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**FISHERIES**

# Electronic Technologies in U.S. Fisheries



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March 18, 2026

# Electronic Technologies in U.S. Federal Fisheries



- Electronic Monitoring: Video cameras, sensors, and GPS
- eLogbook: Commercial and recreational vessel reported effort and catch
- eDSM: early discussions on Electronic Dockside Monitoring programs
- VMS: Satellite based location tracking
- eDealer: electronically reported purchase data from fish buyers
- Observer technologies



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# U.S. Electronic Monitoring Programs

## Alaska

### Under Regulation

- Bering Sea and Aleutian Island (BSAI) Non-Pollock Trawl Catcher/Processor (C/P)
- Bering Sea Pollock Trawl C/P and Motherships
- Central Gulf of Alaska Rockfish Trawl C/P
- BSAI Pacific Cod Longline C/P
- Small Boat Fixed Gear (Longline and Pot)
- Halibut Deck Sorting Trawl C/P
- Pollock Trawl Catcher Vessels

### Pilot Project

- Southeast Alaska Salmon Gillnet
- Gulf of Alaska Rockfish Trawl Catch Vessels

## West Coast

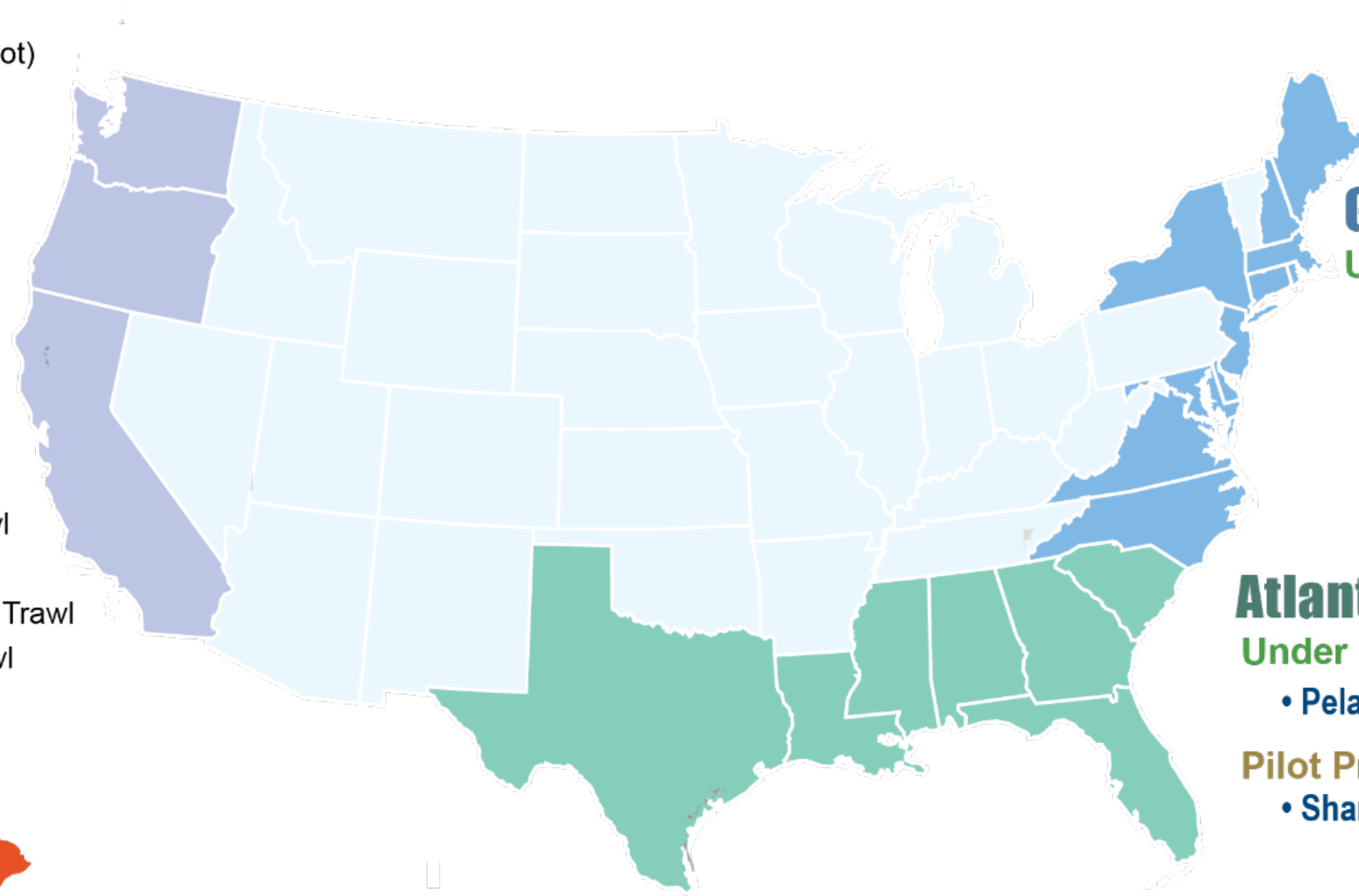
### Under Regulation

- Whiting Mid-Water Trawl
- Fixed Gear IFQ
- Non-Whiting Mid-Water Trawl
- Groundfish Bottom Trawl

## Pacific Islands

### Pre-implementation

- Pelagic Longline - Hawaii Deep and Shallow Set



## Greater Atlantic

### Under Regulation

- Groundfish - Logbook Audit
- Groundfish - Maximized Retention

## Atlantic HMS

### Under Regulation

- Pelagic Longline

### Pilot Project

- Shark Bottom Longline

# From Data to Decision

<b>EM Program Objective</b>	<b>Science (Stock Assessment)</b>	<b>Management (Quota/Limits)</b>	<b>Compliance</b>
<b>Catch &amp; Discard Accounting</b>	<b>PRIMARY</b>	<b>PRIMARY</b>	<b>Secondary (Unregulated Discards)</b>
<b>Bycatch (ETP) Monitoring</b>	<b>PRIMARY</b>	<b>PRIMARY (Caps)</b>	<b>Secondary (Handling Rules)</b>
<b>Retention Compliance</b>	<b>Secondary (In Combination with Shore-side Sampling)</b>	<b>Secondary (In Combination with Shore-side Sampling)</b>	<b>PRIMARY</b>

# Implementation & Sampling Design

- **Data Verification (Logbook Validation) Model**
  - Participating vessels utilize EM on 100% of trips to verify self-reported data
  - Audit Model**
    - % of trips/hauls randomly selected for review to ensure logbook accuracy
  - Full Review Model**
    - 100% EM recording and 100% video review
- **Selective Trip Coverage**
  - EM systems are only activated for specific, randomly selected trips
- **Full and Maximized Retention Models**
  - Verify that unregulated discarding does not occur at sea
  - Shore-side Monitoring**
    - Port-based sampling provides the catch composition and biological data
- **Sensor Driven Start/Stop Recording**
  - Video recording is triggered only during fishing activity



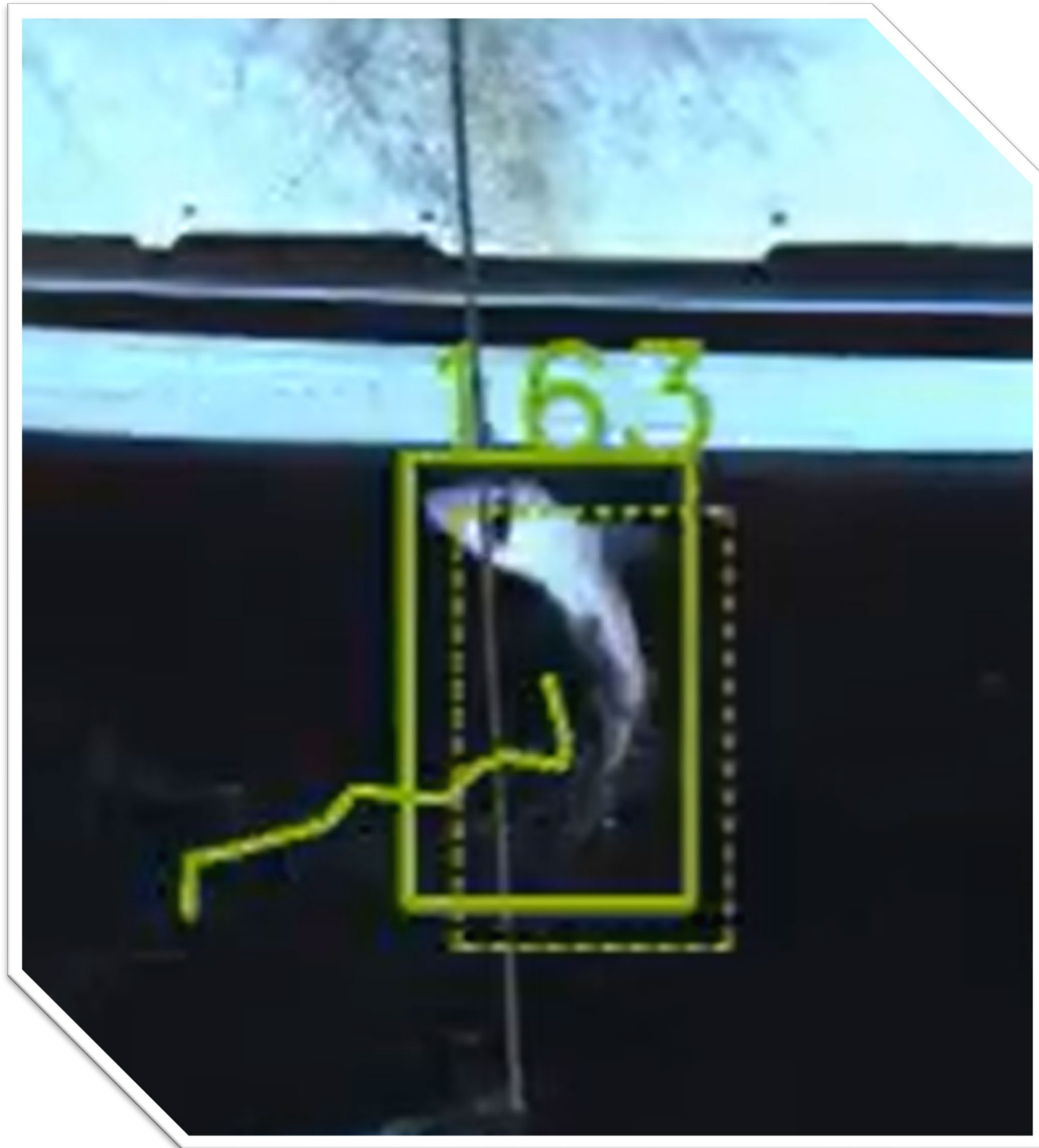


# Data Governance & Ownership



- **Two Data Categories**  
Distinguishing between raw video footage and the annotated data
- **Funding and Governance**  
Examining how industry-funded versus agency-funded models influence data control and access
- **Third-Party Service Providers**  
The role of vendors in data reception, processing, and storage
- **Record Retention and Privacy**  
Managing retention periods and protecting sensitive information under legal mandates
- **Data Ownership Frameworks**  
Clearly defining the rights of the industry, service providers, and government agencies

# Integrating AI Into The EM Lifecycle



## Image Acquisition

Leveraging NOAA Research vessels to collect high-fidelity images for training species classification and length estimation models

## AI Initiatives

Developing extendable ML/AI models allowing algorithms to be adapted across various regions and gear types

## Vessel-Specific Models

Developing tailored models to account for the unique vessel configurations

## Model Sharing and Collaboration

Providing classification and length models to EM service providers through an Application Programming Interface (API) via cooperative agreements to be integrated directly into review software

## Video Review Efficiency

Partnering with EM providers to incorporate activity recognition

# Bigelow EM Library Project

NOAA Northeast Fisheries Science Center and CVision AI

Project Goal: Leverage the bottom trawl survey aboard R/V Henry B. Bigelow to collect a library of videos suitable for training machine learning algorithms

Approach: Install cameras over three sampling stations and conveyor to gather data, matched with ground truth from FSCS software

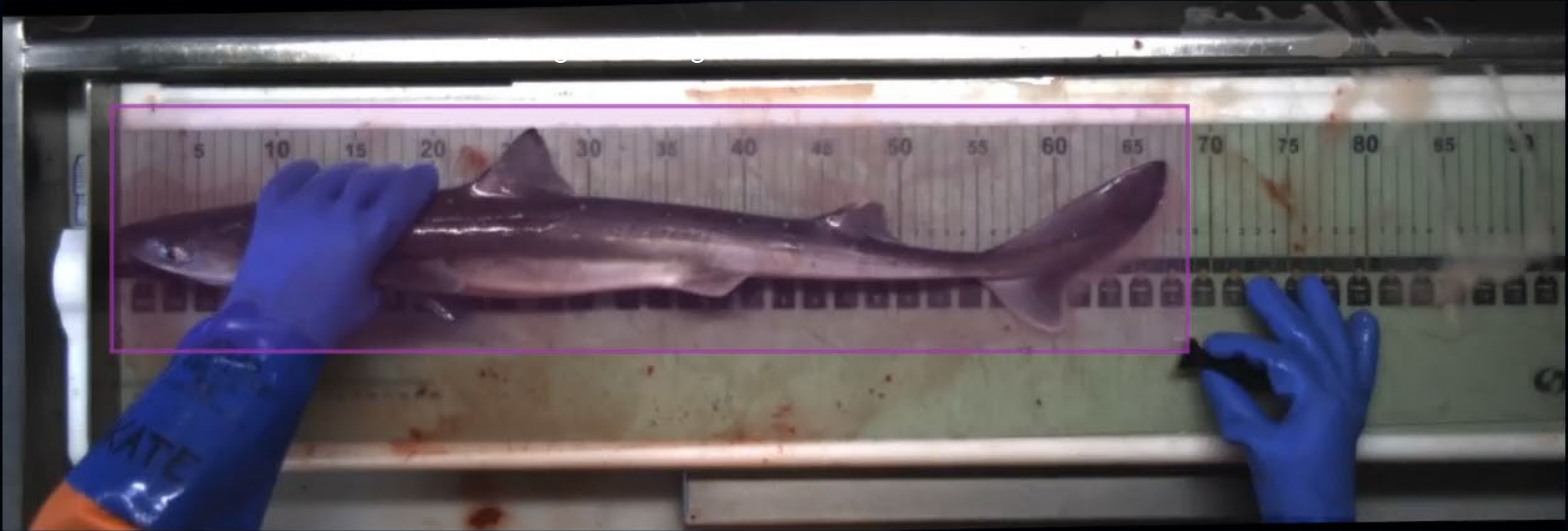


# Footage – Tracking

NOAA Image Library > All Media > 00abdaee-4415-11e9-8ef8-000af7ef4a40.mp4 (104 of 267946)

Tracklets 100%

Jonathan Takahashi  
jonathan.takahashi@cvisionai.com JT



Annotation Browser

00abdaee-4415-11e9-8ef8-000af7ef4a40.mp4 Less -

Object Detector Processed 2020-02-29 08:11:39.205730

Tracklet Generator Processed 2020-07-07 16:27:51.159994

Demo

Entities Less -

- 497 Detection >
- 9 FSCS >
- 44 Tracklet >

0:00 / 0:59 14 1x



# Alaska ML/AI Project

Alaska Fisheries Science Center,  
Alaska Regional Office,  
Pacific States Marine Fisheries  
Commission,  
neXus Data Solutions,  
Alaska Pacific University

## Objectives:

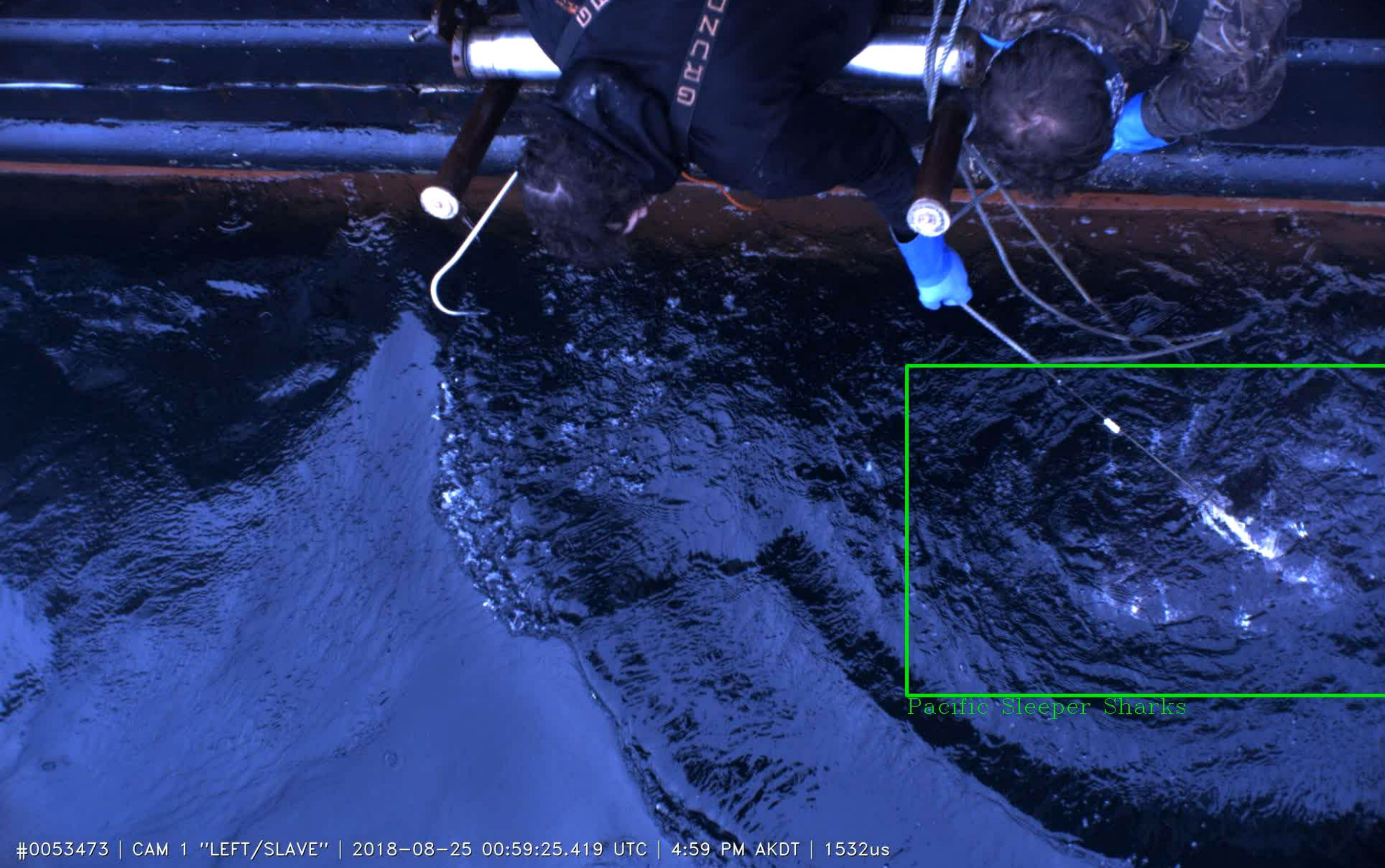
Develop ML tools to automate  
video review

Assess the ability for ML to detect  
species

Generate data to inform  
management recommendations

# Spiny Dogfish

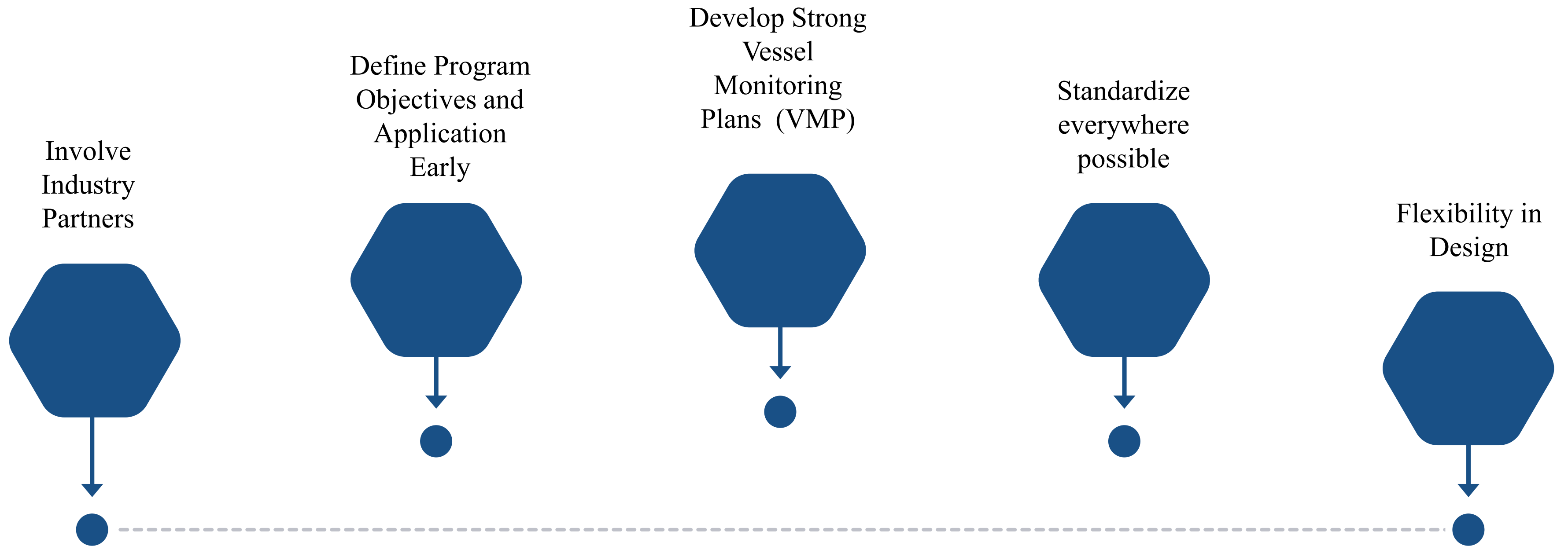
# Sleeper Shark



Pacific Sleeper Sharks

#0053473 | CAM 1 "LEFT/SLAVE" | 2018-08-25 00:59:25.419 UTC | 4:59 PM AKDT | 1532us

# Foundations for EM Program Success



# Future Direction

**Investigate and Trial Electronic Dockside Monitoring**  
Explore the feasibility of camera-based systems at landing sites

**Establish Interoperability Standards**  
Partner with international bodies (ICES) and EM providers to standardize raw video output

**Standardize AI Protocols**  
Develop uniform requirements for training imagery and metadata

**Scale Extendable AI Models**  
Continue expanding machine learning initiatives

**Move Towards Performance-Based Requirements**  
Shift from rigid specifications to performance-based technical standards

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*Thank  
You!*

