NOAA FISHERIES

SEFSC

Gulf of Mexico Shrimp Effort Estimation

Presentation to:
Gulf of Mexico Fishery Management Council

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Goals and Recent Reception

- Develop a method to produce robust effort estimates with:
  - -Simplified assumptions
  - -Increased transparency
  - -Modernized code
  - -More complete use of the data
- Workshop was recommended by Gulf Shrimp AP in November 2022 and was held February 22-23, 2023
- Brought together SEFSC, SERO, GMFMC, Shrimp AP and SSC reps
  - -Review of history of shrimp effort estimation in the Gulf
  - -Thorough examination of proposed new SEFSC estimation model
  - -Comparison of results with previous estimation method
- Agreement in the validity of the approach with some suggestions for further examination
- Similar positive reception at the **GMFMC SSC** and **GMFMC Shrimp AP**
  - -Some additional suggestions for further investigation

SEFSC Estimation Process

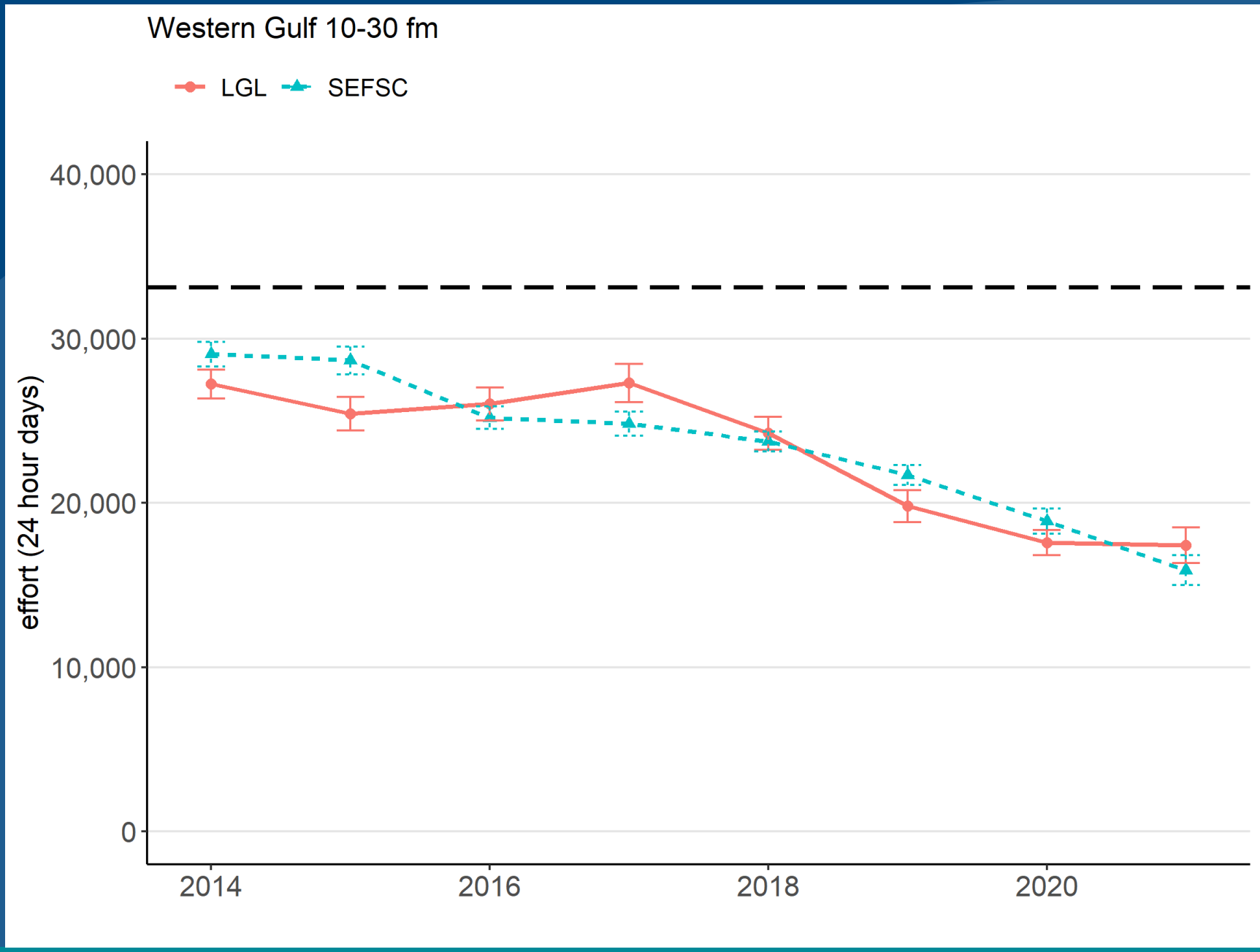
1. Pull and QC raw ELB track data
2. Determine optimal cutpoint to classify fishing activity
3. Keep only fishing activity that fits the profile of a tow
4. Assign ELB effort to GOM stat/depth zones
5. Scale up to total fleet effort according to landings aggregated at the season/area level and matched by vessel ID
6. Allocate total scaled effort to depth zones/stat areas according to observed ELB effort distribution

Assumptions

1. ELB devices are capturing all fishing activity
2. There is no systematic bias in classification of effort from ELB devices
3. CPUE of vessels with ELBs on board is representative of the total fleet
4. Spatial distribution of ELB vessels is representative of the total fleet within strata
5. Reporting of landings is similar between ELB and non-ELB vessels

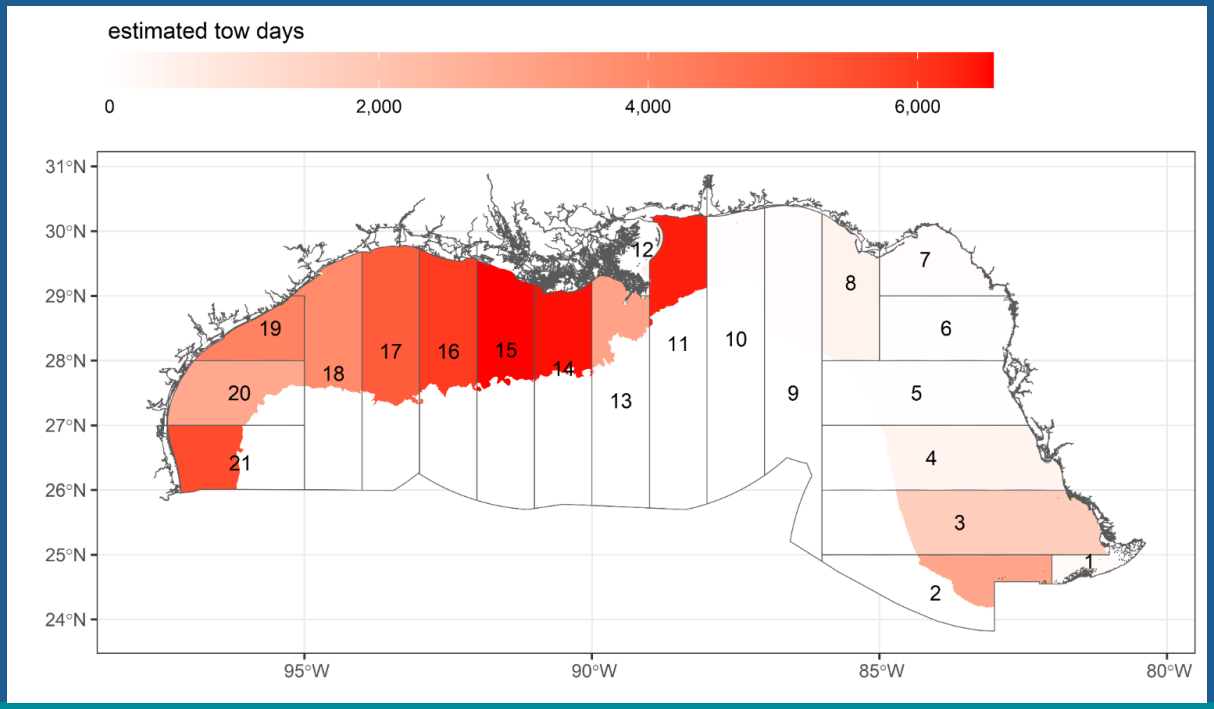
Summary of Changes

- Effort classification
  - Distances are calculated using the Vincenty ellipsoid method
  - GOM bathymetry used to filter out data at depths too deep for shrimping activity (>2,500 ft)
  - Higher resolution, updated shapefile that encompasses entire Gulf EEZ
  - Upper fishing speed threshold is calculated using a Gaussian mixture distribution rather than using fixed numbers
- Scaling of effort to total fleet
  - Done using landings at aggregate level of time/area rather than attempting to match trips. This ensures 100% of ELB recorded effort is used in the calculation rather than only those trips that are matched (50-60%)
- Code
  - Code is substantially simplified and modernized
  - All processing and report generation is done in a single R script with one input parameter (year)


Western Gulf 10-30 fm
LGL
SEFSC
40,000
30,000
20,000
10,000
0
effort (24 hour days)
2014
2016
2018
2020

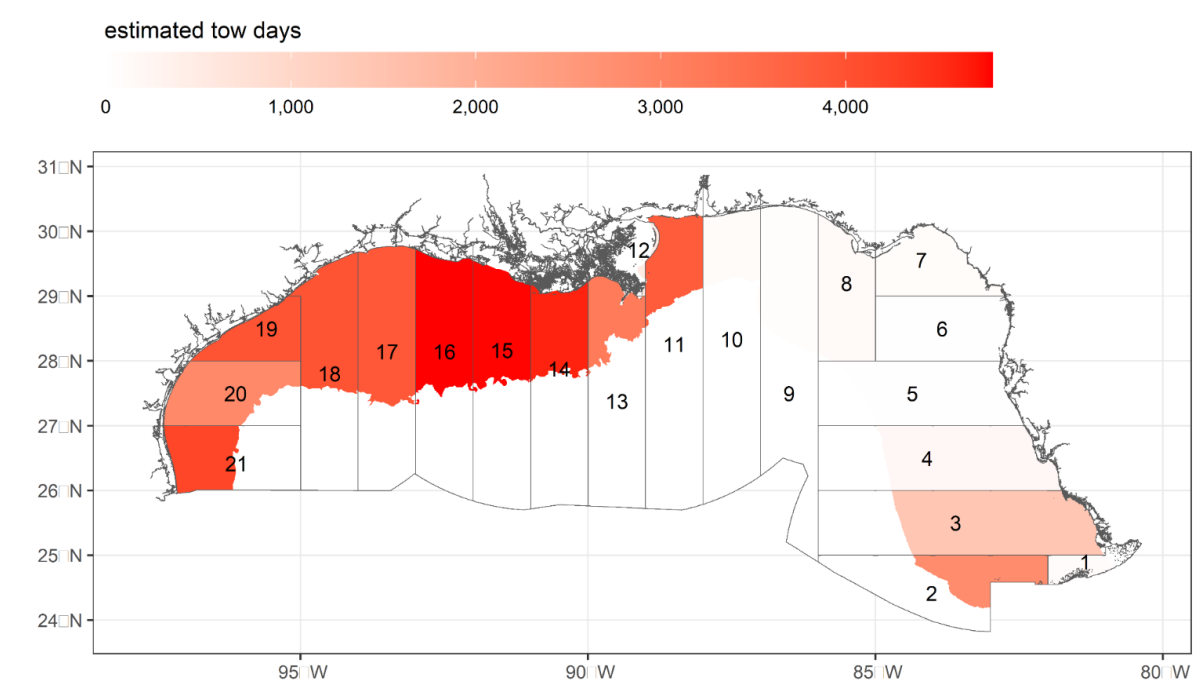
2020 SEFSC Offshore Estimates

Region	Depth	Landings (tail lbs.)	Effort (24 hr. days)	Baseline (2001-2003)	Pct. Decrease from Baseline
Western Gulf (Zones 10-21)	10-30 fm	21,524,472	18,861	82,811	77.2%
Total Gulf	All	68,804,865	59,475	–	–

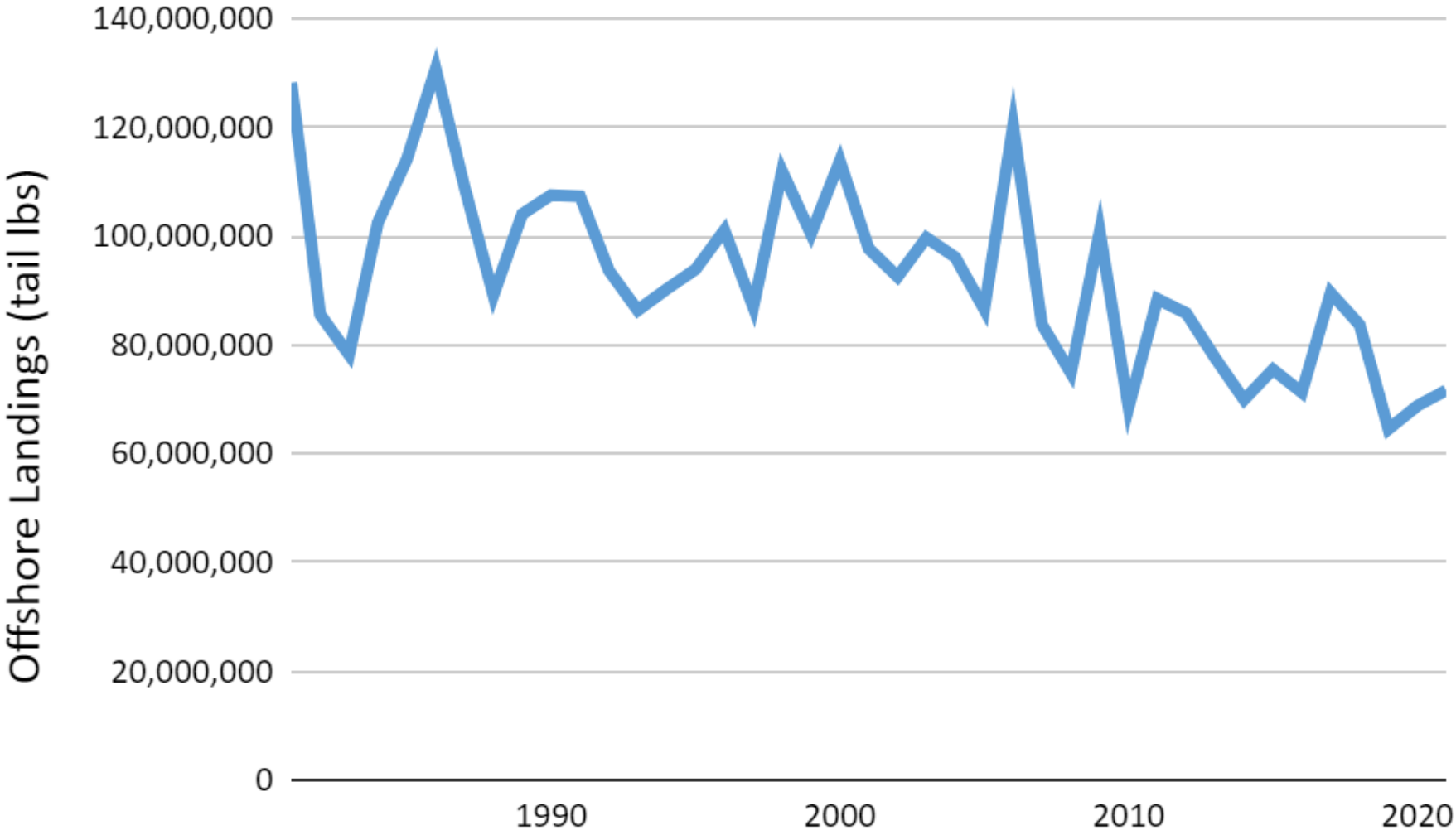


2021 SEFSC Offshore Estimates

Region	Depth	Landings (tail lbs.)	Effort (24 hr. days)	Baseline (2001-2003)	Pct. Decrease from Baseline
Western Gulf (Zones 10-21)	10-30 fm	24,628,473	15,945	82,811	80.7%
Total Gulf	All	71,649,809	46,688	–	–



GOM Total Offshore Landings



Acknowledgements

- Gulf of Mexico Shrimp Fishing Industry
- Gulf of Mexico Commercial Shrimp Fishermen
- Gulf of Mexico Fishery Management Council, SSC and Shrimp AP
- Internal SEFSC Shrimp Bycatch and Effort Workgroup

Appendix 1: ELB Effort Distribution

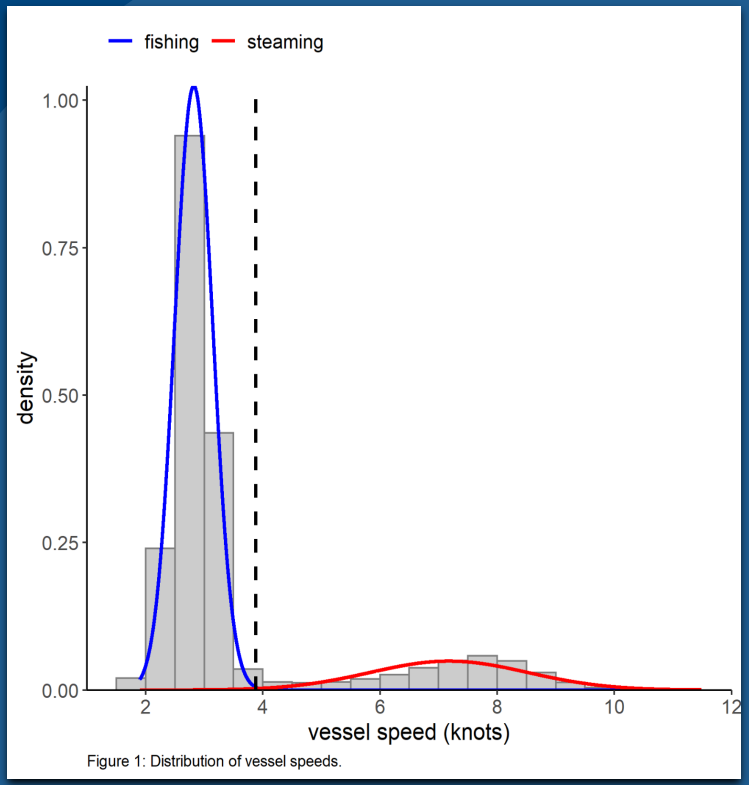
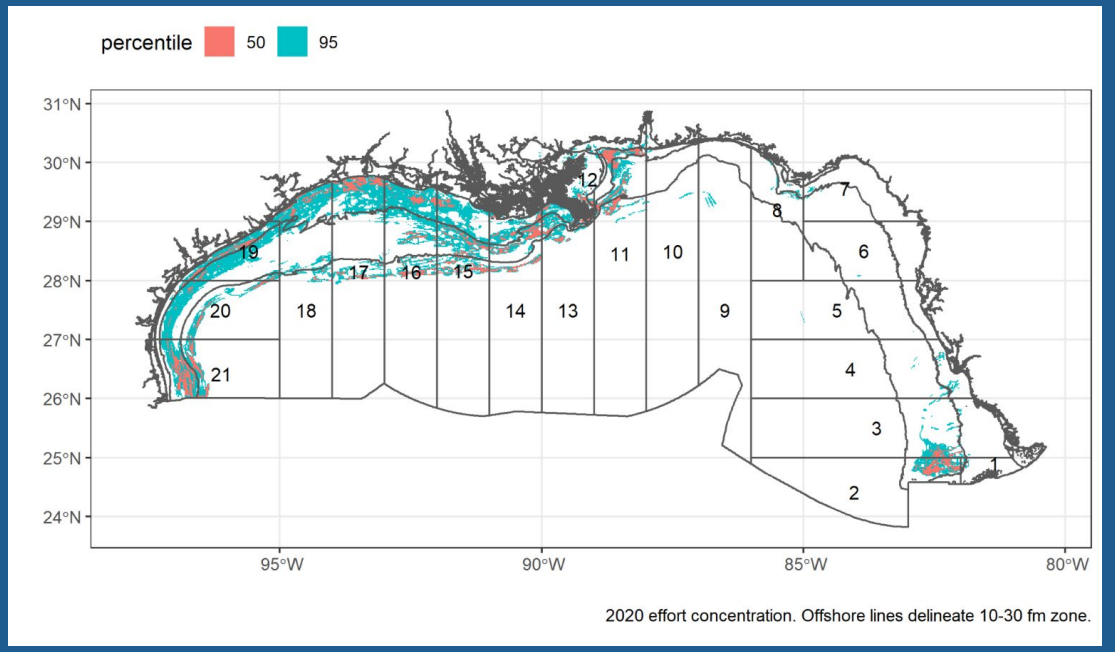
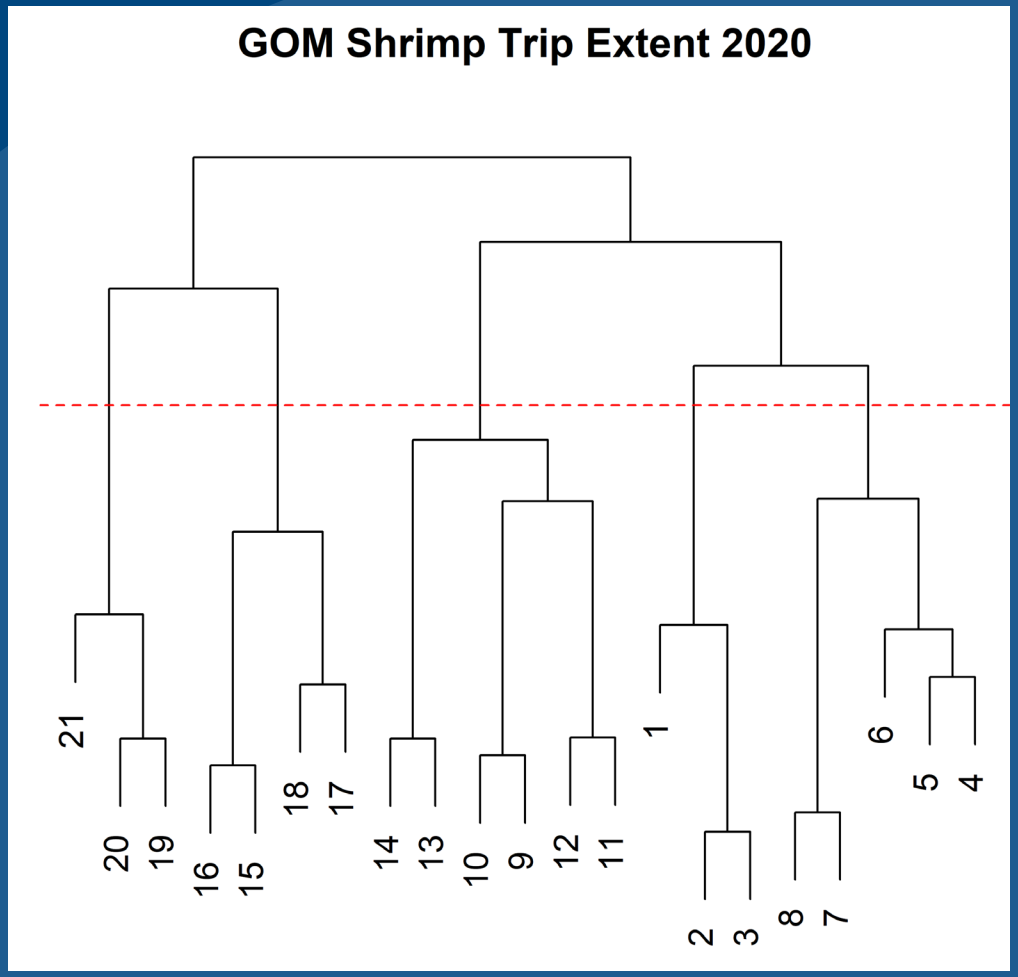


Figure 1: Distribution of vessel speeds.



2020 effort concentration. Offshore lines delineate 10-30 fm zone.

Appendix 2: Effort Scaling



Area Definitions:

1. Zones 1-3
2. Zones 4-8
3. Zones 9-14
4. Zones 15-18
5. Zones 19-21

Quadrimesters:

1. Jan-Apr
2. May-Aug
3. Sep-Dec

$$\text{total effort} = \sum \text{ELB effort}_{\text{area/time}} \times (\text{total landings}_{\text{area/time}} / \text{ELB landings}_{\text{area/time}})$$

Appendix 3: SEFSC Next Steps / Recommendations

- SEFSC will explore issues and suggestions raised at the shrimp effort estimation workshop, the GMFMC SSC, and the GMFMC Shrimp AP

- Suggest adoption of the revised method for effort estimates beginning with 2020