

**NOAA
FISHERIES**

NMFS' Side-by-side Pilot Testing of cVMS and Historical cELB Units for Gulf Shrimp Vessels

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Why did we conduct this evaluation?

3G Cellular transmission chip used in the current shrimp cELB program was no longer supported by the cellular network

Objective here:

Compare/Evaluate cELB and cVMS data to ensure data streams are comparable.



Which cVMS Units were compared?



Pluggable/Solar devices

WOODS HOLE

NEMO

GROUP FOR EARTH,
FROM SPACE
A CLS COMPANY



3G CDMA cELB

cELB



NEMO

Solar panel



USB plug



RV Caretta and RV Southern Journey



Gulf Shrimp Trawl Vessel



First Deployment Methods

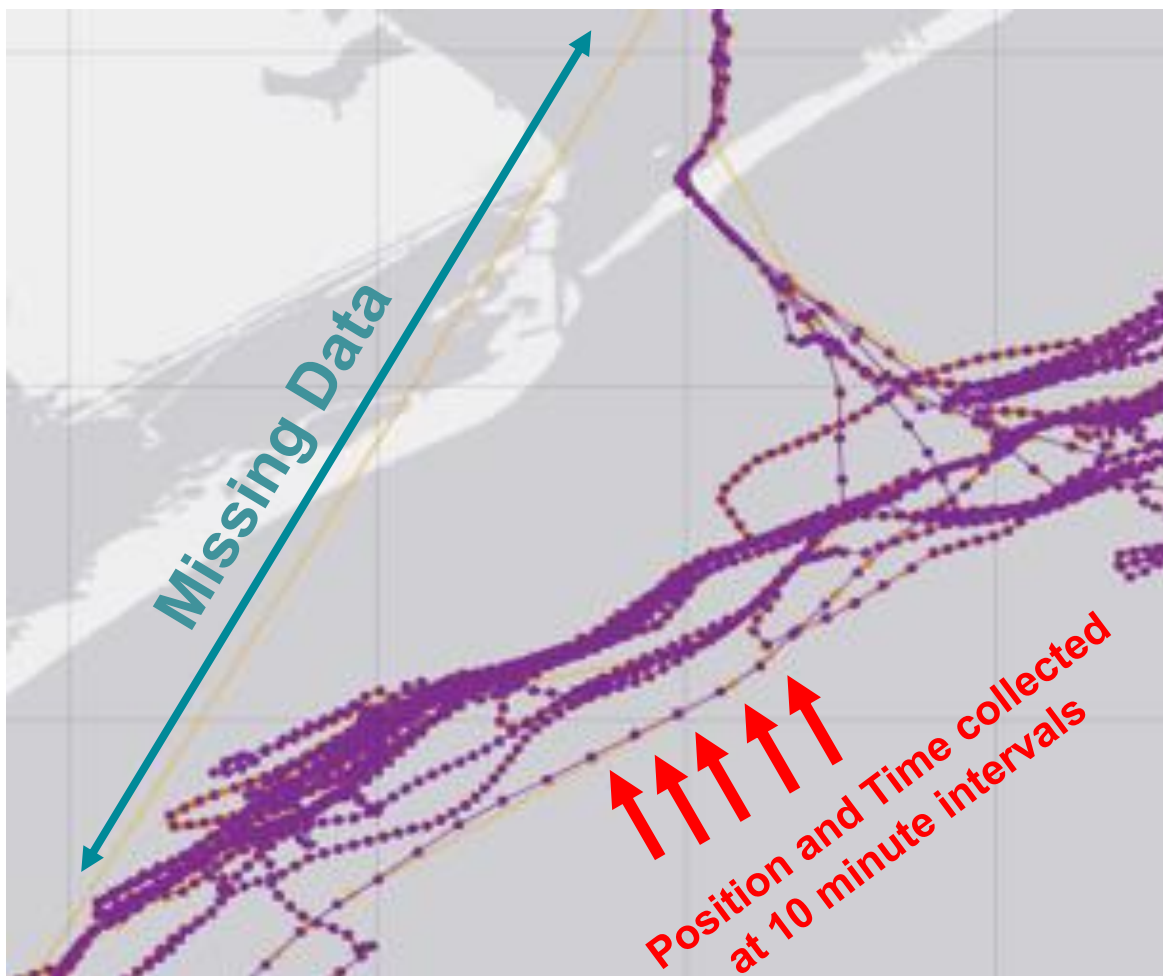
- NEMO/Faria data were checked/corrected for ping rate issues during collection in the first two weeks and then left to operate without interference.
- The NEMO/Faria data were retrieved from password protected web service and screened for completeness.
- cELB data were retrieved via miniUSB drives and mailed to NOAA Fisheries.
- NEMO/Faria/cELB were cleaned by eliminating observation rows containing out of range coordinate/time data.
- Tows were extracted from data set based on tow speed.
- Compare estimated tow effort (Tow Days) between cELB/Faria and cELB/NEMO.

SAME PROCESS USED IN EFFORT ALGORITHM

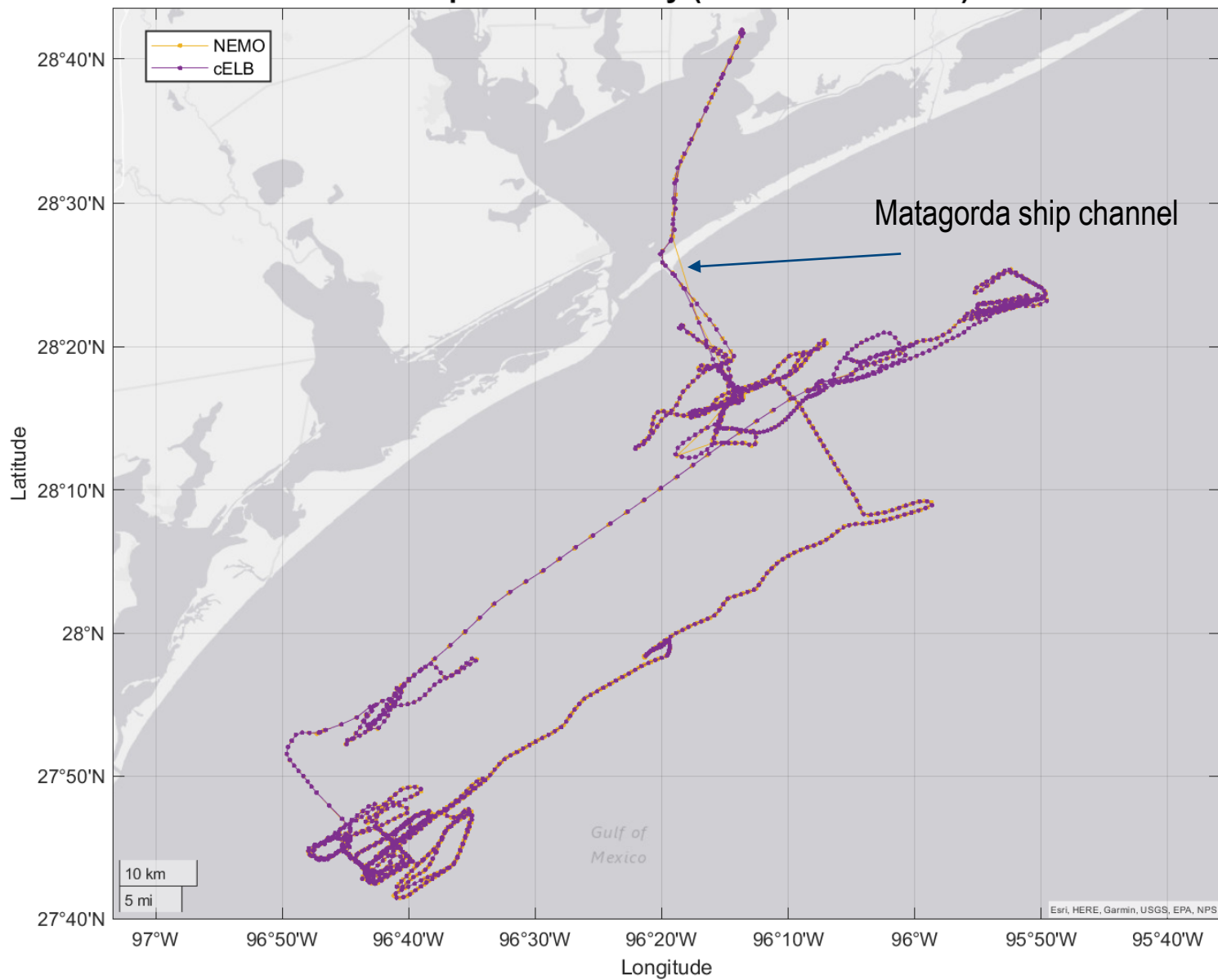


Why do we “clean” the data? Processing identifies bad or missing data: Both cVMS and cELB

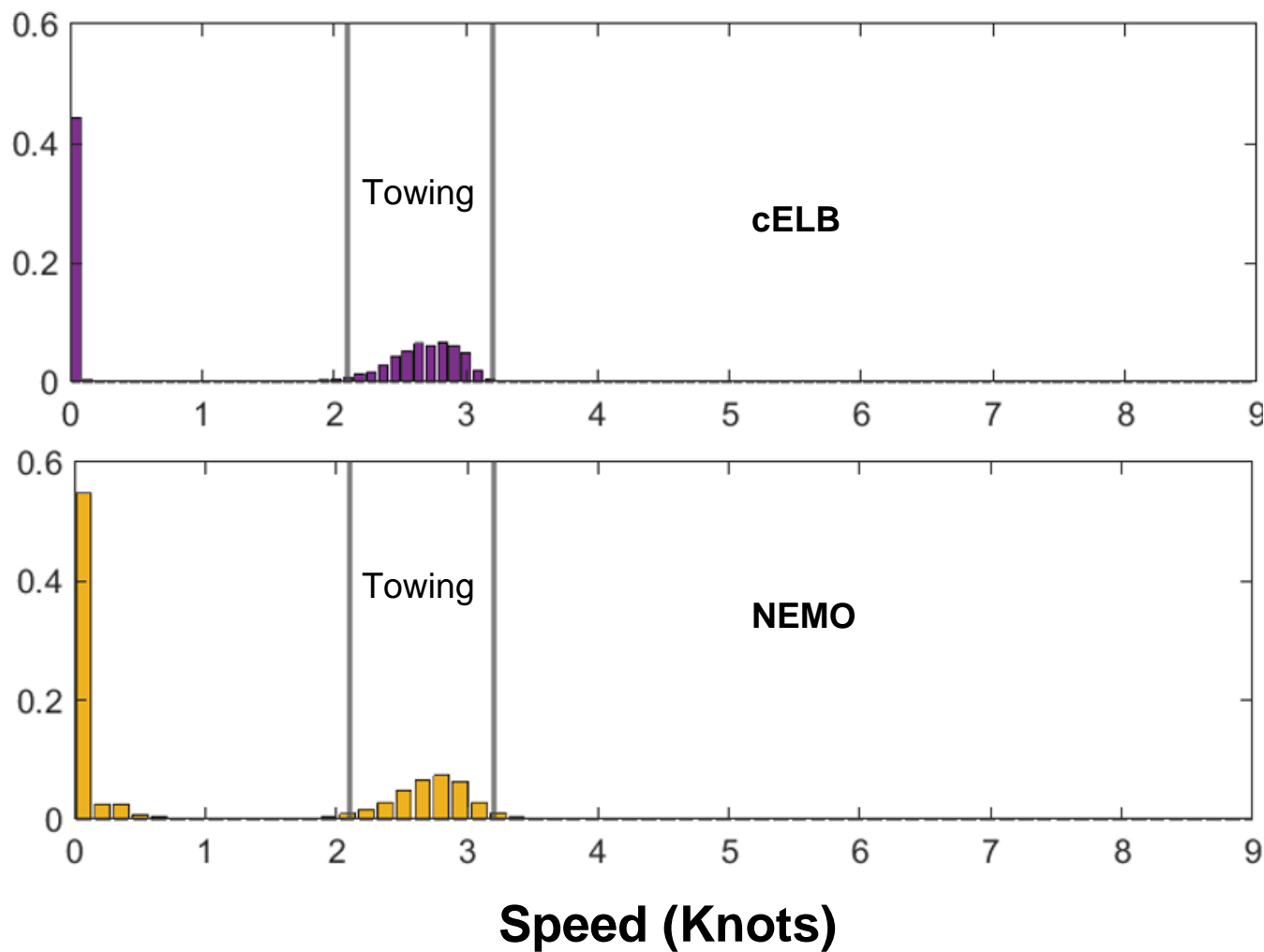
VMS and ELB pings are not synchronized



Shrimp Vessel I Study (All Data - Cleaned)

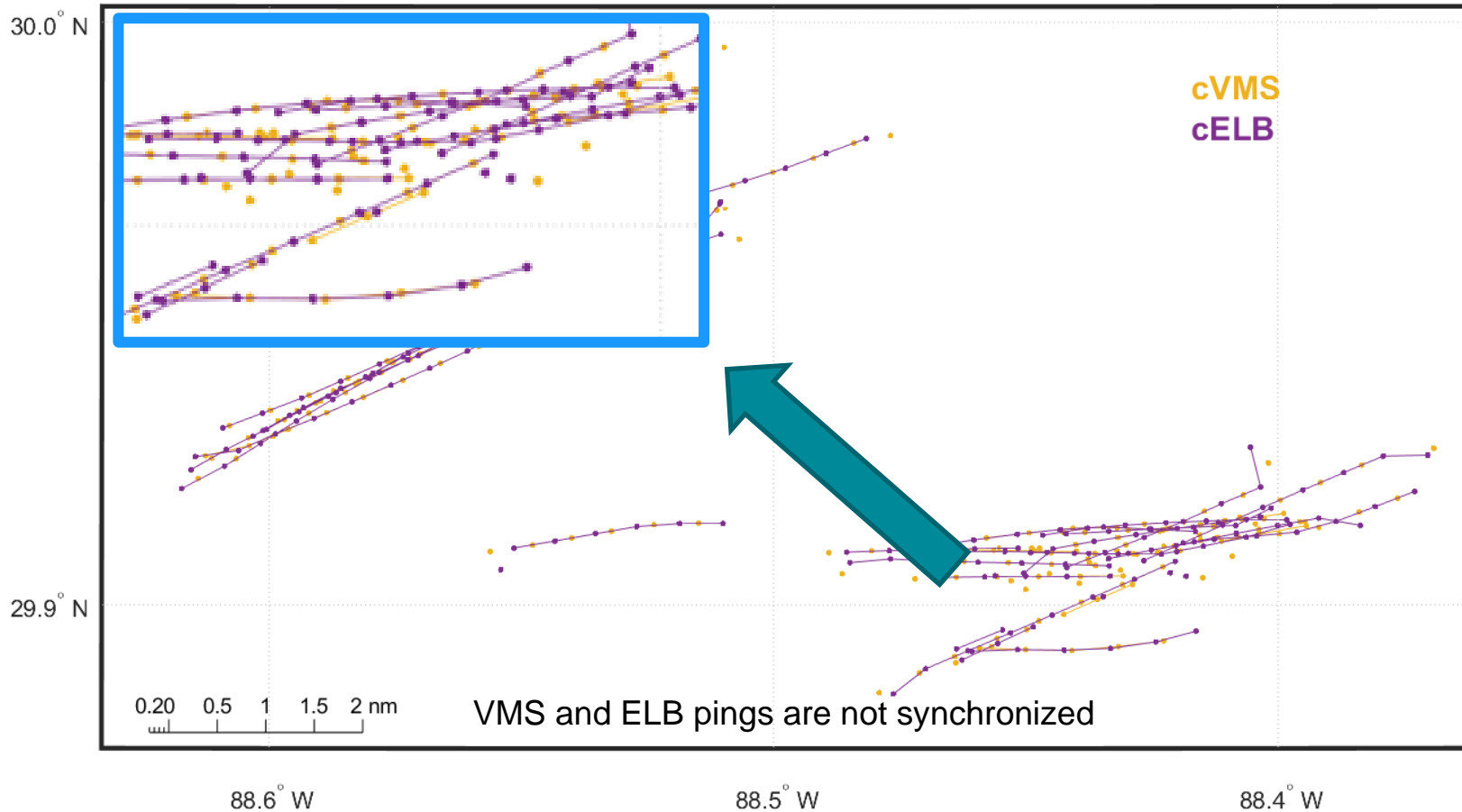


Extract tow segments based on speed range.



Data processed to identify individual tows and calculate effort (Tow Days)

Caretta Study (Fishing)



Data issues in first deployment

- Faria did not record position data consistently across time on all fishing vessels: **Devices were faulty. Bulletin was sent out to Industry**
- NEMO devices not deployed on fishing vessels

First Deployments 2022

Public Outreach was conducted through Council meetings and SEFSC Gear Management Team

| Vessel | Location | Faria | NEMO | cELB | Other Technology? | Comments |
|---------------------|-------------|-------|------|------|---------------------|--------------------------|
| RV Caretta | Panama City | | X | X | FishBit data logger | Tows during TED Testing |
| RV Southern Journey | GoM | | X | X | | Not Trawling |
| Shrimp Vessel I | AL | | X | X | | Did not fish |
| Shrimp Vessel II | AL | | X | X | | Did not fish |
| Shrimp Vessel III | East Coast | | X | X | | Did not fish |
| Shrimp Vessel IV | FI | X | | X | | Faria units did not work |
| Shrimp Vessel V | FI | X | | X | | Faria units did not work |
| Shrimp Vessel VI | FI | X | | X | | Faria units did not work |

"X" = Corrupt or no data collected

NMFS thanks the three industry vessels providing information for this project. For additional information contact Farron Wallace Farron.Wallace@noaa.gov.



Second Deployment Methods

- Raw NEMO data were retrieved from password protected web service and screened for completeness.
- Raw ZEN data were acquired directly from LGL.
- cELB data were retrieved via miniUSB drives in all cases.
- **Raw ZEN and cELB data were processed through the new shrimp algorithm to estimate Tow Days**



Data issues in Second Deployment

- NEMO position and time data incomplete across time on all fishing vessels: Device was reliant on solar power and significant amount of data was missing likely due to low power conditions.
- Several ZEN non-paired tows.
- cELB data for Vessel 3 had section of bad data in the middle of the record.

Second Deployments 2023

Public Outreach was conducted through the Council/Shrimp Fishery and LGL

| Vessel | Location | ZEN | NEMO | cELB | Other Technology? | Comments |
|------------------|-------------|-----|------|------|---------------------|---------------------|
| Shrimp Vessl I | Palacios TX | X | X | X | WindPlot and Others | Many tows monitored |
| Shrimp Vessl II | Palacios TX | X | X | X | WindPlot and Others | Many tows monitored |
| Shrimp Vessl III | Palacios TX | X | X | X | WindPlot and Others | Many tows monitored |
| Shrimp Vessl IV | Palacios TX | X | X | X | WindPlot and Others | Many tows monitored |
| Shrimp Vessl V | Palacios TX | X | X | X | WindPlot and Others | Many tows monitored |

"X" = Incomplete or no data collected

NEMO-power fully reliant on Solar

NMFS thanks LGL and the five industry vessels for volunteering for this project. For additional information contact Farron Wallace Farron.Wallace@noaa.gov.

Results cELB Comparison to cVMS

| <i>First Deployment</i> | | | | |
|-------------------------|----------------------|--|------|-----------------|
| Vessel | Estimation Process | cELB | NEMO | Pct. Difference |
| RV Caretta | Sum all Tows | 1.49 | 1.46 | -2.13 |
| RV Southern Journey | Sum across all Trips | NEMO matched cELB track over a large geographic area | | |

| <i>Second Deployment</i> | | | | |
|--------------------------|----------------------------|-------|-------|-----------------|
| Vessel | Estimation Process | cELB | ZEN | Pct. Difference |
| Fishing Vessel 1 | New Shrimp Effort Algrithm | 10.37 | 10.35 | -0.23 |
| Fishing Vessel 2 | New Shrimp Effort Algrithm | 16.30 | 16.27 | -0.18 |
| Fishing Vessel 3 | New Shrimp Effort Algrithm | 10.67 | 10.66 | -0.05 |
| Fishing Vessel 4 | New Shrimp Effort Algrithm | 7.89 | 7.92 | 0.31 |
| Fishing Vessel 5 | New Shrimp Effort Algrithm | 8.74 | 8.87 | 1.44 |



NEMO¹ and ZEN

- Pros
 - Accurate compared to cELB
 - Works with Effort Algorithm
 - Little/no delay obtaining data
 - Can discover data failures quickly
- Cons
 - Industry reluctant to send data to OLE.

Agency is evaluating moving VMS program administration from OLE to NMFS S&T.

cELB

- Pros
 - Historical baseline
 - Works with Effort Algorithm
 - Currently deployed on Vessels
- Cons
 - Antenna failure common
 - Extended time lag to discover data issues and replacement
 - Long delay to obtain data
 - Requires data cards to be removed and swapped then sent to NOAA resulting sig. delays in obtaining data

1. Only devices that are plugged into ships power.



Final Takeaway

1. NEMO devices require ships power for charging.
2. Caretta NEMO had a -2.13% difference relative to cELB in total estimated tow days. However, relatively low number of observations compared to second deployment (1.5 tow days).
3. Comparison of ZEN summary statistics (tow days) generated by the new shrimp effort algorithm are within 0.2% compared to cELB (60 tow days).
4. Decreasing cELB coverage levels since resorting to mail-in procedures from a high of approximately 60% down to 40% in 2021.
5. The 3G cELB device may no longer meet Agency needs or data standards: timeliness, long-term reliability and decreasing efficiency, cannot ID hardware problems in a speedy manner resulting in data loss.



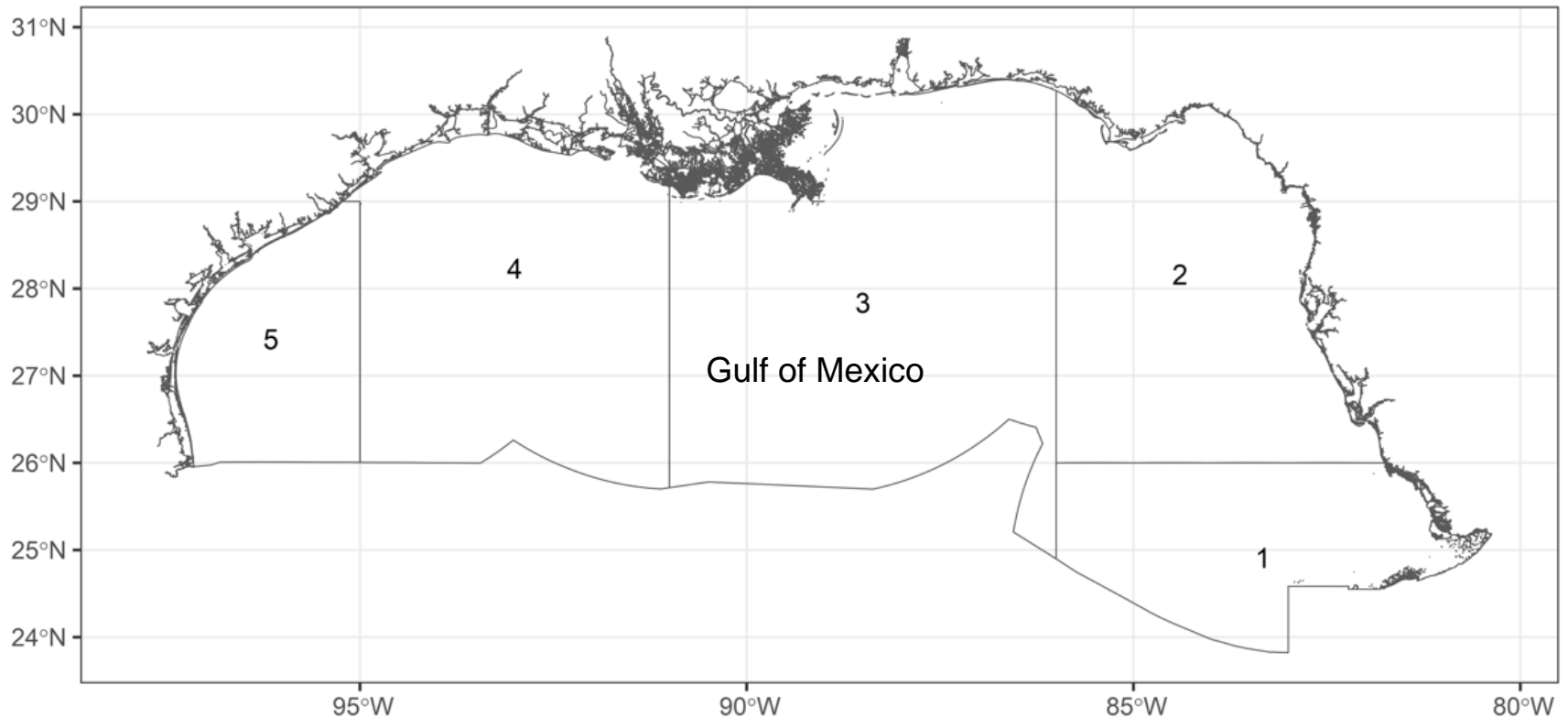
Questions

Thanks to LGL and all the Captains and crews of the eight F/Vs that participated in this important work.

Gulf Shrimp cELB Coverage.

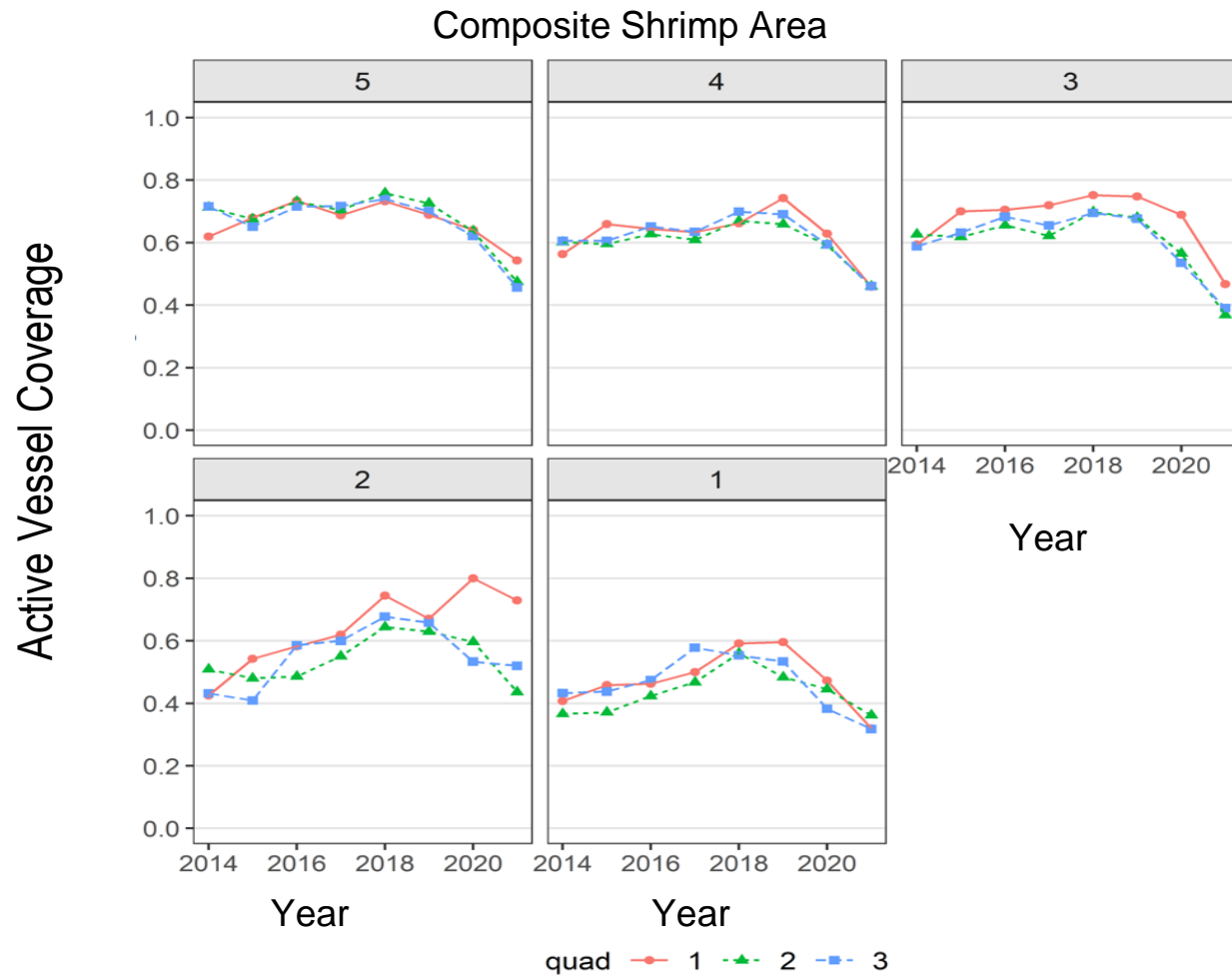


Composite Shrimp Trip Areas



Aggregate shrimp trip areas.

cELB coverage 2014-2021 in 4-month periods



cELB coverage 2014-2021 in 4-month periods

Composite Shrimp Area

