

Electronic Monitoring for Coastal Dungeness Crab Fishery Management



Washington
Department of
**FISH and
WILDLIFE**

Electronic Monitoring (EM)

- Why EM?
- Existing data tools and shortcomings
- Electronic Monitoring
 - System Requirements
 - System Options
- EM Pilot Project



Why?

Electronic Monitoring

Purpose: Improve our ability to monitor fishing activity in real-time with robust and verifiable data.

Need: Tools to achieve precise, accurate, and timely accounting of effort including where, when, and amount.



Why?

Electronic Monitoring

EM is necessary to meet:

- ESA/MMPA obligations
 - Track co-occurrence of fishing gear and marine mammal activity
- Co-management responsibilities
 - Confirm catch area reporting for co-management
- Tri-State commitments

Co-management is unique to WA – EM may look different here than other coastal states

EM can also support improved:

- Biotoxin management and public safety concerns
 - Allow evisceration orders triggered by biotoxins
- Enforcement
 - Gear Tampering
 - Fair start provisions
 - Closed areas
- Human safety considerations
- Economic viability and sustainability of the fishery



Current Fishing Location Data

Paper logbooks

- Only 76% average compliance since 2011
- Large delay in receiving logbooks
- Takes many staff hours to organize, enter, and store
- Discrepancies between logbooks and fish tickets are found months later
- Multiple opportunities for errors to occur



Logbook Compliance

	# of Fish Tickets	# of logs Received	% of Fish Tickets with Corresponding Logbook
2009-10	4,897	187	3.8%
2010-11	5,375	3,934	73.2%
2011-12	4,693	3,163	67.4%
2012-13	4,921	3,623	73.6%
2013-14	4,315	3,374	78.2%
2014-15	3,831	3,133	81.8%
2015-16	4,051	3,316	81.9%
2016-17	4,596	3,767	82.0%
2017-18	4,220	3,403	80.6%
2018-19	4,363	3,410	78.2%
2019-20	4,081	2,911	71.3%
2020-21	3,781	2,459	65.0%
10-year average	4,285	3,256	76.0%



System Requirements

The EM system must meet minimum technical specifications to support improved fishery monitoring.

Fine-Scale Location Data

- Confirm catch area reporting
- Individual pot location
- Enforce evisceration orders and biotoxin closures

Cellular data uploads

- Too many vessels for staff to physically download data
- Needed for near real time data

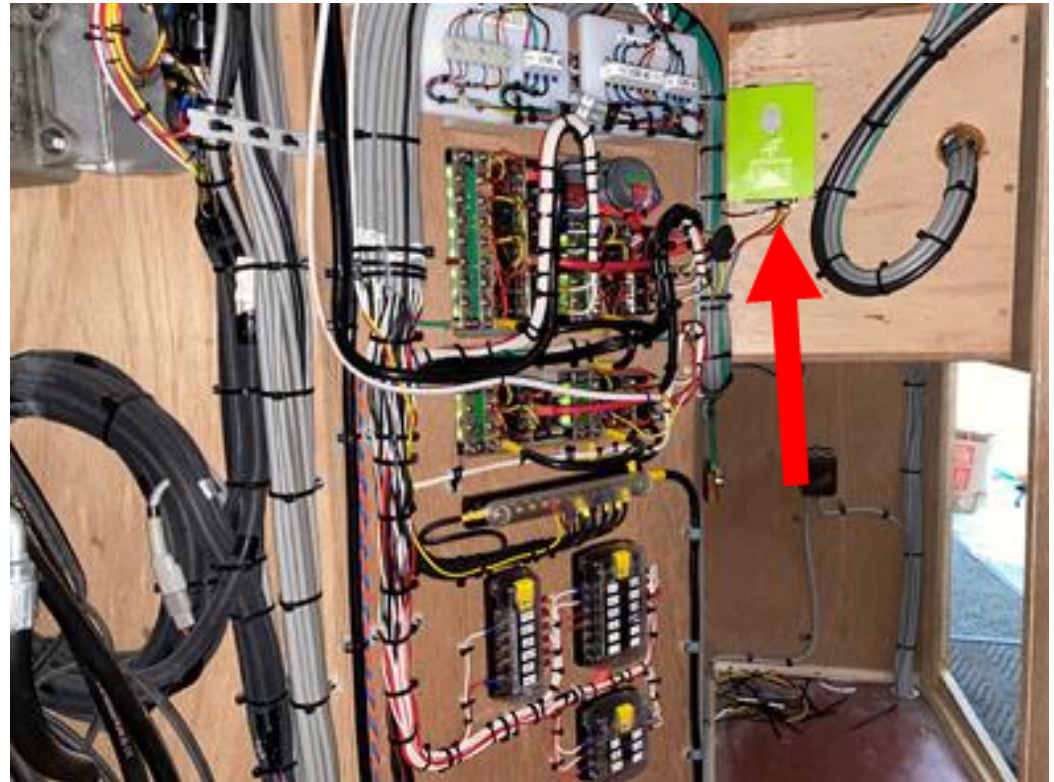


EM Pilot Project

WDFW has been testing Archipelago's Lite Integrated Monitoring Equipment (LIME) system

– Features

- Low cost
- Cellular data transfer
- Hydraulic sensor/RFID
- BRNKL security system
 - Battery/shore power monitoring
 - Bilge pump activity
 - Door sensors
 - Single take camera



EM Pilot Project: E-Logbook

WDFW is also testing an electronic logbook app by Archipelago

- Currently requires an Android tablet
- Mirrors our current paper logbook
- GPS locations auto-fill
- Reduces staff time entering logbook data

The screenshot shows the 'Trip' entry screen. At the top, there is a blue header with a back arrow, a crab icon, and the word 'Trip'. Below this, there are several input fields: 'Trip #' (4), 'Vessel' (Pacific Crab), 'Crab Licens...' (12345), and 'Federal #' (564 678). A 'Port' field contains 'Westport'. There are two 'Start Date' and 'Landing Date' fields, both marked as 'required' with a red 'X' icon. Below these are two 'Fish Ticket #' fields. A 'Comments' field is at the bottom. A blue bar with the word 'String' and a red '+' icon is visible. At the bottom, a red bar shows 'Set 1' and 'Mar.23 16:17' with a red edit icon.

The screenshot shows the 'String' entry screen. At the top, there is a blue header with a back arrow, a crab icon, and the word 'String'. Below this, there are several input fields: 'Date' (2022-03-23), 'String #' (1), 'Depth (fm)', 'Pots Fished', 'Pots Lost', and 'Soak Time (days)' (0.0). There are two 'Start Coordinates' and 'End Coordinates' fields, both marked as 'required' with a red 'X' icon and a red location pin icon. Below these are 'Number of Crab Retained' and 'Catch Area' (- Select -). At the bottom, a blue bar shows 'String 1' and navigation icons.



EM Pilot Project: RFID Tag Reader

Two vessels tested long-range RFID (Radio-frequency identification) tag readers

- Could eliminate gear tampering
- Easily enforce pot limits
- Potentially identify marine mammal entanglement locations
- Inconsistent pot reads
- Scanner and tag failure over time



EM Pilot Project: Crab Counter

One vessel tested a crab counter mounted to the crab chute

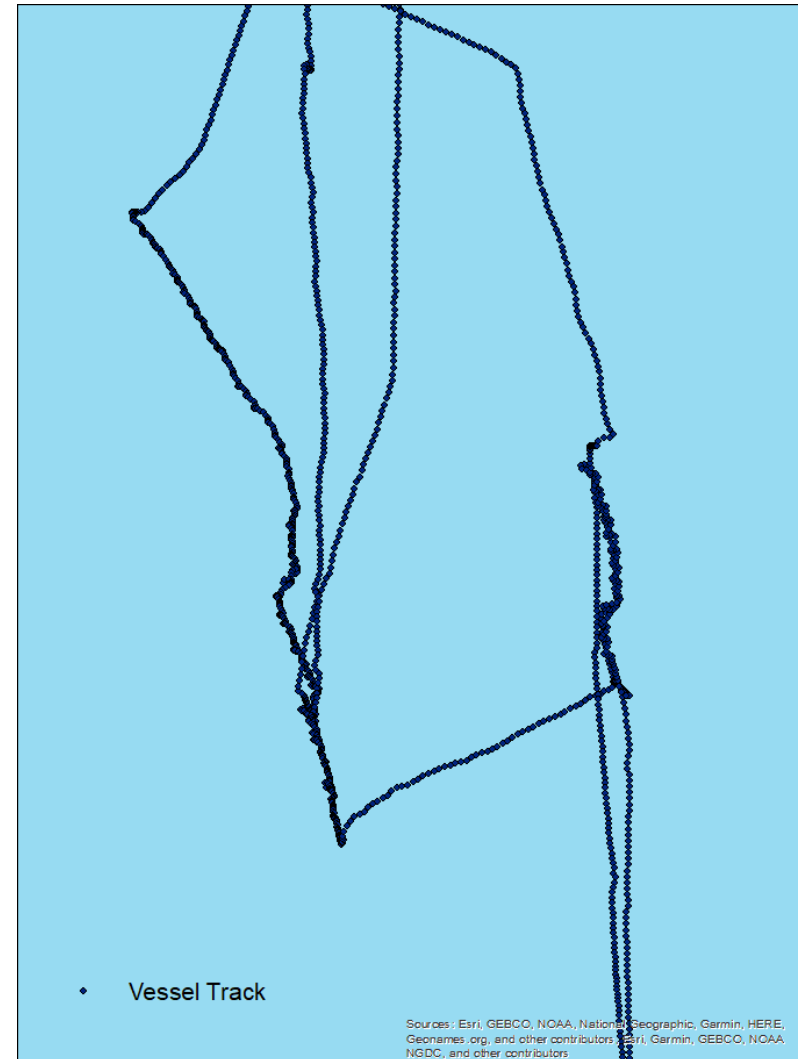
- Obtains crab counts per string/trip
- Adaptable to most vessel configurations
- Difficult to disconnect and reconnect during offloads
- Inconsistent crab counts when abundance is high



LIME Data Overview

Location Data

- 10 second ping rate
- Near real time
- Could estimate string locations using vessel speed
- Very few data gaps
 - Cell coverage better nearshore
 - Working with the provider to eliminate data gaps



LIME Data Overview

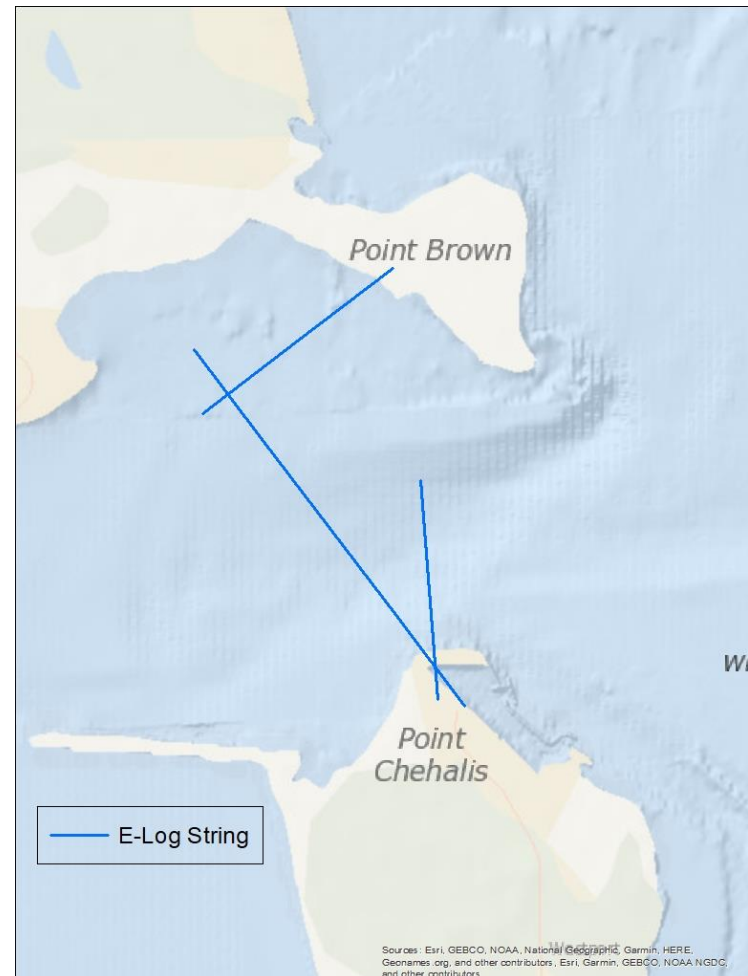
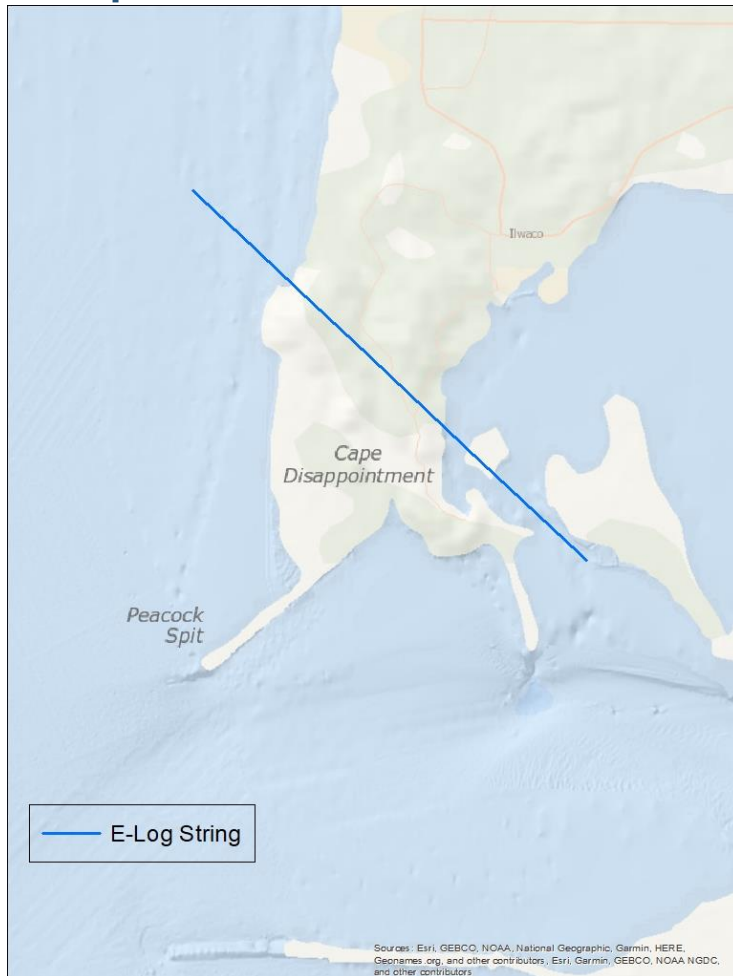
Electronic Logbook Data

- Accuracy varies between users
- Not received in near real time
- Submission compliance issues
- Most users claimed it was easier to use than paper logbooks
- Reduces WDFW staff workload
- Can add multiple data fields
 - Bycatch
 - Marine mammal sightings



E-logbook Data

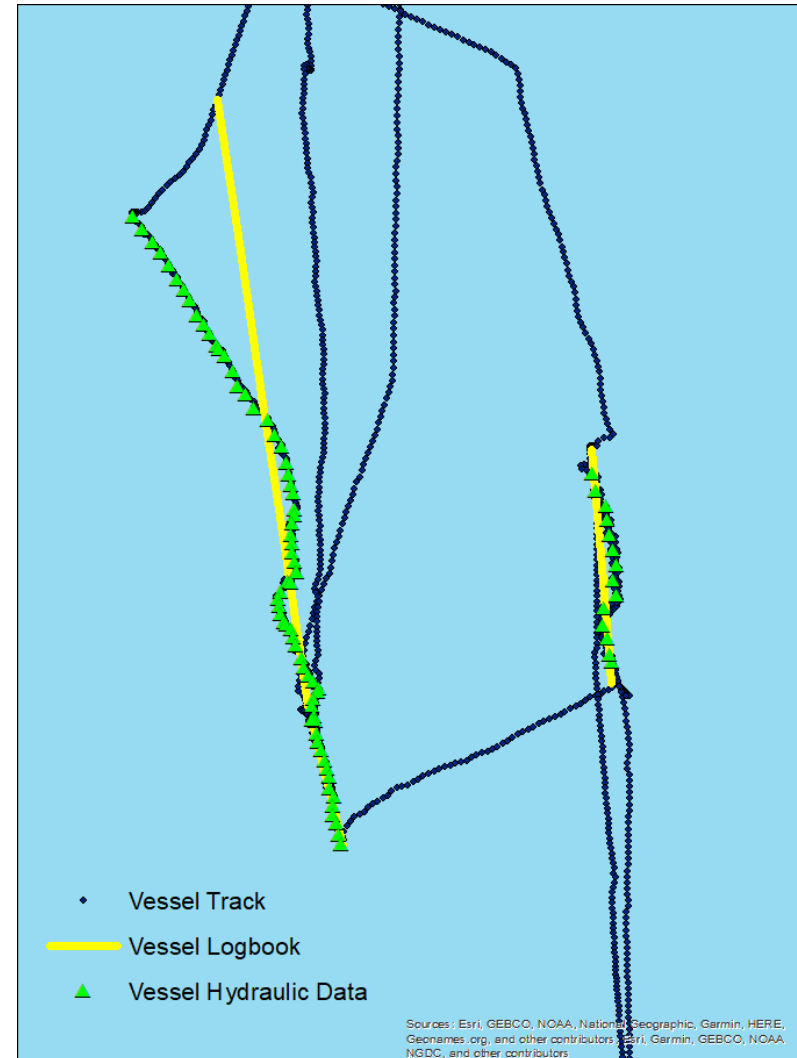
Examples of common errors



LIME Data Overview

Hydraulic Sensor Data

- Accurate active fishing locations
- Easily enumerate pots hauled
- More detail than E-log data
 - Eliminates user errors/non-compliance
- Easily confirm fish ticket catch areas



System Components

EM System with Hydraulic Sensor

- Cheaper
- Less equipment to install and maintain
- Can meet minimum EM needs

EM Video Enhanced System with Hydraulic Sensor included

- More expensive
- More equipment
- Video review – staff time
- Bycatch monitoring
- Provides ability to enforce gear tampering



Evaluating EM Systems

High

Medium

Low

Data Needs	Independent Monitoring					Self-Reporting		Both
	Solar Logger	EM System with Hydraulic Sensor	EM System with RFID Tags	Video-based EM System	At-sea Observer	Paper Logbook	Electronic Logbook	EM system with hydraulic sensor and agency app/condensed logbook
Accurate fishing location	High	High	High	High	High	Medium	Medium	High
Ability to confirm catch area reporting	High	High	High	High	High	Medium	Medium	High
Timely data transfer	High	High	High	High	Medium	Low	Low	High
Pot limit enforcement	Low	High	High	High	High	Low	Low	High
Enforcement of closed areas	Medium	High	High	High	High	Medium	Medium	High
Ability to quantify bycatch and marine mammal sightings	Low	Low	Low	Medium	High	Medium	Medium	High
Enforce gear tampering	Low	Medium	High	High	High	Low	Low	Medium
Estimate pots lost	Low	Medium	High	Medium	Medium	Medium	Medium	Medium
Cost	\$	\$\$	\$\$\$	\$\$\$	\$\$\$	N/A	\$	\$\$



EM Discussion

