



**NOAA
FISHERIES**

Pacific Islands Region, Pacific
Islands Regional Office
and Science Center

Regional EM experiences – Pacific Islands

National Electronic Monitoring
Workshop – West Coast
February 12-13, 2020



NOAA FISHERIES

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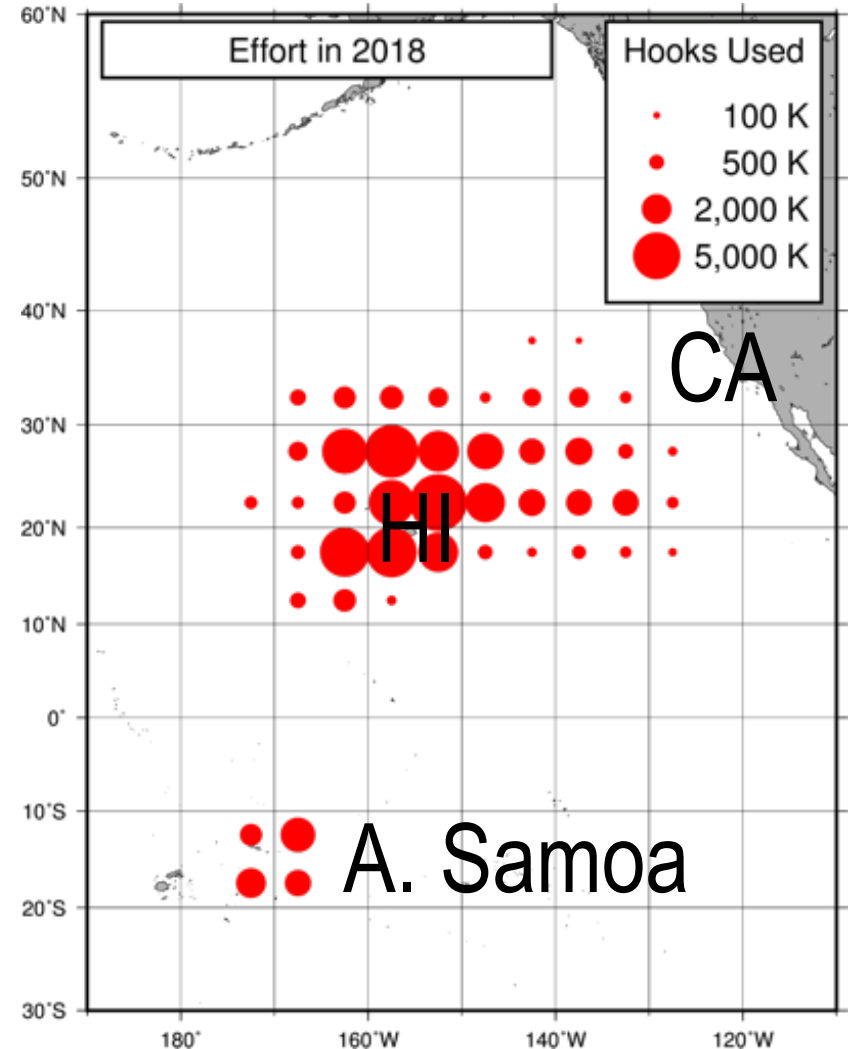


Eric Kingma, Hawaii Longline
Association,
Executive
Director



Agenda

- 1) Overview of longline fisheries under jurisdiction of the Western Pacific Fisheries Management Council
- 2) Established longline observer program since 1994
- 3) Results of two longline EM projects
- 4) Considerations of future EM cost structure in longline fisheries



Longline fishery (2018)	Vessels	Target species	Effort (million hooks)	Observer coverage (%)	Ex-vessel value (\$million)
Hawaii deep-set	143 →	Bigeye tuna	58.5 (*)	20	96
Hawaii shallow-set	11 ↓	Swordfish	0.5 (*)	100	4
A Samoa deep-set	13 ↓	South Pacific albacore	6.0	20	4

Fishery closures due to protected species interactions

* - spatial closures with interactions with false killer whales

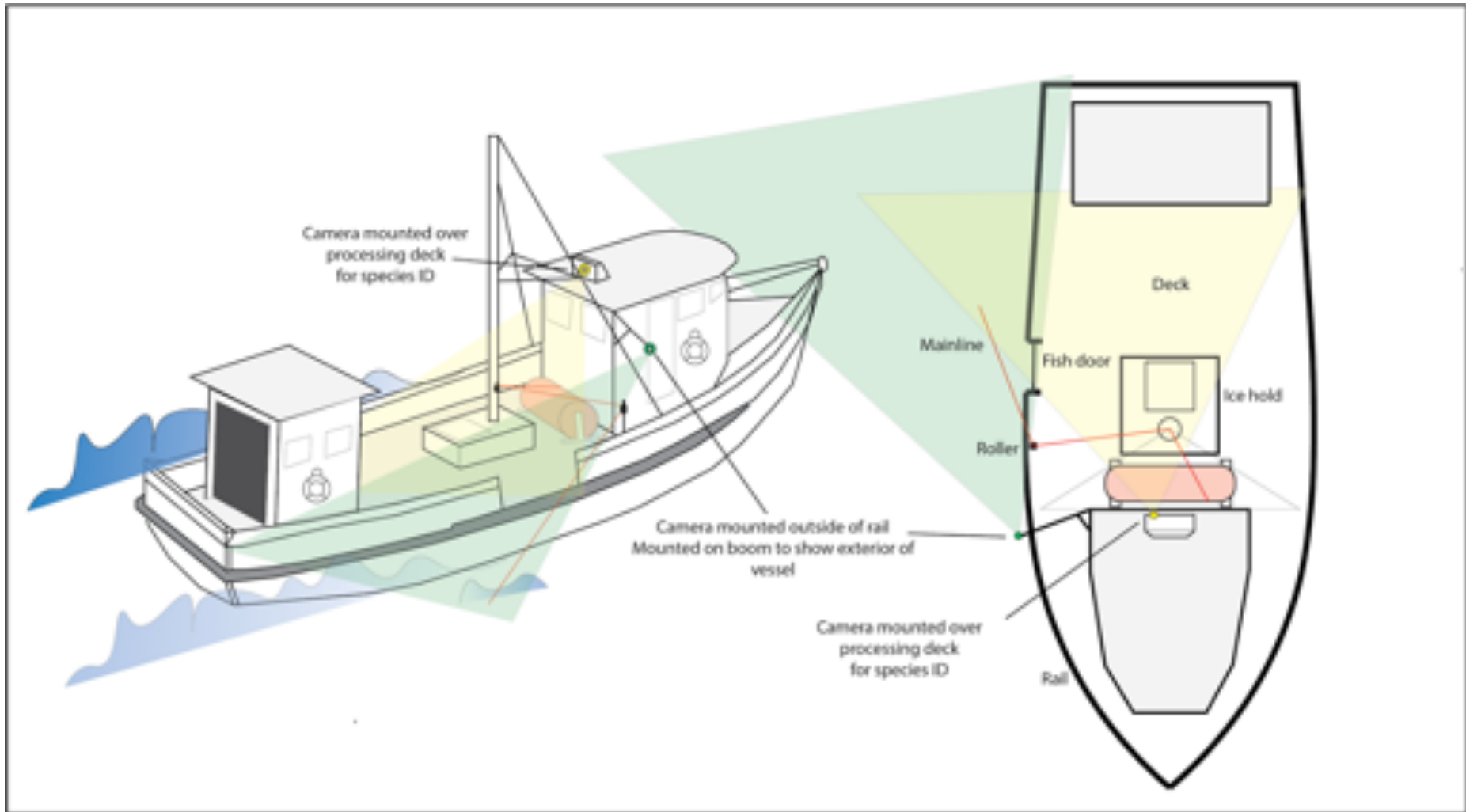
* - fishery closures with interactions with loggerhead and leatherback sea turtles



Objective - catch accountability with concurrent EM System and observers

- 18 volunteer vessels
- NMFS bought systems from SWI
- System performance –
 - In 2017, systems provided 7% coverage and fully functioned on 88% of trips
 - In 2018, systems provided 10% coverage and fully functioned on 95% of trips
- Video only on hauls
- 0.5 Terabytes per trip with two 3mp camera set-up
- 85% of observer fields collected

Recommended view



Evaluation of Electronic Monitoring Pre-implementation in the Hawai'i-based Longline Fisheries

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Results - deep-set longline trips with concurrent EM system and observer

Deep-set longline fishery (193 hauls)	Observer	EM	% difference
Kept (retained) catch	6,647	6,666	0.4
Bycatch (discarded) catch	8,464	6,735	-20.4
Sharks (discarded)	1,657	696	-50.8
Sea Turtles	2	2	0.0
Marine Mammals	1	1	0.0
Seabirds	11	10	-9.1

Results - total comparison of detection when sharks, lancetfish, snake mackerel, and anything unidentified are removed from comparison categories

Detection category	Observer	EM	% difference
Total detection	17,052	15,180	-11.0
No sharks, lancetfish, snake mackerel and unidentified catch included	9,400	9,089	-3.3

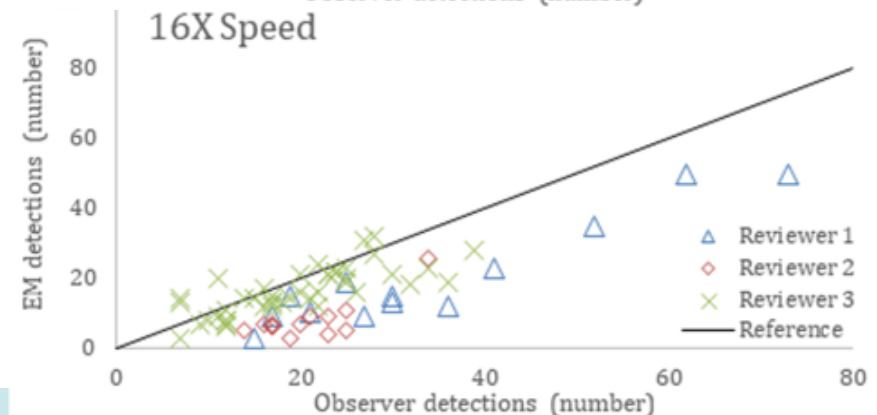
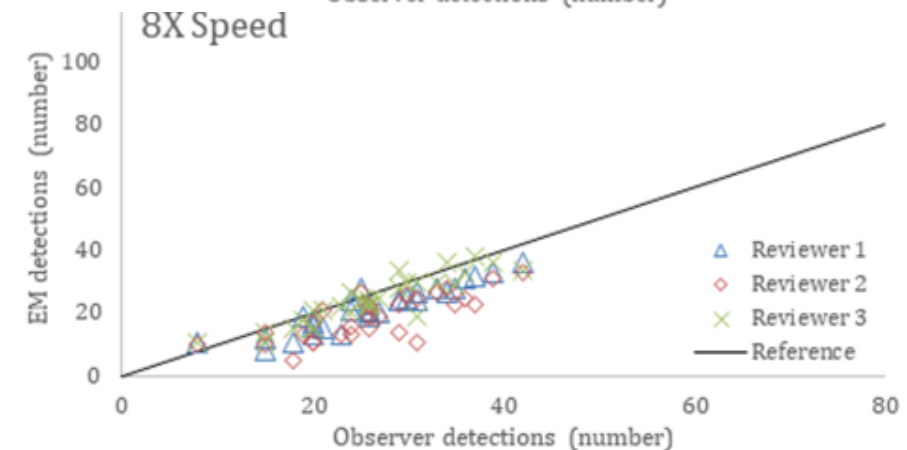
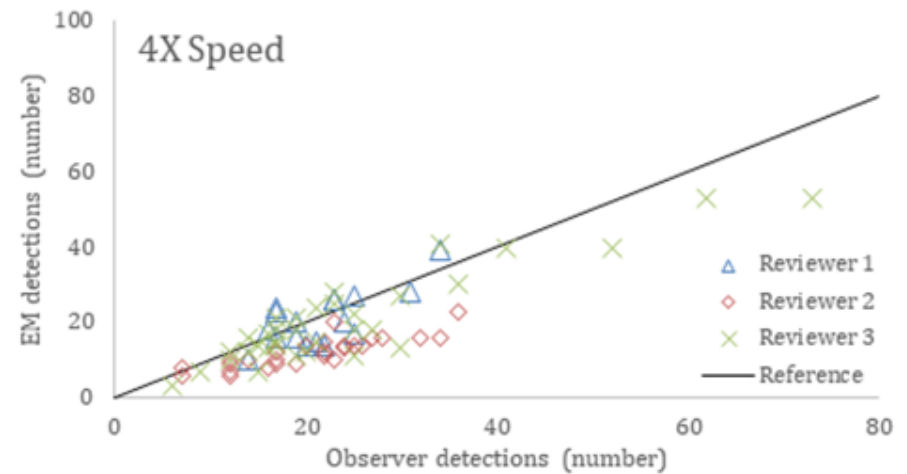
Future – 1) conduct catch handling study so bycatch is brought into the camera field of view and/or,
2) bycatch estimation for some species (above) is statistically based on observer data

Objective – comparison between three video speeds with emphasis on protected species detection

- 3 reviewers watch at 8x speed to assess variance (30 hauls)
- 3 reviewers watch a set at 4x - 4 hours per haul,
- 8x - 3 hours per haul, and
- 16x - 2 hours per haul
- Fishing trips selected *a priori*, those with known protected species interactions

Results – comparison between three video speeds

- 8x speed is optimal for retained, bycatch and protected species interactions



Results – protected species detection

Species/Groups	Observer	EM	Detection %
Sea turtles	32	31	96.9
Marine mammals	7	6	86.7
Seabirds	9	4	44.4

- Missed sea turtle and marine mammal were both on camera for over 1 minute each. Both were during a 4x review.
- Skipped due to reviewers skipping through the footage because 4x was “painfully slow”
- 16x missed seabirds
- 8x speed is fast enough to keep reviewer attention without reducing quality

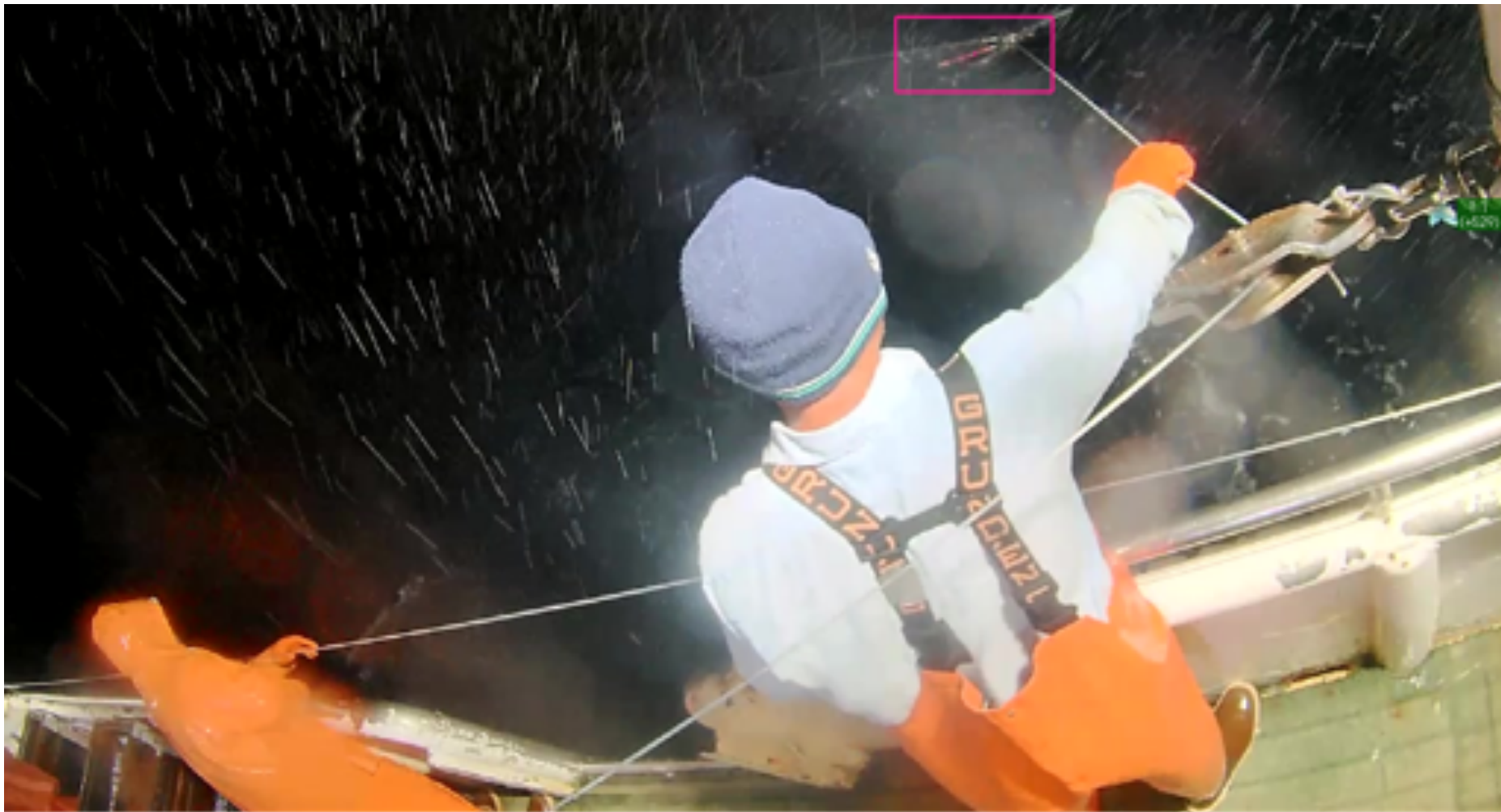
HiLLEM 2020 plans

- Catch handling study with bringing sharks closer to the fish door
- Seabird interactions have increased, working with the Council on a tori line (bird scaring device) study to learn how best to deploy tori lines
- Additional machine learning
- Collaboration with PIFSC/PIRO protected resources and industry to assess EM role –
 - 1) is the hook dislodged, how much trailing gear remains
 - 2) can a mortality and serious injury (MSI) determination be made

Annual costs for with a federal/3rd party model based on 25% of sets reviewed - \$2,830,518

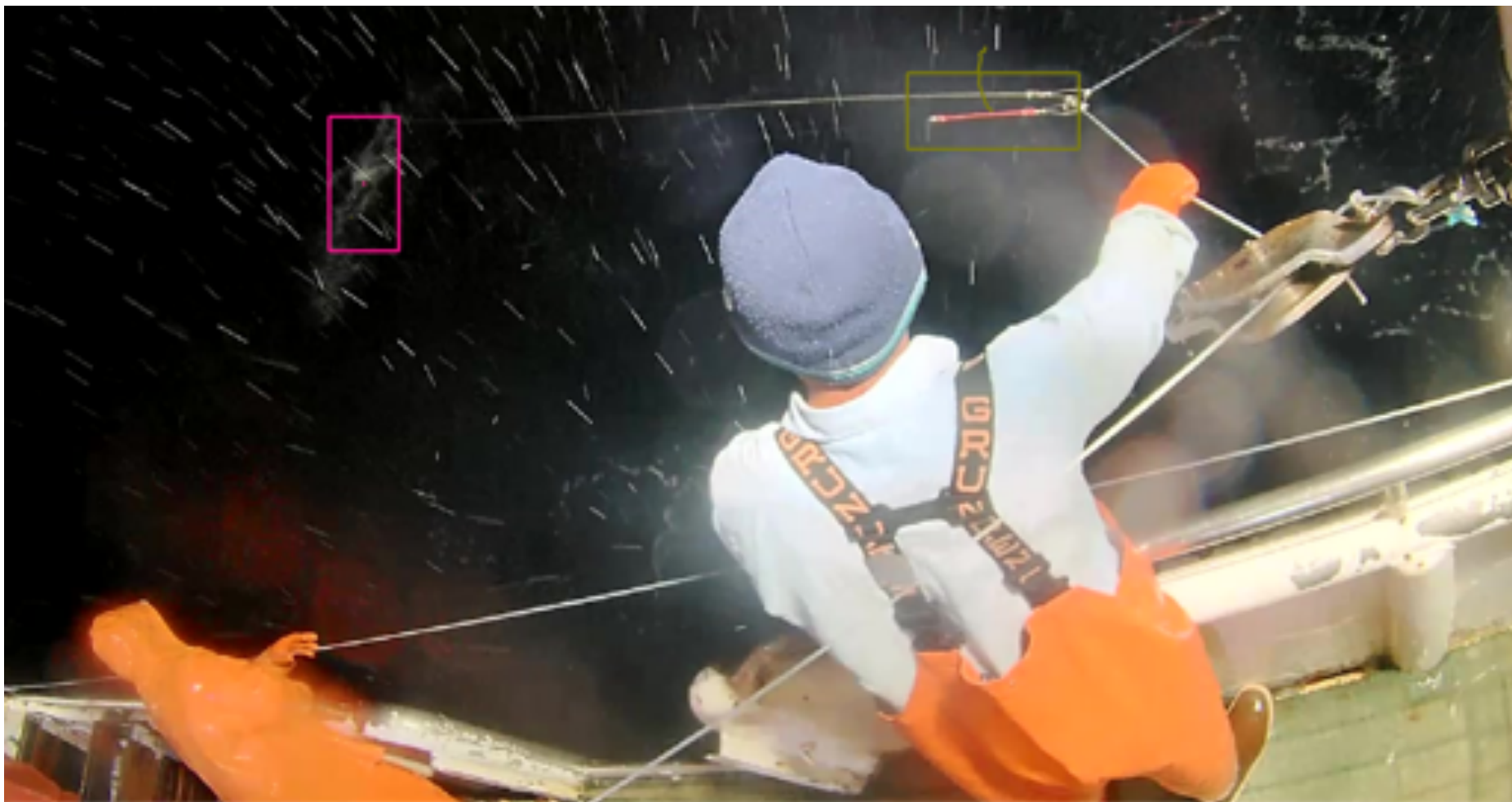
Sampling Cost \$2,351,183	Administrative Costs \$479,335
Equipment purchases, leases, and installation	Program administration support
Equipment maintenance and upkeep	Certification of EM service providers
Data transmission	EM program performance monitoring
Video processing and storage	Data analysis and storage of Federal records





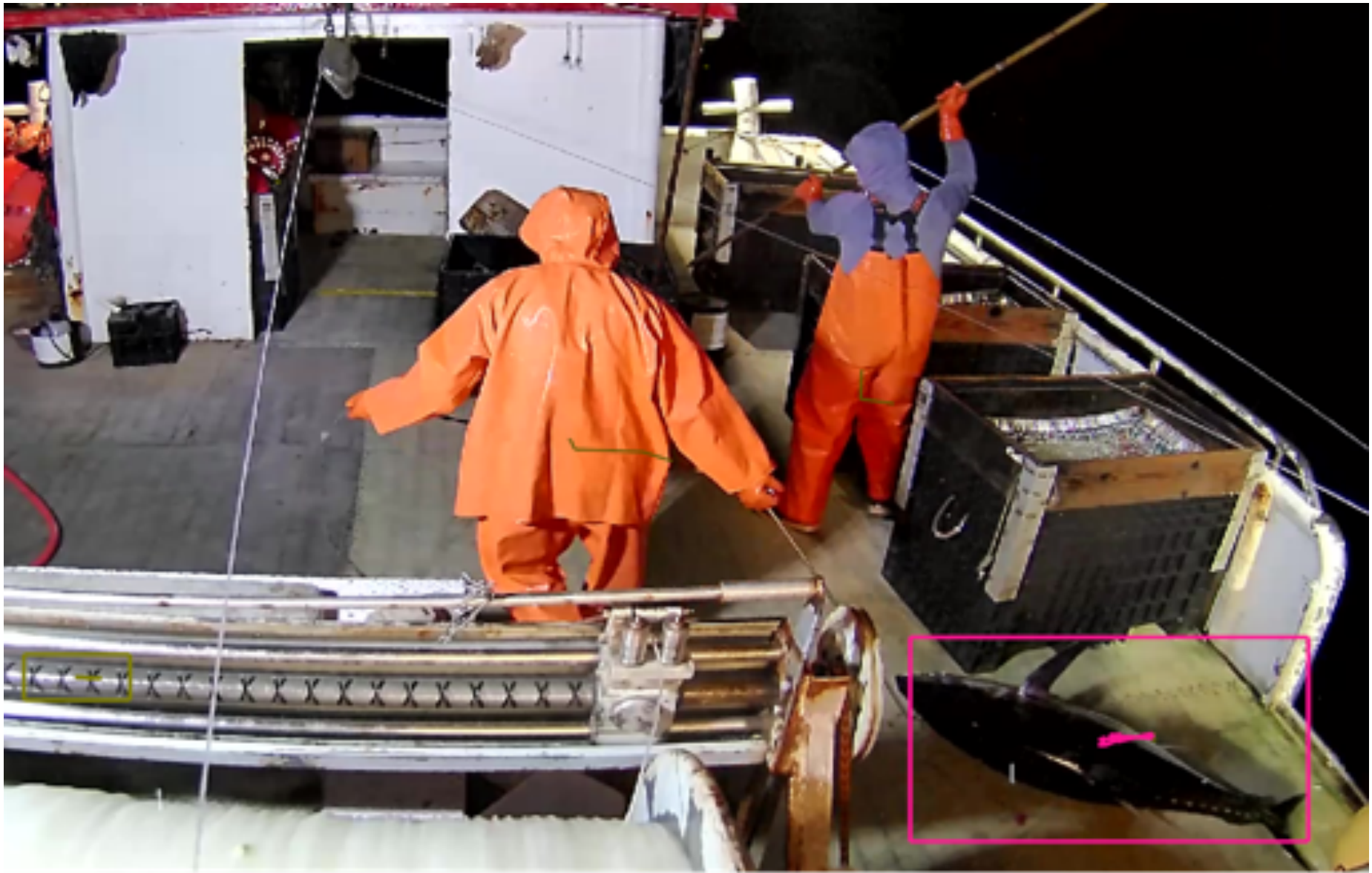
1.) The algorithm successfully identifies that there is a "heavy" branch line.



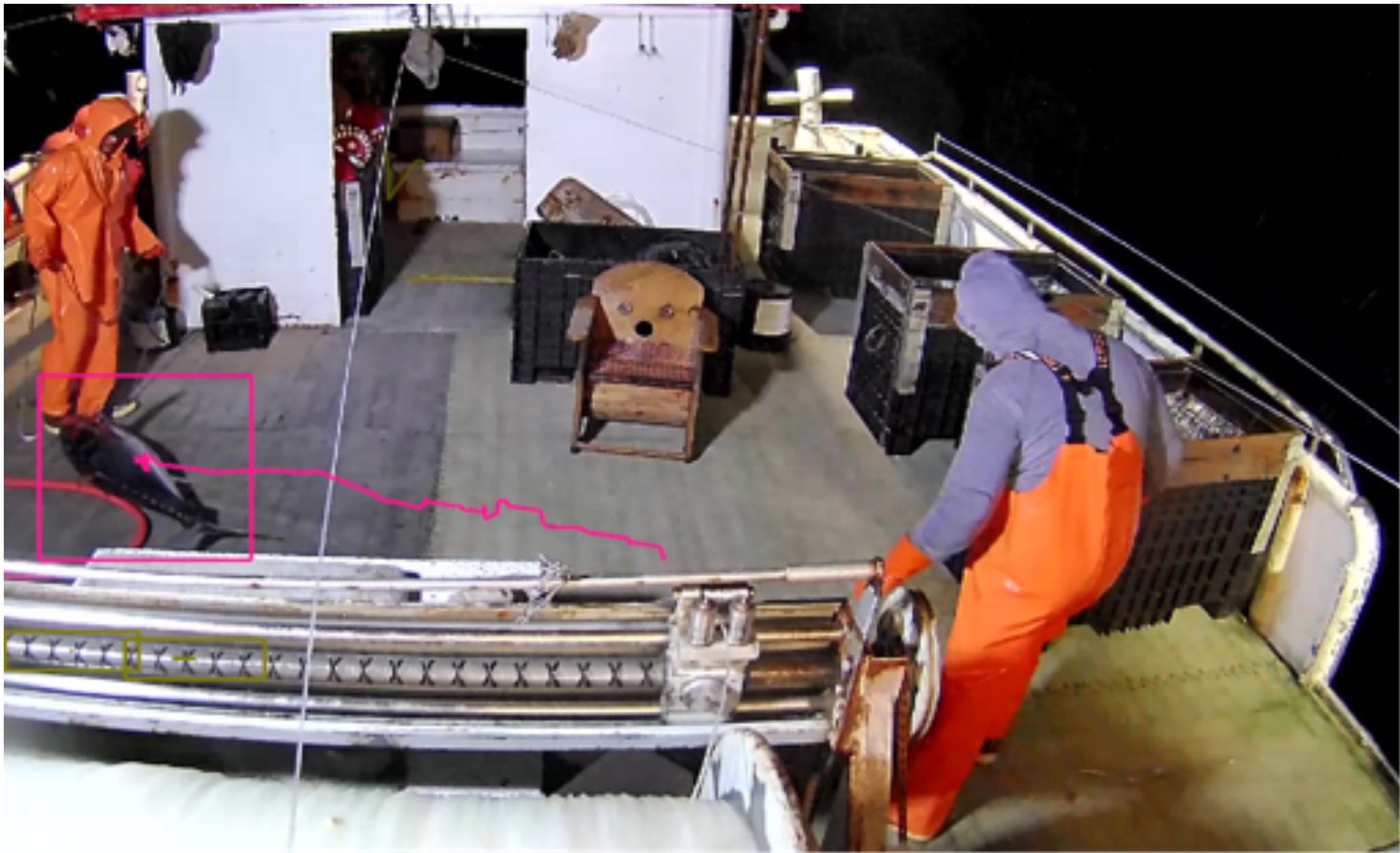


2.) A few frames later, the algorithm still has the "heavy" leader, and finds the fish that comes up to the surface, off the vessel, in bad weather, labeled as tuna





3.) The first time a human can identify the fish happens about ten seconds after the algorithm correctly identifies it. The same algorithm is run on the second camera and also detects the same catch correctly labeled



4.)VIAME enables tracking the path of where the fish went. This enables most kept/release determinations to be done without looking at the photo: