Collaborative efforts to post-stratify the GRSC estimates for FL

SSC Meeting
January 2022

What's the issue?

- The FWRI, SEFSC, and PIs from the GRSC met between the last SSC and today to discuss the FL estimates from the GRSC:
  - The spatial distribution of fish in the GRSC conflicts with data from both the SEAMAP and FWRI surveys.
  - Extrapolating across the vast areas of the Florida Shelf could be an issue.
    - We discussed whether sparse positive observations for large spatial strata could have a large effect on the final estimates, and whether post-stratification may be appropriate.
      - Specifically, we discussed whether cutting the 10-40 depth stratum into 10-25 and 25-40 may be more appropriate.
    - We also discussed whether the GRSC, particularly for FL, differed from survey expectations because it was a snapshot in time.
      - Specifically, we discussed comparing the trends (relative abundance in the Big Bend and SFL) through time from the surveys.

More details:

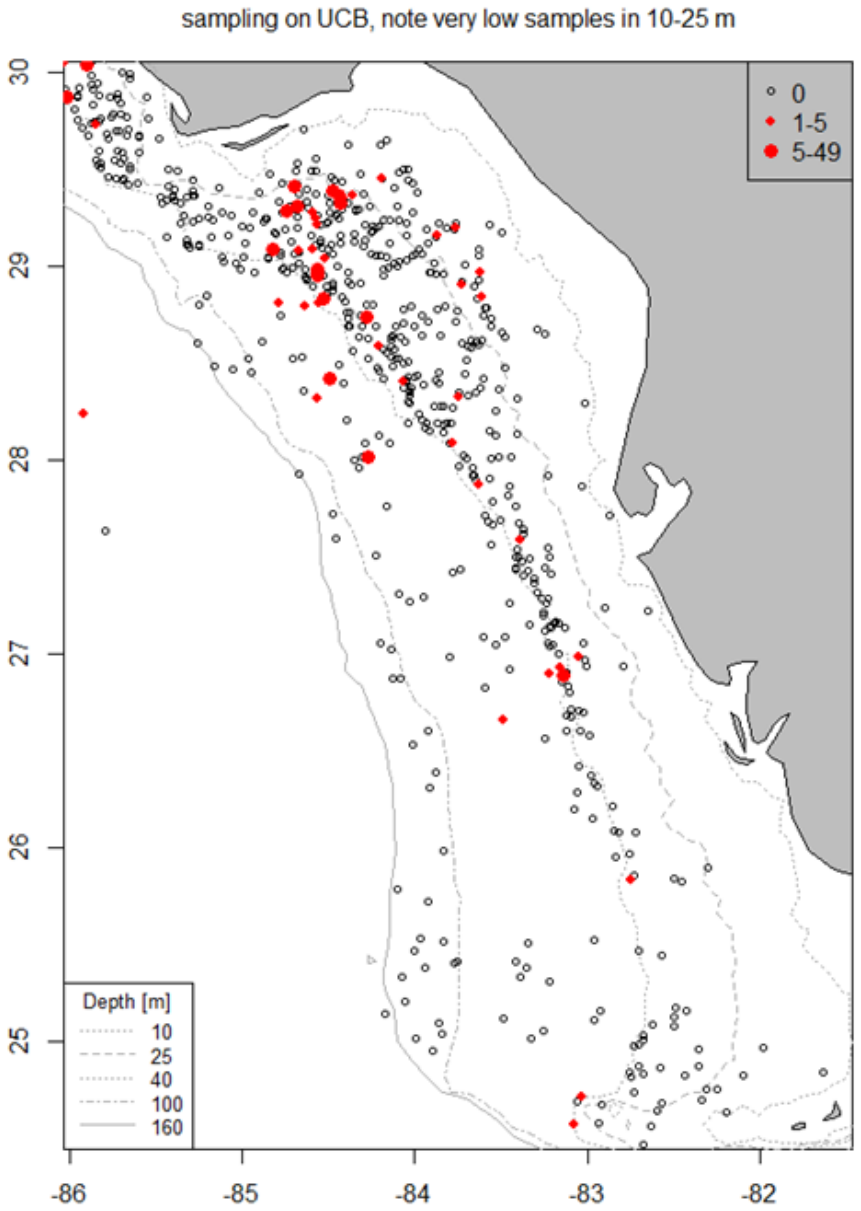
From the GRSC:

- A large proportion (>50%) of the FL RS population is in the Big Bend (mid FL) area of Florida (~27 million in the shallow 10-40 meter depth range out of 47 million).
- ~10.2 million are in South region (South of Tampa) with 4.5 million in the shallowest depth stratum.
- This means that ~30% of the total abundance in the GOM (92 mill) is in the shallowest depths of mid and south FL. This conflicts with the distribution of fish from the SEAMAP and FL surveys.

	Natural & Uncharacterized	143,538	748	0.61		46,921,038	10,300,890
	Red Snapper low probability	*92,616*				*14,653,325*	*5,462,227*
	NW Region- Deep	*1,557*	*13*	*0.009*	*0.000*	*0*	
	NW Region- Mid	*1,148*	*17*	*0.014*	*0.007*	*81,238*	*82,058*
	NW Region- Shallow	*2,009*	*23*	*0.024*	*0.000*	*0*	
	Mid Region- Deep	*3,295*	*2*	*0.001*	*0.000*	*0*	*0*
	Mid Region-Mid	*3,013*	*0*	-	-	*0*	
	Mid Region- Shallow	*19,460*	*77*	*0.052*	*0.271*	*5,265,679*	*2,616,464*
	Southern Region- Deep	*9,871*	*15*	*0.010*	*0.000*	*0*	*0*
	Southern Region- Mid	*18,358*	*13*	*0.013*	*0.315*	*5,786,192*	*3,859,150*
	Southern Region- Shallow	*33,905*	*53*	*0.048*	*0.104*	*3,520,216*	*2,844,339*
	Red Snapper probable	*28,065*				*15,454,698*	*5,838,704*
	NW Region- Deep	*98*	*7*	*0.005*	*0.211*	*20,614*	*20,410*
	NW Region- Mid	*693*	*7*	*0.006*	*0.000*	*0*	
	NW Region- Shallow	*1,145*	*11*	*0.008*	*1.847*	*2,115,089*	*2,118,505*
	Mid Region- Deep	*419*	*2*	*0.001*	*0.000*	*0*	*0*
FL	*Mid Region-Mid*	*4,026*	*10*	*0.009*	*1.057*	*4,256,027*	*3,042,427*
	Mid Region- Shallow	*8,030*	*138*	*0.107*	*1.021*	*8,199,695*	*4,479,071*
	Southern Region- Deep	*1,928*	*6*	*0.004*	*0.000*	*0*	*0*
	Southern Region- Mid	*9,383*	*10*	*0.016*	*0.000*	*0*	
	Southern Region- Shallow	*2,343*	*49*	*0.038*	*0.368*	*863,273*	*532,486*
	Red Snapper high probability	*22,858*				*16,813,015*	*6,494,764*
	NW Region- Deep	*8*	*6*	*0.004*	*0.000*	*0*	
	NW Region- Mid	*220*	*5*	*0.004*	*0.000*	*0*	
	NW Region- Shallow	*399*	*18*	*0.016*	*0.635*	*253,470*	*227,876*
	Mid Region- Deep	*45*	*0*	-	-	*0*	*0*
	Mid Region-Mid	*5,074*	*10*	*0.011*	*1.418*	*7,195,848*	*5,984,849*
	Mid Region- Shallow	*6,487*	*210*	*0.174*	*1.424*	*9,236,065*	*2,510,522*
	Southern Region- Deep	*390*	*4*	*0.003*	*0.000*	*0*	*0*
	Southern Region- Mid	*9,301*	*14*	*0.014*	*0.000*	*0*	
	Southern Region- Shallow	*932*	*28*	*0.022*	*0.137*	*127,631*	*94,323*
	Artificial	7,763	84		16	123,377	20,125
	Total		832			47,044,415	10,300,910

NOAA FISHERIES

The shallowest depth strata is estimated to have large abundance based on very few samples. From the GRSC:



FWRI sampling indicates very few fish in depths from 10-25 m, which is similar to what the GRSC observed (almost no positive stations in 10-25 meters, with most of the fish in the 10-40 depth range in 25-40 meters. Extrapolating across a very heterogenous and large stratum (10-40) may have inflated the Florida numbers.
From FWRI:

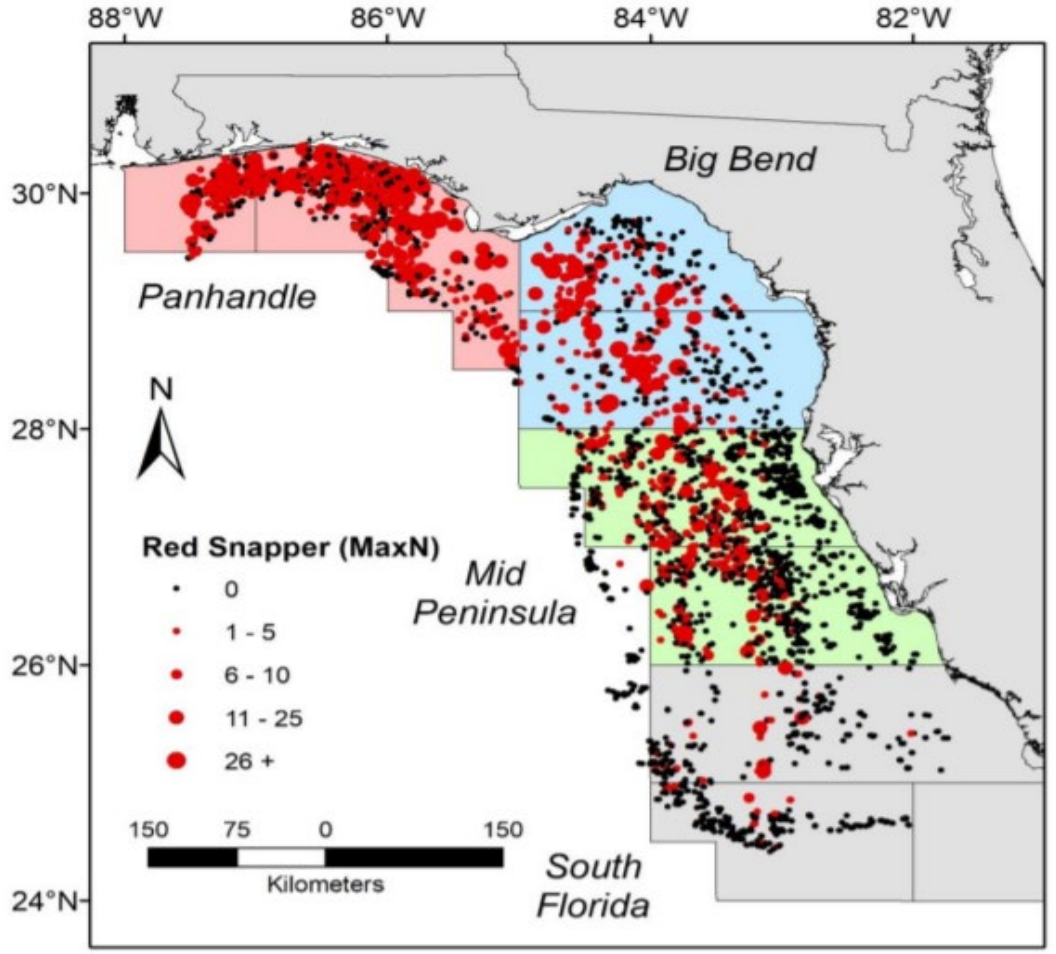
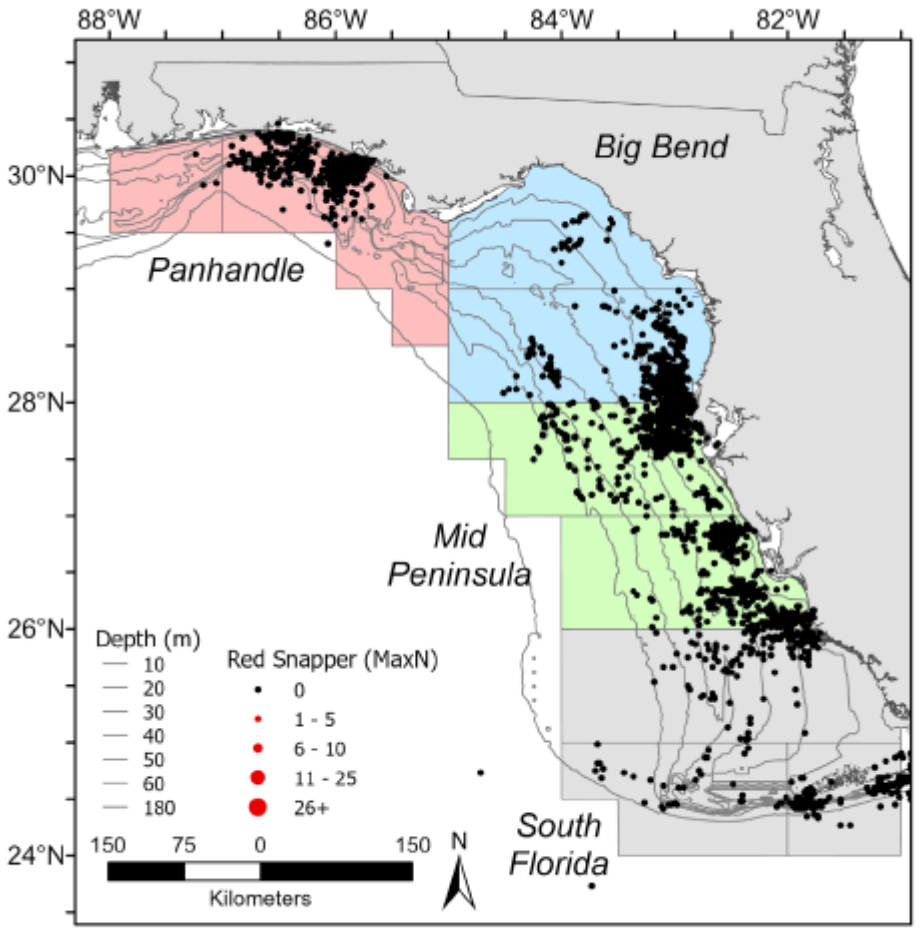
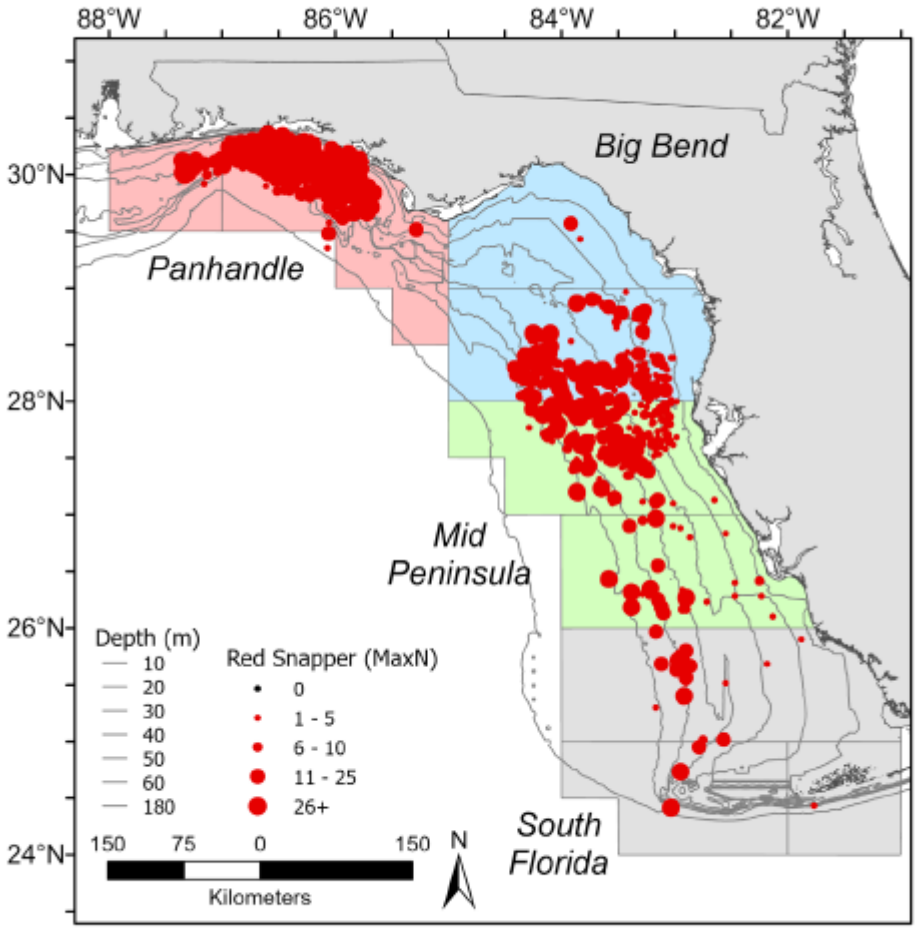


Figure 3. Map of the location of all sampling sites and site-specific abundance of Red Snapper from the FWRI reef fish survey.

Sampling Distribution – 2015-2020 Fishery-Dependent (FWRI)

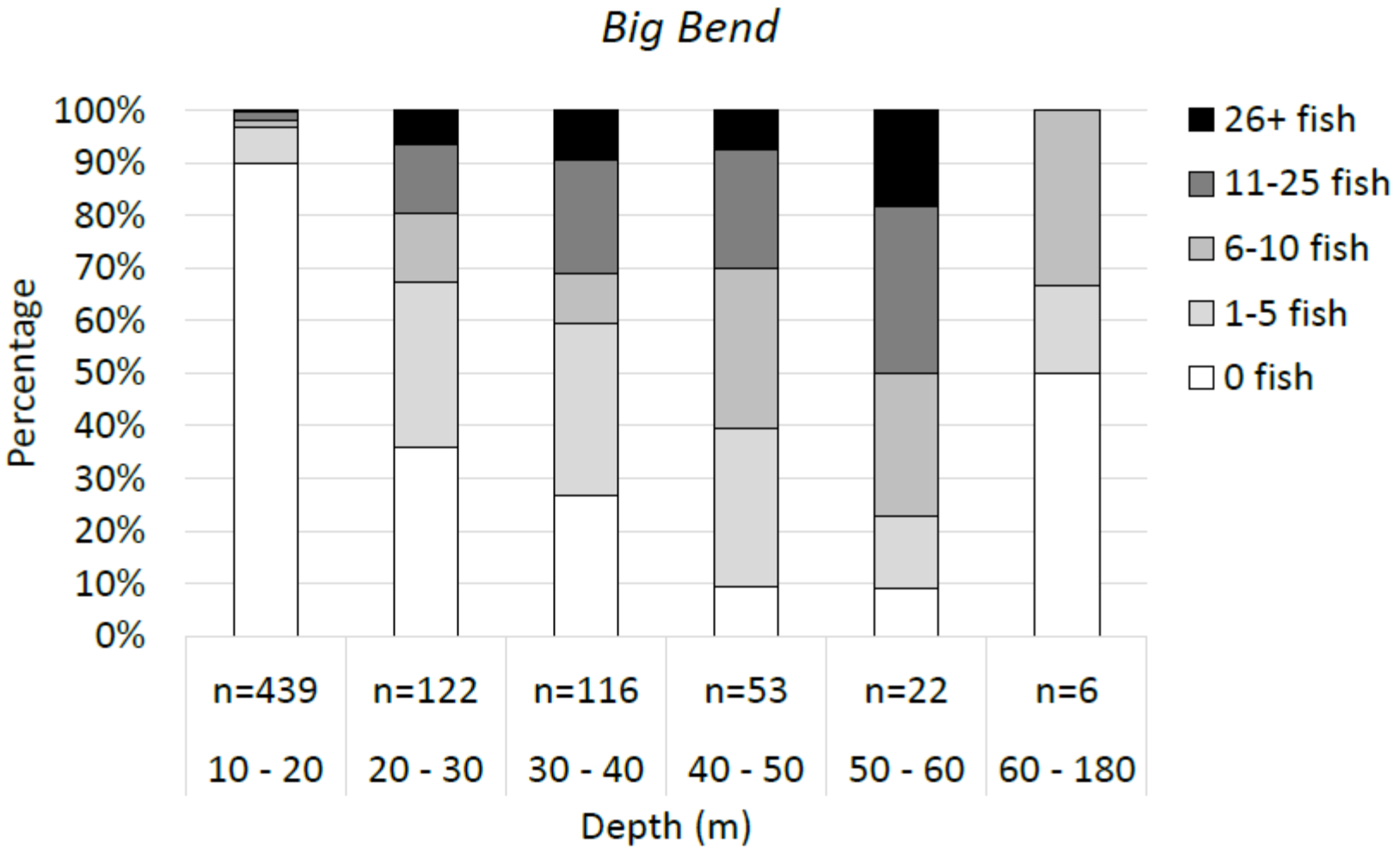


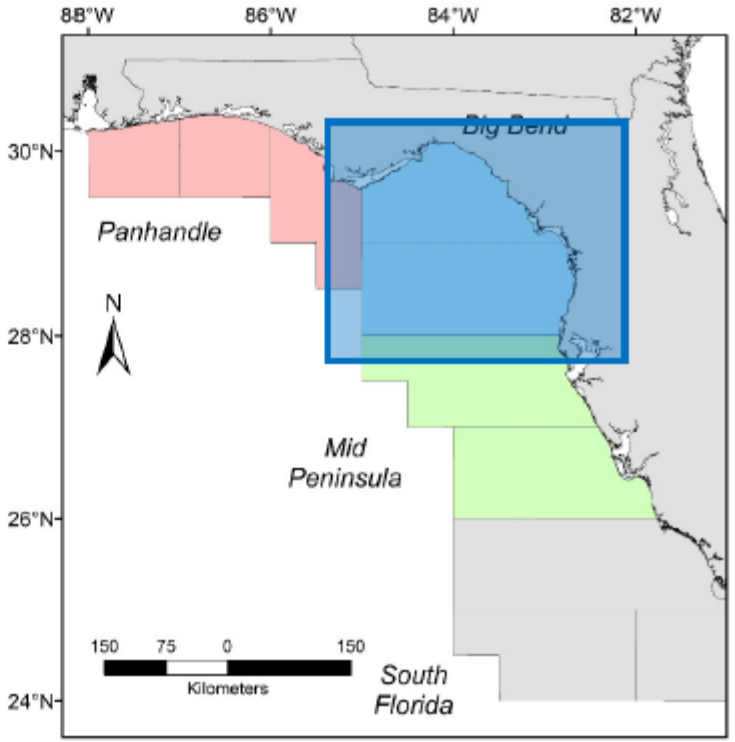
Stations with 0 Red Snapper



Stations with > 0 Red Snapper

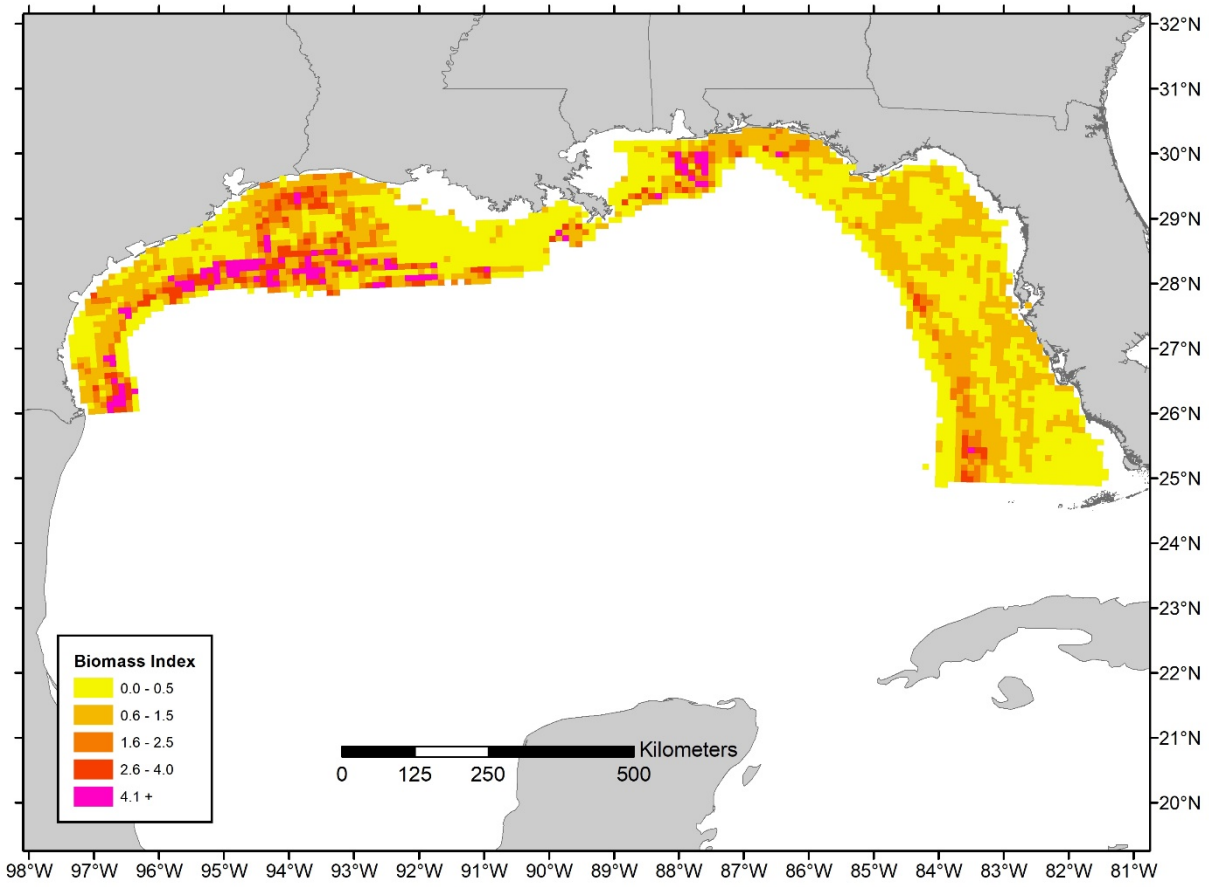
Fisheries Dependent Sampling Efforts – 2015-2020 (FWRI)





- GRSC mapping would look very different than Karnauskas et al., with more exploitable fish in the east.
- The spatial distribution of commercial landings does not show large catches in the Big Bend and SFL even though there is commercial effort in those areas, but for other species.

Figure 2. Relative biomass index reproduced from Karnauskas et al. 2017.



CM Landings Distribution:

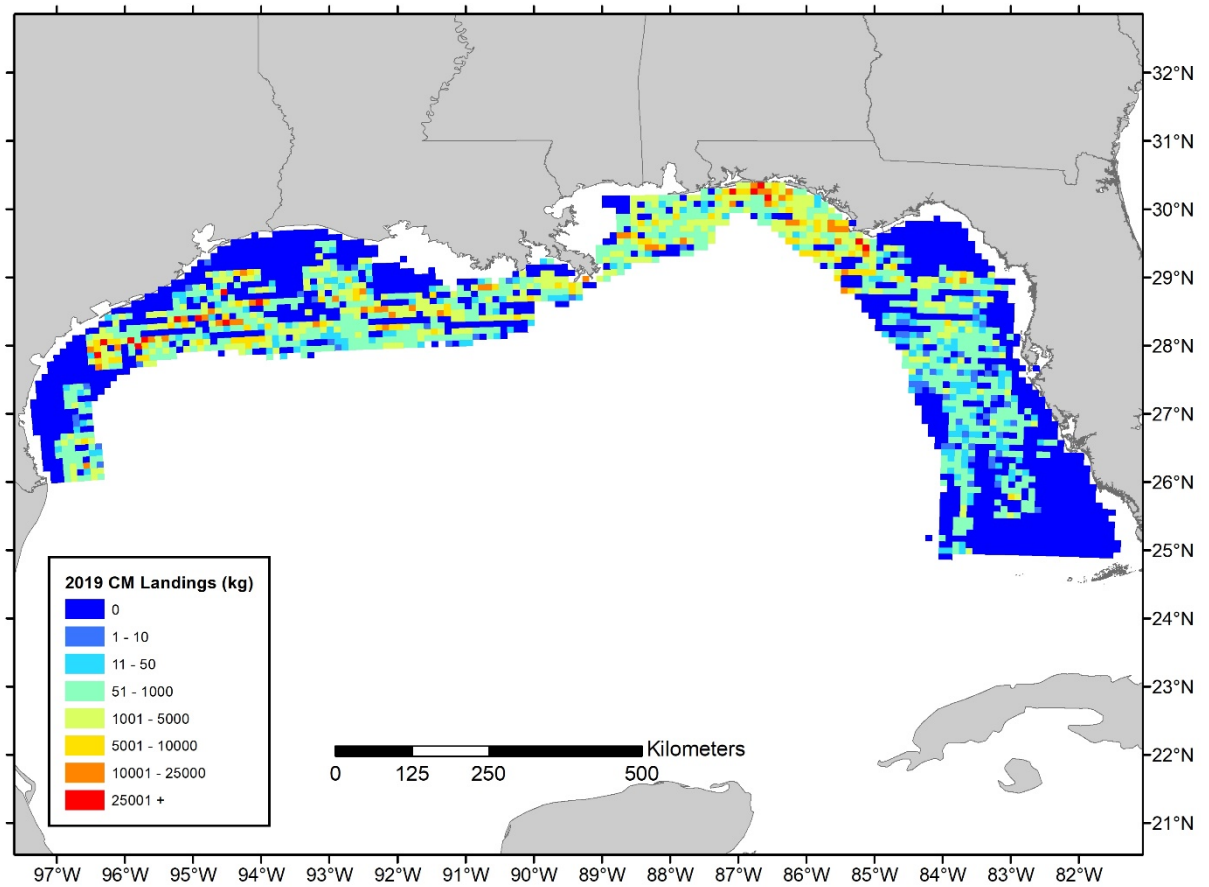
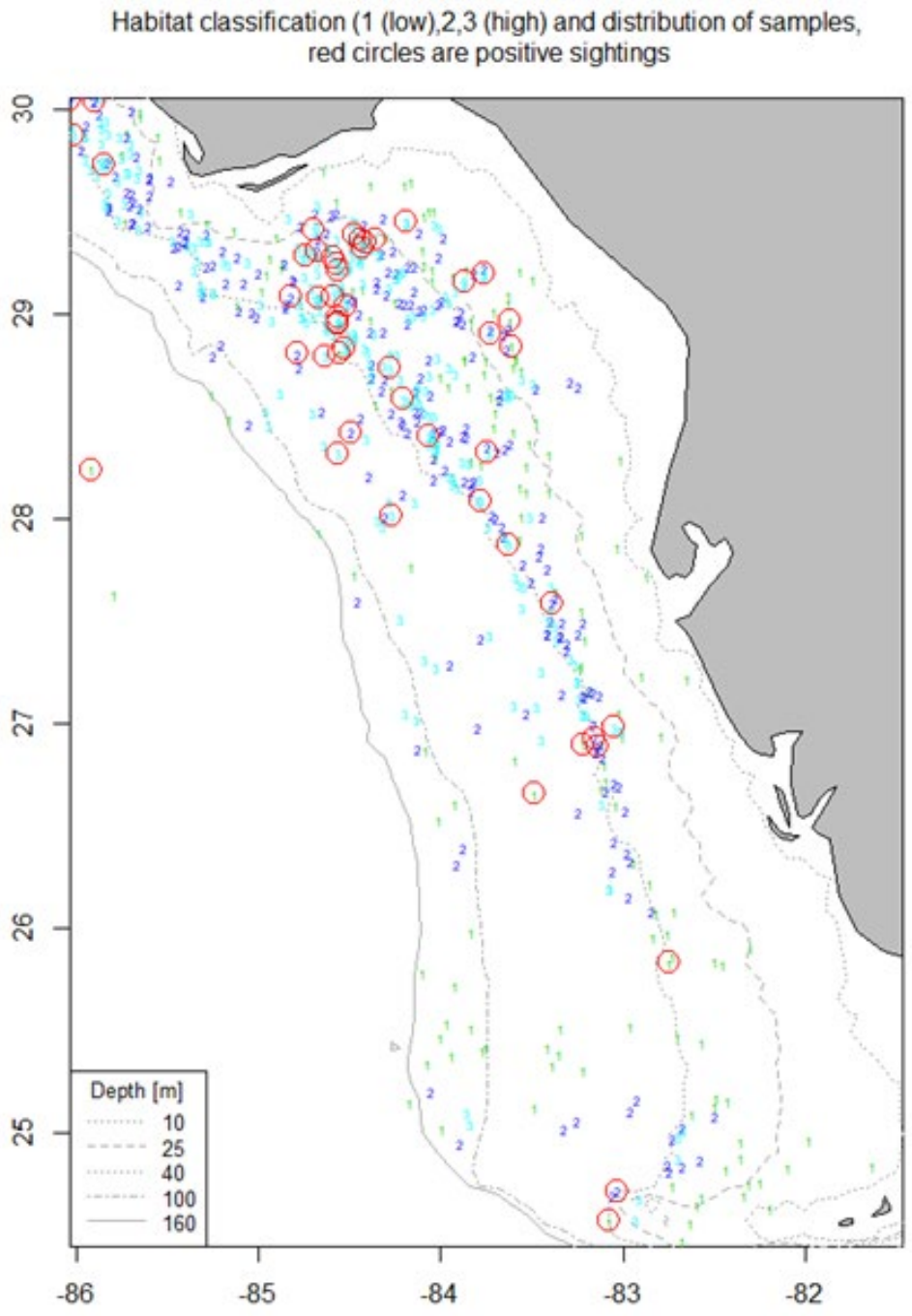


Figure 4. 2019 red snapper estimated commercial landings (kg) per 10 x10 km grid cell.

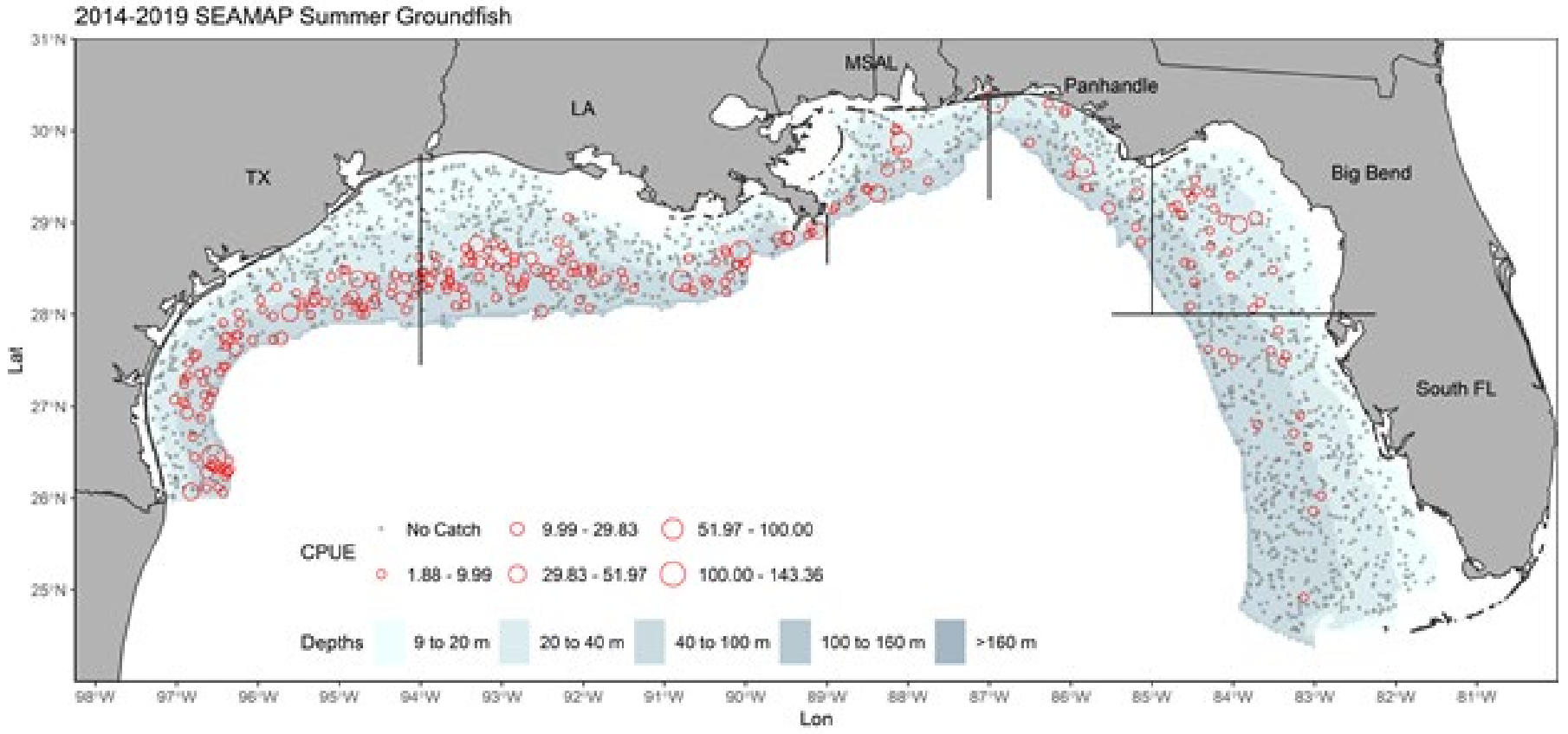


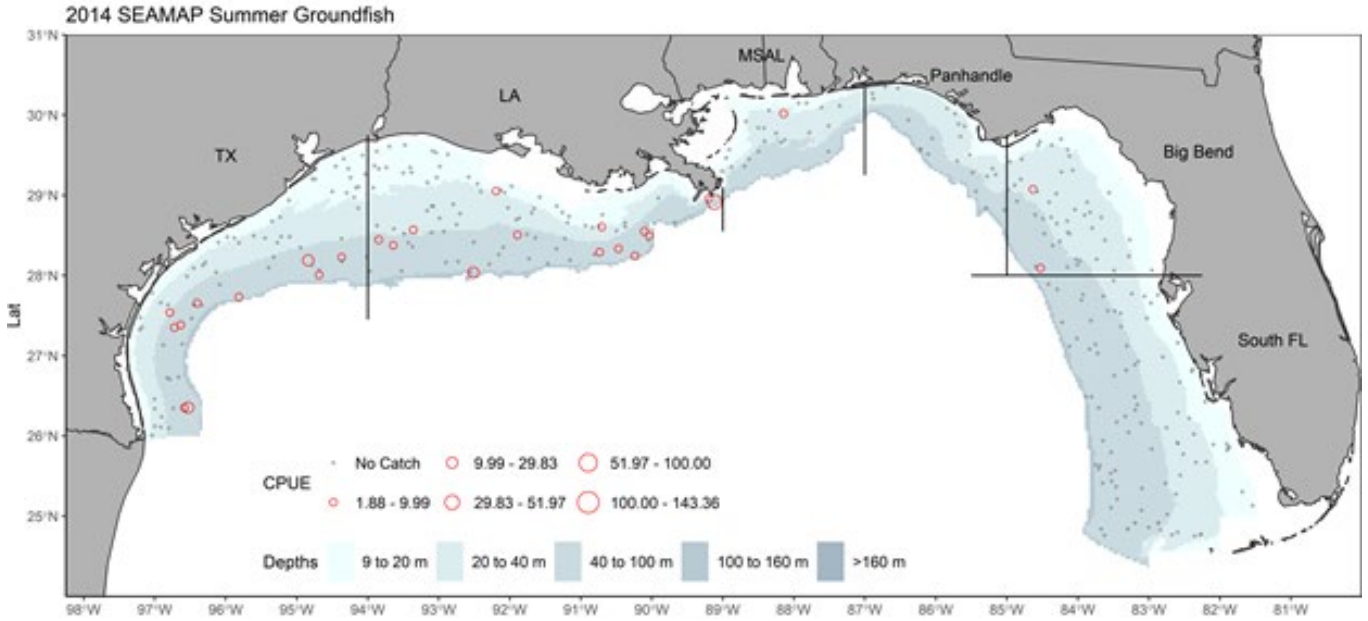
- Even though the samples were selected from the RF model probabilities, they do not seem to cover the large swaths of low probability habitat and seem to be concentrated in the deeper part of the 10-40 depth zone.
- The discussion amongst collaborators focused on:
    - The heterogenous nature of sampling and captures from 10 meters to 40 meters.
    - The affects of artificial vs natural reef sampling in the FWRI survey.
    - In-season vs. closed season sampling.
    - Are there temporal trends?
    - What depth strata are possible during post-stratification?

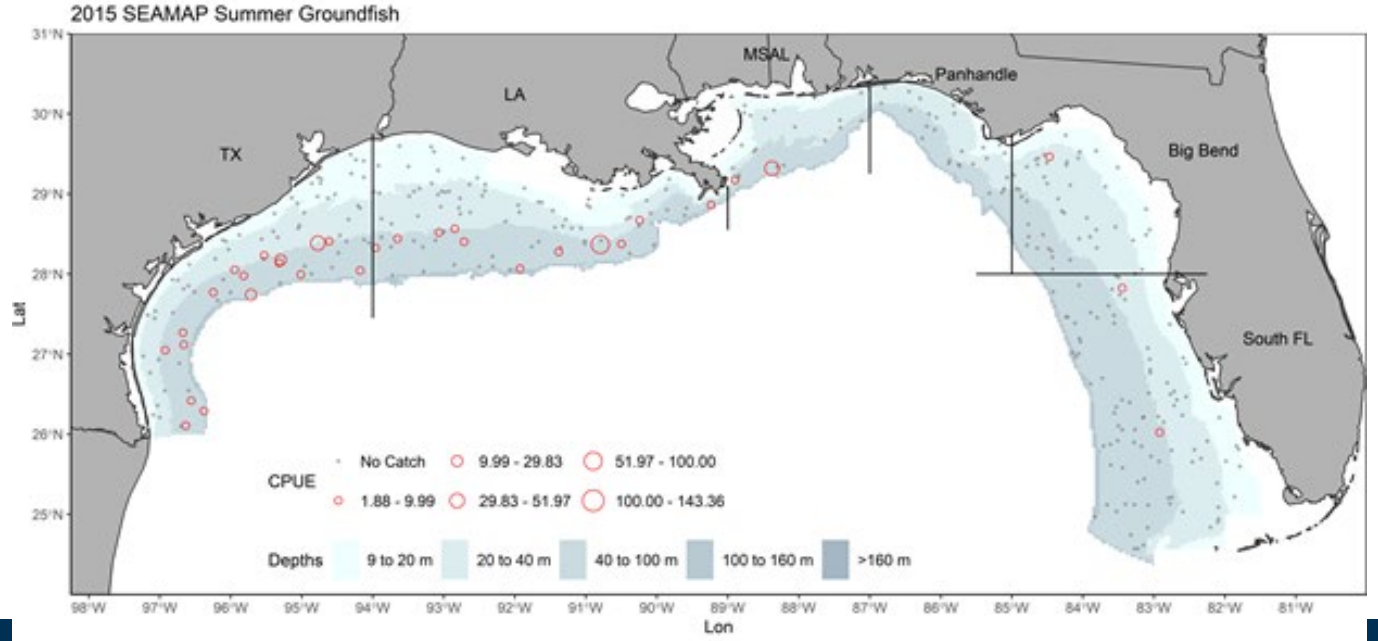
What's the plan?

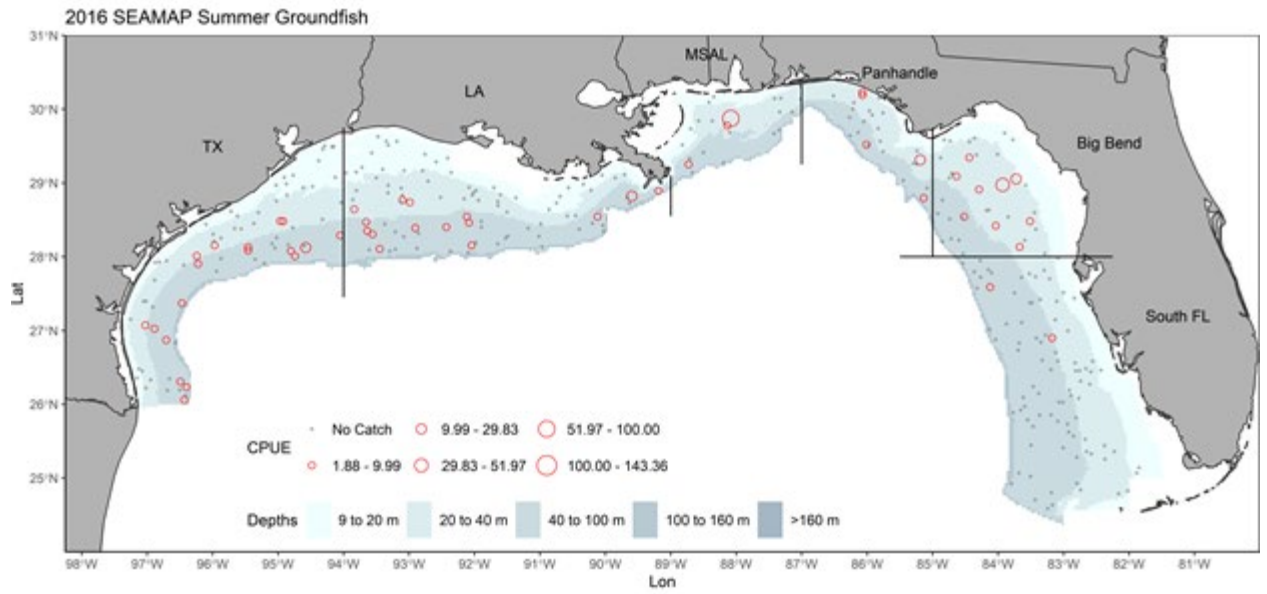
- The GRSC PIs, FWRI staff and SEFSC staff will collaborate to:
  - Look at temporal patterns in the survey data;
  - Look at size composition data to understand why smaller fish were collected in FL than in other regions; and
  - Determine whether, how and who will do the post-stratification of the FL estimates.

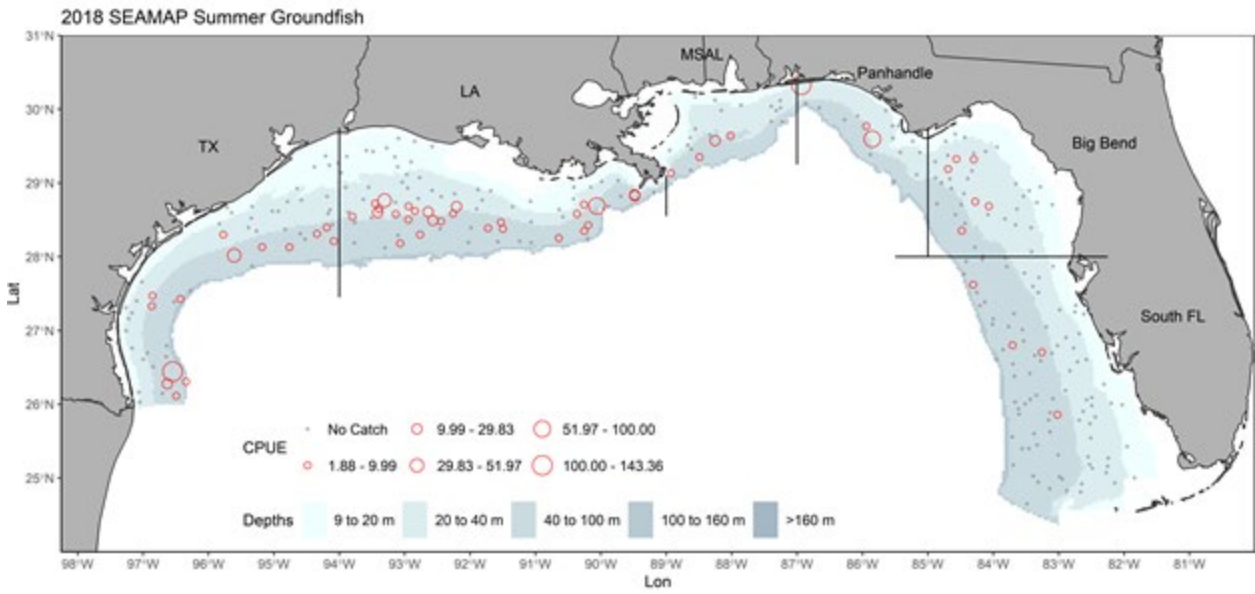
Maps for the temporal trends discussion SEAMAP Summer Groundfish:

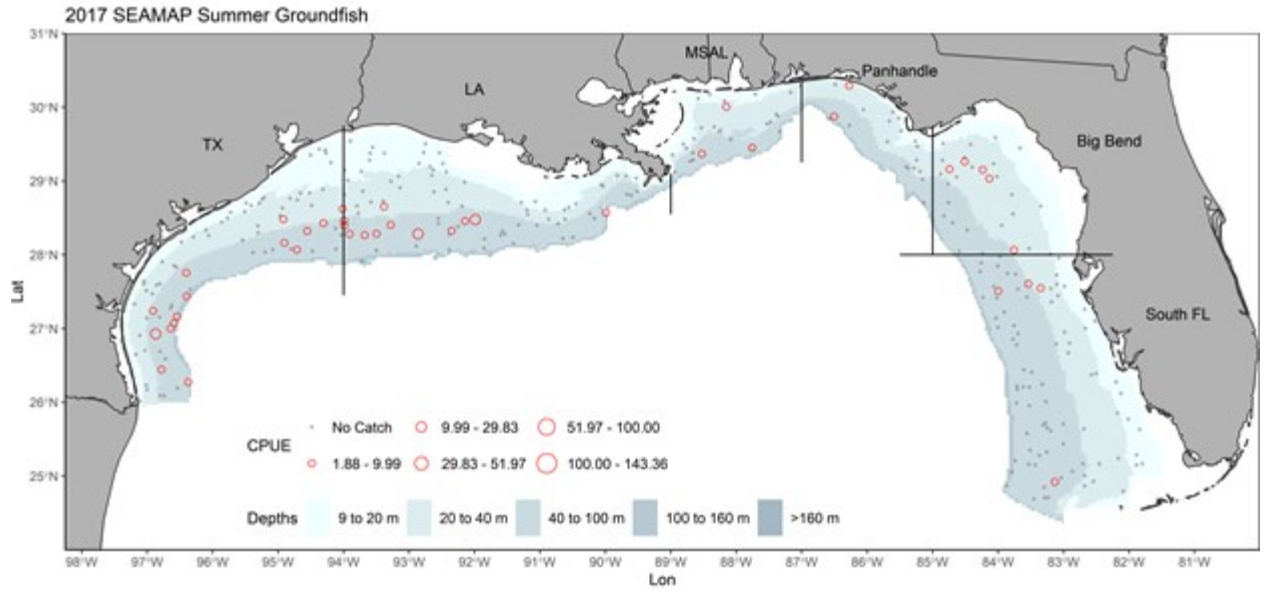


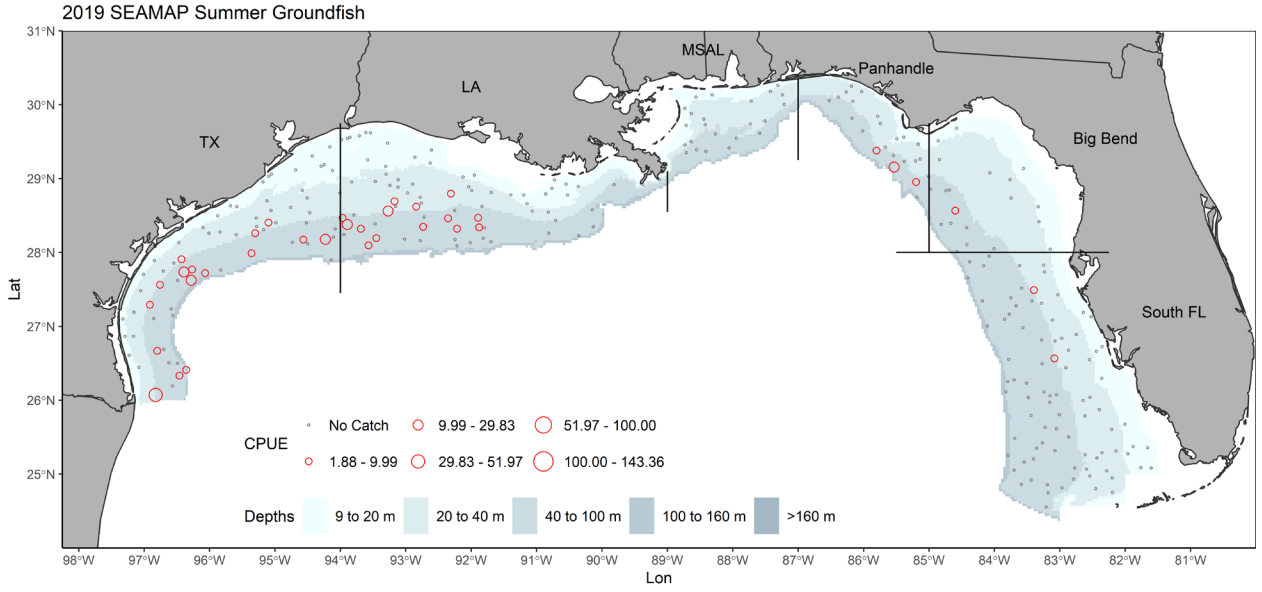

2014 SEAMAP Summer Groundfish
MSAL
Panhandle
LA
TX
Big Bend
South FL
Lat
CPUE
No Catch
9.99 - 29.83
51.97 - 100.00
1.88 - 9.99
29.83 - 51.97
100.00 - 143.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m


2015 SEAMAP Summer Groundfish
MSAL
Panhandle
LA
TX
Big Bend
South FL
Lat
Lon
CPUE
No Catch
9.99 - 29.83
51.97 - 100.00
1.88 - 9.99
29.83 - 51.97
100.00 - 143.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m

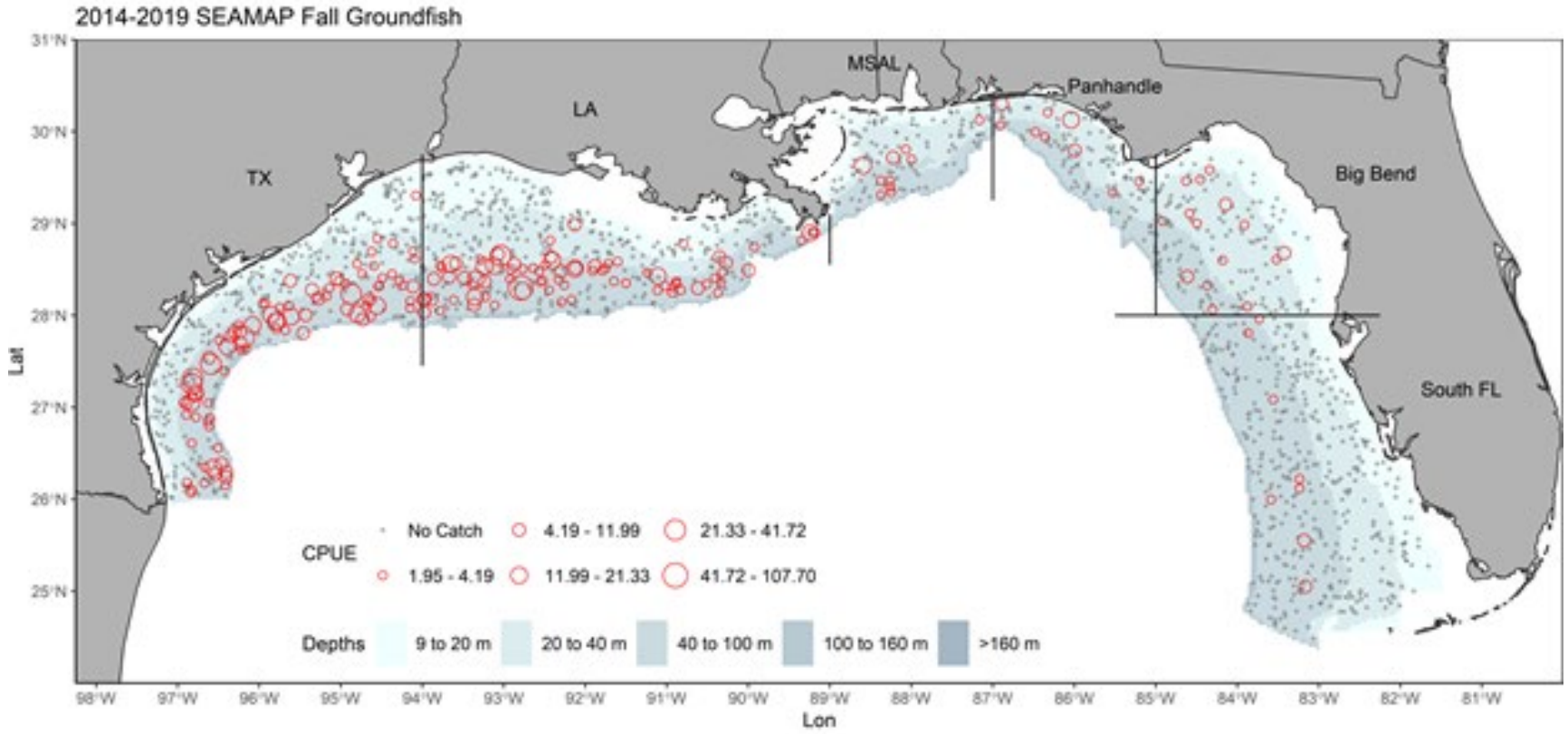

2016 SEAMAP Summer Groundfish
MSAL
LA
TX
Panhandle
Big Bend
South FL
CPUE
No Catch
9.99 - 29.83
51.97 - 100.00
1.88 - 9.99
29.83 - 51.97
100.00 - 143.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
Lat
Lon

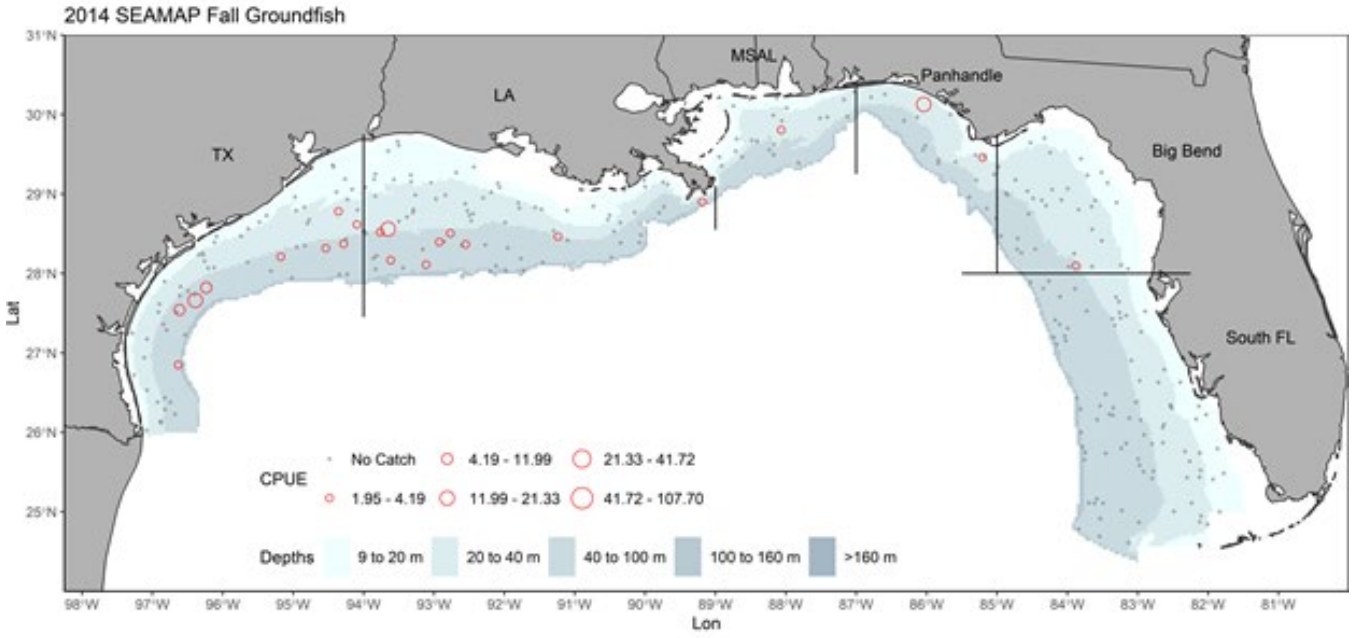

2018 SEAMAP Summer Groundfish
MSAL
LA
TX
Panhandle
Big Bend
South FL
CPUE
No Catch
9.99 - 29.83
51.97 - 100.00
1.88 - 9.99
29.83 - 51.97
100.00 - 143.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
Lat
Lon

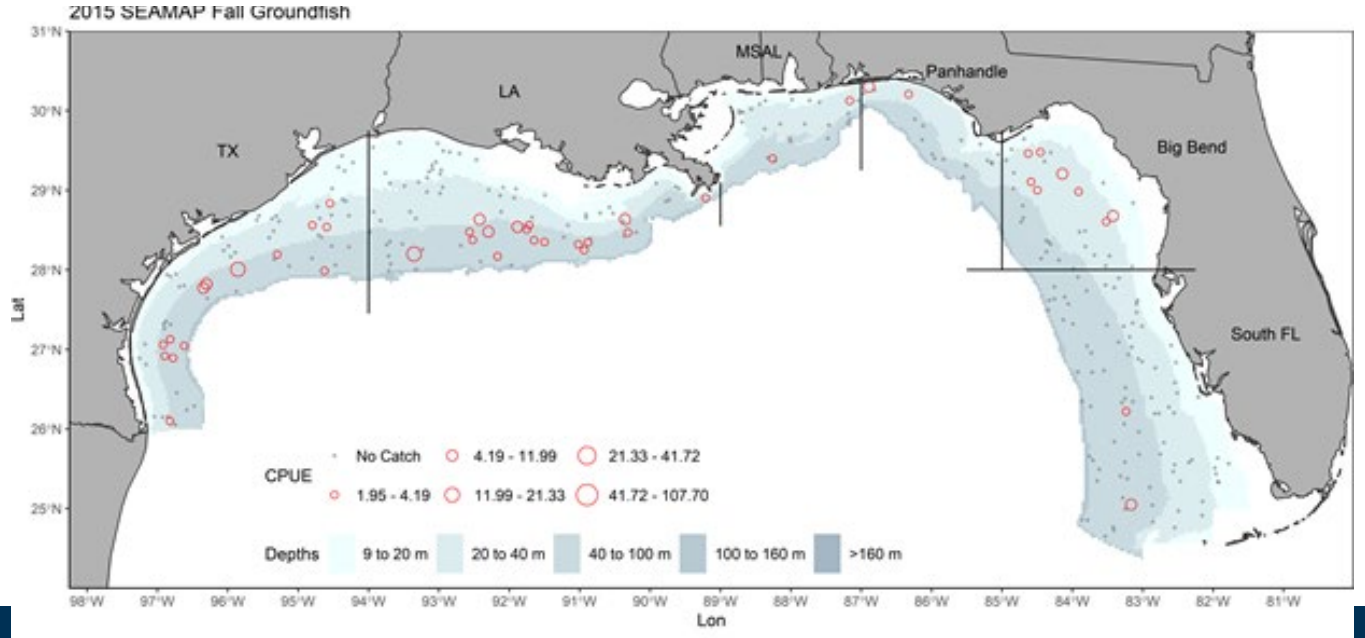

2017 SEAMAP Summer Groundfish
MSAL
LA
TX
Panhandle
Big Bend
South FL
CPUE
No Catch
9.99 - 29.83
51.97 - 100.00
1.88 - 9.99
29.83 - 51.97
100.00 - 143.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
Lat
Lon


2019 SEAMAP Summer Groundfish
MSAL
LA
TX
Panhandle
Big Bend
South FL
CPUE
No Catch
9.99 - 29.83
51.97 - 100.00
1.88 - 9.99
29.83 - 51.97
100.00 - 143.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
Lat
Lon

SEAMAP Fall Groundfish:

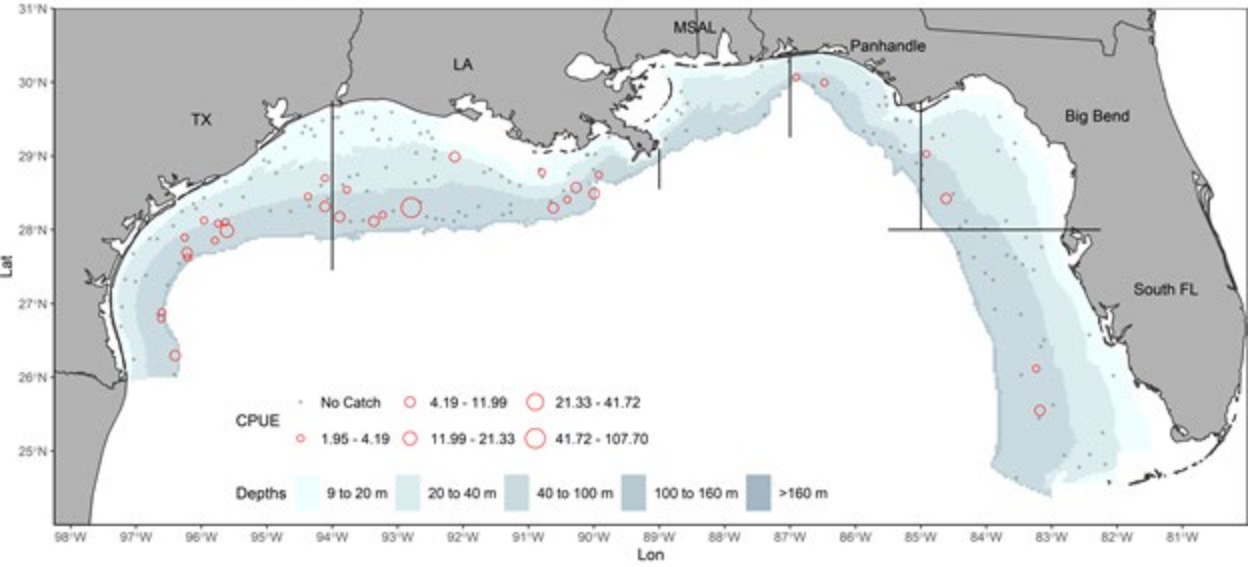




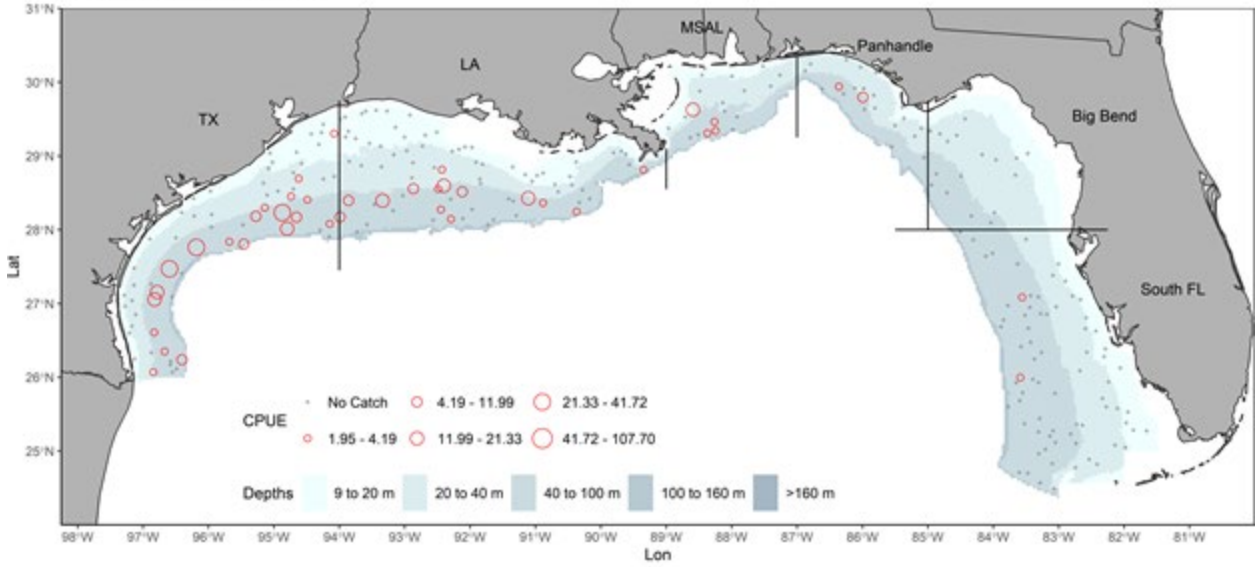


NOAA FISHERIES

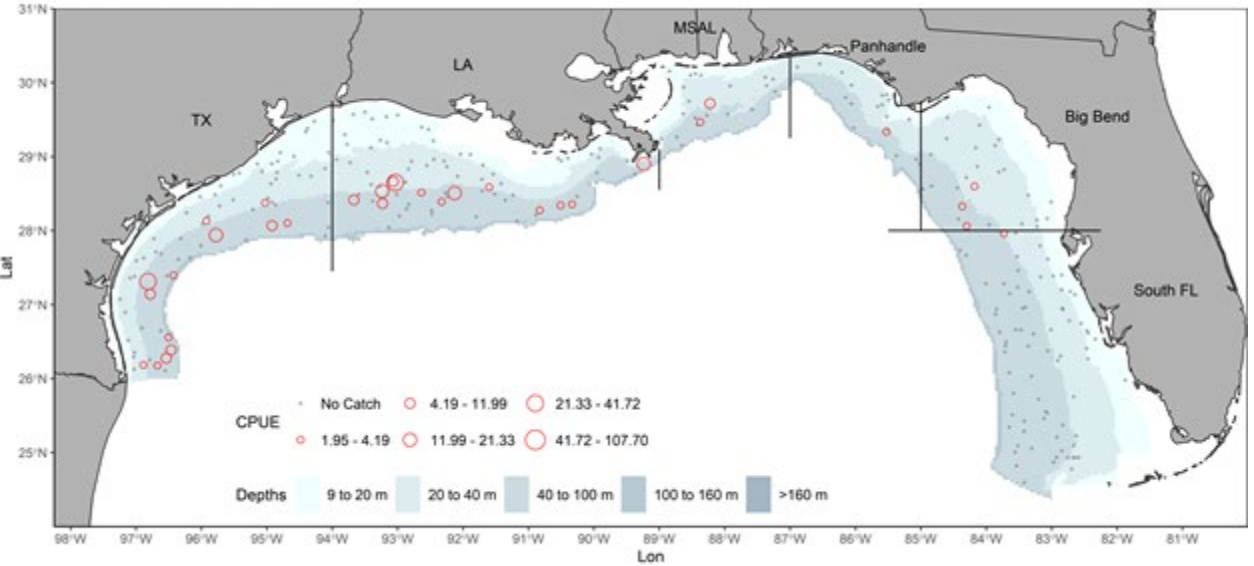
2016 SEAMAP Fall Groundfish



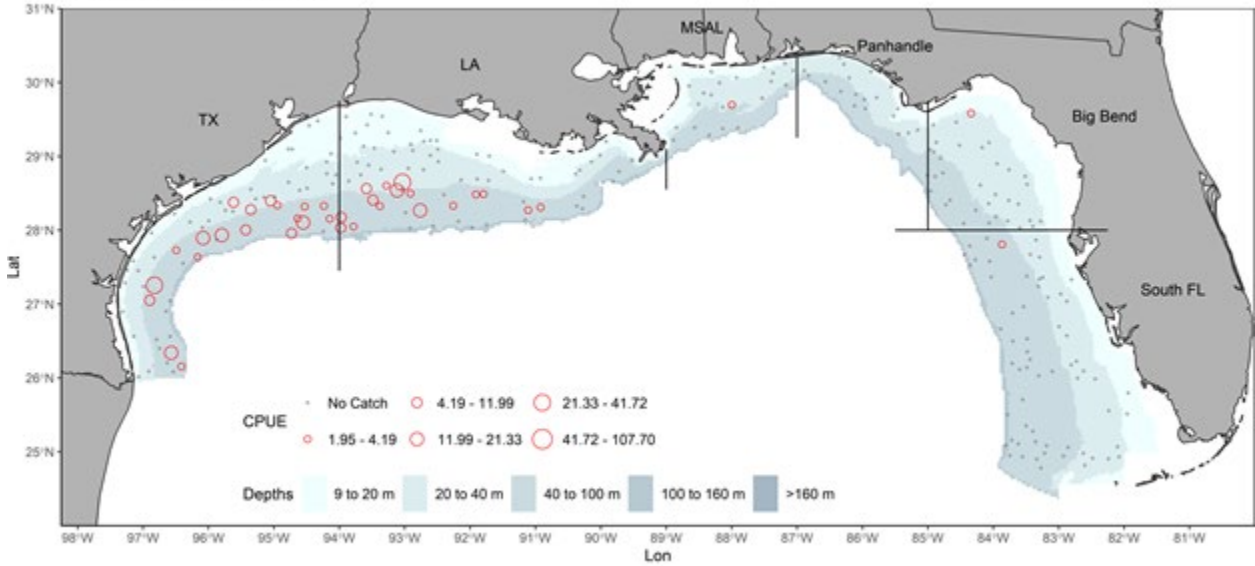
2018 SEAMAP Fall Groundfish



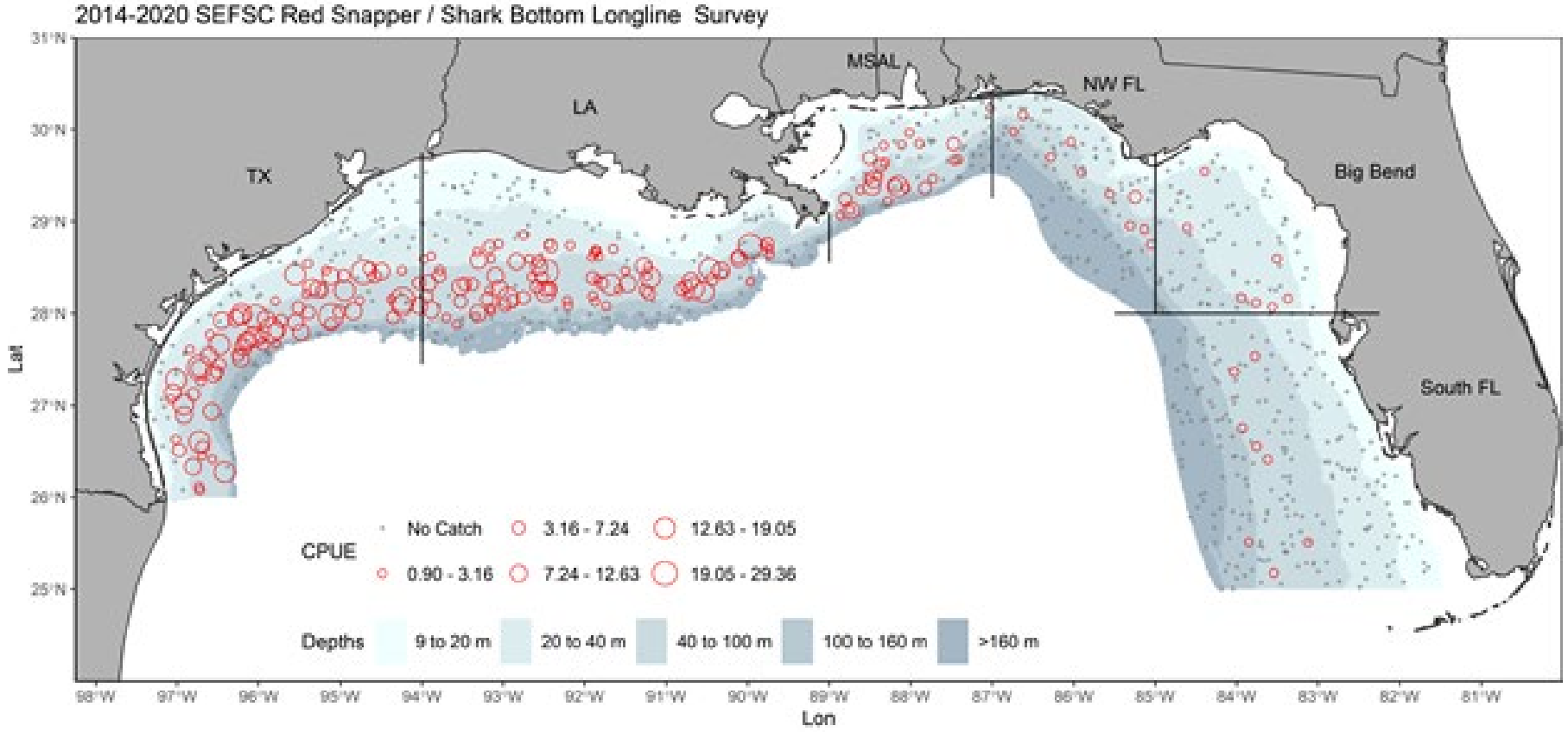
2017 SEAMAP Fall Groundfish

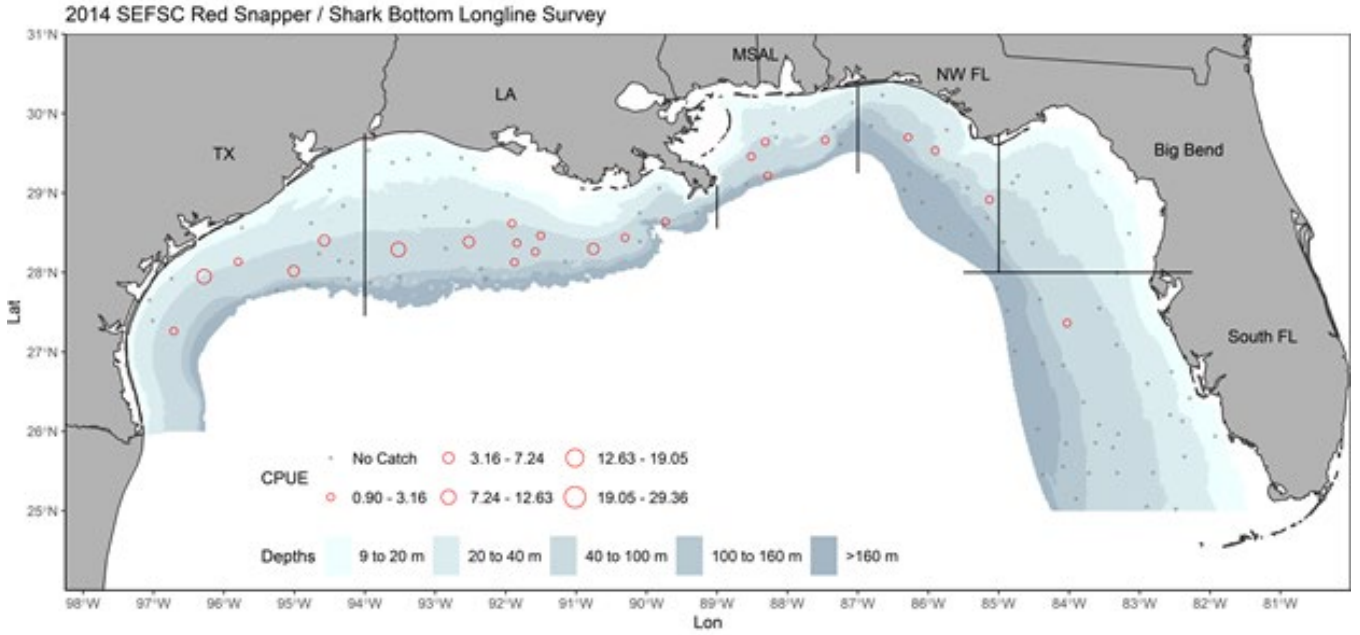


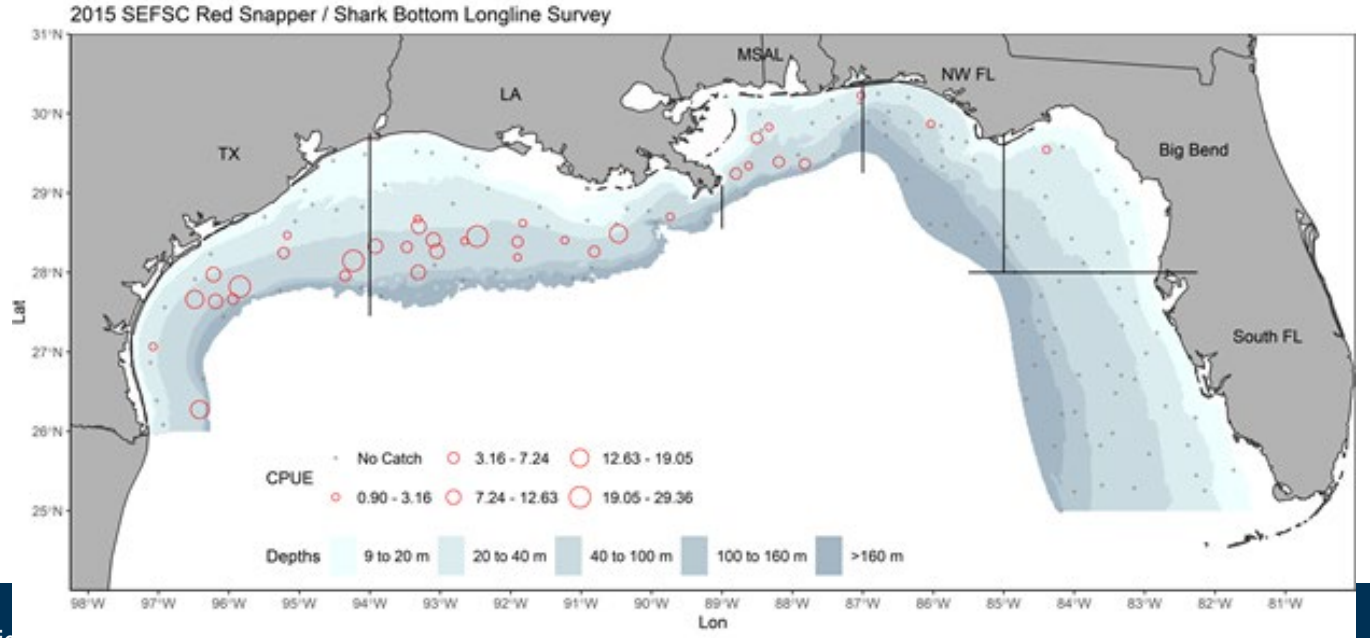
2019 SEAMAP Fall Groundfish

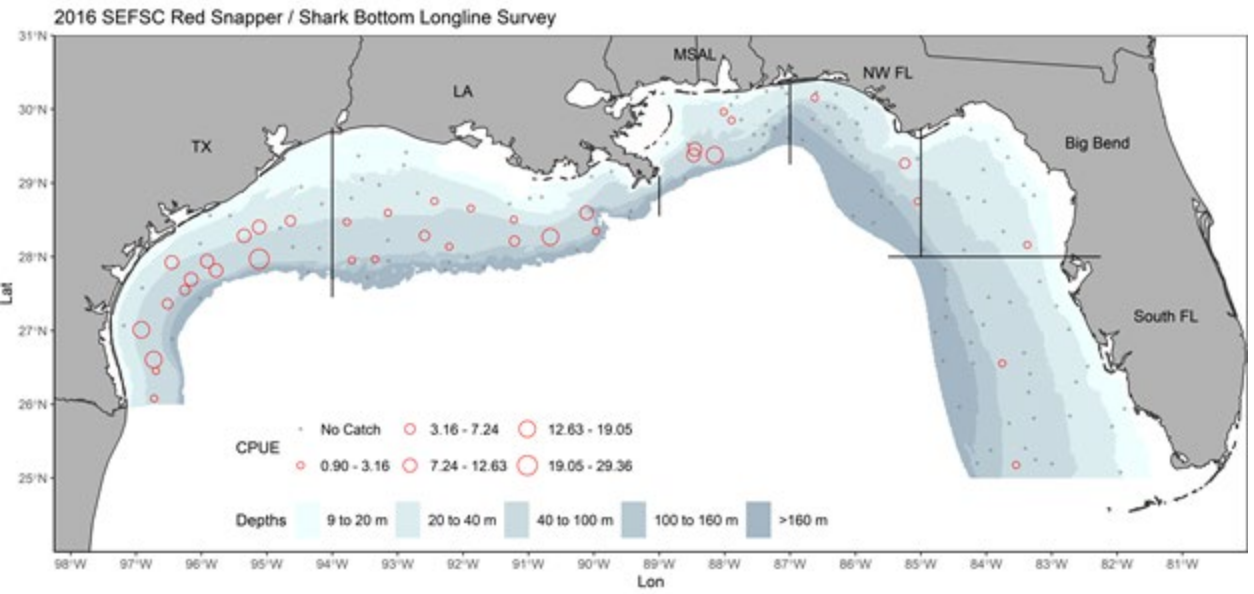


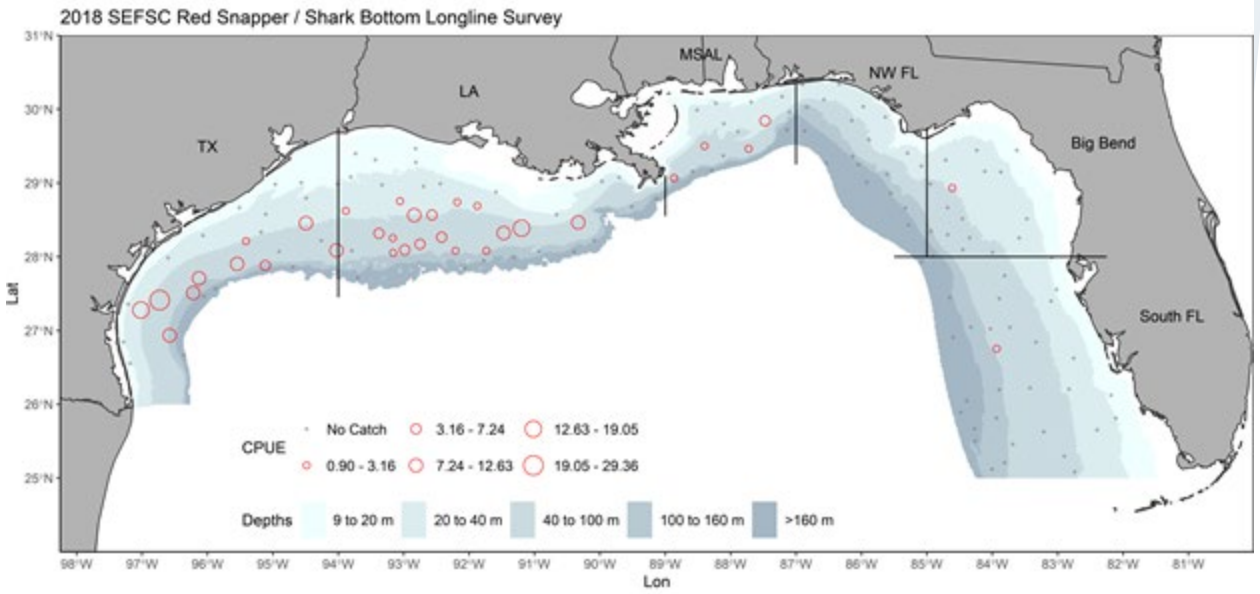
Bottom Longline Survey

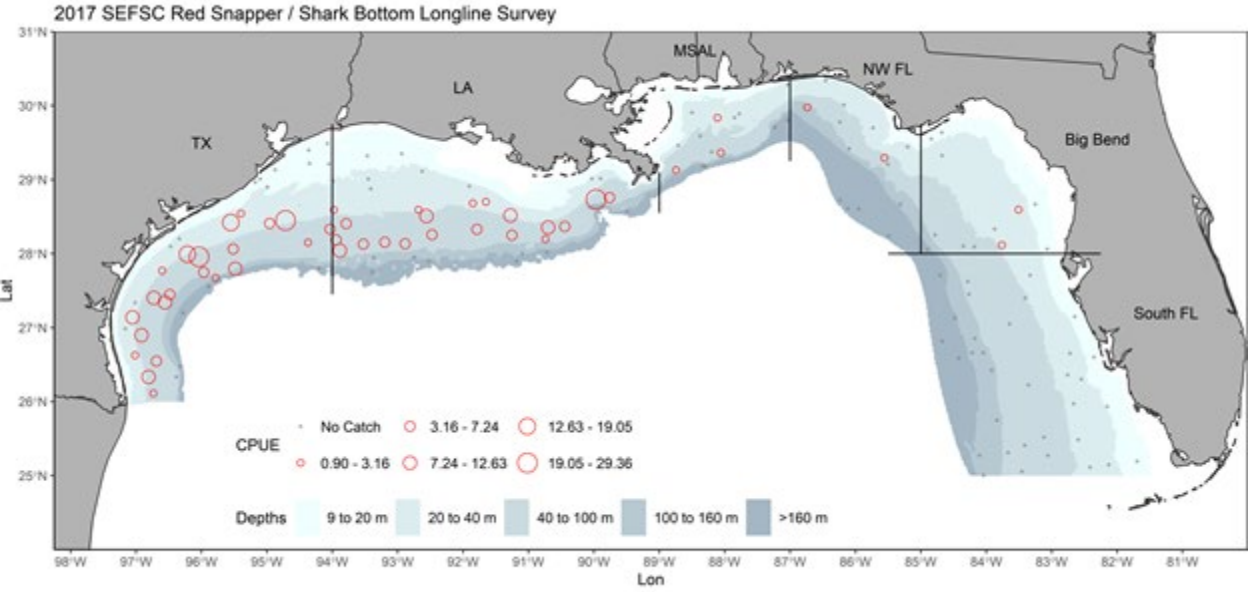


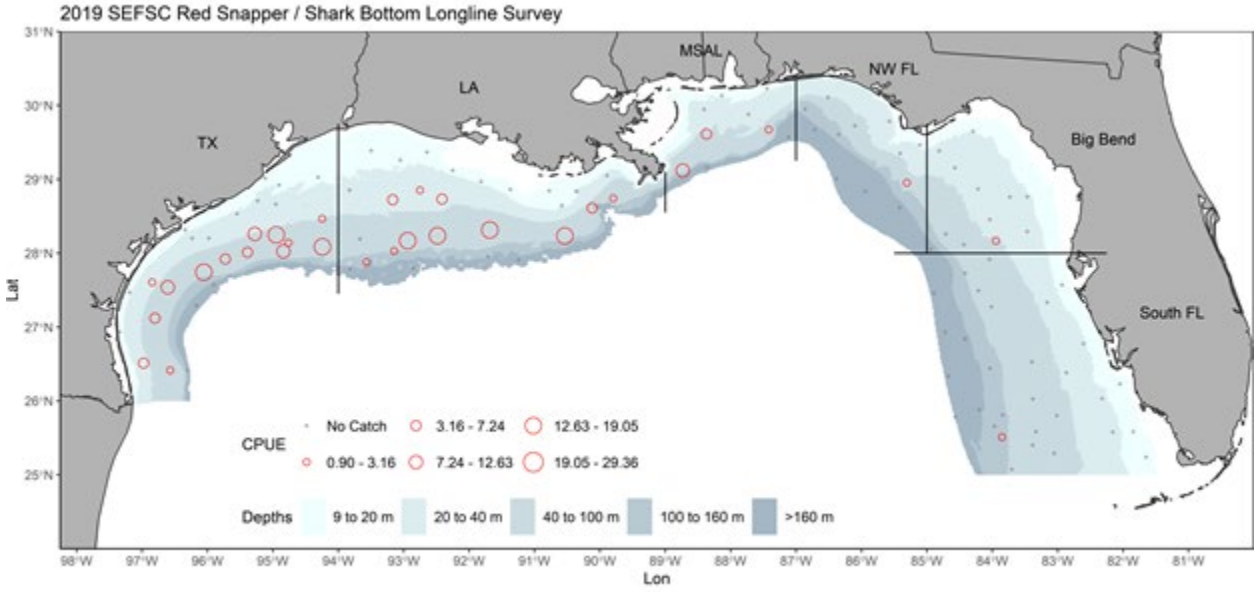

2014 SEFSC Red Snapper / Shark Bottom Longline Survey
MSAL
NW FL
LA
TX
Big Bend
South FL
Lat
Lon
CPUE
No Catch
3.16 - 7.24
12.63 - 19.05
0.90 - 3.16
7.24 - 12.63
19.05 - 29.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m


2015 SEFSC Red Snapper / Shark Bottom Longline Survey
MSAL
NW FL
LA
TX
Big Bend
South FL
Lat
Lon
CPUE
No Catch
3.16 - 7.24
12.63 - 19.05
0.90 - 3.16
7.24 - 12.63
19.05 - 29.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m

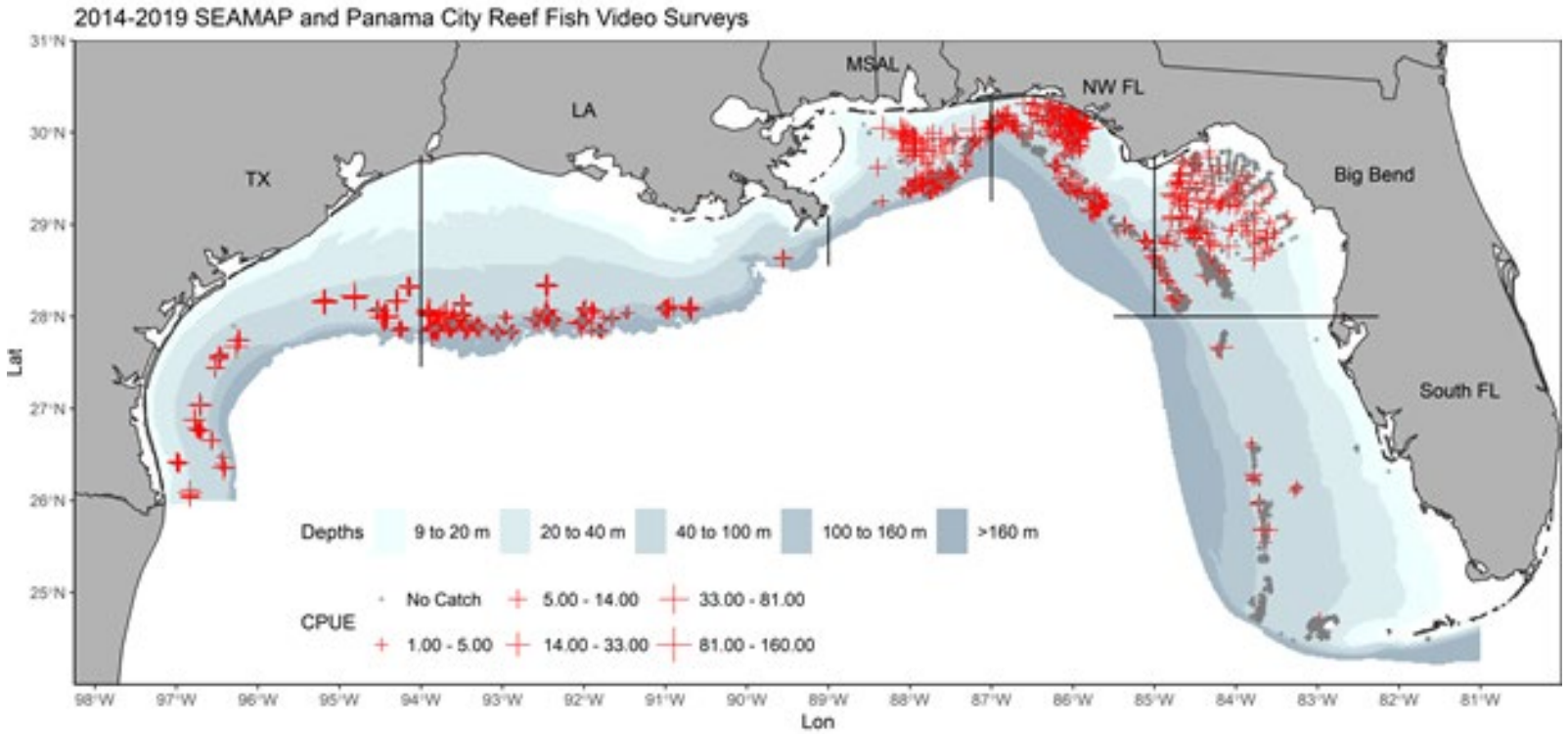

2016 SEFSC Red Snapper / Shark Bottom Longline Survey
MSAL
LA
NW FL
TX
Big Bend
South FL
CPUE
No Catch
3.16 - 7.24
12.63 - 19.05
0.90 - 3.16
7.24 - 12.63
19.05 - 29.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
Lat
Lon


2018 SEFSC Red Snapper / Shark Bottom Longline Survey
MSAL
LA
NW FL
TX
Big Bend
South FL
CPUE
No Catch
3.16 - 7.24
12.63 - 19.05
0.90 - 3.16
7.24 - 12.63
19.05 - 29.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
Lat
Lon

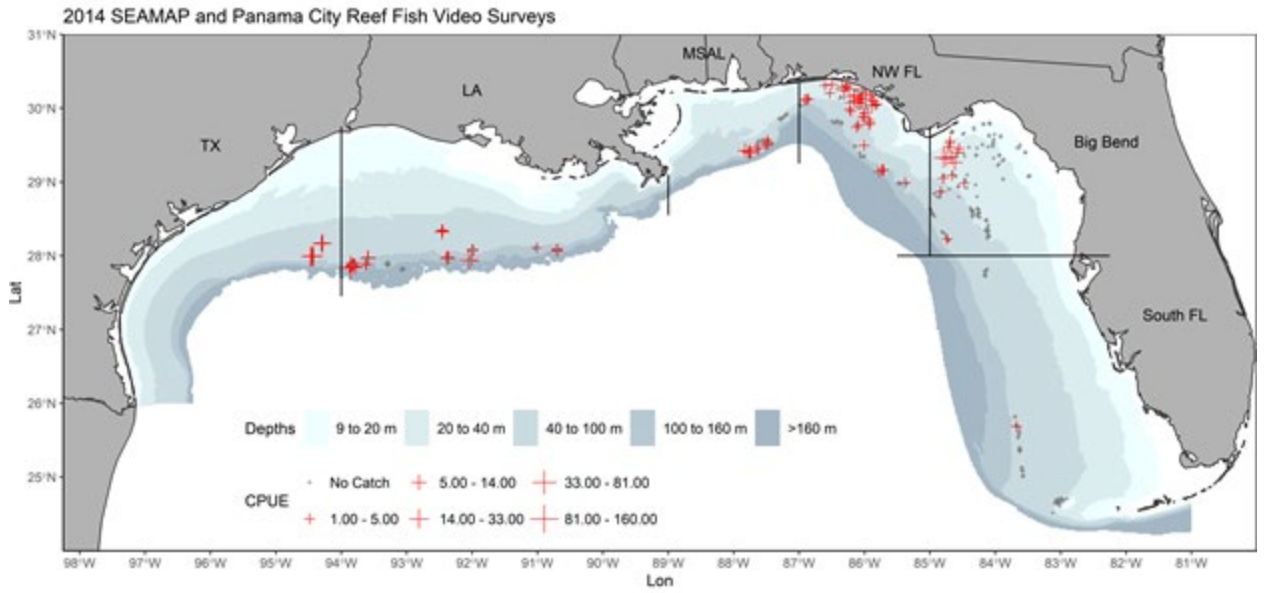

2017 SEFSC Red Snapper / Shark Bottom Longline Survey
MSAL
LA
NW FL
TX
Big Bend
South FL
CPUE
No Catch
3.16 - 7.24
12.63 - 19.05
0.90 - 3.16
7.24 - 12.63
19.05 - 29.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
Lat
Lon

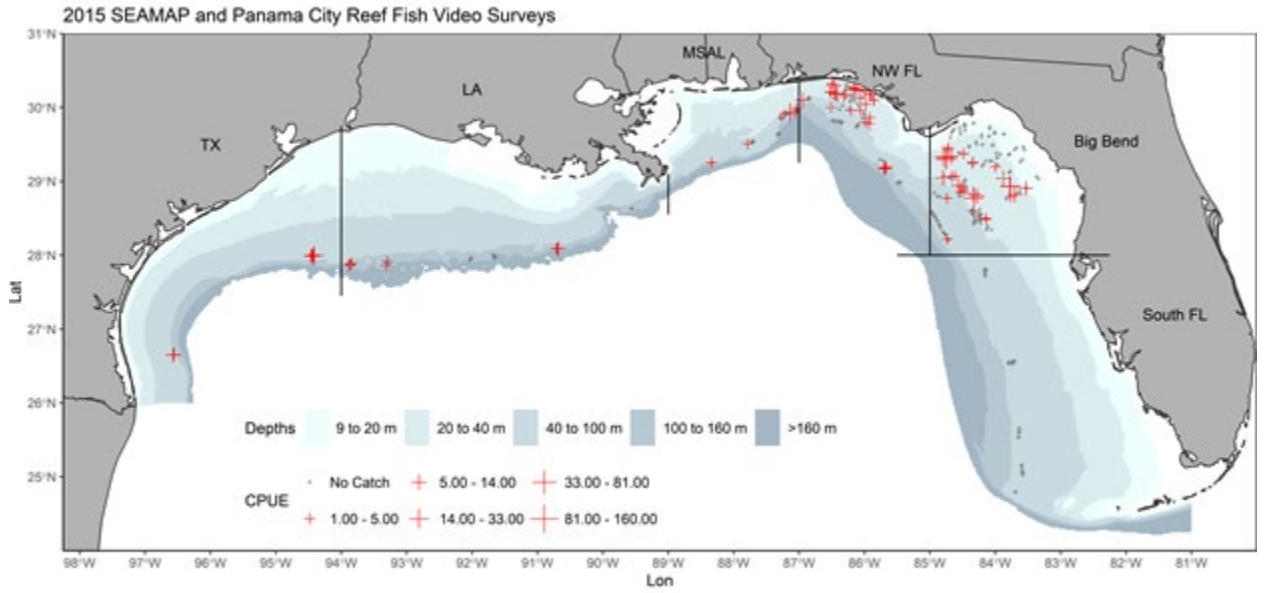

2019 SEFSC Red Snapper / Shark Bottom Longline Survey
MSAL
LA
NW FL
TX
Big Bend
South FL
CPUE
No Catch
3.16 - 7.24
12.63 - 19.05
0.90 - 3.16
7.24 - 12.63
19.05 - 29.36
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
Lat
Lon

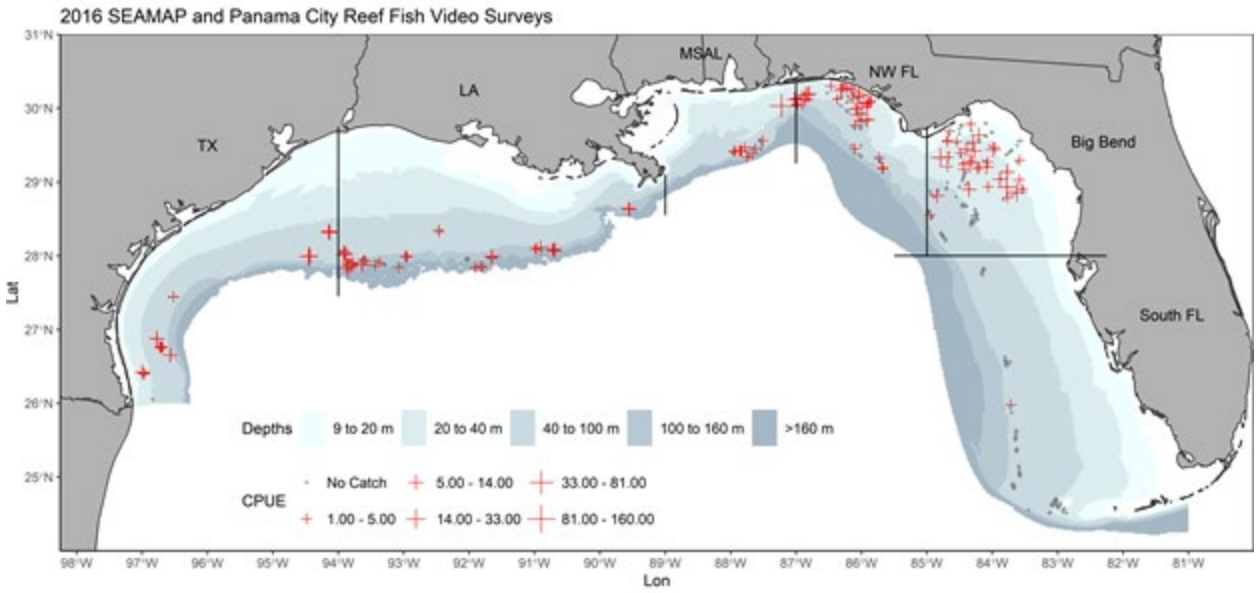
NMFS Reef Fish Video Surveys:

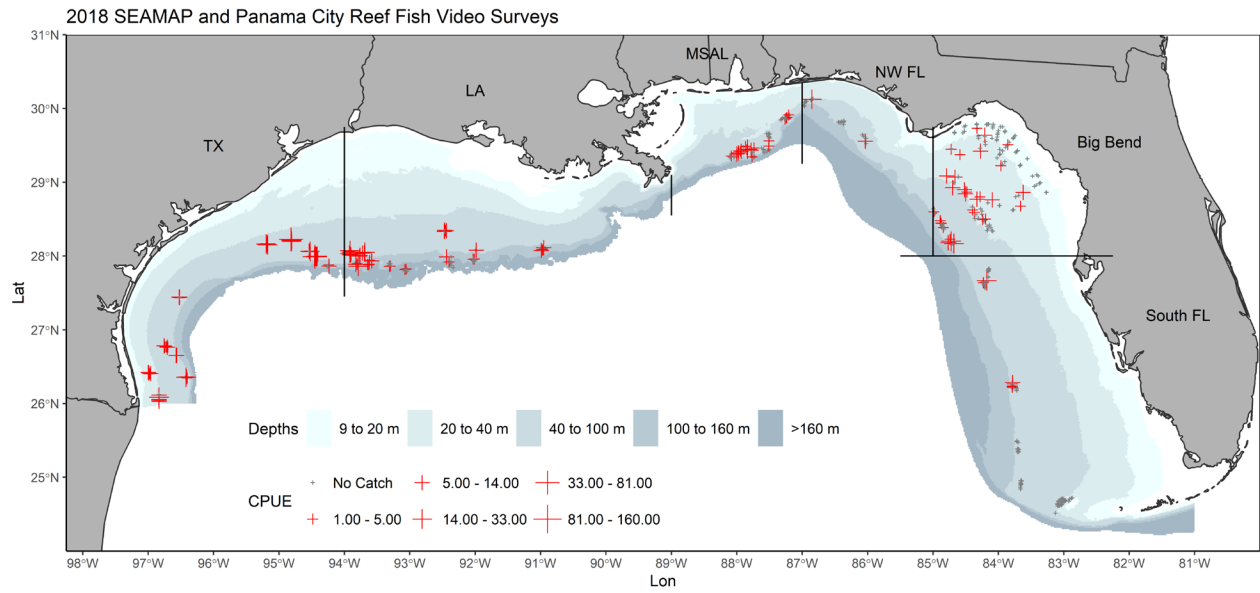


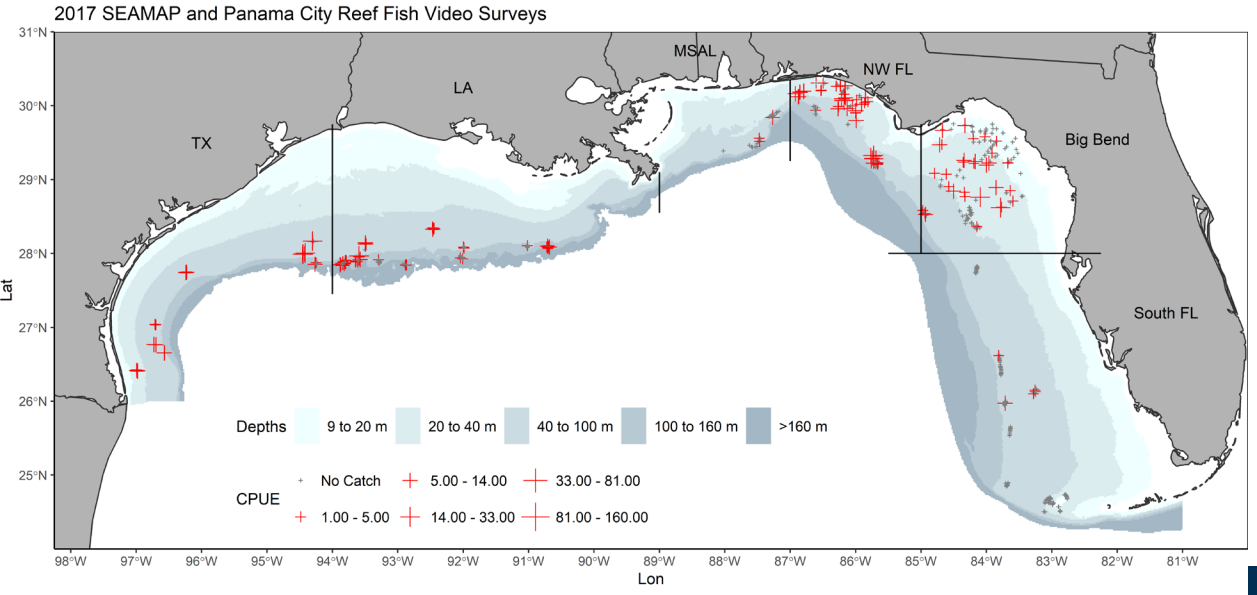
NOAA FISHERIES

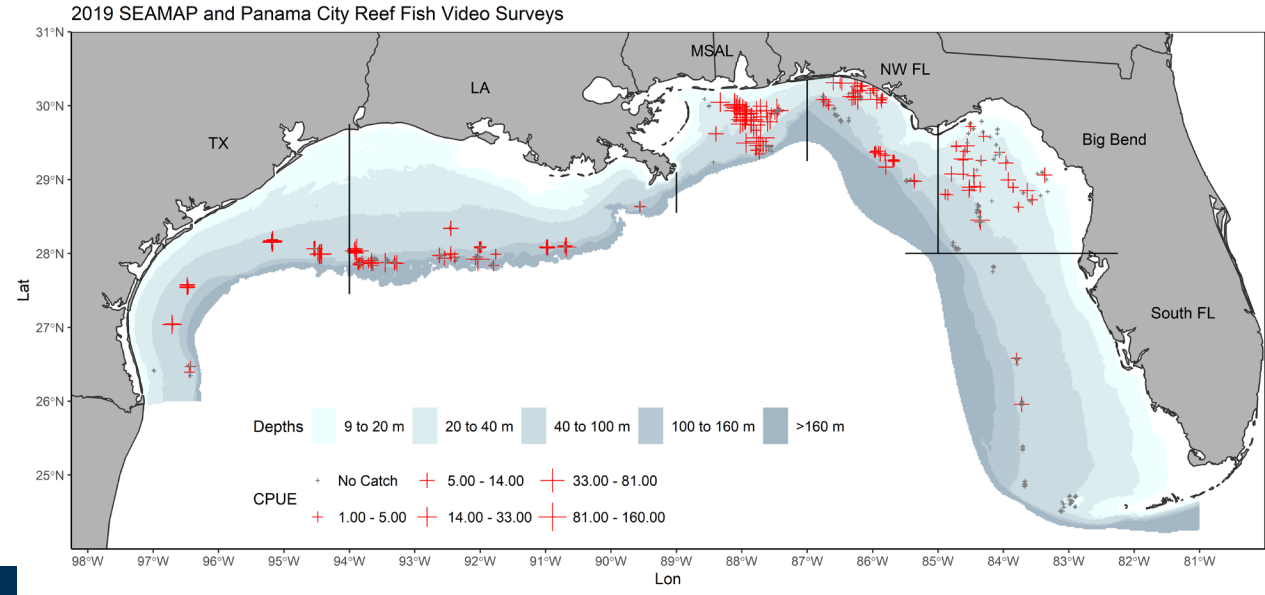

2014 SEAMAP and Panama City Reef Fish Video Surveys
MSAL
NW FL
LA
TX
Big Bend
South FL
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
CPUE
No Catch
5.00 - 14.00
33.00 - 81.00
1.00 - 5.00
14.00 - 33.00
81.00 - 160.00
Lat
Lon


2015 SEAMAP and Panama City Reef Fish Video Surveys
MSAL
NW FL
LA
TX
Big Bend
South FL
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
CPUE
No Catch
5.00 - 14.00
33.00 - 81.00
1.00 - 5.00
14.00 - 33.00
81.00 - 160.00
Lat
Lon


2016 SEAMAP and Panama City Reef Fish Video Surveys
MSAL
NW FL
LA
TX
Big Bend
South FL
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
CPUE
No Catch
5.00 - 14.00
33.00 - 81.00
1.00 - 5.00
14.00 - 33.00
81.00 - 160.00
Lat
Lon


2018 SEAMAP and Panama City Reef Fish Video Surveys
MSAL
NW FL
LA
TX
Big Bend
South FL
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
CPUE
No Catch
5.00 - 14.00
33.00 - 81.00
1.00 - 5.00
14.00 - 33.00
81.00 - 160.00
Lat
Lon


2017 SEAMAP and Panama City Reef Fish Video Surveys
MSAL
NW FL
LA
TX
Big Bend
South FL
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
CPUE
No Catch
5.00 - 14.00
33.00 - 81.00
1.00 - 5.00
14.00 - 33.00
81.00 - 160.00
Lat
Lon


2019 SEAMAP and Panama City Reef Fish Video Surveys
MSAL
NW FL
LA
TX
Big Bend
South FL
Depths
9 to 20 m
20 to 40 m
40 to 100 m
100 to 160 m
>160 m
CPUE
No Catch
5.00 - 14.00
33.00 - 81.00
1.00 - 5.00
14.00 - 33.00
81.00 - 160.00
Lat
Lon