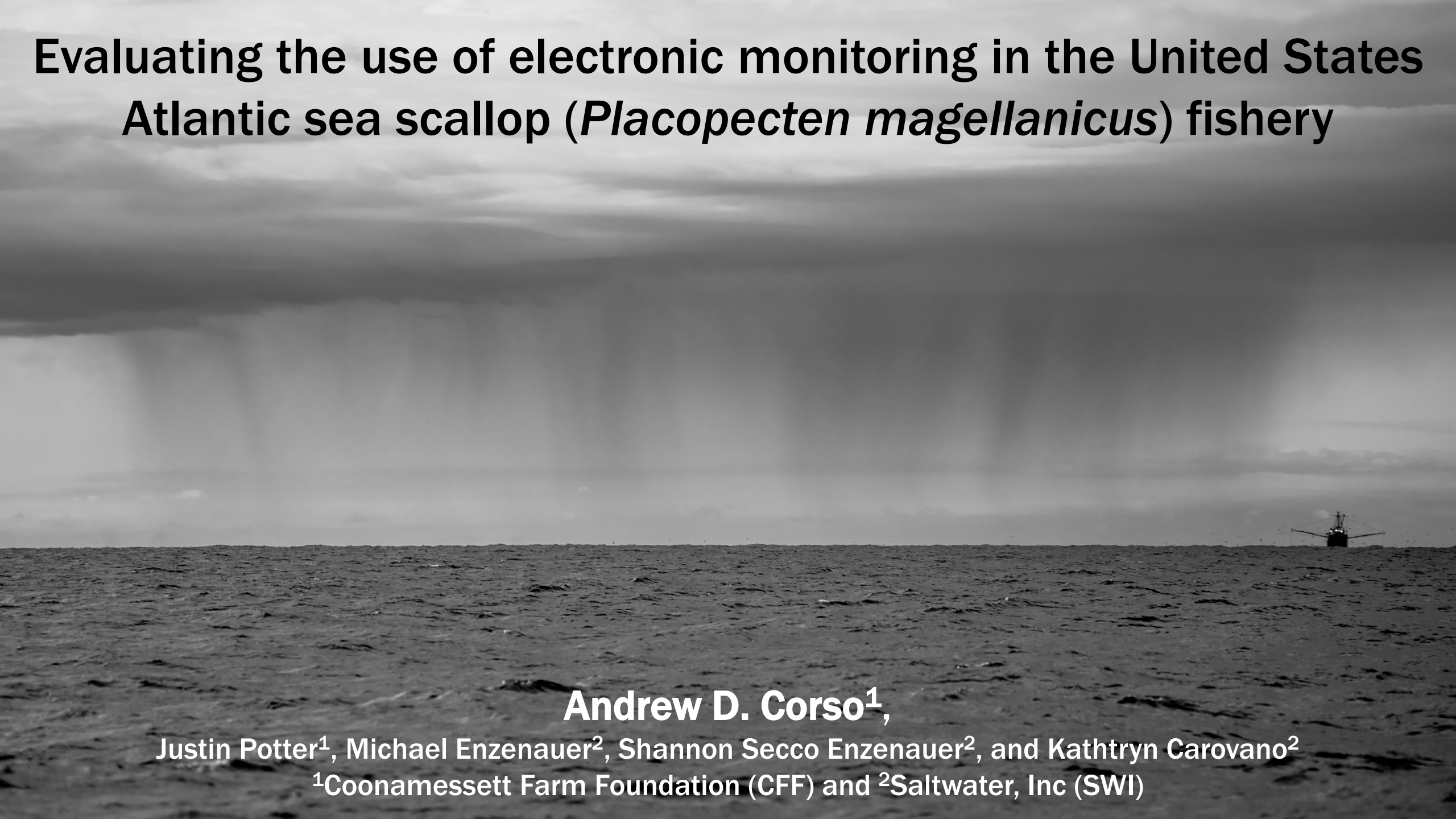
Evaluating the use of electronic monitoring in the United States Atlantic sea scallop (*Placopecten magellanicus*) fishery



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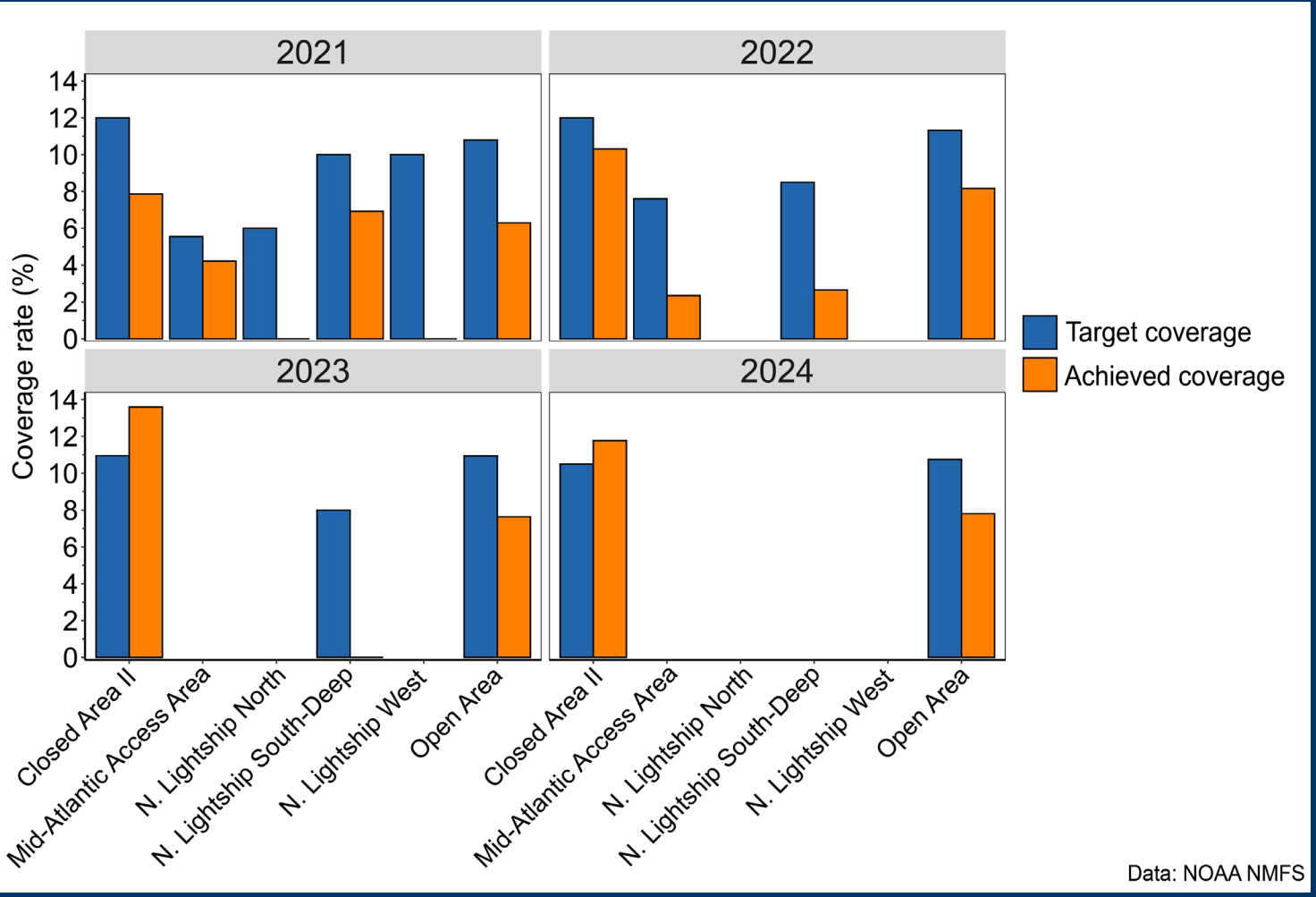
[1]Coonamessett Farm Foundation (CFF) and [2]Saltwater, Inc (SWI)

Industry-funded scallop (IFS) observer program



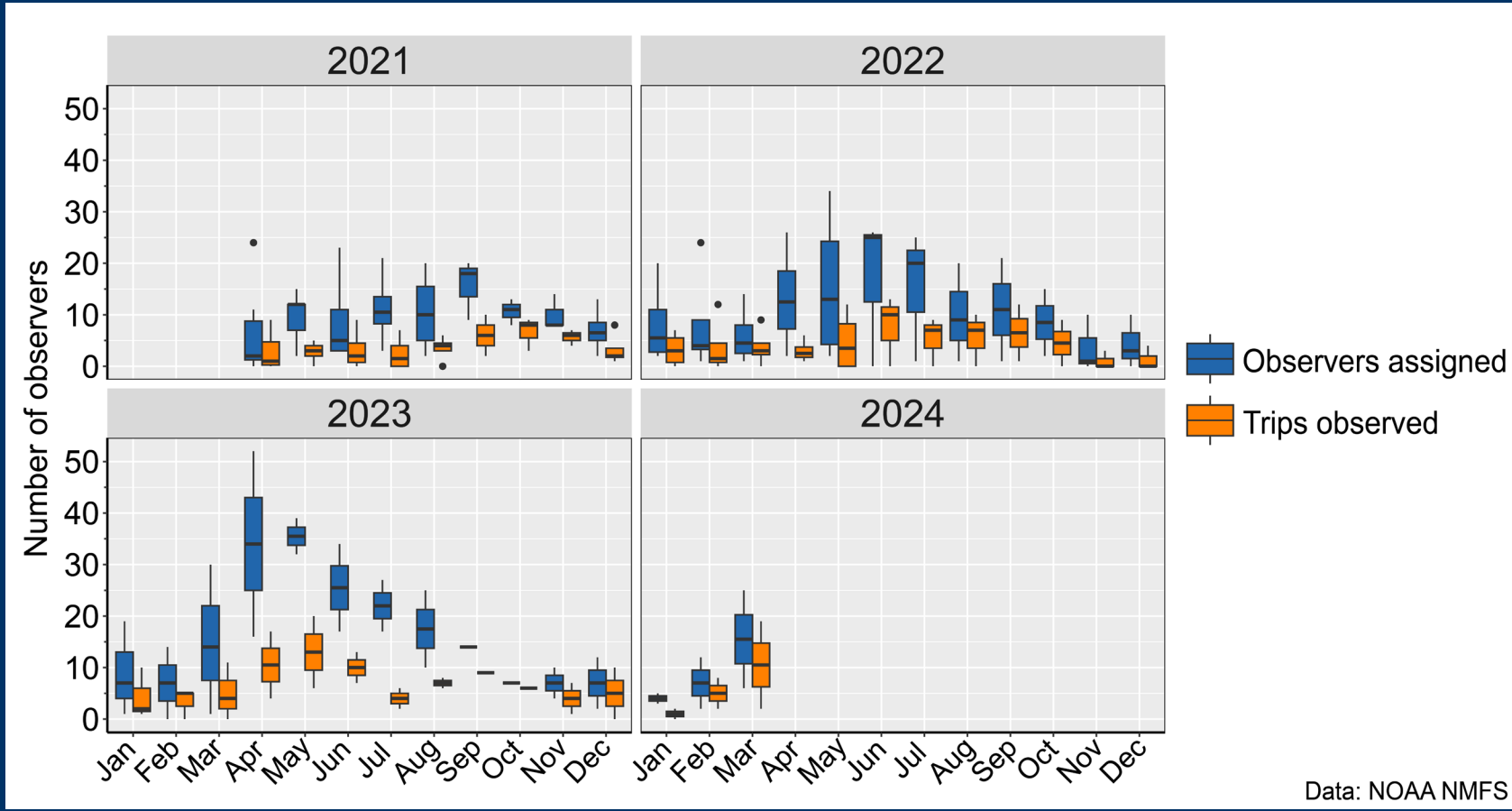
- All permit holders required to participate
- Coverage rates set by NOAA NEFSC
- Who pays for IFS?
  - 1% of Annual Catch Limit set aside
  - Vessels pay observers $782/day
    - Other costs?
  - Receive ~200 lbs/day in return
  - For-profit companies train and manage IFS observers with federal funds

IFS observer program – challenges

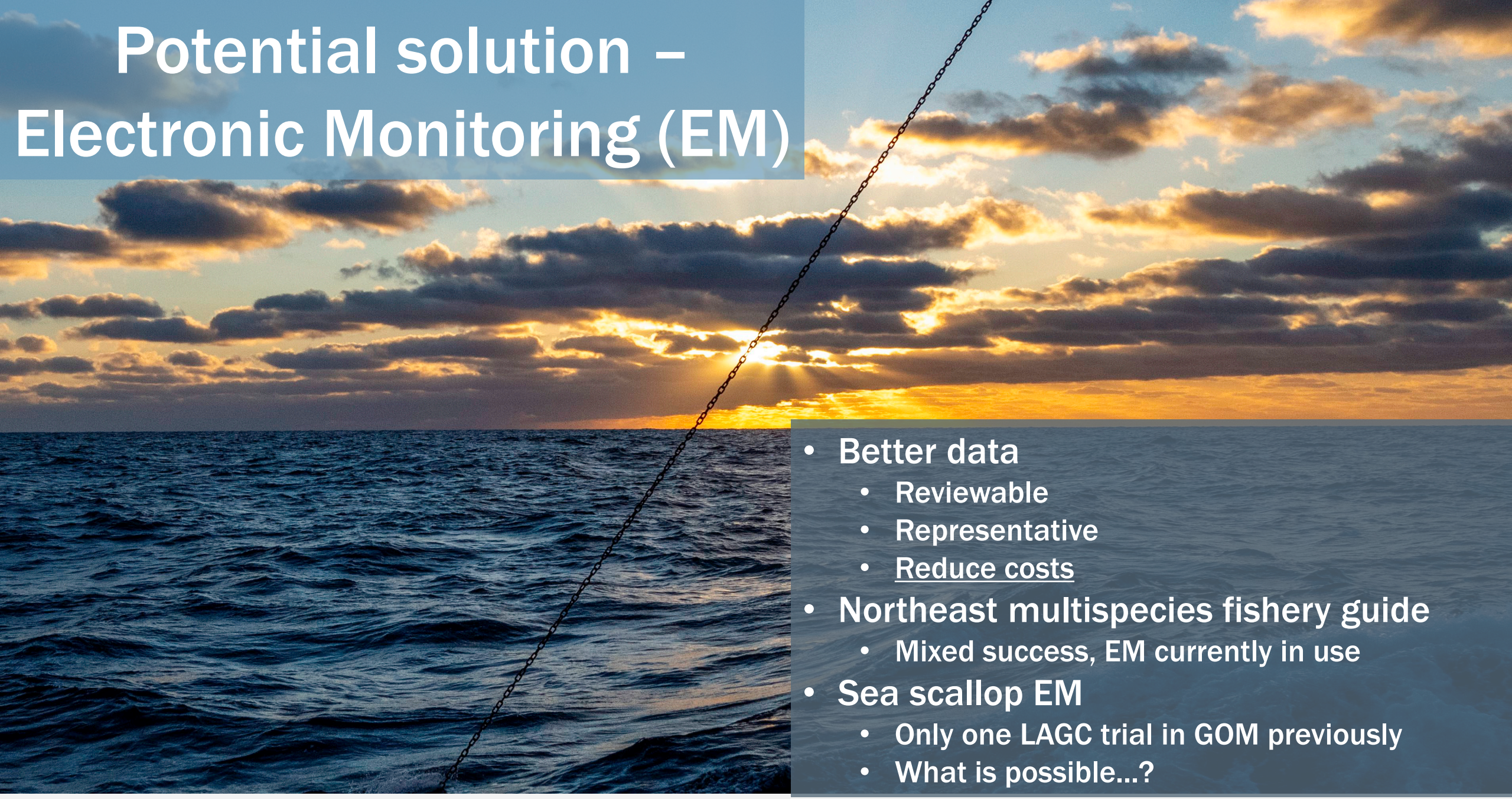
Pre-Trip Notification System (PTNS)

- Vessels required to notify at least > 48 hours prior to a trip

Image source: NOAA NMFS



Potential solution – Electronic Monitoring (EM)



- Better data
  - Reviewable
  - Representative
  - Reduce costs
- Northeast multispecies fishery guide
  - Mixed success, EM currently in use
- Sea scallop EM
  - Only one LAGC trial in GOM previously
  - What is possible…?

EM pilot project objectives

1. Voluntary vessel participation
2. Feedback and installation of EM systems
3. Vessel Monitoring Plans (VMPs)
4. Reviewer template
5. Deployment
6. Bycatch sorting and fisheries-dependent data
7. Analyses
    - *Cost comparison
8. Develop incentives
9. Establish regulatory pipeline
10. Data sharing and access
11. Adoption

Participating vessels

F/V *Kathy Ann*
Barnegat Light, NJ

F/V *Capt John*
Barnegat Light, NJ

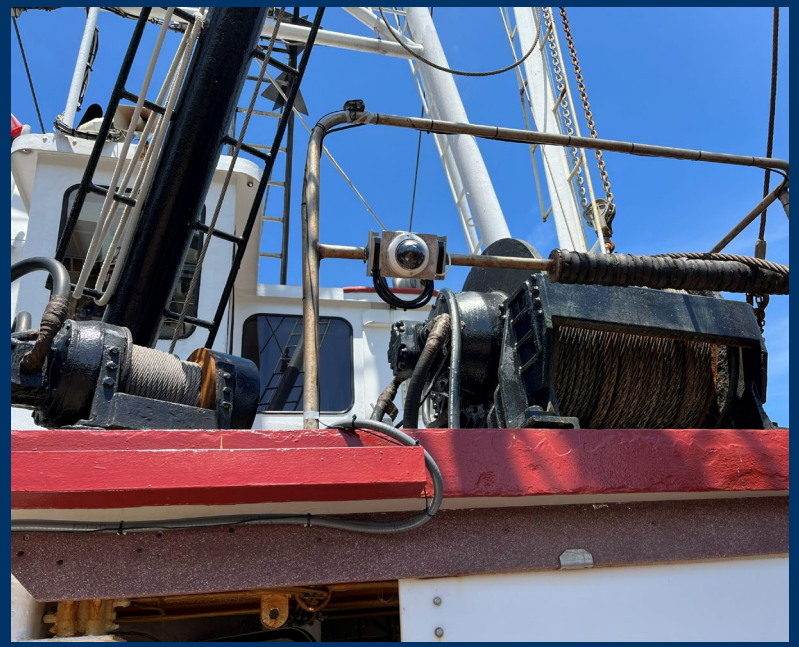
F/V *Grant Larson III*
Barnegat Light, NJ

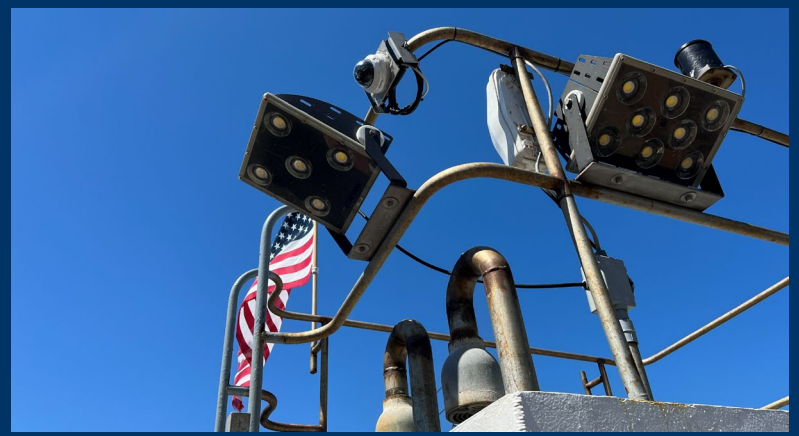
F/V *Susan L*
Cape May, NJ

F/V *Socatean*
New Bedford, MA

F/V *Seafarer*
New Bedford, MA

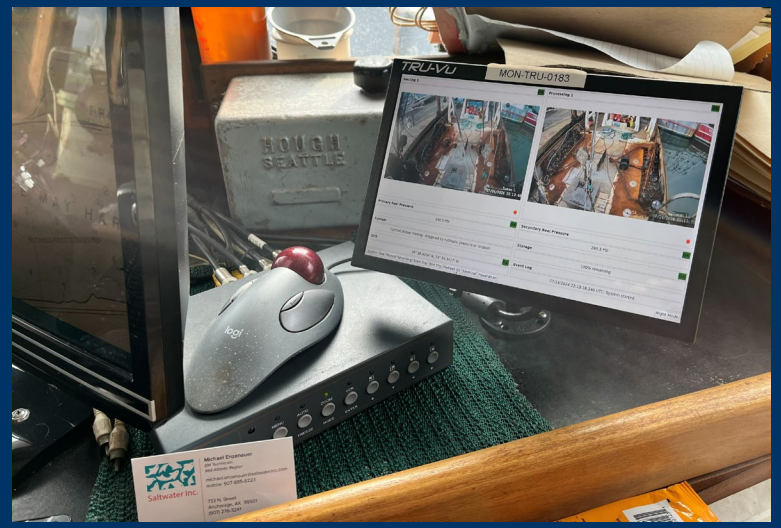
Feedback and installation process

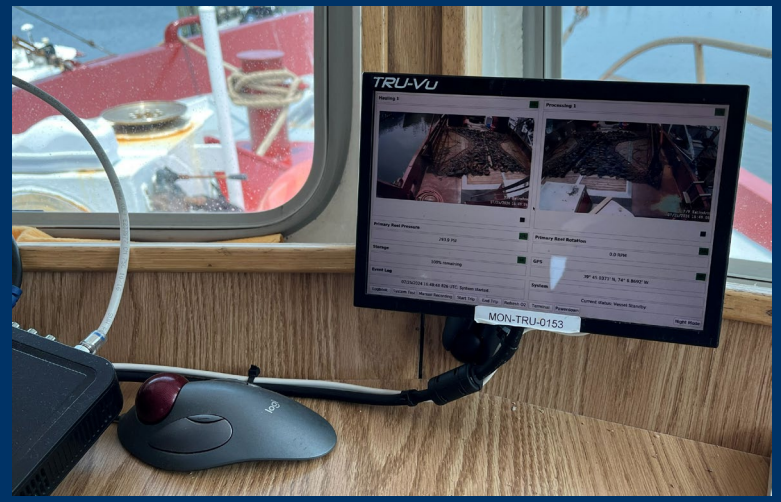




- Installation
  - Usually one person
  - 1-2 days
  - Minimally invasive, some wiring
- Two cameras
  - One facing towards each dredge
  - Bow or stern facing depending on lighting
  - 1080p & 1520p
- Winch or pressure operated
  - 20 retrieve rotations
  - 400 psi

Feedback and installation process





- Control box
  - Two removable hard drives
  - Powers all system components
- Live display in wheelhouse
- Also installed Lowell Deck Data Hub on vessels
- Small stipend for installation and training time

Vessel Monitoring Plans and deployment

- Follows the NOAA NEFSC EM Audit Model Program Reviewer Guidance Manual
- Each VMP includes
  - Objectives
  - EM system specs
  - Installation details
  - Guide for vessel operator
  - EM system troubleshooting
- 21 days-at-sea (DAS) per year target
- Review
  - O2Review
  - Time, location, tow distance, dredge type, catch sorting method, and catch composition, sea scallop predators, container type
  - High-grading and deckloading

Review goals

SCALLOP DREDGE AND SCALLOP TRAWL FISHERIES SAMPLING PRIORITIES 29

Scallop Dredge and Scallop Trawl

- *Day trips*: observe every haul
- *Multiday trips*: observe at least 50% of hauls
  - All hauls during on-watch hauls should be observed
- Record catch from both nets/dredges combined
- Biologically sample scallop shell heights from every other observed haul

First Haul of Watch

- Measure scallops from <u>one basket</u> of kept scallops in the shell
- Have crew member shuck scallops from that basket, obtain the meat weight (to the nearest 0.1lb) and obtain corresponding volume (to the nearest 50mL)

Other Hauls in Watch

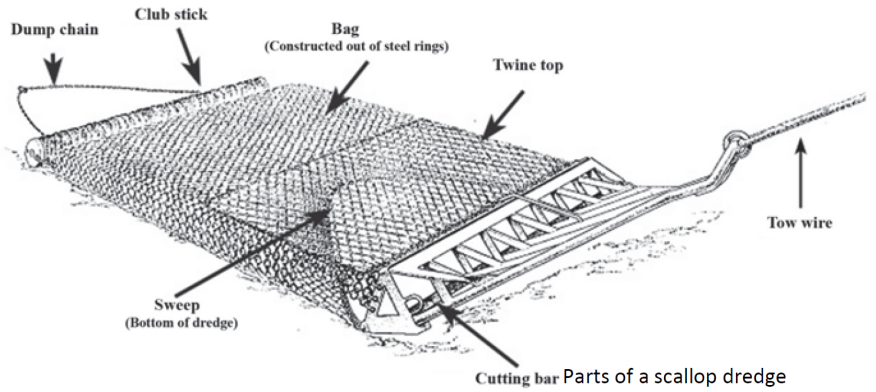
- Measure <u>100 scallops</u> in the shell from both dredges for each disposition

- Biologically sample finfish at least once per watch, and any hauls with exceptionally large amounts of finfish bycatch

- If grey meats or parasites are observed, resample meat weight at least twice per watch; weigh affected meats separately from clean meats

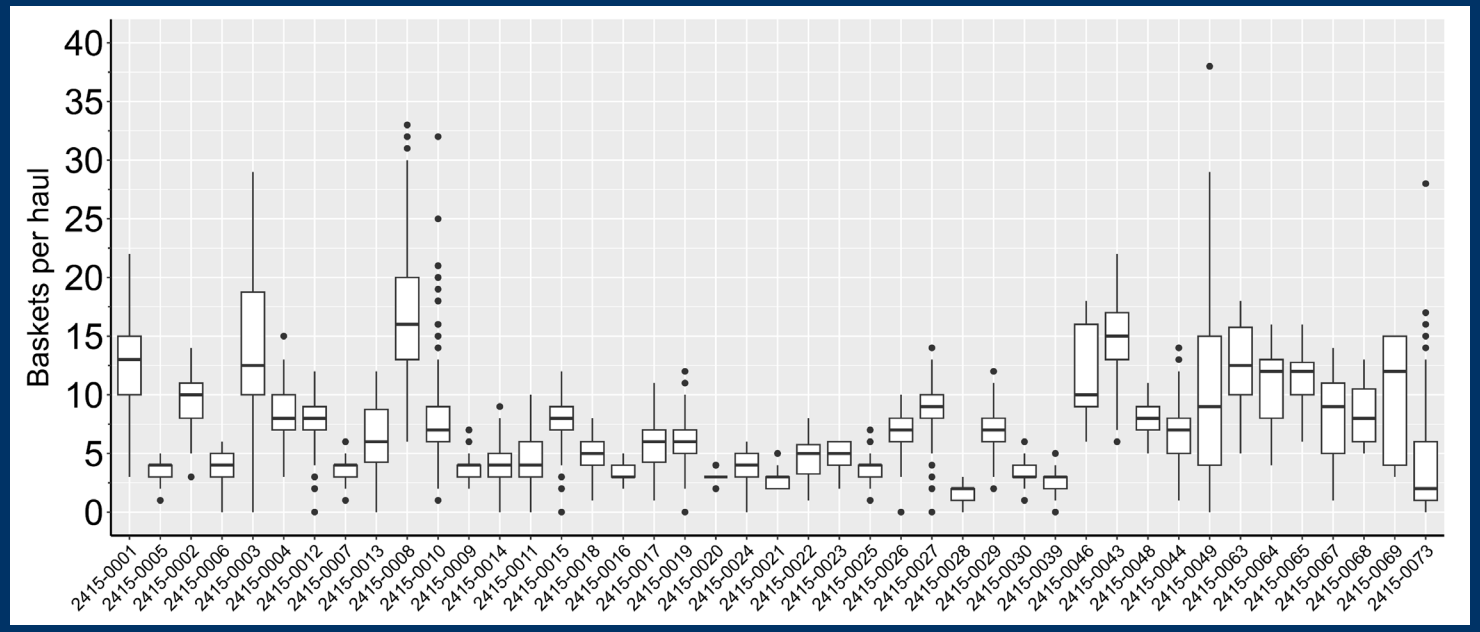
All areas

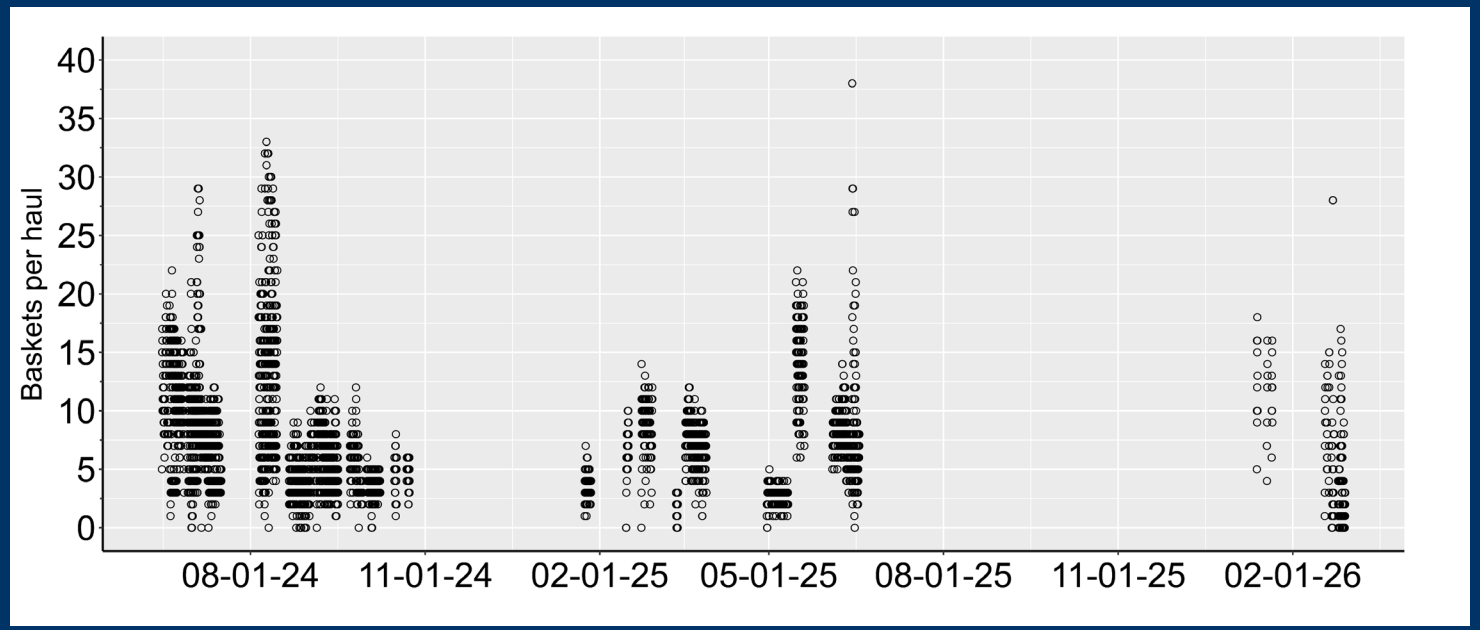
<u>Priority 1</u>	<u>Priority 2</u>
Flounder, Summer	Cod, Atlantic
Flounder, Windowpane (LF)	Flounder, Windowpane (AS)
Flounder, Winter	Skate, Barndoor (D)
Flounder, Yellowtail (LF)	
Monkfish	<u>Priority 3</u>
Scallop, Sea	Flounder, Yellowtail (AS)
	Ocean Pout
	Skate, nk



Parts of a scallop dredge

IFS

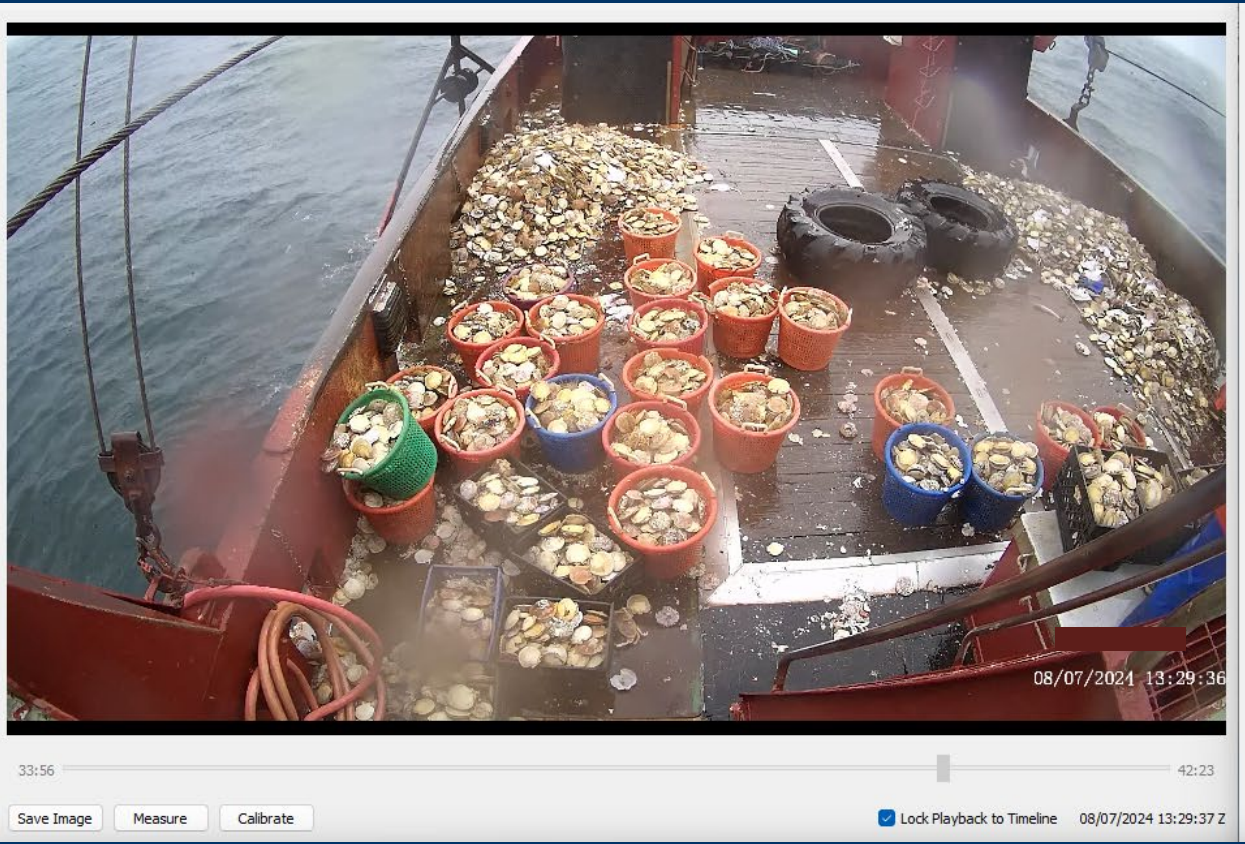




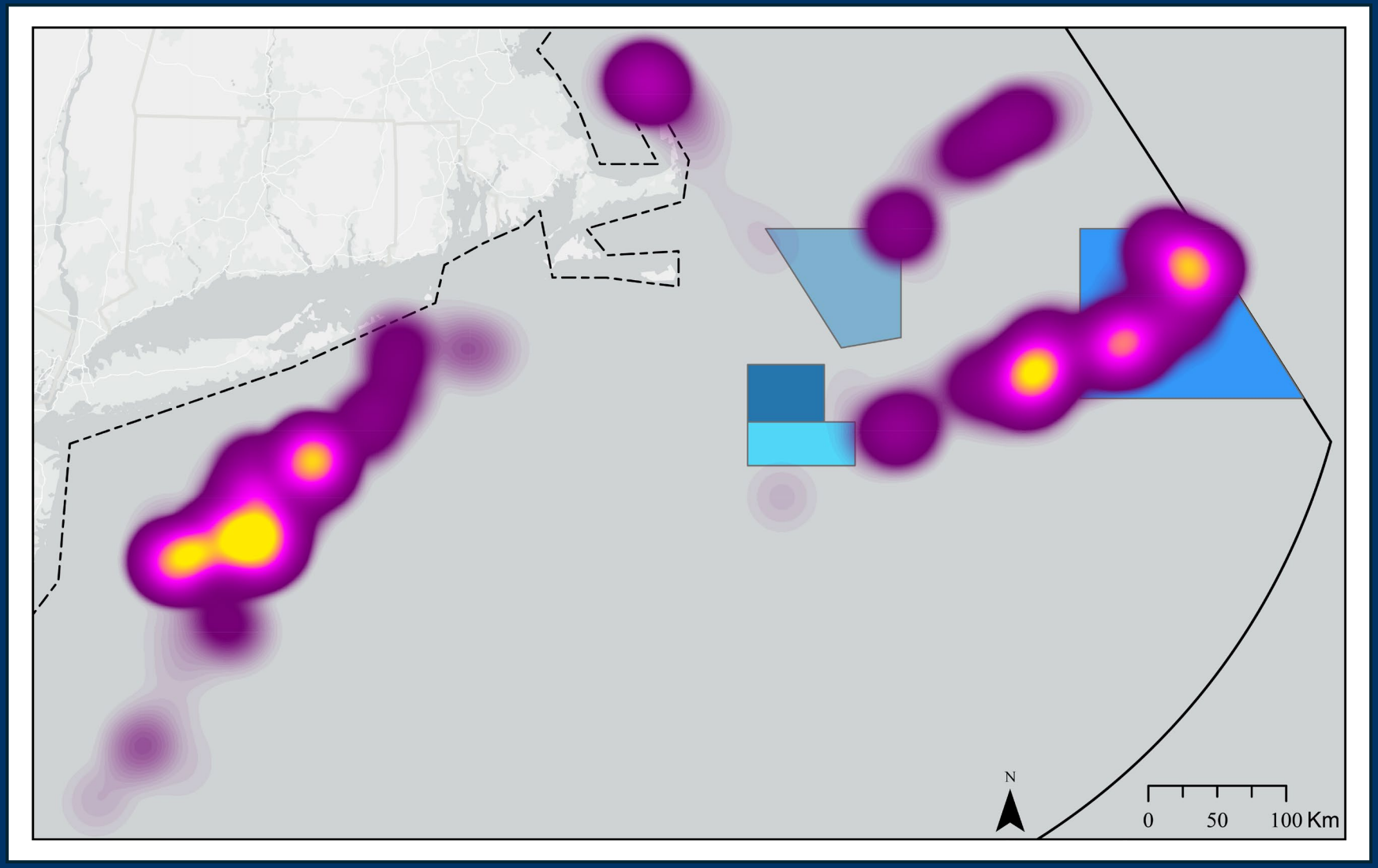
EM pilot results

- 75 fishing trips
  - 43 reviewed
- 569 days-at-sea
  - 330 reviewed
- 5,059 hauls reviewed
- 34,273 baskets of sea scallops

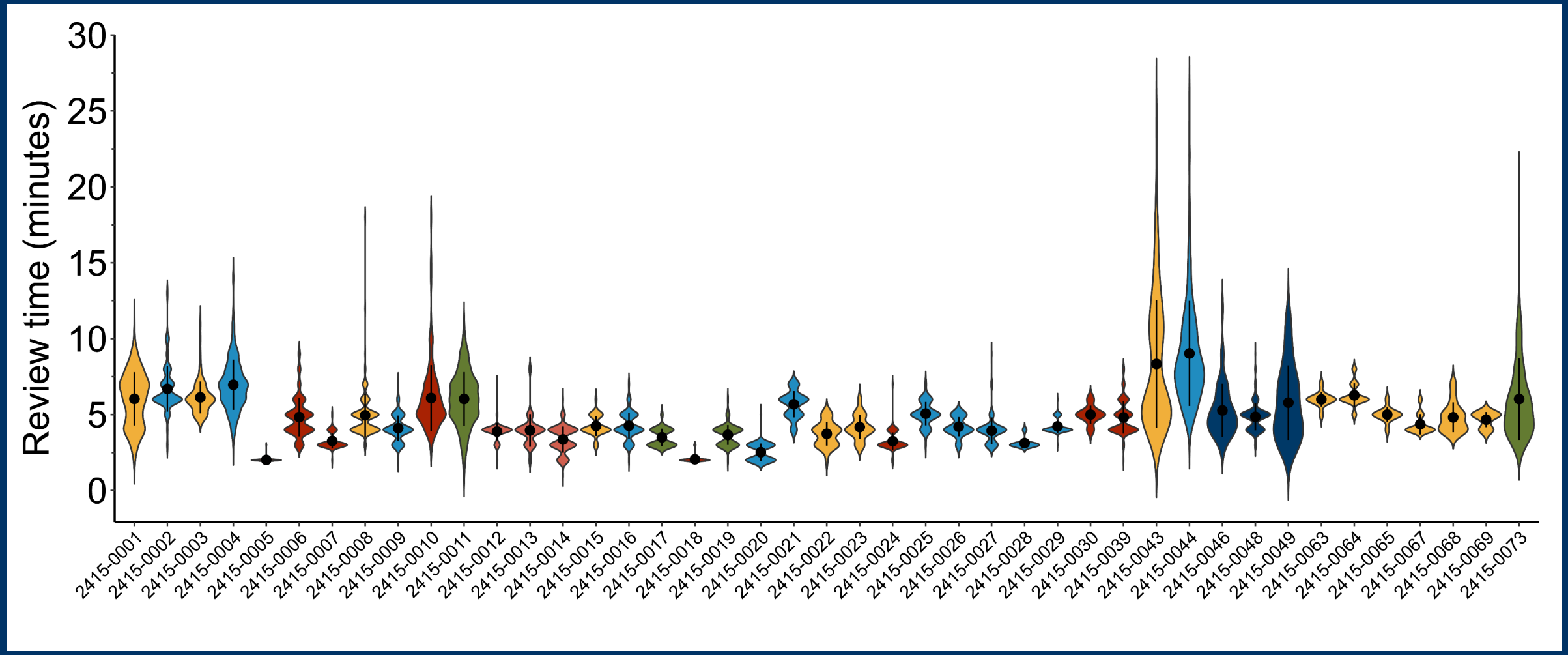
EM pilot results



Spatial coverage of reviewed trips (2024 – present)

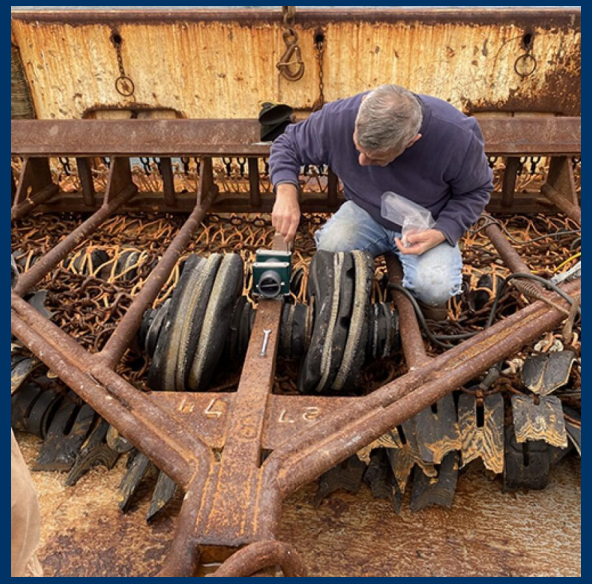


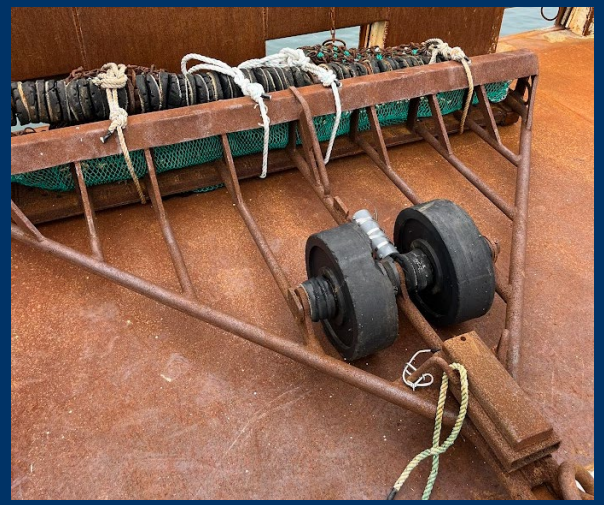
Review time



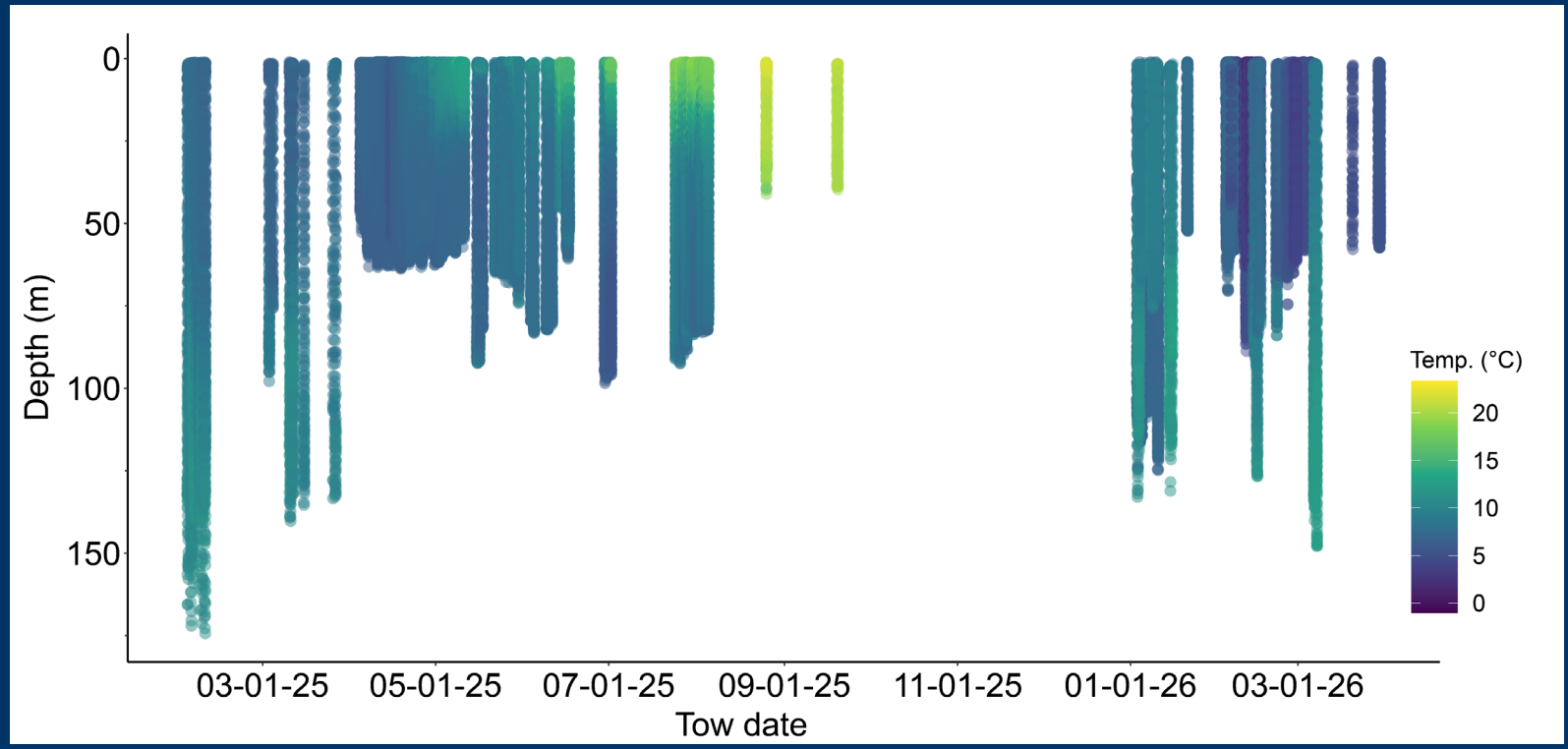
Mean review time = 4.93 ± 0.3 min

Temperature and depth data





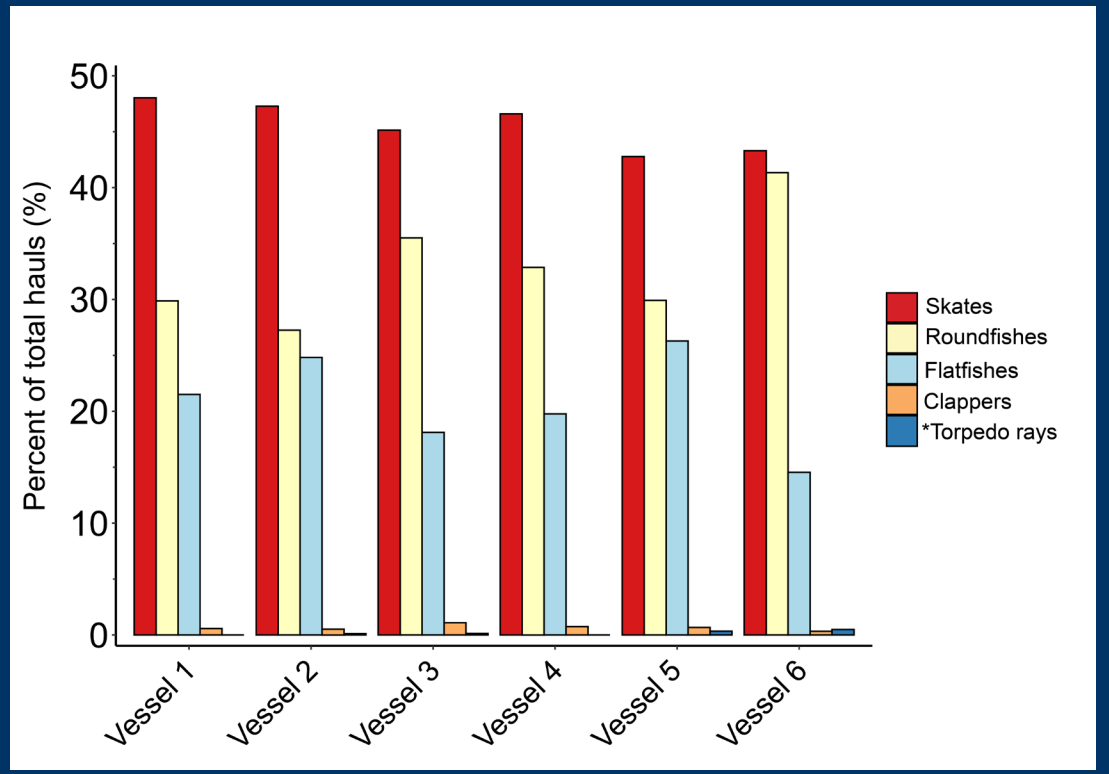
- Started with Lotek dredge-mounted sensors
  - Challenges getting data
- Switched to Environmental Monitoring on Lobster Traps (eMOLT) sensors



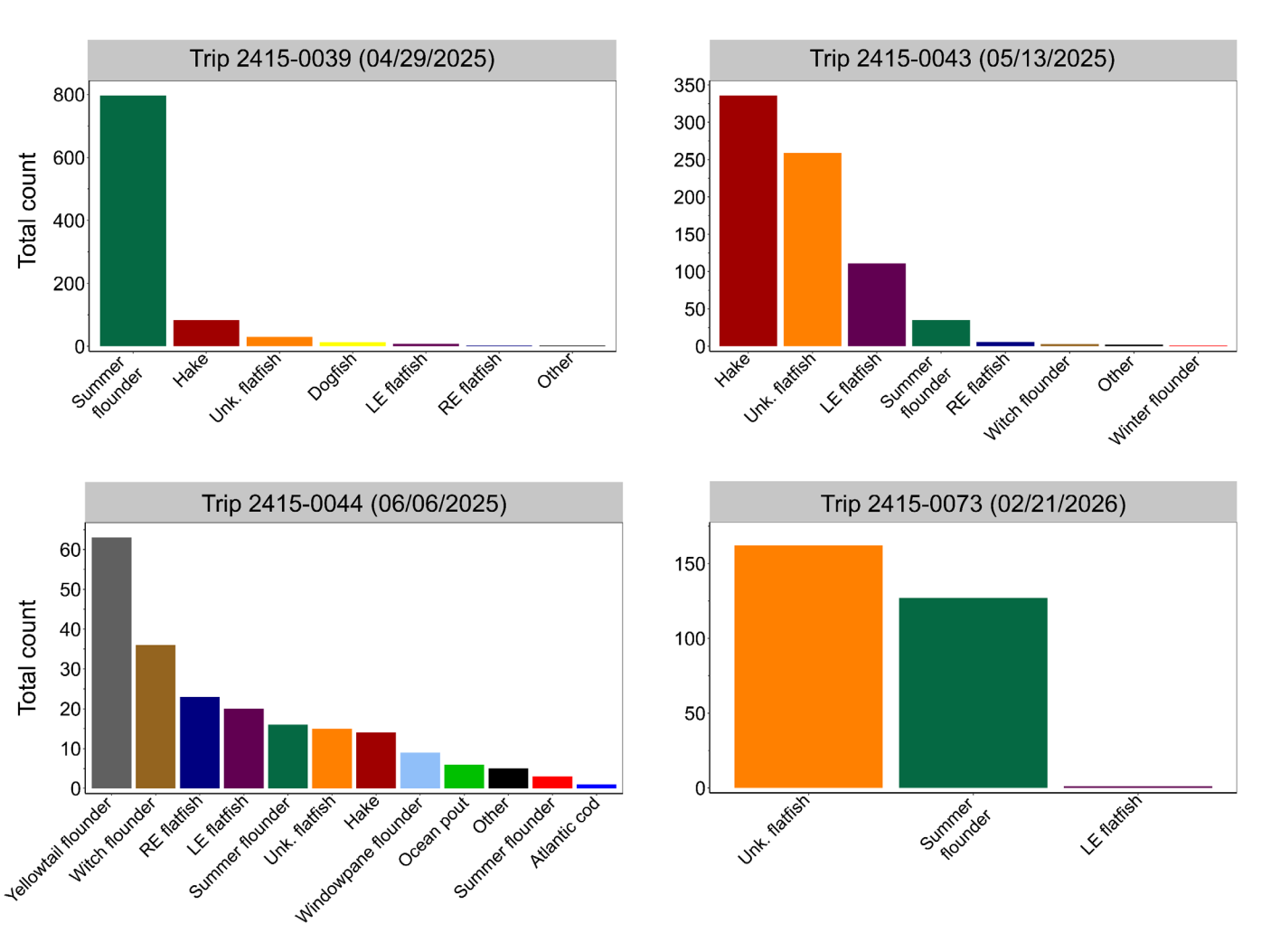
Bycatch monitoring – Year 1

Large skates, monkfish, dogfish, yellowtail flounder, silver hakes, filamentous hake. Base of piles made up of cancer crabs, empty shells, crushed shells, sand dollars.

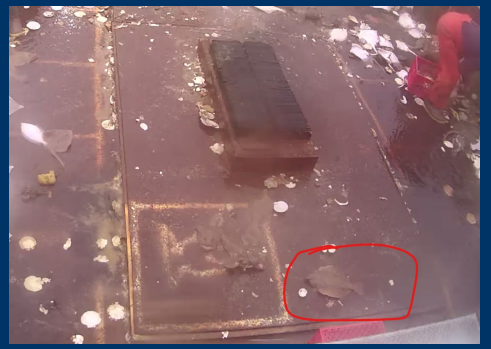
- First year
  - No catch handling modification
  - Reviewers IDing roundfish, flatfish, clappers, skates, protected species, and pelagics



Bycatch monitoring – Year 2



- Second year
  - Move all bycatch (except skates) to designated ID squares
  - Trialed different paint colors

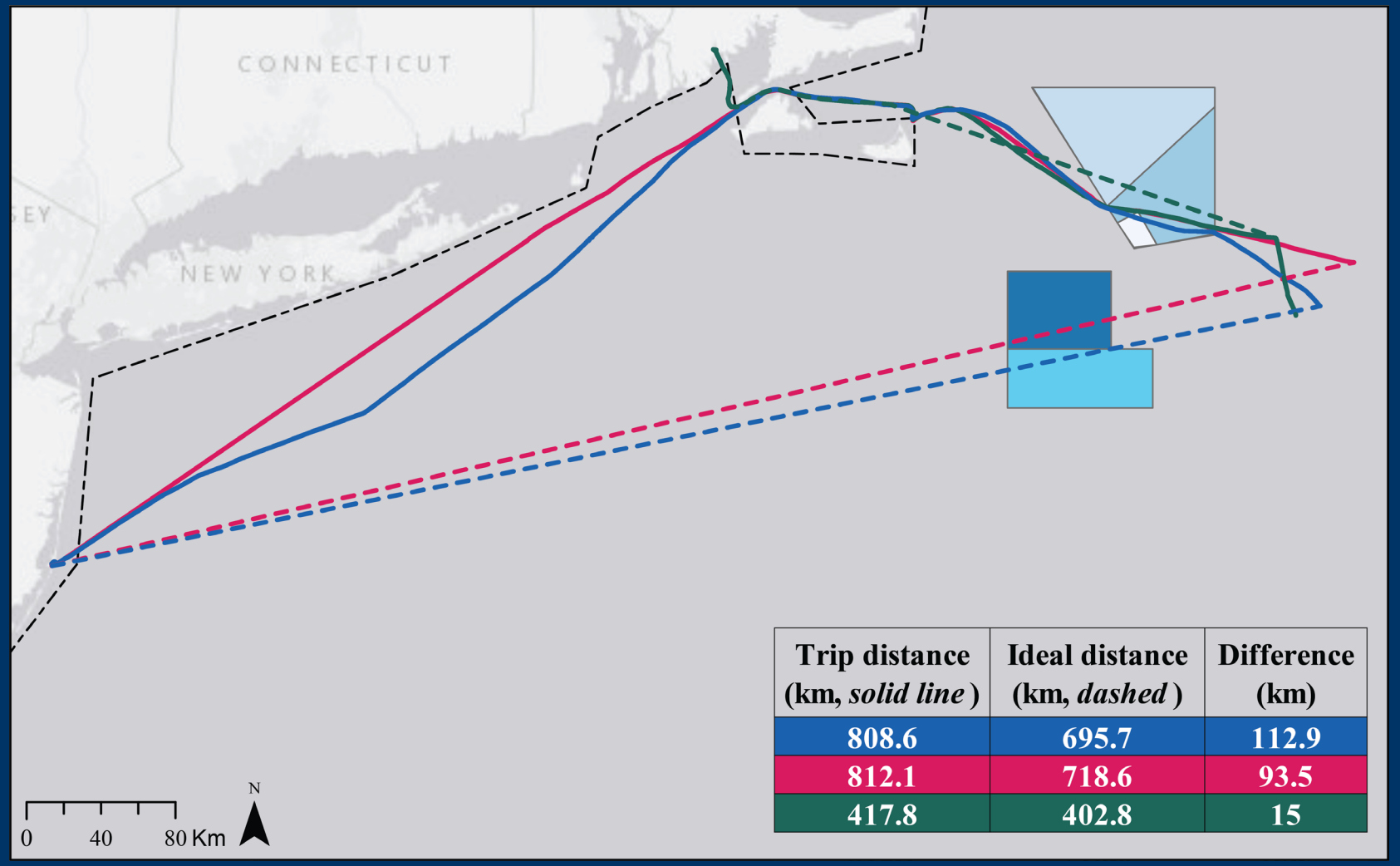


EM feedback

- EM issue impacting data in 244 hauls (5%)
- Four vessels affected
- Minor issues
  - Salt spray
  - Night lighting
  - Glare

- Recorded in-person interviews with Captain, owners, and crew
  - “I’m for EM and believe it will help improve fishing practices and address problems facing the industry” - Vessel 3.
  - “Yes, cameras are easy to use; it is good data obtained easily. There is no hindrance to crew. Cameras can be used for security and verifying reported injuries” - Vessel 2.
  - “I believe EM could be a better option for managing the fishery. I’d say there is interest to see what happens and that further development would be appealing to a lot of us” - Vessel 1.

Incentive strategies



Trip distance (km, *solid line*)	Ideal distance (km, *dashed*)	Difference (km)
808.6	695.7	112.9
812.1	718.6	93.5
417.8	402.8	15

1. Days-at-sea changes
   - Start/stop with fishing effort
2. Transiting through closed areas
3. Observer exemption
4. Other ideas?

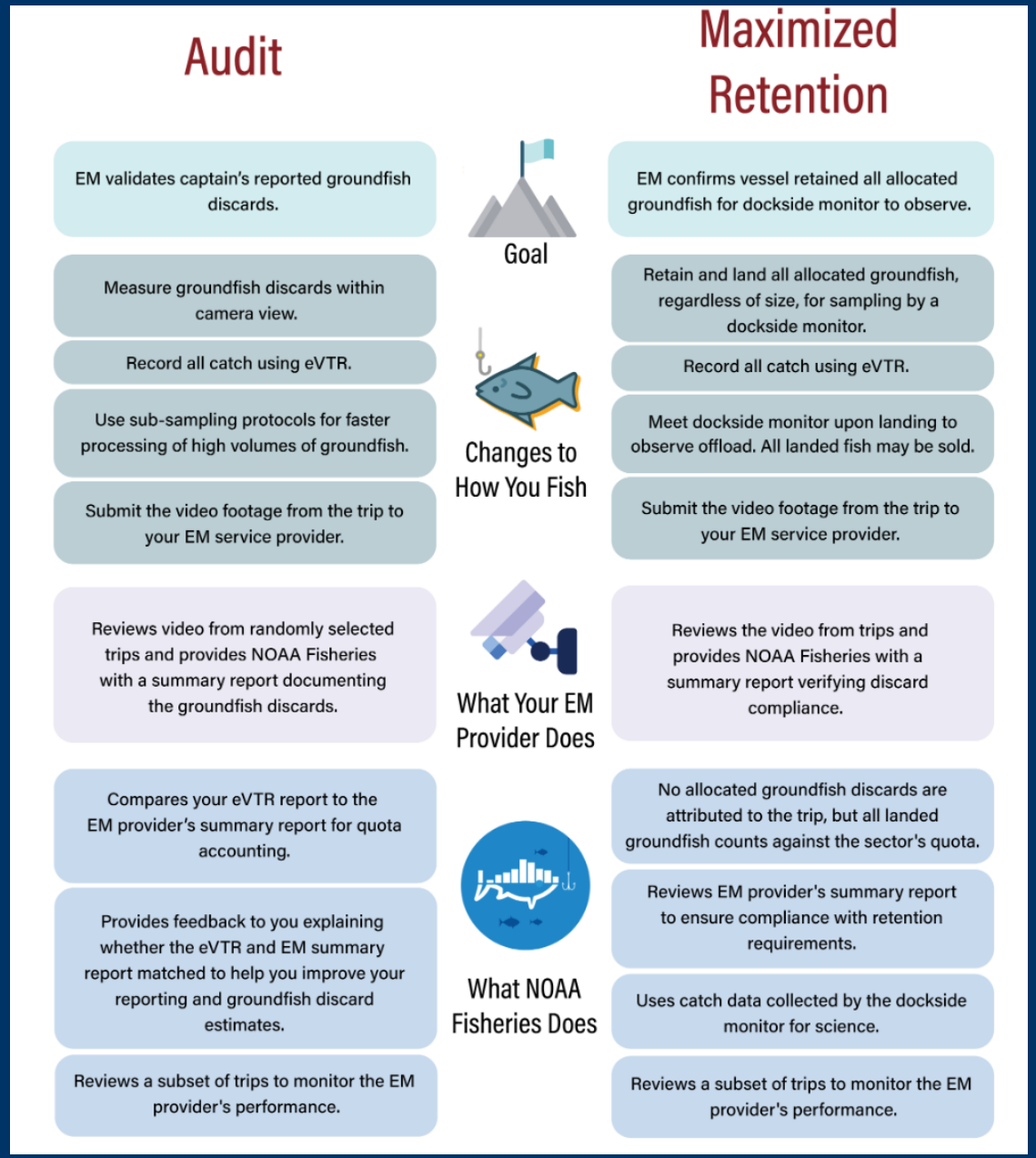
Regulatory framework

NE groundfish example

- Vessel opts in for entire year
- Records all fishing activity
- No At-Sea Monitoring (ASM) observers, but carries NEFOP periodically for sampling
- Different models

Sea scallop ideas

- Audit model with less coverage?
- Replace IFS observers?



EM Timeline

May 2010
Sectors began developing monitoring programs to track sector allocations.

2010-2014
NOAA completed a pilot EM program for groundfish.

June 2016-2020
Audit model piloted with industry and other stakeholders.

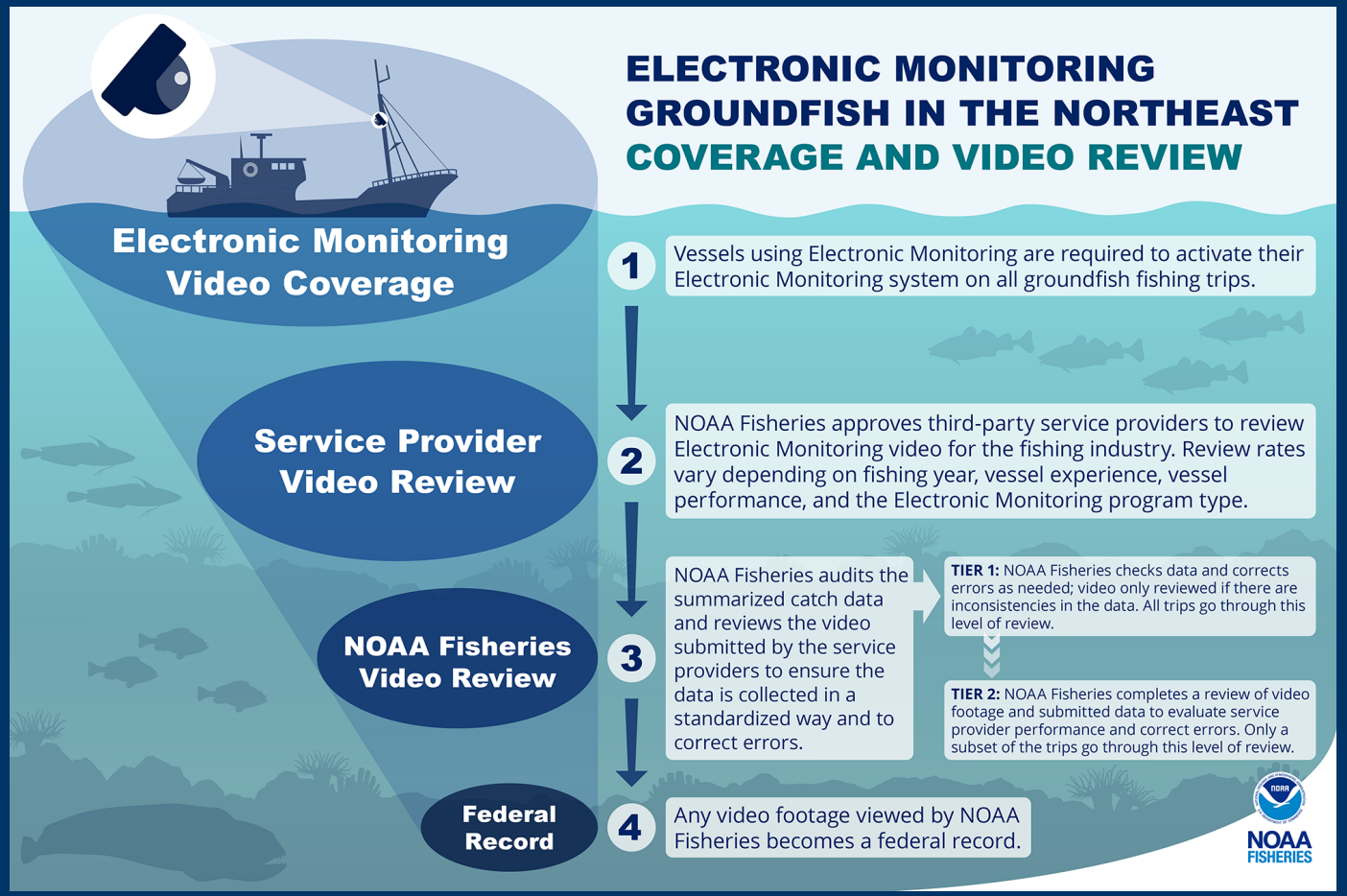
August 2018-2021
Maximized retention model piloted with industry and other stakeholders.

May 1, 2021
Sectors started using approved audit EM programs.

Image source: NOAA NMFS

Data storage and access

- Pilot results: 100 – 900 GB per trip
- Short-term storage, transmission, ownership/access, and long-term storage
- West Coast EM (§ 660.603)
  - EM service providers maintain data
  - At least 12 months after end of fishing year
- Some footage becomes public record

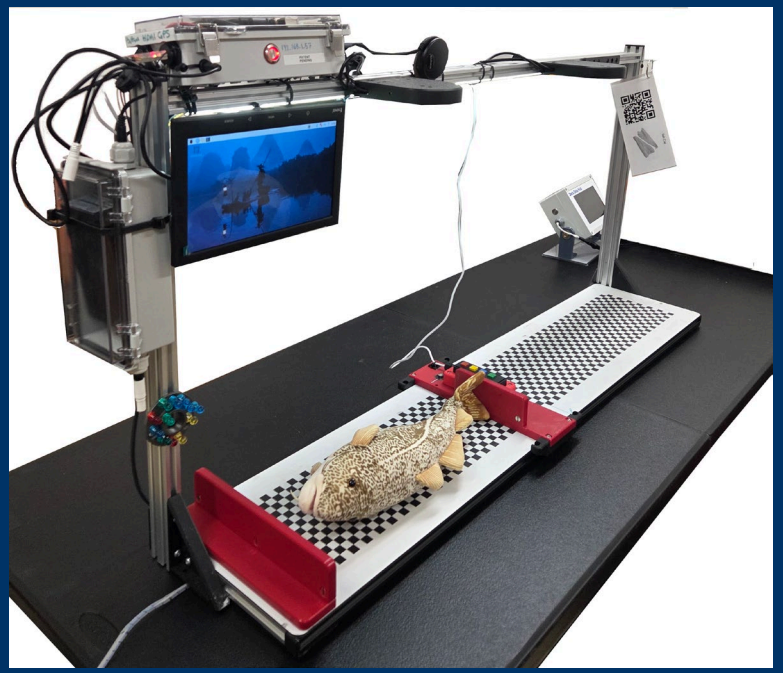


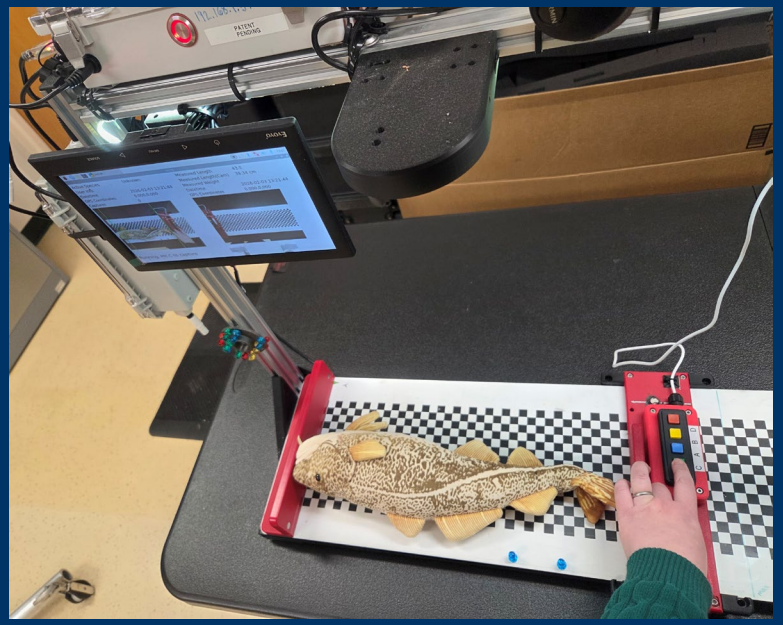
Acknowledgements

- National Fish and Wildlife Foundation (NFWF)
- Participating vessel owners, captains, and crew
  - F/V *Kathy Ann*
  - F/V *Capt John*
  - F/V *Grand Larson III*
  - F/V *Susan L*
  - F/V *Socatean*
  - F/V *Seafarer*
- Saltwater review team
- George Maynard (NOAA NEFSC / eMOLT)
- NOAA GARFO and NEFSC teams

- Other observer costs? Comments?
- Incentive strategies
- Regulatory framework options
  - Audit model, total replacement, or new ideas?
- Bycatch sampling effort
- High grading ideas
- Recently received 2-year extension/expansion from NFWF
  - More vessels, more bycatch handling, and incentives trial
  - Exempted Fishing Permit (EFP) in review
- Best feedback and engagement strategies moving forward

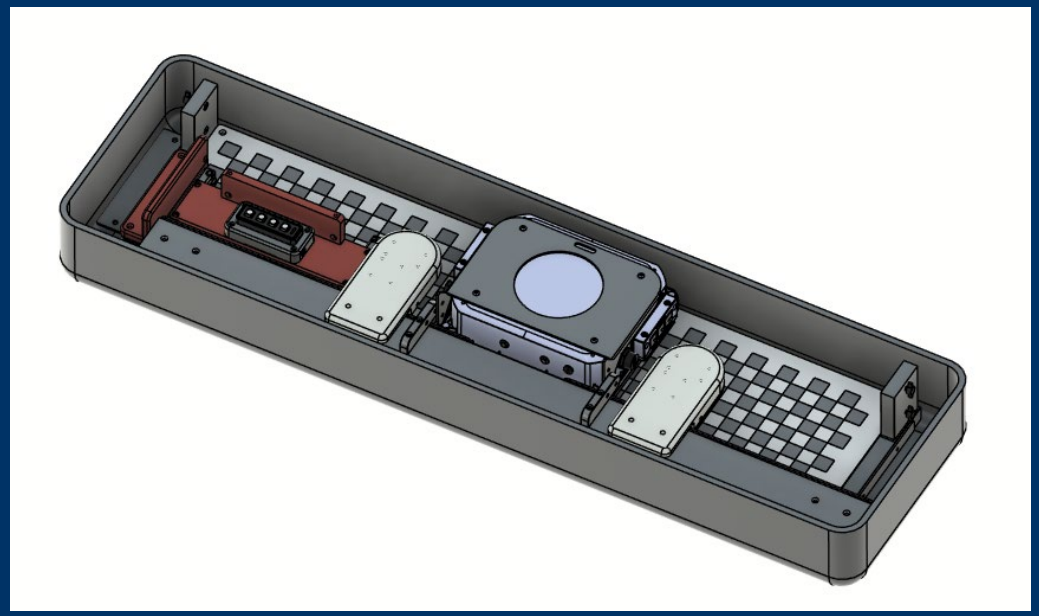
Discussion topics



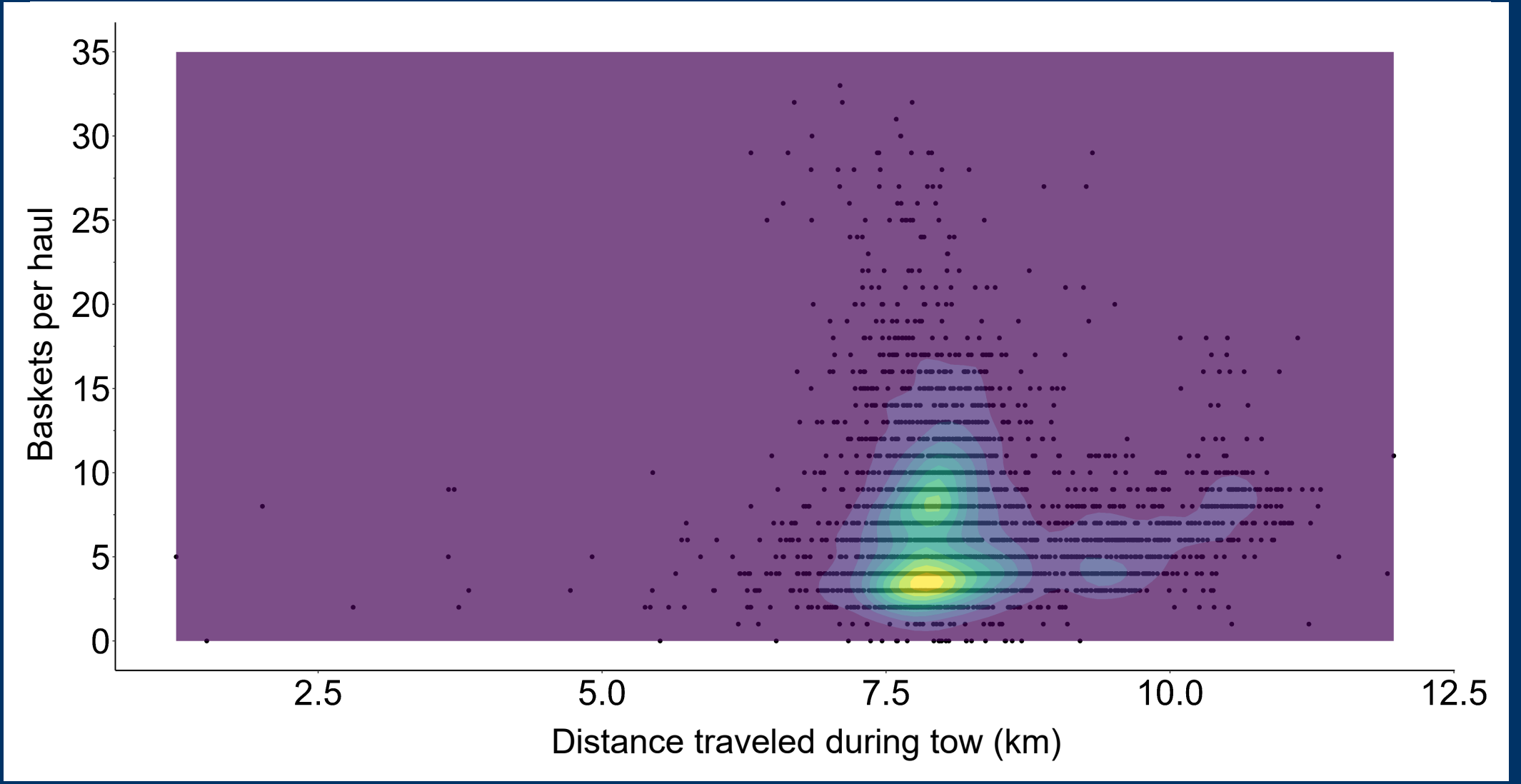


Next steps – bycatch…

- Acbotics collaboration do develop fish board compatible with Lowell DDH
- Alternative to virtual camera measurements
- V2 in production



Distance traveled per haul



Review

- O2Review software
- Follows the EM Audit Model Program Reviewer Guidance Manual
- Begin time, end time, begin location, end location, straight kilometers, traveled kilometers, haul number, gear used, dredge type, catch sorting method, and catch composition.
- Presence of sea scallop predators, container type (i.e., crate vs. basket), and whether high-grading or deckloading occurred.
  - Deckloading
    - Hauls included
    - Final count of filled containers
  - High-grading
    - Is the selective harvest of scallops to retain only the most valuable catch visible?

Temperature and depth data