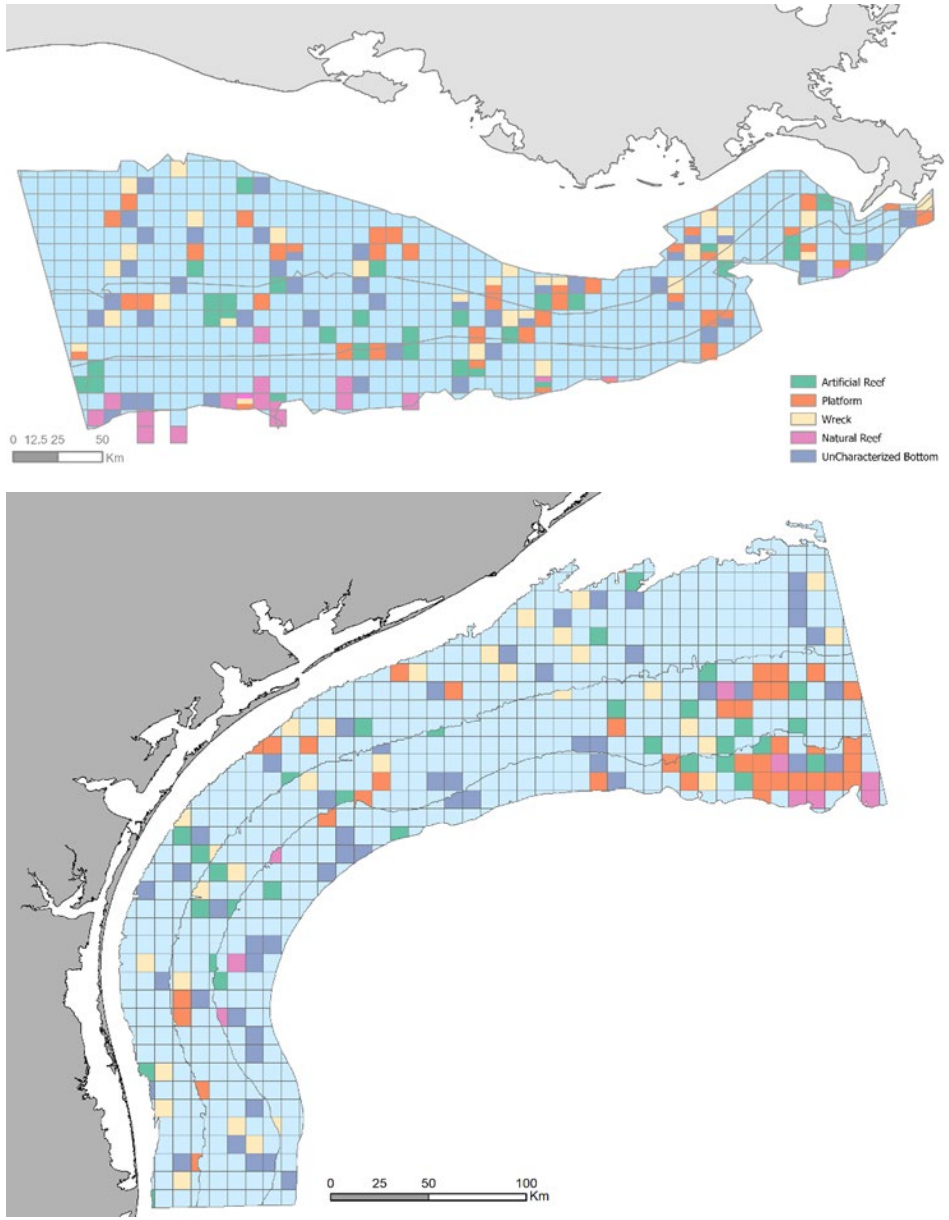


Regional sample designs and results (Ch. 11)

- All regions used randomized backbone
- All sampling stratified by habitat type
- Design details differ across regions due to
  - Conformation to existing leveraged projects in some regions
  - Differences in knowledge about habitat distribution across regions
- Details for each region are described in Final Report
  - Western Gulf of America (Ch. 11.1)
  - Alabama and Mississippi (Ch. 11.2)
  - Western Florida (Ch 11.3)
  - South Atlantic (Ch 11.4)

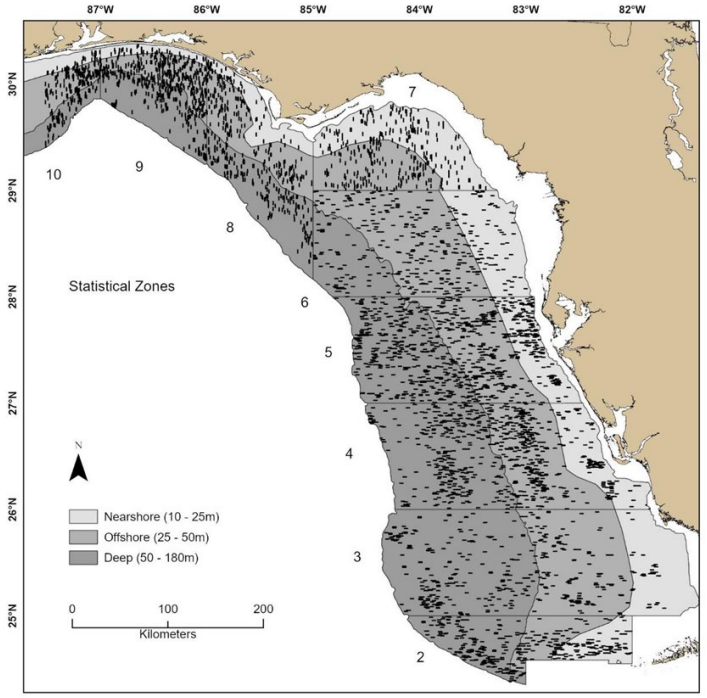
Design example: Western GoA (Ch. 11.1)

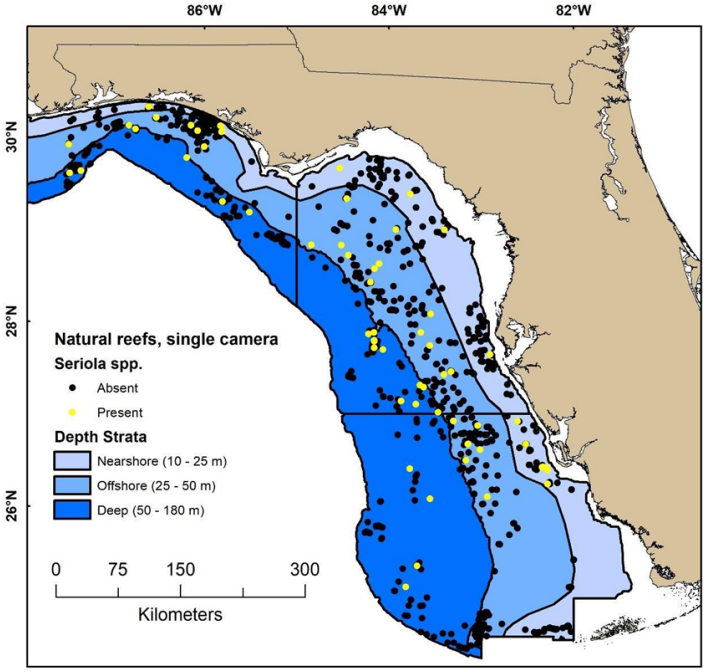
- Stratified random design
- Three depth zones:
  - shallow (20-40m)
  - mid (40-70m)
  - outer shelf (70-150m)
- Habitats:
  - Artificial reefs (AR)
  - Standing gas platforms (P)
  - Natural reefs (NR)
  - Uncharacterized bottom (UCB)
- Survey locations randomly selected in two stages for each habitat type
  - PSU = 5-km x 5-km grid cell
  - SSU = single location within cell
- Effort proportional to available habitat area in each depth zone



Design example: West Florida (Ch. 11.3)

- Leveraged effort of G-FISHER survey
  - Uses stationary Stereo Baited Remote Underwater Video (SBRUV) cameras
- G-FISHER design based around standardized random habitat mapping surveys
- Stratification by region, depth, and habitat type
- Stratified-random, two-stage cluster sampling
  - PSU: 0.1nm x 0.1nm micro grids
  - SSU: random point in target habitat polygon
- Effort allocated based on habitat availability and managed species richness
- Supplemented to meet needs of GAJ project
  - Active acoustics surveys at subset of G-FISHER sites
  - Full 360-degree SBRUV counts conducted at subset of G-FISHER sites
    - Abundance from regular single-camera counts compared to 360 counts to develop calibration coefficients
  - Paired baited-unbaited SBRUV trials conducted to evaluate influence of bait on counts of GAJ
  - Uncharacterized bottom surveyed using towed C-BASS camera system





Absolute abundance estimates by region

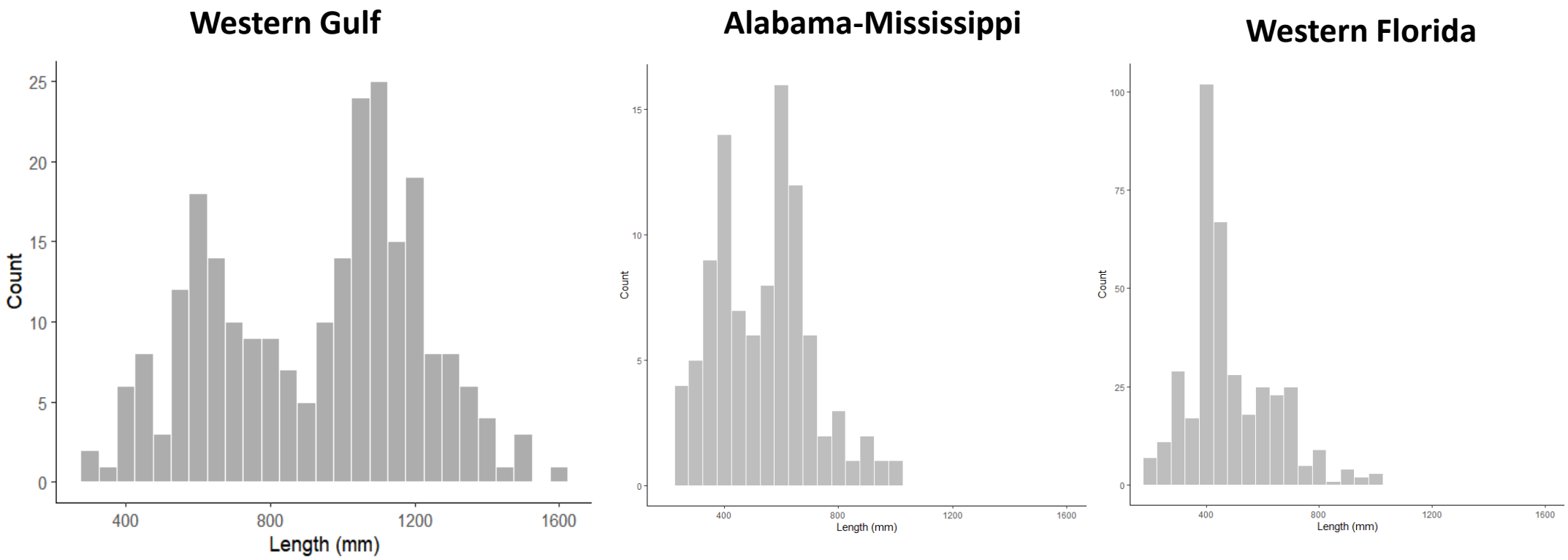
- Camera-only:

Region	Estimate	SD	CV %
Western Gulf	2,548,592	1,733,436	68.0
Alabama-Mississippi	341,528	194,394	56.9
Western Florida	726,416	164,933	22.7
Total Gulf	***3,616,536***	***1,752,082***	***48.4***
South Atlantic	***3,079,636***	***1,077,180***	***35.0***

- Acoustic:

Region	Estimate	SD	CV %
Western Gulf	615,788	211,828	34.4
Alabama-Mississippi	105,942	4,204	4.0
Western Florida	550,405	241,405	43.9
Total Gulf	***1,272,135***	***321,193***	***25.2***
South Atlantic	***3,089,458***	***1,281,063***	***41.5***

Regional size distributions



Note: very limited size data available from South Atlantic region

Caveats and future research needs

- Species identification on videos difficult for Seriola spp.
  - When species IDs were uncertain, we did not include those fish in our counts (leading to a conservative abundance estimate)
- MaxN is a conservative estimate (floor) of number of fish present during sampling event
- Camera ESAs not well grounded in unified theory or empirical data
  - Fish density estimates highly sensitive to ESA
  - When in doubt, we tended to use a larger ESA, resulting in conservative density/abundance estimates
- Acoustic counts
  - Disagreement (sometimes large) between stratum-specific and regional estimates using the two methods
  - Translation of raw acoustic data into fish counts is a complex and difficult process
  - Automated filtering algorithms may work well in test cases, but not across all conditions
  - Problems with using species ratios to correct acoustic counts
    - Sites where GAJ seen on video, but no LBWCF counted using acoustics
    - Sensitive to species included in LBWCF category
    - Since our acoustic estimates are generally lower than our camera-only estimates, our species list for LBWC fish was likely too broad
- Effective gear calibrations require large investment of time and resources
  - Calibration coefficients likely habitat and region specific
- Lack of comprehensive habitat maps (fine and broadscale): major limiting factor in estimating absolute abundance

CIE Review of early draft report

- Early version of project report benefited from suggestions of SEDAR sponsored review
- Review focused primarily on one objective: abundance estimates
- Regardless of absolute abundance estimates derived, this project has fundamentally advanced our understanding of the biology and ecology of Greater Amberjack
- In revising the report, the investigators incorporated as many suggestions from the review committee as feasible
- The estimates and CVs in this presentation and in the final report are not the same ones examined by the review committee

Project webpage, Final Report and forthcoming publications

- Please see the project webpage:
  https://gulfseagrant.org/reef-fish-extension/greater-amberjack-research-program/
- Read a full copy of the final technical report:
  https://masgc.org/assets/publications/uploads/26-029.pdf#asset:65775:url
- And check out the interactive StoryMap:
  https://storymaps.arcgis.com/stories/535c01f8f91b4e77933603862d1f6f34
- The results of this project will continue to be improved as publications benefit from the scientific journal peer-review process and are ultimately accepted. We encourage you to refer to those contributions as they become available.


Questions