NOAA FISHERIES
Greater Atlantic Region

Electronic Monitoring in the Northeast Region

A summary of EM programs in the Northeast

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Electronic Monitoring of Mid-Water Herring Trawl Fishery

- Study to determine utility of EM in fishery (2016-2018)
  - **Conclusion:** EM and Portside Sampling (PS) suitable tool to monitor catch retention on MWT vessels targeting herring
- With the implementation of IFM Omnibus Amendment (April 2020) midwater trawl vessels may choose an ASM or EM & Portside as their monitoring option
- **Goal:** EM used to confirm catch retention and verify compliance with slippage restrictions at sea, portside sampling will supply species composition data for quota monitoring
- **Service provider:** Saltwater Inc.
- **Application:** EM 100% coverage, provider completes primary review at 50% of total trips, Portside sampling – 50% selection
- Exempted Fishery Permit (EFP) will be issued to administer EM in this fishery for the first two years of the IFM

EM in Groundfish Sectors

At-sea monitoring requirements for sector vessels

"Electronic monitoring may be used in place of actual observers if the technology is deemed sufficient by NMFS for a specific trip type based on gear type and area fished, in a manner consistent with the Administrative Procedure Act."

Regional EM programs

Goal: To develop EM for use as an alternative tool to meet sector monitoring requirements

Current programs:

Audit-model (discard estimation)

Maximized retention (compliance)

Groundfish Amendment 23

Goal: To improve the reliability and accountability of catch reporting

EM in Groundfish Sectors: Audit-Model

Number of vessels: 20

Gear type: Trawl (5), Longline (3), Gillnet (5), Jig (7)

Vessel size: 31’ to 63’

Ports: RI, MA, NH, ME

Goal: Use cameras to validate discards reported by fishermen in vessel trip report

Challenges: Lack of high-volume vessels; data lags; incorporating new data sources into existing system

The Nature Conservancy

Maine Coast Fishermen’s Association

Cape Cod Commercial Fishermen’s Alliance
Small Boats. Big Ideas.

Gulf of Maine Research Institute
Science. Education. Community.

teem.fish MONITORING
Local focus. Global impact.

NMFS

EM in Groundfish Sectors: Maximized Retention

Number of vessels: 3

Gear type: Trawl (3)

Vessel size: 44’ to 68’

Ports: RI, MA, ME

Goal: Use cameras to verify that fishermen retain all catch, including discards, and collect catch data on shore via dockside monitoring program

Challenges: Lack of high-volume vessels; minimum size regulations; new dealer codes; dockside monitoring program

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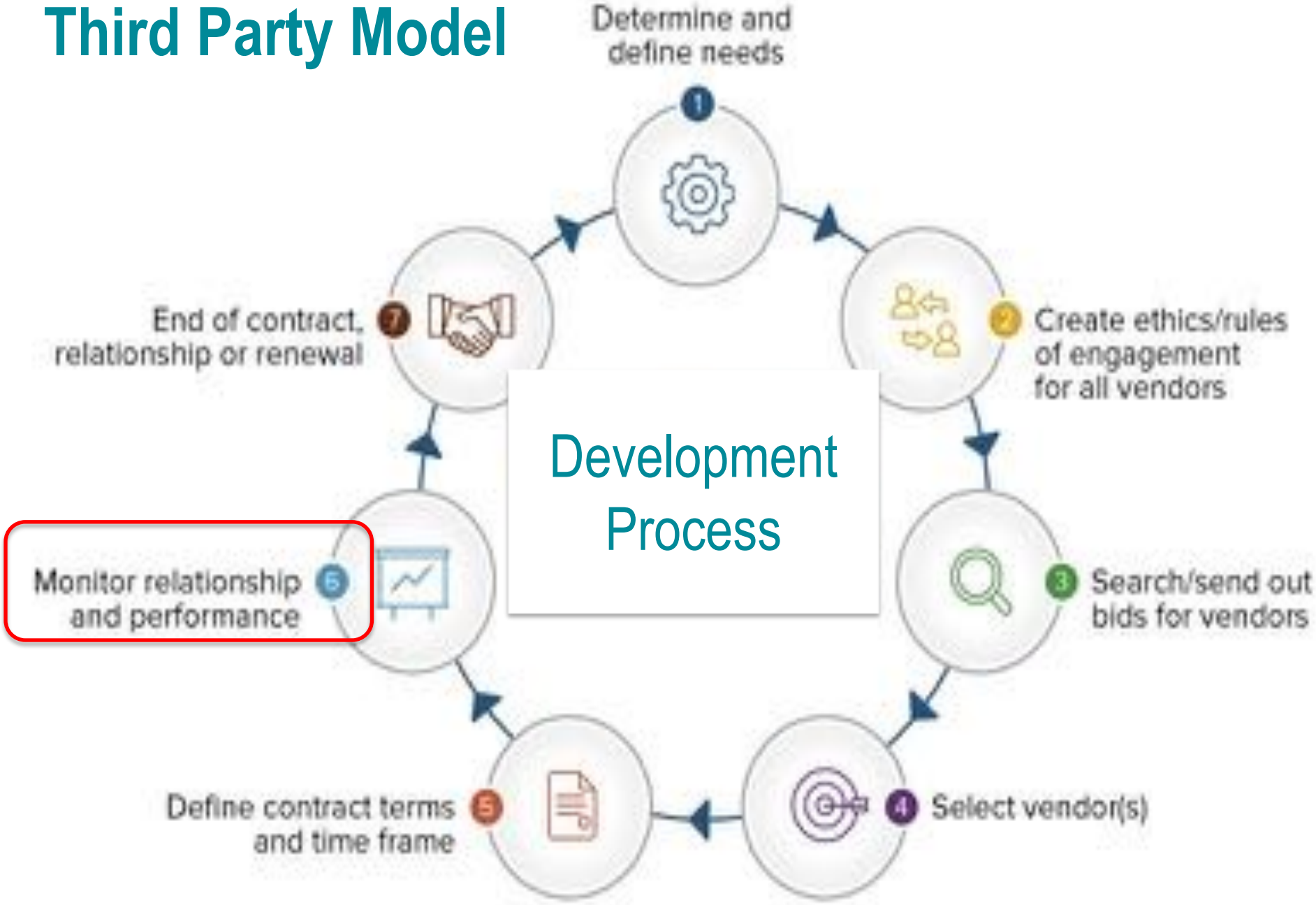
Integrated Monitoring

Third Party Model



‘Primary’ Review

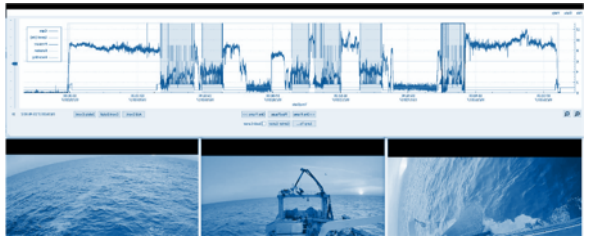
- Conducted by the service provider
- Video review rate determined by NMFS (50% random trip review)
- Data uploaded to NMFS and used for quota monitoring
- Used to validate eVTR’s

VS.

‘Secondary’ Review

- Conducted by NMFS staff
- Used as a QA/QC of the primary review
- Can be used to identify errors in primary review
- Video “access”
- Random trip selection
- Feedback directed to service provider

1°



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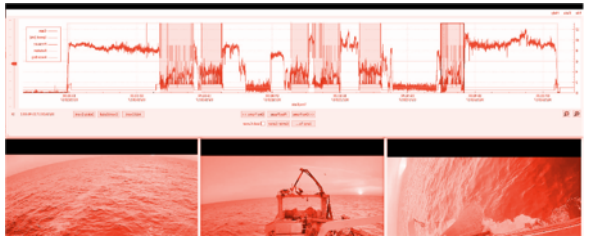
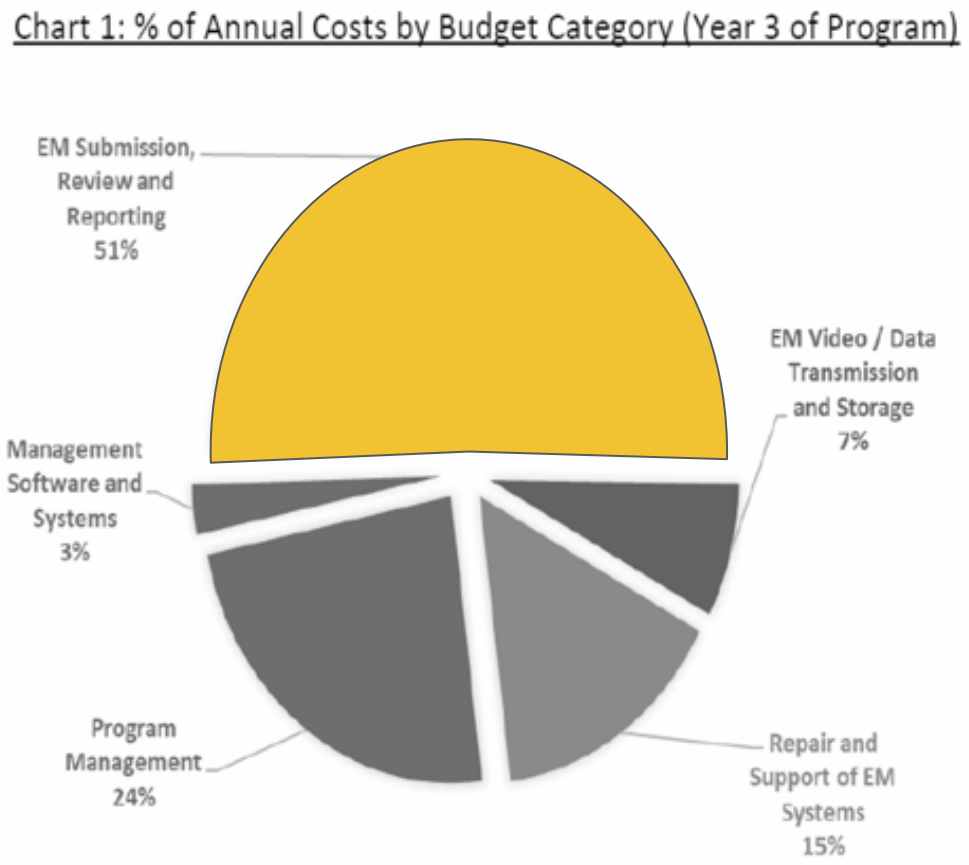


Industry Costs for an EM Program

- Currently video review is the largest component of EM program costs
- Much of this involves simple species identification and length measurement
- Efficiencies are needed in video review processes
- Cost Drivers:
  - Level of review rate
  - Weight estimation
  - Audit tolerances (eVTR and EM report)



https://eminformation.com/wp-content/uploads/2019/04/TNC-EM-Cost-Assessment-Report-Submission-to-NEFMC-4_10_19.clean_.pdf
Cap Log Group LLC & The Nature Conservancy

Other Regional EM Initiatives

1. **EM in the For-Hire Groundfish Fishery *(The Nature Conservancy)***
   Goal: Pilot the use of EM to validate catch reported on the captain's eVTR

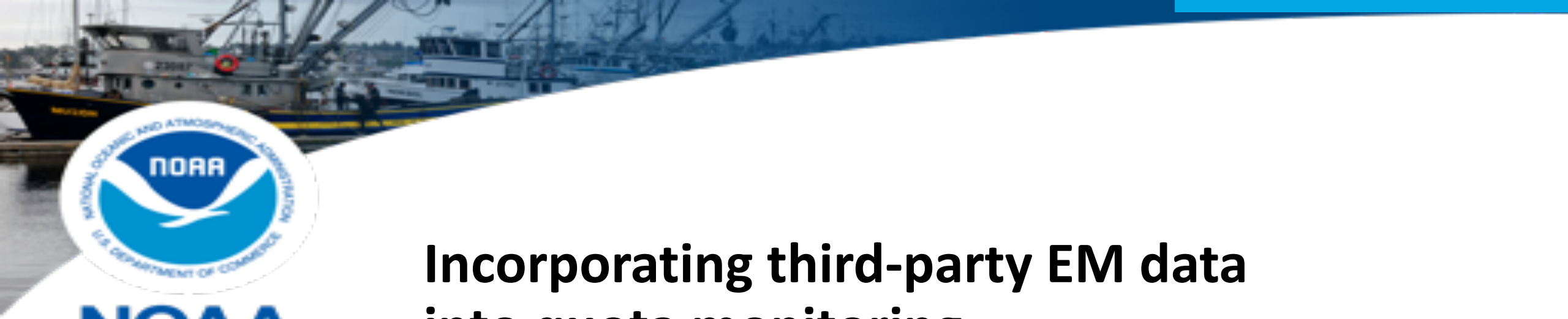
2. **EM in Northern Gulf of Maine Scallop Fishery *(Maine Coast Fishermen's Association)***
   Goal: Pilot the use of EM to monitor fleet and collect fishery data; develop machine learning to increase program cost-effectiveness

3. **Machine Learning on the NOAA R/V Bigelow *(Northeast Fisheries Science Center)***
   Goal: Build a library of images during the bottom trawl survey; use image to develop fish identification algorithms for 3rd party video review software

4. **Unifying EM and VTR Collection Systems *(Greater Atlantic Regional Fisheries Office)***
   Goal: Conceptualize system that will link EM/VTR data sources at the point of collection rather than during post-processing. Initiate haul-level functionality in eVTR portal and add API hooks to EM sensor data for haul event identification

What's Next for EM in the Northeast?

- Testing EM with high discard volume vessels
- Improving EM infrastructure
- Singular shared data system for management & science
- Incorporating Machine Learning initiatives
- Operational specifications and requirements that can be utilized in multiple fisheries and gear types



Incorporating third-party EM data into quota monitoring

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Greater Atlantic Regional Fisheries Office

2020-02-12

Audit-Model Design

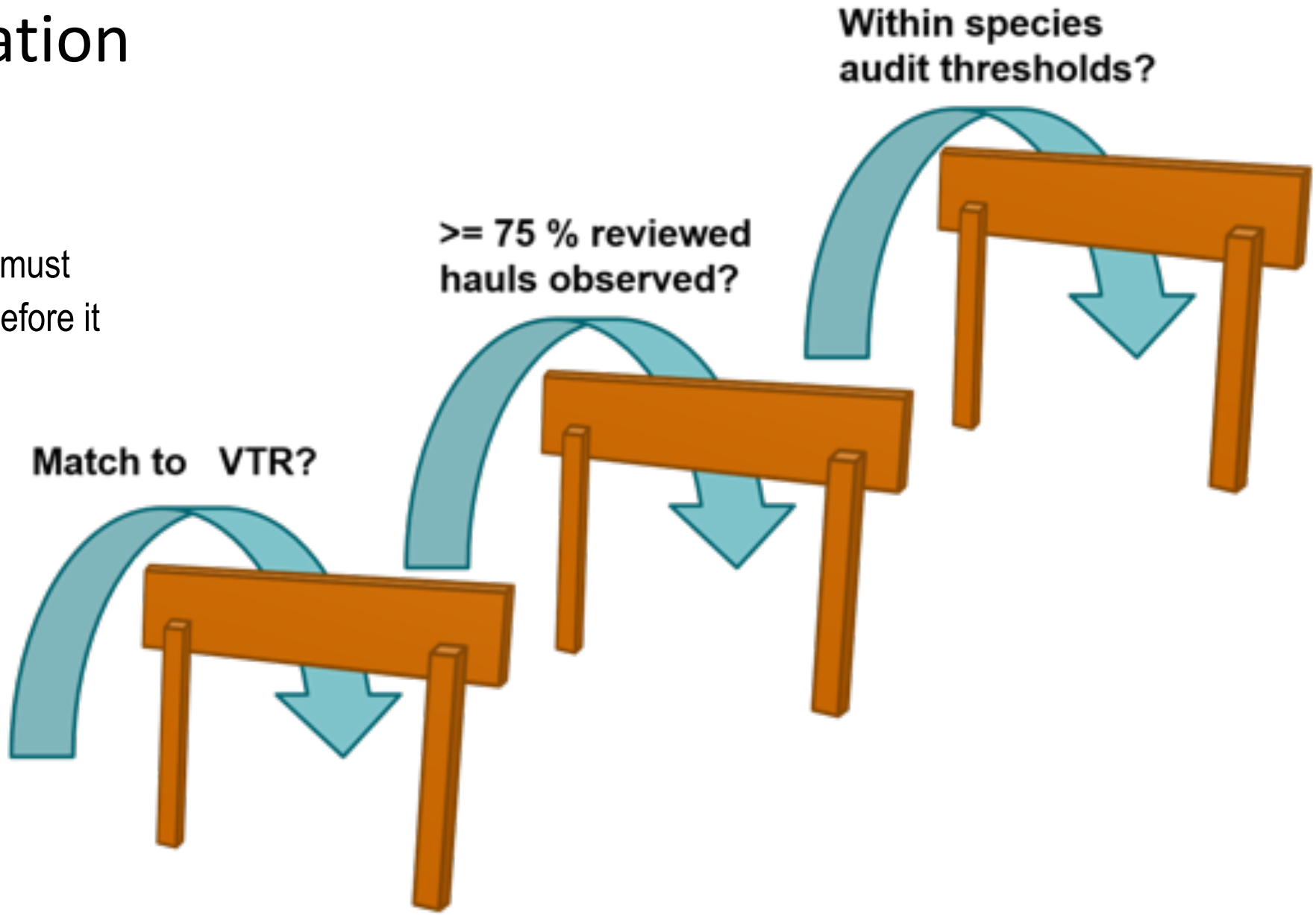
- **Data Collection**
  - EM data collected on groundfish discards only
  - Full trip reviews (100% of hauls)
  - Reviewer records species and length for each animal that is converted to a weight
- **Discard Estimation:**
  - Relies on haul-level matching of EM and VTR logbook to construct complete trip and compare discards between sources

Sequential matching algorithm
1st Pass: Ordinal
2nd Pass: Munkres

- **Trip discard source varies depending on EM-VTR comparison:**
  - Human Observer
  - VTR
  - EM
  - Discard rate

EM Data Validation

EM and VTR data quality must surpass several hurdles before it can be used…



Audit Thresholds

- Absolute difference between EM and VTR must be less than weight tolerance
- Three thresholds based on species risk tolerance
  - HIGH
  - MEDIUM
  - LOW
- Result from simulation of fishing year 2016-2017 EM data with targeted pass rate of 80%

Species	Weight Tolerance (lbs)
Cod	25
Haddock	100
Halibut	50
Ocean pout	50
Plaice	100
Pollock	100
Redfish	50
White hake	50
Windowpane flounder	50
Winter flounder	50
Witch flounder	50
Wolffish	50
Yellowtail flounder	50

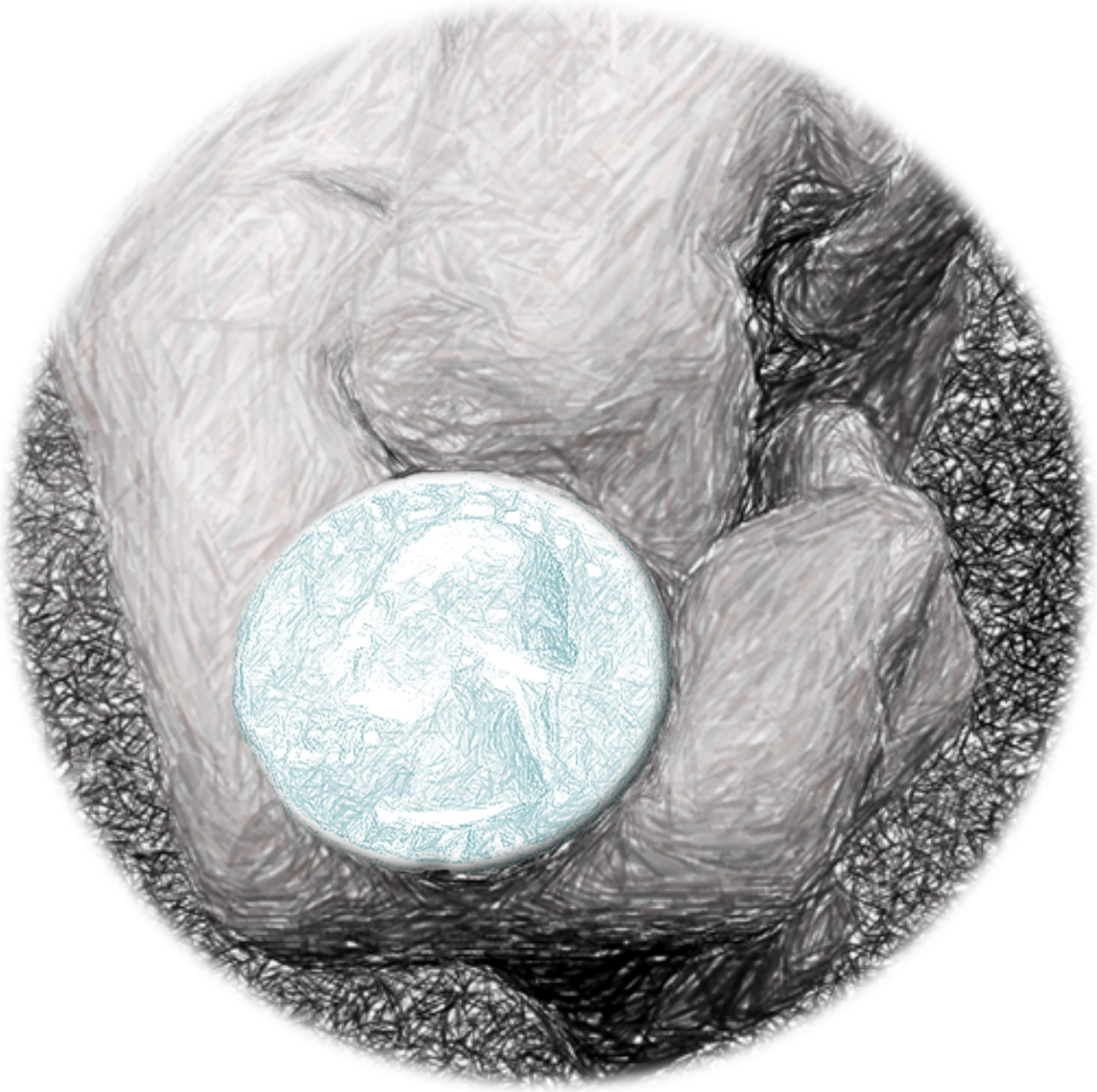
Audit Selection

Random subset of trips **selected** for review

- FY2018: 100%
- FY2019: 50%

Capable of modifying review rate

- Performance based
- Fishing location
- Landings
- Gear
- Behavior

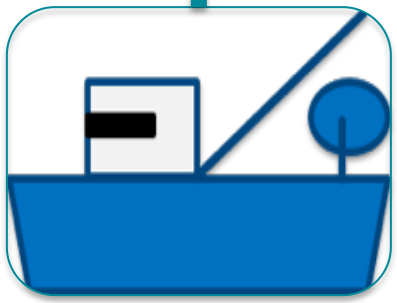


EM Data Transmission: Vendor → Agency

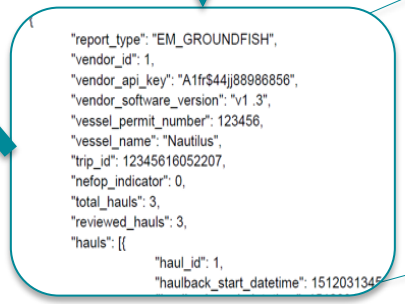
Hard drive sent to vendor

Video review

GARFO API



Trip completion



Annotated JSON
(**J**ava**S**cript **O**bject **N**otation)

Days **EM Data Turnaround Time**

Days	EM Data Turnaround Time
0-10	• VTR Received (eligible for audit selection)
0-7	• Trip Selected for Review
0-1	• Reviewer Notification
3-70 (~21)	• Transcribed EM Data (JSON) Received by Agency
0-7	• EM Data Incorporated into Quota Monitoring

Making it all work

QM data systems updated

Process EM data

Identify Groundfish trips

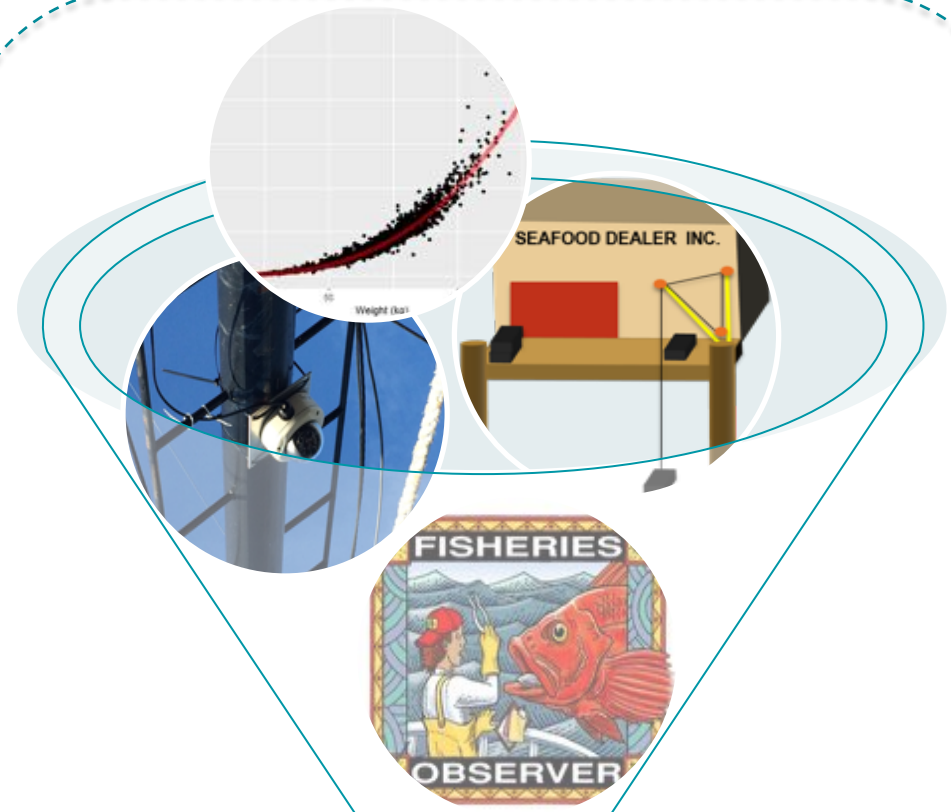
Audit Model Procedure (AMP)

Determine discard source

Selected trips to vendor

Distribute AMP reports

Weekly Refresh Cycle

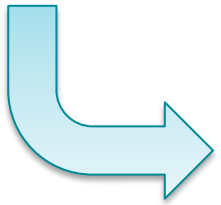


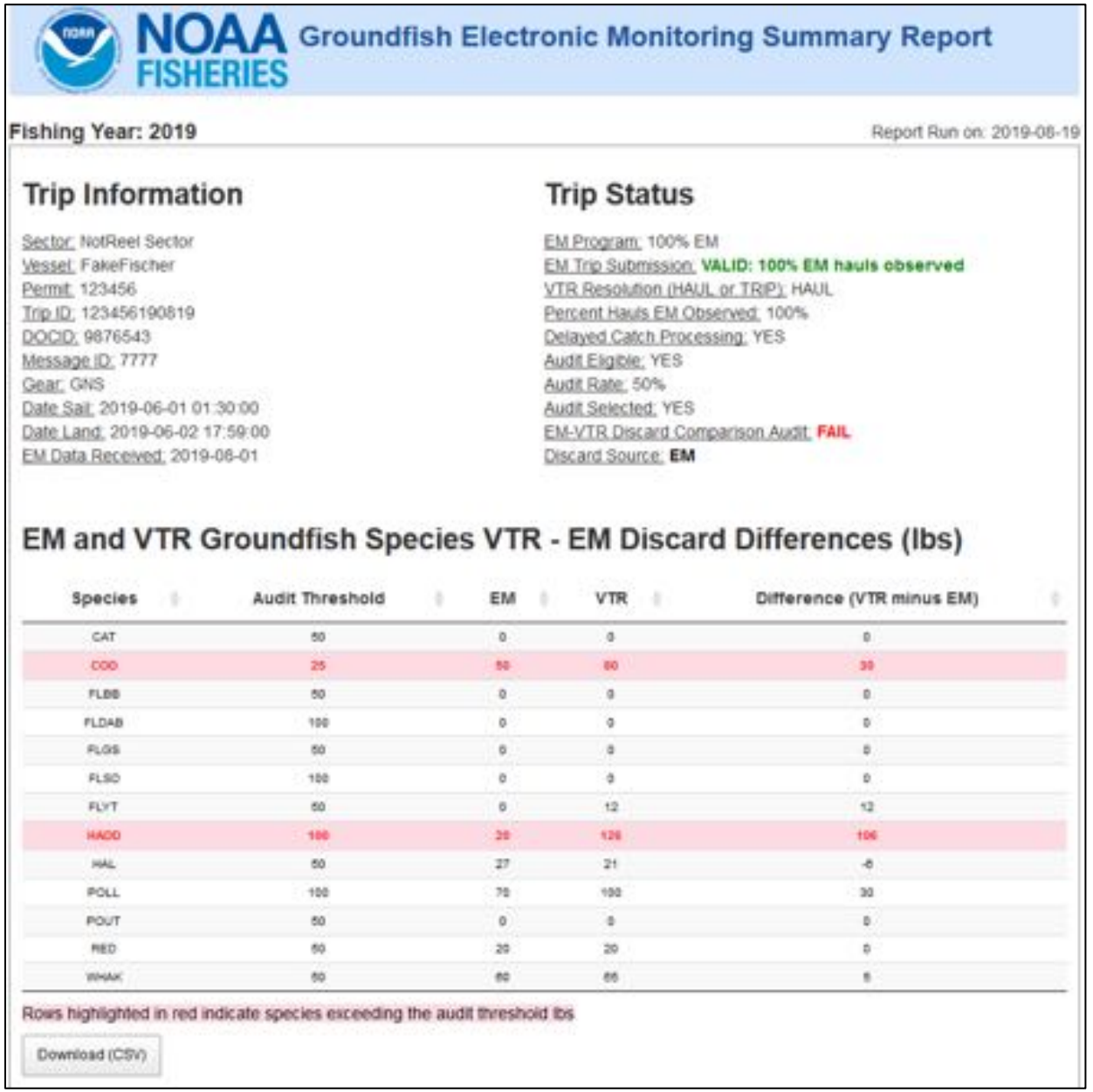
Catch

Communication

Automated **trip-level summary report** provides weekly data quality feedback to EM participants

- Improve data quality and promotes transparency





NOAA FISHERIES Groundfish Electronic Monitoring Summary Report

Fishing Year: 2019 — Report Run on: 2019-08-19

Trip Information

Sector: NotReel Sector
Vessel: FakeFischer
Permit: 123456
Trip ID: 123456190819
DOCID: 9876543
Message ID: 7777
Gear: GNS
Date Sail: 2019-06-01 01:30:00
Date Land: 2019-06-02 17:59:00
EM Data Received: 2019-06-01

Trip Status

EM Program: 100% EM
EM Trip Submission: VALID: 100% EM hauls observed
VTR Resolution (HAUL or TRIP): HAUL
Percent Hauls EM Observed: 100%
Delayed Catch Processing: YES
Audit Eligible: YES
Audit Rate: 50%
Audit Selected: YES
EM-VTR Discard Comparison Audit: FAIL
Discard Source: EM

EM and VTR Groundfish Species VTR - EM Discard Differences (lbs)

Species	Audit Threshold	EM	VTR	Difference (VTR minus EM)
CAT	50	0	0	0
COD	25	50	80	30
FLBB	50	0	0	0
FLDAB	100	0	0	0
FLGS	50	0	0	0
FLSO	100	0	0	0
FLYT	50	0	12	12
HADO	100	20	120	100
HAL	50	27	21	-6
POLL	100	70	100	30
POUT	50	0	0	0
RED	50	20	20	0
WHAK	50	60	65	5

Rows highlighted in red indicate species exceeding the audit threshold lbs

Download (CSV)

Weekly **selected trip list**

- Tracks all known trips in system
- Identifying attributes (permit, date, status)

PERMIT	TRIP_ID	DATE_TRIP	VTR_EXIST	EM_DATA_EXIST	AUDIT_SELECTED
123456	12345619121406	14-Dec-19	1	1	1
123456	12345619122905	29-Dec-19	1	0	1
123456	12345620020104	1-Feb-20	0	0	0