

Final Report Alaska Track 1: Review of the 2015 Season

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Overview

Pacific States Marine Fisheries Commission (PSMFC) launched the Electronic Monitoring (EM) program in 2012 in anticipation of the Pacific Fishery Management Council (PFMC) considering EM as a compliance monitoring tool in the newly implemented Pacific Trawl Rationalization Program. In 2014, PSMFC expanded its EM program into Alaska to work with the National Marine Fisheries Service - Electronic Monitoring Cooperative Research and Implementation Program which “has been developed to be responsive both to the implementation of the North Pacific Fishery Management Council (NPFMC) EM Strategic Plan, and to Senate language included in the 2014 NMFS appropriations bill, which directed NMFS to work with the small boat fixed gear fleet to implement a program designed to test the functionality of available electronic monitoring systems.” (NMFS 2014) Multiple research tracks are being undertaken as part of this cooperative research.

At the February 2014 EM workshop in Juneau, a draft EM monitoring approach (Track 1) for deploying standard EM cameras was presented by industry members based on information needs outlined in a NOAA memo delivered to the EM workgroup. Track 1 identified fishery specific data elements, priority species, operator responsibilities and other operational factors to be tested in order to identify and inform decision points for NPFMC consideration.

The field work for Track 1 had two initial objectives. The first was to collect field data to define, evaluate and verify assumptions associated with technology-based monitoring of Alaskan fixed gear fleets. Tasks under this objective included: evaluate the ability of EM reviewers to identify groups of species (specific groupings per NMFS 2014), determine halibut release methods and injury codes from video, and assess logbook effort data needed to support an EM program. The second objective was to test operational components of an EM program in order to identify field service needs and develop local support capacity. Tasks under this objective included: evaluate camera configurations, test handling procedures such as full retention of rockfish to aid in the identification of cryptic species, identify field support services needed to ensure data quality, and evaluate the role of dockside monitoring in validating handling procedures and/or improving data quality. Also included in this objective was collecting cost data and identifying decision points related to cost factors.

Track 1 began in spring 2014 with deployment of EM systems on nine vessels in two home ports. The results of the 2014 season were reported in April of 2015 (PSMFC 2015). In 2015, the field work continued, with the deployment of EM systems on 12 volunteer vessels. The vessels were all longline vessels targeting sablefish (*Anoplopoma fimbria*), Pacific cod (*Gadus macrocephalus*) and/or Pacific halibut (*Hippoglossus stenolepis*). Sixty-eight trips were monitored using systems from Archipelago Marine Research Ltd (AMR).

PSMFC reviewed video from trips where:

- a. the EM data are complete,
- b. the skipper reported no rockfish discards, and
- c. dockside monitoring information could be used to assess rockfish species identification.

For those trips where these three criteria were not met, only meta-data about the trip and hauls were captured. The information presented in this document pertains to the work completed in 2015 on Track 1 - Operationalizing Deployment of EM Systems.

Definition of Catch

For the purposes of EM review, catch is defined as anything seen by an EM reviewer, excluding sea birds and marine mammals that are swimming freely alongside the vessel. If catch is kept on the vessel (excluding use as bait or food), it is recorded as retained, if not, it is recorded as discard. Discards includes marine organisms that wash out of the net, fall off or out of fishing gear before it comes onboard the vessel, or are free floating on the surface.

If camera views were not sufficient to see the whole deck, fish were recorded as retained or discarded based on whether they were retained or discarded at the rail. It is possible that some fish were brought onboard and later discarded out of view of the rail cameras; these fish would be recorded as retained in the EM data since the discard was not visible to the EM reviewer. In instances where fish were initially retained and later discarded in view of the rail cameras, the fish were recorded as discarded.

Providers

PSMFC contracted with Archipelago Marine Research (AMR) to install EM systems on 12 volunteer fishing vessels, collect data drives from the vessels, collect dockside monitoring data, collect logbooks, and provide logistical support. The vessels made landings in several ports including Homer, Kodiak, Seward, and Sitka.

The on-board AMR EM Observe system included a sensor to capture hydraulic pressure activity, a GPS to capture locations from which the speed of the vessel was calculated, and 2-4 cameras. Additionally, an engine oil pressure sensor triggered the system to power down to sleep mode during periods of inactivity (e.g., at night or in port) in order to reduce power drain.

Sensor data (GPS and hydraulics) were collected at 10-second intervals when the EM system was fully powered on. Video began recording when the hydraulic pressure exceeded a trigger threshold set by the EM technician and specific to each vessel. In order to capture all catch handling, video recording continued for 2 hours past the last point when pressure was above the trigger threshold.

Video feed and system information were displayed on the user interface (typically installed in the wheelhouse) providing vessel operators with a live update of system performance, and continuous video feeds (even when not recording).

PSMFC employees reviewed the raw video and sensor data using EM Interpret™ Pro (EMI) software from AMR. The software integrates the hydraulic sensor and GPS data with the synced video output in order to facilitate identification and recording of trip and haul information (such as start and end times). The software also allows the reviewers to record catch information. Metadata such as GPS location data, dates and times are automatically recorded along with the haul and catch annotations from the reviewers.

AMR support staff stationed in the ports reviewed video clips from each vessel after the data retrieval to assess the video quality, camera placement, and system function. These data were then used to make adjustments to the installation as necessary.

Dockside Monitoring

Dockside monitors were deployed in multiple ports to collect landed catch data from fishing vessels. All vessels were instructed to keep all of their rockfish or report any discarded rockfish to the dockside monitor. The dockside monitor instructions are provided in Appendix 1. Dockside monitor datasheets were transmitted to PSMFC.

Effort Logs

Effort logs developed by AMR were distributed to all of the participating vessels. Images of effort logs were transmitted to PSMFC. The effort log is provided in Appendix 2.

Review Rules

Based on results from the 2014 field work, a subgroup of the EM work group assessed the possible data that could be valuable to capture from the vessels in Track 1. The group developed new rules for which types of data should be captured from each trip depending on how a trip's on-board system performed, whether rockfish discarding occurred and whether or not dockside monitoring was successfully completed.

Metadata, trip, and haul level data were collected for all monitored trips (described in bullets 1-3; hereafter, review level 1-3). For trips with complete sensor data, complete video, full rockfish retention, and dockside monitoring, video was reviewed to collect catch data (bullets 1-4; hereafter review level 1-4).

1. Metadata
 - a. ADFG permit #
 - b. Date drive retrieved
 - c. Field assessment notes (Archipelago notes when drive was picked up)
 - d. Logbook: Y/N
 - e. Vessel Attributes: vessel configuration; fishing gear; deck gear; camera location; EM configuration; and fishing characteristics – **Howard will help categorize each vessel into the appropriate attribute strata**
2. Initial review to answer the following:
 - a. Is sensor data complete? Y/N
 - b. Is imagery/video complete? Y/N
 - c. Was there dockside monitoring? Y/N
3. Trip and Haul data
 - a. Trip
 - i. Start and end date, time and locations
 - ii. Start and end ports
 - iii. Time gaps – characterize type of time gap
 - iv. Target fishery
 - v. Streamer line used (Y/N)
 - b. Haul
 - i. Start and end date, time and locations
 - ii. Gear type
 - iii. Time gaps, GPS gaps, sensor gaps, video gaps (Y/N)
 - iv. No video (Y/N) and why if No
4. Video Review
 - a. Paper/dockside data (effort logs, IPHC logs and dockside monitor data)
 - i. Key punch all data and maintain data tables
 - b. Video data
 - i. Catch (including inverts, birds, and mammals)
 1. species IDs to lowest level
 2. counts

3. disposition: Retained – General, Retained – Damaged, Discarded – General, Discarded – Damaged, Drop off below water, Drop off above water, Utilized onboard
- ii. For discarded Halibut Catch
 1. Injury key/Release condition
 2. Release method
- iii. Time to review
- iv. Confidence in species ID. EM reviewers will provide a data confidence rating (high, medium, and low)
- v. Image quality: EM reviewers will provide an image quality assessment (high, medium, low) – this is new for 2015
 1. For low image quality, they will assign a reason for the low image quality. Note that AMR will provide field assessment notes that might provide more information about why there was low quality.
- vi. Fill out vessels score card – NOTE: No scorecard was used in 2015
 1. Compliance with extended presentation of seabirds

Video Review

Video reviewers at PSMFC determined the dates and times of trips and hauls, along with location information based on the video and sensor data. Reviewers also assessed the completeness of the sensor and video data during each trip, and noted their confidence for hauls that required full catch-review. The quantitative data from the sensor readings and locations helped validate whether the video was complete.

Video for a trip was deemed incomplete if: the system was not powered for the beginning or end of the trip, the video turned on after the start or before the end of the catch hauling, or there was an unexplained video gap that was long enough to miss a haul or part of the catch. If video from a trip was incomplete, the duration of the video failure was noted along with the reason for the gap.

Video reviewers were trained by a PSMFC staffer working with the North Pacific Groundfish Observer Program (NPGOP) on Alaska species reporting conventions. The reviewers were instructed to record species to the lowest identifiable taxonomic level regardless of the groupings requested by the EM working group.

For catch data, video reviewers recorded species, count, damage to fish, disposition (retained or discarded), whether the discard was intentional or a drop-off from the line. If the fish was a discarded halibut, reviewers assessed the release method and condition for each fish. Reviewers did not estimate weight of catch.

For cases where the video stopped recording before catch handling was completed, fish that were onboard at the time of the video ending were reported as retained.

Discards were categorized as intentional or unintentional depending on the method of discard. Any fish that dropped off of the gear (i.e., without visible shaking or other interaction by a crew member, or without hitting the roller) was defined as unintentional. All other discards were categorized as intentional.

Video reviewers recorded the number of minutes it took to review each haul. On-deck sort time was calculated from the start and end times of catch handling in the video. Review rate was calculated as review minutes divided by sort minutes.

Results

PSMFC processed EM data for 24 halibut trips, 16 Pacific cod trips, and 27 sablefish trips containing 156, 190 and 177 hauls respectively from 12 fishing vessels (Table 1). The data spanned 98 longline halibut sea days, 57 longline Pacific cod sea days, and 122 longline sablefish sea days with trips averaging 4.08, 3.56 and 4.52 days respectively. Of the total 67 trips, 20 were prescribed review through level 4. There were only two vessels reviewed through level 4 in the Pacific Cod Fishery; for confidentiality reasons, data from these trips is withheld. In addition, data was collected on one trip not included in this report. In that case, a camera was intentionally turned off because a crew member was uncomfortable with the video.

Table 1. Summary of data including: number of vessels, number of trips, number of hauls, sea days, and trip length. One trip was excluded; see details in text.

Data Summary		Longline Halibut	Longline Pacific Cod	Longline Sablefish	All Fisheries
Vessels	<i>Review 1-3</i>	8	3	6	11
	<i>Review 1-4</i>	4	2	4	7
	Total	10	3	6	12
Trips	<i>Review 1-3</i>	19	*	15	34
	<i>Review 1-4</i>	5	*	12	17
	Total	24	16	27	67
Hauls	<i>Review 1-3</i>	132	*	114	246
	<i>Review 1-4</i>	24	*	63	87
	Total	156	190	177	523
Sea Days	<i>Review 1-3</i>	78	*	75	153
	<i>Review 1-4</i>	20	*	47	67
	Total	98	57	122	277
Average Trip Length (Days)	<i>Review 1-3</i>	4.11	*	5	4.23
	<i>Review 1-4</i>	4	*	3.92	3.9
	Total	4.08	3.56	4.52	4.18

* Data withheld for confidentiality

Effort Log, Dockside Monitoring and Rockfish Retention

Forty-five of the 67 trips (67%) had a complete logbook submitted with the video data (Table 2). Sixteen (24%) had no logbook submitted. Seven of the halibut trips (29%), 4 of the Pacific cod trips (25%), and 18 of the sablefish trips (67%) had the landing monitored by a dockside monitor. Nineteen of the halibut trips (79%), six of the Pacific cod trips (38%), and 17 of the sablefish trips (63%) reported complete rockfish retention.

Table 2. Logbook submissions, dockside monitoring, and rockfish retention.

Effort Log Completeness of All Trips	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total	Percent Total
Complete	18	9	18	45	67%
Incomplete	2	4		6	9%
No Logbook	4	3	9	16	24%

Number of Trips with Dockside Monitoring

Total	7	4	18	29	43%
Percent of total trips	29%	25%	67%	43%	

Number of Trips with Full Rockfish Retention

Total	19	6	17	42	63%
Percent of total trips	79%	38%	63%	63%	

Data quality

Data confidence was rated as high or medium for all but one of the reviewed hauls. The longline sablefish fishery had a slightly higher proportion of reviewed hauls with medium or low confidence level (Table 3). All of the hauls with medium and low confidence were due to image quality.

Catch handling was not always completed before the video ended automatically (2 hours after the end of the haul based on the hydraulic sensor dropping below the trigger threshold). The video ended before processing was complete for 7 of the total 125 reviewed hauls (Table 3). The target species tended to be the species on deck at the time the video ended.

For trips where video was assessed as incomplete, no pattern emerged for the reason of video failure. Reasons included power loss, power button pressed, a system reboot, or an unexplainable gap. Video was most likely to be incomplete on a vessel's first or second trip (Figure 1). Of the vessels that had complete video on their first trip in 2015, several had AMR systems onboard in 2014. Gaps in video after the third trip tended to be short gaps related to a system error.

Table 3. Data quality including video and sensor completeness, data confidence, and image quality.

Trip Level Data Quality (all review levels)

Complete Video Data (Number of Trips)	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total
Total	20	11	24	55
Percent of trips	83%	69%	89%	82%
Complete Sensor Data (Number of Trips)				
Total	17	9	25	51
Percent of total trips	71%	56%	93%	76%

Table 3, cont. Data quality.

Haul Level Data Quality (review level 1-4 only)

Video Completeness (Number of Hauls)	Longline Halibut	Longline Pacific Cod*	Longline Sablefish	Total
Video complete	22		63	85
Intermittent gaps in video coverage				0
Video ends before catch handling ends	2		0	2
Video starts after haul start				5
No video				0
Total	24		63	92
Catch Completeness (Number of Hauls)				
Complete - All catch brought onboard was recorded	24		63	87
Incomplete - Part of catch not recorded				0
Data Confidence from Video (Number of Hauls)				
High	23		57	80
Medium	1		5	6
Low			1	1
Unusable				
No Video				0
Image Quality (Number of Hauls)				
High	22		50	72
Medium	2		12	14
Low			1	1
Unusable				
No Video				0
Primary Reason for Medium Image Quality (Number of Hauls)				
Condensation			2	2
Glare			1	
Night Lighting	2		1	3
Poor Camera Angles			4	4
Water Spots			4	4
Primary Reason for Low Image Quality (Number of Hauls)				
Condensation				
Glare				
Night Lighting				
Poor Camera Angles			1	1
Water Spots				
No data from one or more cameras				

* Data withheld for confidentiality

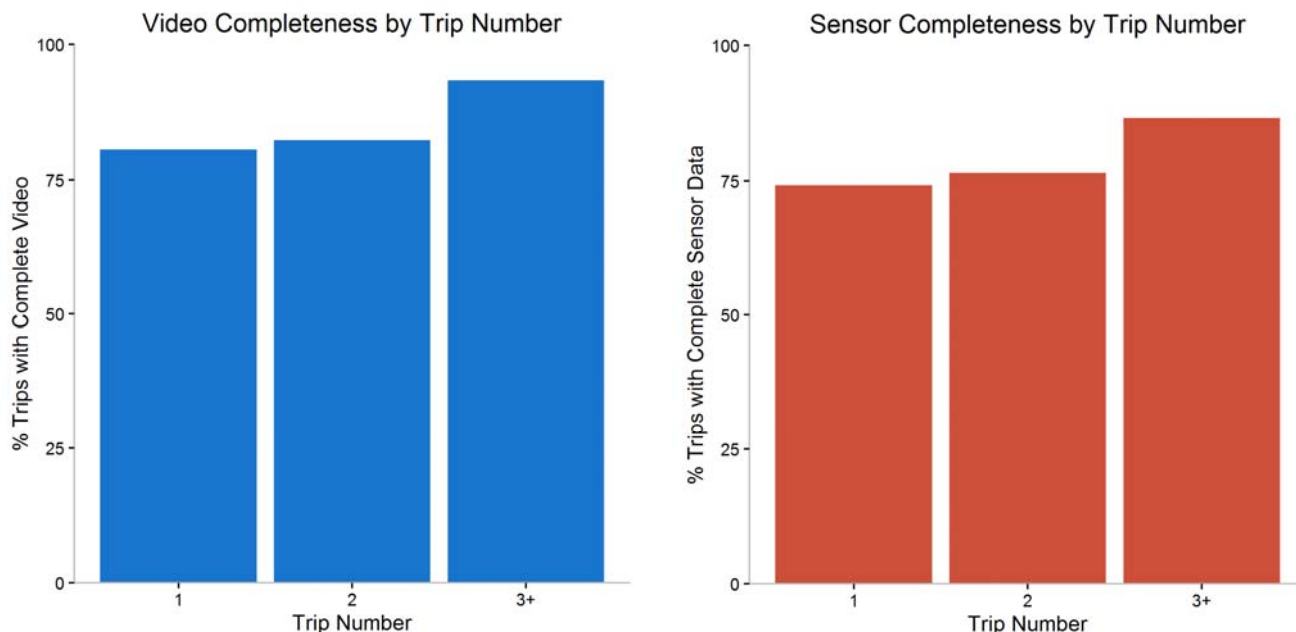


Figure 1. Video and sensor completeness in relation to the number of trips the electronic monitoring system had been on a specific vessel. As a vessel made more trips, the likelihood of video and sensor data being complete was higher.

Review Rate

Review rate was similar in the halibut and sablefish target fisheries: approximately half of real time (Table 4; e.g. one hour of catch handling time could be reviewed in 30 minutes). The review rate in the Pacific cod fishery was slower at three-quarters of real time (e.g., one hour of catch handling could be reviewed in 45 minutes).

Pacific cod hauls tended to have a larger variety of species caught, as well as being the only fishery where stern hauling was conducted. Stern haulers were more difficult to review due to a side view of the line (as opposed to a top down view), as well as poor lighting on the line at night.

Table 4. Review rate by target fishery. Review of both retained and discarded catch included.

	Longline Halibut	Longline Pacific Cod	Longline Sablefish
Haul Count	24	*	63
Average Sort Min/Haul	147	*	190
Average Review Min/Haul	76	*	89
Average Review Min/Sort Min	0.54	0.79	0.46

* Data withheld for confidentiality

Catch summary

Since total catch accounting is the goal for EM in the SE AK longline sector, all species of retained or discarded marine organisms were reported and summarized to the target fishery level (Table 5). Video reviewers identified a high proportion of retained and discarded catch to species level. Exceptions were generally species groups that are known to be problematic, such as short and longspine thornyheads, shortraker and rougheye rockfishes and arrowtooth and Kamchatka flounders. There were also 7 rockfish that were recorded as “Rockfish – unidentified”, 4 that were recorded as “Rockfish, Dark unidentified” and 15 that were recorded as “Rockfish – Small Red unidentified” out of the total 1275 rockfish that were recorded.

Dockside monitors recorded only landed rockfish bycatch, so comparisons of EM data and dockside monitoring were generated for retained rockfish at the trip level. The dockside monitor shortraker and rougheye rockfish counts were aggregated for comparison with the shortraker/rougheye rockfish recorded by the video reviewer. The dockside monitor shortspine and longspine thornyhead counts were treated similarly; they were aggregated and compared to the thornyheads recorded by the video reviewer. The counts of landed rockfish bycatch were generally similar between video reviewers and dockside monitors (Figure 2; Table 5).

For most discarded species, the majority of discards were discarded after interaction with the vessel or a crew member (Table 6). Interaction may include the crew member throwing the fish overboard after the fish comes onboard, a crew member shaking the line or manipulating the hook to release the fish before the fish comes onboard, or the fish hits the vessel and falls back into the water while no crew is attending the line. Sixteen percent of the sablefish discards in the sablefish fishery occurred with no interaction with the vessel or crew (dropped off of the line).

One of the criteria for a trip to be selected for review was that a skipper self-reported that all rockfish were retained and landed. Despite this, in a number of cases the EM reviewer saw rockfish discarding in the video. Although self-reporting was not always accurate, the majority of discarded rockfish were identified to species. Furthermore, the reviewers could almost always tell if a fish was discarded or retained because the majority of these discards occurred after interaction with the vessel or crew (Table 6). These observations suggest that EM may be an accurate method of monitoring even without full rockfish retention.

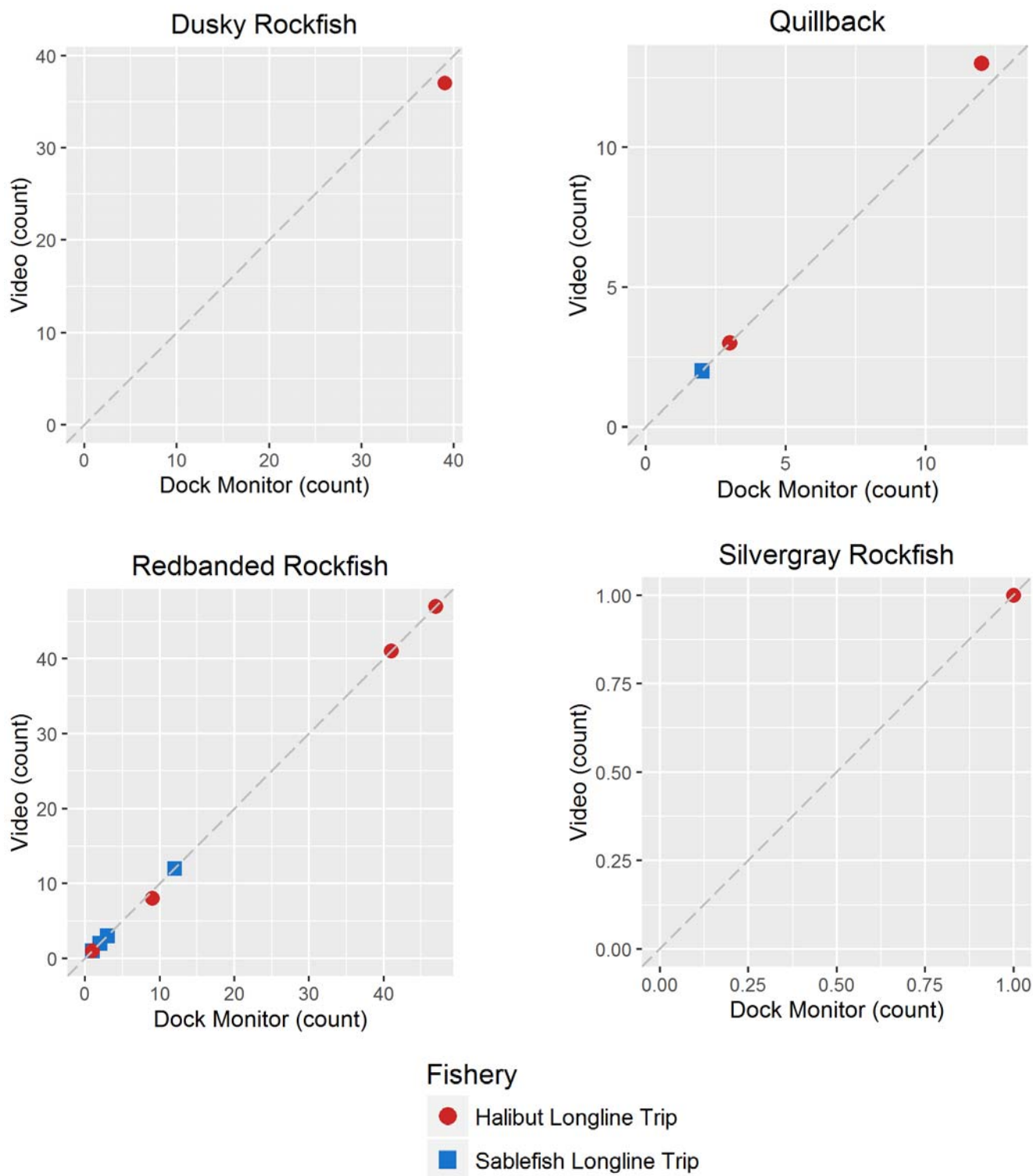


Figure 2. Comparison of dockside monitor and video retained rockfish counts aggregated to the trip level. The dashed grey line is the video = dockside monitor line. If video and dockside monitor counts agreed, the point would fall on the dashed line. Pacific Cod Longline Data is withheld for confidentiality.

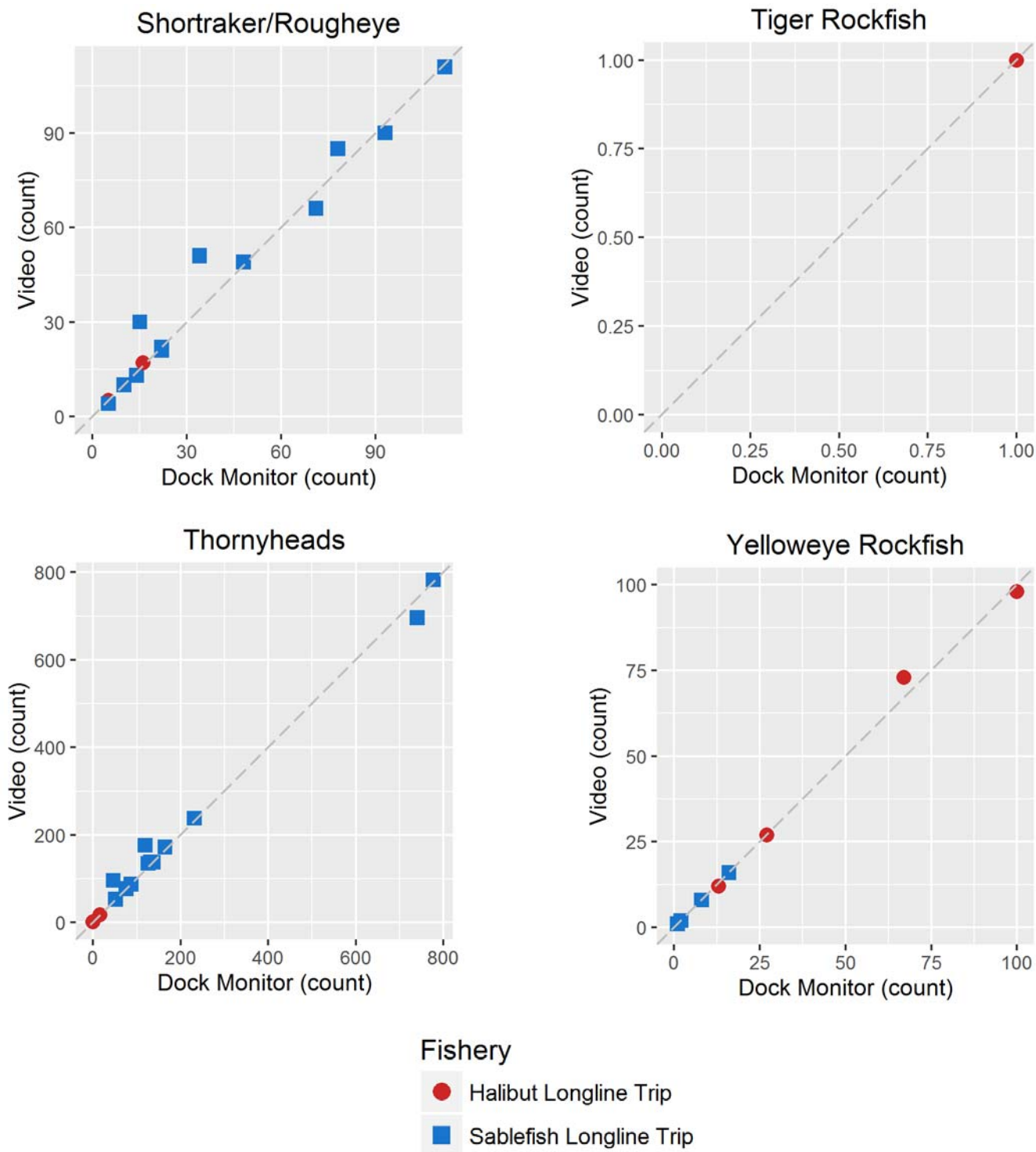


Figure 2, cont. Comparison of dockside monitor and video retained rockfish counts aggregated to the trip level. The dashed grey line is the video = dockside monitor line. If video and dockside monitor counts agreed, the point would fall on the dashed line. Pacific Cod Longline Data is withheld for confidentiality.

Table 5. Counts of landed (dockside monitor), and video recorded retained and discarded catch. The dockside monitor was tasked with recording rockfish bycatch only. Non-rockfish species information is included for completeness.

Species	Longline Halibut				Longline Pacific Cod*				Longline Sablefish			
	<u>Dockside</u> <u>Monitor</u>	<u>Video</u>		<u>Unknown</u>	<u>Dockside</u> <u>Monitor</u>	<u>Video</u>		<u>Unknown</u>	<u>Dockside</u> <u>Monitor</u>	<u>Video</u>		<u>Unknown</u>
	Retained	Retained	Discarded		Retained	Retained	Discarded		Retained	Retained	Discarded	
Rockfish and Thornyheads												
Rockfish - unidentified		3							2	1		
Rockfish, Black												
Rockfish, Canary												
Rockfish, Dark unidentified												
Rockfish, Dusky (was Light Dusky)	39	37	5									
Rockfish, Northern												
Rockfish, Quillback	15	16							2	2		
Rockfish, Red Banded	98	97	14						18	18		
Rockfish, Redstripe												
Rockfish, Rosethorn	3	3										
Rockfish, Silvergray	1	1										
Rockfish, Small Red unidentified		2								4	3	
Rockfish, Tiger	1	1										
Rockfish, Yelloweye	207	210	4						27	27		
Rockfish, Rougheye	3	3							418	251	2	
Rockfish, Shortraker	18	14	4						106	69	1	
Rockfish, Shortraker/Rougheye unidentified		5	2							232	8	
Rockfish, Shortraker/Rougheye Total	21	22	6						524	552	11	
Rockfish, Longspine Thornyhead										1		
Rockfish, Shortspine Thornyhead	16	5							2,684	680	28	
Rockfish, Thornyhead unidentified		13								2,107	171	
Rockfish, Thornyheads Total	16	18							2,684	2,788	199	

* Data withheld for confidentiality

Table 5, cont. Counts of landed (dockside monitor), and video recorded retained and discarded catch.

Species	Longline Halibut				Longline Pacific Cod*				Longline Sablefish			
	Dockside Monitor Retained	Retained	Video Discarded	Unknown	Dockside Monitor Retained	Retained	Video Discarded	Unknown	Dockside Monitor Retained	Retained	Video Discarded	Unknown
Sablefish	NA	73	49		NA				NA	20,671	867	1
Pacific halibut	NA	1	1,522	1	NA				NA	78	492	
Pacific cod	NA	147	34		NA				NA	15	7	
Lingcod	NA	88	4		NA				NA	16	17	
Flatfish	NA				NA				NA			
Flatfish - unidentified	NA		4		NA				NA		2	1
Flounder, Arrowtooth	NA		15		NA				NA		117	
Flounder, Kamchatka	NA		7		NA				NA		17	
Flounder, Kamchatka/Arrowtooth - unidentified	NA		33		NA				NA	3	90	
Flounder, Kamchatka/Arrowtooth Total	NA		55		NA				NA	3	224	
Sole, Dover	NA				NA				NA		1	
Sole, Flathead	NA		1		NA				NA			
Sole, Petrale	NA		1		NA				NA			
Sole, Rock Sole unidentified	NA		4		NA				NA			
Other Fish	NA				NA				NA			
Pollock (Walleye Pollock)	NA				NA				NA			
Grenadier (Rattail), Giant	NA				NA				NA	1	265	
Grenadier, (Rattail) - unidentified	NA				NA				NA	6	3,948	
Flatnose, Pacific (Codling)	NA				NA				NA		3	
Greenling - unidentified	NA				NA				NA			
Ratfish, Spotted	NA		7		NA				NA		3	
Ronquil/Searcher - unidentified	NA				NA				NA			
Roundfish - unidentified	NA	1			NA				NA		34	
Sculpin - Myoxocephalus unidentified	NA				NA				NA			
Sculpin - unidentified	NA				NA				NA			
Sculpin, Bigmouth	NA				NA				NA			
Sculpin, Great	NA				NA				NA			
Sculpin, Irish Lord - unidentified	NA				NA				NA			
Sculpin, Red Irish Lord	NA				NA				NA			
Sculpin, Yellow Irish Lord	NA				NA				NA			
Fish head /lips or parts	NA		3		NA				NA	2	463	
Fish - unidentified	NA				NA				NA		5	

* Data withheld for confidentiality

Table 5, cont. Counts of landed (dockside monitor), and video recorded retained and discarded catch.

Species	Dockside Monitor Retained	Longline Halibut			Dockside Monitor Retained	Longline Pacific Cod*			Dockside Monitor Retained	Longline Sablefish		
		Retained	Video Discarded	Unknown		Retained	Video Discarded	Unknown		Retained	Video Discarded	Unknown
Shark	NA				NA				NA			
Shark, Pacific Sleeper (Mud)	NA				NA				NA			
Shark, Spiny Dogfish	NA		234		NA				NA		160	
Skate	NA				NA				NA			
Ray, (Skate) - unidentified	NA		1		NA				NA		4	
Skate - Soft Snout unidentified	NA		15		NA				NA		29	
Skate - Stiff Snout unidentified	NA				NA				NA			
Skate, Alaska	NA				NA				NA			
Skate, Aleutian	NA		5		NA				NA		1	
Skate, Bering	NA		5		NA				NA			
Skate, Big	NA		99		NA				NA		2	
Skate, Longnose	NA		315		NA				NA		96	
Skate, Roughtail	NA				NA				NA		106	
Crab	NA				NA				NA			
Crab - unidentified (Family Unknown)	NA				NA				NA			
Crab, King - unidentified	NA				NA				NA		1	
Crab, King, Couesi	NA				NA				NA		1	
Crab, Tanner - Unidentified	NA				NA				NA	1	16	
Coral	NA				NA				NA			
Bryozoans/Coral Unid	NA	1			NA				NA	3	44	
Coral, Red Tree	NA	3	2		NA				NA	2		
Invert	NA				NA				NA			
Invertebrate - unidentified	NA				NA				NA	2	122	
Sand Dollars, Sea Urchins	NA				NA				NA		10	
Sea Anemone - unidentified	NA		2		NA				NA		1	
Sea Whip, Sea Pen - unidentified	NA		5		NA				NA			
Snail - unidentified	NA		11		NA				NA		1	
Snail, Empty Shell	NA				NA				NA		1	
Sponge - unidentified	NA		7		NA				NA		44	
Worm - unidentified (flatworms, ribbon worms)	NA				NA				NA		5	
Octopus - unidentified	NA		2		NA				NA			
Starfish - unidentified	NA		3		NA				NA		7	
Starfish, Basket	NA		2		NA				NA	1	5	
Starfish, Brittle	NA				NA				NA	2	300	
Starfish, Sunstar	NA		11		NA				NA		9	
Bird	NA				NA				NA			
Albatross, Black-footed	NA				NA				NA	1	1	
Fulmar, Northern	NA				NA				NA		1	
Gull - unidentified	NA				NA				NA		9	
Gull, Glaucus-winged	NA				NA				NA		1	
Gull, Herring	NA				NA				NA		3	
Unknown	NA				NA				NA	1	4	
Miscellaneous - unidentified (rocks, mud, garbage, etc)	NA	1	21		NA				NA	4	42	

* Data withheld for confidentiality

Table 6. Counts of discarded catch divided as intentional or unintentional discards.

Species	Longline Halibut				Longline Pacific Cod*				Longline Sablefish			
	Interacted w/ vessel or crew	Drop-off	Utilized Onboard	Total	Interacted w/ vessel or crew	Drop-off	Utilized Onboard	Total	Interacted w/ vessel or crew	Drop-off	Utilized Onboard	Total
Rockfish and Thornyheads												
Rockfish - unidentified									1			1
Rockfish, Dark unidentified												
Rockfish, Dusky (was Light Dusky)	5			5								
Rockfish, Northern												
Rockfish, Quillback												
Rockfish, Red Banded	12	2		14								
Rockfish, Small Red unidentified									2	1		3
Rockfish, Yelloweye		4		4								
Rockfish, Rougheye												
Rockfish, Shortraker	3	1		4					1			1
Rockfish, Shortraker/Rougheye unidentified	2			2					8			8
Rockfish, Shortspine Thornyhead									26	2		28
Rockfish, Thornyhead unidentified									136	35		171
Sablefish	46	2	1	49					745	122		867
Pacific halibut	1,522			1,522					492			492
Pacific cod	25	2	7	34					7			7
Lingcod	2	2		4					15	2		17
Flatfish												
Flatfish - unidentified	4			4					2			2
Flounder, Arrowtooth	7		8	15					117			117
Flounder, Kamchatka	2		5	7					17			17
Flounder, Kamchatka/Arrowtooth - unidentified	27		6	33					89	1		90
Sole, Dover									1			1
Sole, Flathead	1			1								
Sole, Petrale	1			1								
Sole, Rock Sole unidentified	4			4								
Other Fish												
Pollock (Walleye Pollock)												
Grenadier (Rattail), Giant									257	8		265
Grenadier, (Rattail) - unidentified									3,842	106		3,948
Flatnose, Pacific (Codling)									3			3
Greenling - unidentified												
Ratfish, Spotted	7			7					3			3
Ronquil/Searcher - unidentified												
Roundfish - unidentified									29	5		34
Sculpin - Myoxocephalus unidentified												
Sculpin - unidentified												
Sculpin, Bigmouth												
Sculpin, Great												
Sculpin, Irish Lord - unidentified												
Sculpin, Red Irish Lord												
Sculpin, Yellow Irish Lord												
Fish head /lips or parts	3			3					463			463
Fish - unidentified									3	2		5

* Data withheld for confidentiality

Table 6, cont. Counts of discarded catch divided as intentional or unintentional discards.

Species	Longline Halibut			Total	Longline Pacific Cod*			Total	Longline Sablefish			Total
	Interacted w/ vessel or crew	Drop-off	Utilized Onboard		Interacted w/ vessel or crew	Drop-off	Utilized Onboard		Interacted w/ vessel or crew	Drop-off	Utilized Onboard	
Shark												
Shark, Pacific Sleeper (Mud)												
Shark, Spiny Dogfish	232	2		234					158	2		160
Skate												
Ray, (Skate) - unidentified		1		1					4			4
Skate - Soft Snout unidentified	15			15					29			29
Skate - Stiff Snout unidentified												
Skate, Alaska												
Skate, Aleutian	5			5					1			1
Skate, Bering	5			5								
Skate, Big	97	2		99					2			2
Skate, Longnose	313	2		315					95	1		96
Skate, Roughtail									105	1		106
Crab												
Crab - unidentified (Family Unknown)												
Crab, King - unidentified									1			1
Crab, King, Couesi									1			1
Crab, Tanner - Unidentified									16			16
Coral												
Bryozoans/Coral Unid									42	2		44
Coral, Red Tree	2			2								
Invert												
Invertebrate - unidentified									122			122
Sand Dollars, Sea Urchins									10			10
Sea Anemone - unidentified	2			2					1			1
Sea Whip, Sea Pen - unidentified	5			5								
Snail - unidentified	11			11					1			1
Snail, Empty Shell									1			1
Sponge - unidentified	7			7					44			44
Worm - unidentified (flatworms, ribbon worms)									5			5
Octopus - unidentified	1		1	2								
Starfish - unidentified	3			3					7			7
Starfish, Basket	2			2					5			5
Starfish, Brittle									300			300
Starfish, Sunstar	9	2		11					9			9
Bird												
Albatross, Black-footed									1			1
Fulmar, Northern									1			1
Gull - unidentified									9			9
Gull, Glaucus-winged									1			1
Gull, Herring									3			3
Unknown									2	2		4
Miscellaneous - unidentified (rocks, mud, garbage, e	21			21					42			42

* Data withheld for confidentiality

Pacific halibut

The data collected for the volunteer vessel study included Pacific halibut release information. Data collected included the method of release and the condition of each individual fish at time of release. These release methods and condition ratings were identical to those used by the observer program with the additions of three new release methods after consulting with the observer program: “Hand release”, “Other careful release” and “Other non-careful release”. The majority (~80%) of Pacific halibut were released carefully using the “Hook twisting and shaking” method (Tables 7 and 8). The next largest release method (5%) was recorded as “Unknown”. In the Pacific cod target fishery, hand release was the second most frequently used method of discard.

Table 7. Pacific halibut counts for each type of discard, release method, and release condition for the three target fisheries.

Discard Type	Release Method	Release Condition	Longline Halibut	Longline Pacific Cod*	Longline Sablefish
General	Crucifying	Minor	6		
General	Crucifying	Moderate	4		1
General	Crucifying	Severe	1		
General	Crucifying	Dead/Sand Fleas/Bleeding	1		
General	Crucifying	Unknown	38		4
General	Cut the gangion	Minor	1		
General	Gaff	Moderate	9		
General	Gaff	Severe			1
General	Gaff	Dead/Sand Fleas/Bleeding			
General	Gaff	Unknown	17		
General	Hand release	Minor	15		2
General	Hand release	Dead/Sand Fleas/Bleeding	1		
General	Hand release	Unknown	7		10
General	Hit the roller	Minor	4		
General	Hit the roller	Moderate			1
General	Hit the roller	Severe	1		
General	Hit the roller	Unknown	12		
General	Hook twisting and shaking	Minor	686		261
General	Hook twisting and shaking	Moderate	12		8
General	Hook twisting and shaking	Severe	1		1
General	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	41		2
General	Hook twisting and shaking	Unknown	609		178
General	Other careful release	Minor	12		
General	Other careful release	Unknown	2		1
General	Other non-careful release	Minor			
General	Other non-careful release	Moderate			
General	Other non-careful release	Dead/Sand Fleas/Bleeding			
General	Other non-careful release	Unknown			
General	Unknown	Minor	4		2
General	Unknown	Moderate	1		
General	Unknown	Dead/Sand Fleas/Bleeding			2
General	Unknown	Unknown	16		14
Damaged	Crucifying	Dead/Sand Fleas/Bleeding			
Damaged	Hand release	Dead/Sand Fleas/Bleeding	2		
Damaged	Hook twisting and shaking	Minor			1
Damaged	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	19		4
Damaged	Other careful release	Dead/Sand Fleas/Bleeding			1
Damaged	Other non-careful release	Dead/Sand Fleas/Bleeding			
Drop-off Above	Hook twisting and shaking	Minor			
Drop-off Above	No Selection	Unknown			
Drop-off Below	No Selection	Unknown			
Total			1522		494

* Data withheld for confidentiality

Table 8. Pacific halibut counts for each type release method for the three target fisheries.

Release Method	Longline Halibut		Longline Pacific Cod*	Longline Sablefish		Total	% of total
Crucifying	50	3%		6	1%	56	1%
Cut the gangion	1	> 1%				1	> 1%
Drop-off							
Gaff	26	2%		1	> 1%	28	1%
Hand release	25	2%		12	2%	292	8%
Hit the roller	17	1%		1	> 1%	28	1%
Hook twisting and shaking	1368	90%		455	93%	3157	84%
Other careful release	14	1%		2	> 1%	17	> 1%
Other non-careful release							
Unknown	21	1%		12	2%	186	5%
Grand Total	1522	100%		489	100%	3765	100%

* Data withheld for confidentiality

Without corresponding release condition data from onboard the vessel, it is not possible to test how well a video reviewer can assess halibut release condition from EM data. A release condition was not possible to capture for 43% of the discarded halibut in all three fisheries (Table 9). A halibut would be given a release condition of unknown if the video reviewer could not observe both sides of the fish and the injuries could not be observed clearly at point of release. The majority of halibut that had a release condition recorded were assessed as minor.

Table 9. Pacific halibut counts for each type release condition for the three target fisheries.

Release Condition	Longline Halibut		Longline Pacific Cod*	Longline Sablefish		Total	% of total
Minor	728	48%		266	54%	2108	56%
Moderate	26	2%		10	2%	39	1%
Severe	3	> 1%		2	> 1%	7	> 1%
Dead/Sand Fleas/Bleeding	64	4%		9	2%	93	2%
Unknown	701	46%		205	42%	1521	40%
No Selection							
Grand Total	1522	100%		492	100%	3769	100%

* Data withheld for confidentiality

References

National Marine Fisheries Service. 2014. Electronic Monitoring Cooperative Research and Implementation Program. http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/EMCoopResearchPlan614.pdf

Appendix

Appendix 1. Dockside monitor's data sheet



Vessel Offload Record			
Vessel name:		Work order:	
Skipper name:		ADF&G #:	
Port:		Technician name:	
Offload date:	Click here to enter a date.	Offload location	
Data retrieval time (hrs):		Offload monitoring time (hrs):	
Hard drive tracking	Retrieved:	AMR Number:	Work Order:
	Installed:	AMR Number:	Work Order:
Logbooks Collected			Y/N
EM Logbook			
Verified IPHC Logbook (photo or e-log printout)			
Fish Ticket (photo)			Fish Ticket No(s):
Service Summary Checklist		Y/N	Comments
Captain Interview			
Was the captain or crew onboard?			
If not, was the power on or accessible?			
Was the captain aware of any problems?			
Did the captain require technical support during the trip?			
Did the technical issues result in a change of fishing plans?			
If yes, how much time was spent resolving the issue?			
Will the vessel continue to fish in fishery?			
Sensor operation			
Are reasons known for all timegaps?			
Is the GPS functioning normally?			
Did sensors trigger recording?			
Did sensors reach and exceed threshold?			
Cameras and Interface			
Did video record correctly throughout trip?			
Were cameras in focus?			
Were cameras aimed correctly?			
Is the monitor placement acceptable?			

Appendix 1, cont. Dockside monitor's data sheet

Rockfish Offload Data	
Did the skipper retain all rockfish at the (i.e. did not discard at the rail)?	Y N
Did the skipper land all rockfish (delivered to plant)?	Y N
Were any legal- sized halibut discarded?	Y N
Were any seabirds hooked?	Y N

Retained but not landed <small>(declared by fisher, e.g., eaten)</small>					
Rockfish Species	Count	Weight (lbs)	Rockfish Species	Count	Weight (lbs)

Landed					
Rockfish Species	Count	Weight (lbs)	Rockfish Species	Count	Weight (lbs)

Comments and skipper suggestions summary:

Appendix 2. Effort log given to skippers to fill out on each trip

2015 EM Program Effort Logbook

Vessel Name:	Vessel Number:	Did you catch rockfish? Y N
Trip Start Date (mm/dd):	Start Port:	Did you retain and land all rockfish? Y N
Offload Date (mm/dd):	Offload Port:	Did you haul at night? Y N

Did the EM system function normally the entire trip? Y N If no, please describe any problems:	Gear ID	Gear Type	Length of Skate (feet)	Hook Size	Hook Spacing (ft)	No. Hooks Per Skate
	A					
	B					
	C					
	D					

Set		Haulback		Seabirds Caught?	Did you discard legal-sized halibut?	Haul Start Location		Gear ID	No. Skates Set	No. Skates Lost
Date (mm/dd)	Start Time	Date (mm/dd)	Start Time			Lat	Long			
				Y N	Y N					
				Y N	Y N					
				Y N	Y N					
				Y N	Y N					
				Y N	Y N					
				Y N	Y N					
				Y N	Y N					
				Y N	Y N					

Shaded areas are not required if you are completing and sharing your IPHC logbook with EM program staff.