

Preliminary Report Alaska Track 1: Review of the 2015 Season

Alia Al-Humaidhi, Dave Colpo, and Courtney Donovan



Pacific States Marine Fisheries Commission

205 SE Spokane Street, Suite 100

Portland, OR 97202

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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 (EM approach 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. EM approach 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 2014 field work that resulted from EM workgroup discussion had two initial objectives. The first was to collect field data to define, evaluate and verify assumptions associated with specific information requirements for technology-based monitoring of Alaskan fixed gear fleets. Tasks under this objective include: evaluating the ability of EM reviewers to identify species groupings suggested by the NOAA memo, testing the feasibility of EM review to determine halibut release methods and injury codes, and evaluating logbook effort data needed to support an EM program. The second objective involved testing operational components of an EM program in order to identify field service needs and develop local support capacity. Tasks under this objective include: evaluating camera configurations, testing handling procedures such as full retention of rockfish to aid in the identification of cryptic species, identifying field support services needed to ensure data quality, and evaluating 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*). Fifty-eight trips were monitored using systems from Archipelago Marine Research Ltd (AMR) before the end of June when host vessels transitioned to other fisheries.

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 to date 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 before the net comes onboard the vessel, that fall off or out of fishing gear before it comes onboard the vessel, or are free floating on the surface.

If views were not sufficient to see the whole deck, for example one camera's view was obscured, fish were recorded as retained or discarded based on whether they were retained or discarded at the rail. It is possible that some fish brought onboard and recorded as retained were later discarded out of view of the rail cameras, these fish would be recorded as retained in the EM data since the discard could not be observed due to the camera angles. In instances where fish were initially retained and later discarded in view of the rail cameras, a discard record was created.

Providers

PSMFC contracted with AMR to provide and 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 during the season including Homer, Kodiak, Seward, and Sitka.

Archipelago Marine Research (AMR)

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

The system collected sensor data (GPS and hydraulics) at a 10-second interval when fully powered on. Video was triggered to record when the hydraulic pressure exceeded a threshold that was set by the EM technician and was specific to each vessel. Imagery recording would then continue for 2 hours past the last point when pressure was above the threshold to allow for all catch handling to be captured for each haul. For 7 of the 114 reviewed hauls (6%), 2 hours was not long enough to capture all of the catch handling done by the crew after hauling ended (Table 1). All reviewed hauls had video that captured all of the catch coming onboard.

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).

To aid in PSMFC review and interpretation of the video data, AMR provided EM Interpret™ Pro (EMI) software for converting the raw data into usable catch information. EMI integrates the hydraulic sensor and GPS data to the video output to expedite the review process.

AMR EM viewers 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.

Table 1. Video completeness and catch completeness of reviewed hauls (haul count).

Video Completeness of Reviewed Hauls	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total
Video complete	26	22	59	107
Intermittent gaps in video coverage				
Video ends before catch handling ends	2	5		7
Video starts after haul start				
Total	28	27	59	114

Catch completeness of Reviewed Hauls				
Incomplete - Part of catch (beginning, end or middle) was not recorded	0	0	0	0
Complete - All catch brought onboard was recorded	28	27	59	114

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 where data were keypunched and a spreadsheet was maintained with all dockside monitor data received.

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.

For each drive, capture 1-3:

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.
 - 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, 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 has been used to date
 - 1. Compliance with extended presentation of seabirds

Video Review

Data from each hard drive were stored on a server maintained by PSMFC. Video reviewers assessed each hard drive for dates and times of trips and hauls, along with location information and any information that could be assessed regarding the completeness of the sensor and video data during each trip and whether or not dockside

monitoring was successfully completed. The quantitative data available on the sensor readings and location made us confident in our assessment of trips as having complete or incomplete video.

If a trip's video was deemed to be incomplete, the video reviewers noted the reason for that assessment and the duration of the longest video failure during a haul. System sleep gaps were expected when the vessel was in port, or when the engine of the vessel was shut off. The trips that failed either had a system that was not powered for the beginning of the trip, the end of the trip, had an unexplainable gap in the middle of the trip that was long enough to potentially miss a haul, or had video turn on after catch was being hauled, shut off before a haul was completely onboard or had a long enough gap during hauling to miss catch.

Due to the systems being programmed to stop recording video a fixed number of minutes after the vessels' hydraulic pressure dropped below a programmed threshold, catch handling was not always completed before the video ended. This means that fish that were on board at the time of the video ending are reported as retained. The video ended before processing was complete for 7 of the total 114 reviewed hauls. The target species tended to be the species on deck at the time the video ended.

The PSMFC 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 grouping as requested by the EM working group.

Video reviewers recorded species, count, whether the fish was damaged or not, disposition (retained or discarded), whether the discard was intentional or was a drop-off from the line, confidence in the data collected from the video, whether the video was complete, and the number of minutes it took to review each haul. If the fish was a discarded halibut, reviewers assessed the release method and condition for each fish. Reviewers did not estimate weight of catch.

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

Testing Review Rate

Video reviewers recorded the number of minutes it took to review each haul. Sort time was calculated using the beginning and ending time points of the reviewed video. A rate was calculated by dividing the review minutes by the sort minutes.

Results

Data summary

PSMFC received EM data for 17 halibut trips, 16 Pacific cod trips, and 25 sablefish trips containing 93, 190 and 168 hauls respectively from 12 fishing vessels (Table 2). Six of the halibut trips (35%), three of the Pacific cod trips (18%), and eleven of the sablefish trips (44%) had the landing monitored by a dockside monitor. The data spanned 67 longline halibut sea days, 56 longline Pacific cod sea days, and 112 longline sablefish sea days with trips averaging 4.19, 3.50 and 4.67 days respectively.

All but one of the reviewed hauls had medium and high confidence in the data that was captured from the video. The longline sablefish fishery had a slightly higher proportion of reviewed hauls with medium or low confidence level (Table 2). All of the hauls with medium and low confidence were due to image quality.

Table 2. Summary of data including: number of vessels, number of trips, number of hauls, haul level distribution of confidence in data from video, reasons for low confidence or no confidence (unusable), and video completeness. Not included is one halibut trip where the skipper intentionally turned the system off due to someone onboard being uncomfortable with the cameras recording.

Number of Vessels	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total
Total	8	3	6	12

Trips

Number of Trips

Review Level Prescribed

1-3	11	13	14	38
1-4	6	3	11	20
Total	17	16	25	58

Number of Trips with Dockside Monitoring

Total	8	4	17	29
Percent of total trips	47%	25%	68%	50%

Number of Trips with Full Rockfish Retention

Total	9	6	15	30
Percent of total trips	53%	38%	60%	52%

Number of Trips with Complete Sensor Data

Total	12	9	23	44
Percent of total trips	71%	56%	92%	76%

Sea Days

Average Sea Days per Trip	4.19	3.50	4.67	
Total Number of Sea Days	67	56	112	235

Table 2, cont. Summary of data

Hauls

	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total
Number of Hauls				
Total	93	190	168	451
Number of Hauls Reviewed for Catch in This Report	28	27	59	114
Average Number of Hauls per Sea Day				
Average Number of Hauls per Sea Day	1.39	3.39	1.50	1.92
Average Number of Hauls per Trip				
Average Number of Hauls per Trip	5.47	11.88	6.72	7.78
Data Confidence from Video (Number of Hauls)				
High	27	25	53	105
Medium	1	2	5	8
Low			1	1
Unusable				
No Video				
Image Quality (Number of Hauls)				
High	26	13	46	85
Medium	2	14	12	28
Low			1	1
Unusable				
No Video				
Primary Reason for Medium Image Quality (Number of Hauls)				
Condensation			2	2
Glare			1	1
Night Lighting	2	11	1	14
Poor Camera Angles		3	4	7
Water Spots			4	4
Total	2	14	12	28
Primary Reason for Low Image Quality (Number of Hauls)				
Condensation				
Glare				
Night Lighting				
Poor Camera Angles			1	1
Water Spots				
Total			1	1

Of the total 58 trips, 20 were prescribed review through level 4 (Table 3). One trip had partial review at time of this report.

Table 3. Number of trips and hauls prescribed to each level of review for each fishery, and the number of trips where review has been completed or remains to be reviewed.

Number of Trips (Hauls)

Review Complete?	Review Level Prescribed						Total
	Longline Halibut		Longline Pacific Cod		Longline Sablefish		
	1-3	1-4	1-3	1-4	1-3	1-4	
No	11 (65)		13 (157)	0.5 (6)	14 (109)		39 (337)
Yes		6 (28)		2.5 (27)		11 (59)	20 (114)
Total	11 (65)	6 (28)	13 (157)	3 (33)	14 (109)	11 (59)	59 (451)

For trips where video was assessed as incomplete, no pattern emerged for the reason of video failure. Reasons ranged from power loss, to power button being pressed, a system reboot, or unexplainable gap. A pattern did emerge for the failure rate relative to the number of trips a system was on a vessel. The highest failure occurred on the first trip, and the second highest was on the second trip (Figure 1). For the four vessels that passed on their first trip, two of them had AMR systems onboard in 2014. The two failures that occurred on the 6th trip of 2 vessels were single short 1-5 minute system failures, one during each of the 2 failed trips that occurred during a hauling event.

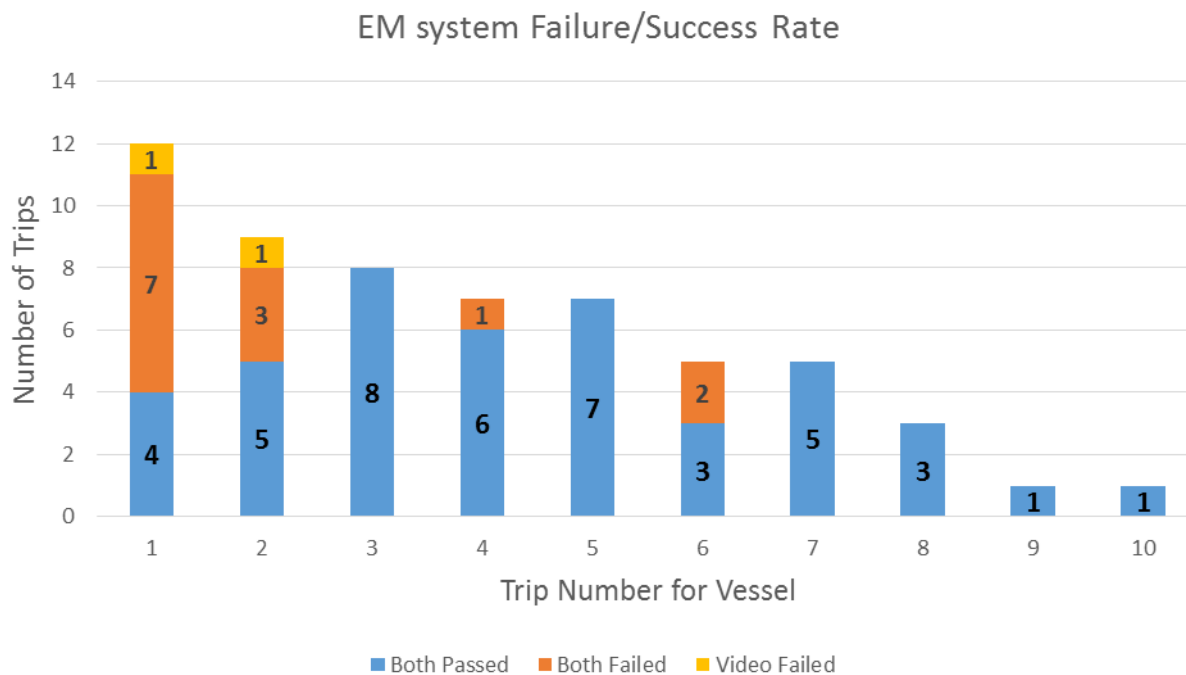


Figure 1. Proportion of trips that failed or passed the EM data complete criteria in relation to the number of trips the system had been on a vessel.

Effort Log

Forty-one of the 58 trips (71%) had a complete logbook submitted with the video data (Table 4). Thirteen (22%) had no logbook submitted.

Table 4. Summary of logbook data submissions for a given trip.

Effort Log Completeness of All Trips	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total	Percent Total
Complete	15	9	17	41	71%
Incomplete		4		4	7%
No Logbook	2	3	8	13	22%
Total	17	16	25	58	100%

Since the effort logs were designed to complement EM data, there is no data to compare logs to EM collected data beyond haul counts.

Rate of review

Rate of review is comparable between the halibut and sablefish target fisheries, taking approximately half real time to review for Halibut and Sablefish hauls. The review rate for Pacific cod haul was slower at three-quarter real time (Table 5). For example, if a haul takes 2 hours to retrieve and handle catch on a halibut targeting haul, it takes a reviewer on average an hour to review that video and capture data from that haul for halibut and sablefish hauls and 1.5 hours for Pacific cod hauls.

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. Due to the Pacific cod vessels being the only fishery we saw stern hauling, it is not possible to pinpoint the reason for the slower review rate.

Table 5. Review rate by target fishery.

	Longline Gear Targeting		
	Halibut	Pacific Cod	Sablefish
	Retained and Discarded	Retained and Discarded	Retained and Discarded
Haul Count	28	27	59
Average Sort Min/Haul	145	110	194
Average Review Min/Haul	77	80	89
Average Review Min/Sort Min	0.53	0.73	0.46

Catch summary

Retained and discarded catch were summarized to the target fishery level (Table 6). It is important to note that the dockside monitor was asked to only record landed rockfish bycatch. Since total catch accounting is the goal for EM in the SE AK longline sector, all species recorded using EM are presented in the catch counts.

Results indicate that EM can be used to effectively quantify and speciate bycatch of rockfishes or rockfish groups with the exception of species known to be problematic. These problematic species are short and longspine

thornyheads, shortraker and rougheye rockfishes and arrowtooth and Kamchatka flounders. There were also 7 rockfish that were recorded as “Rockfish – unidentified”, 3 that were recorded as “Rockfish, Dark unidentified” and 12 that were recorded as “Rockfish – Small Red unidentified” out of the total 642 rockfish that were recorded (3%).

The counts of each rockfish species or grouping were aggregated to the trip level to compare to the dockside monitor records. Graphs were created for those species that were recorded on more than one trip between the three target fisheries (Figure 2). The dockside monitor shortraker and rougheye rockfish counts were aggregated to compare trip level retained counts to the shortraker/rougheye rockfish recorded by the video reviewer. The dockside monitor shortspine thornyheads counts were treated similarly, comparing them to the thornyheads recorded by the video reviewer.

For most discarded species, the majority of discards were discarded after interaction with the vessel or a crew member (Table 7). 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. One fifth (18%) of the sablefish discards in the sablefish fishery happened with no interaction with the vessel or crew (dropped off of the line).

Trips were selected for review if a skipper answered Yes to the question “Did the skipper retain and land all rockfish?” Discards recorded using video revealed 233 discarded rockfish within the 114 reviewed hauls. The majority of these discards occurred after interaction with the vessel or crew (Table 7). This suggests that the selection criteria for trips to be fully reviewed may be too stringent and that assessing rockfish identification using EM is possible without full rockfish retention since we can almost always tell whether a fish is discarded or retained.

Table 6. 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>Video</u>			<u>Dockside</u>	<u>Video</u>			<u>Dockside</u>	<u>Video</u>		
	Monitor Retained	Retained	Discarded	Unknown	Monitor Retained	Retained	Discarded	Unknown	Monitor Retained	Retained	Discarded	Unknown
Rockfish and Thornyheads												
Rockfish - unidentified		3				1				2	1	
Rockfish, Black					28	28						
Rockfish, Canary					1	1						
Rockfish, Dark unidentified						1	3					
Rockfish, Dusky (was Light Dusky)	39	38	5		1							
Rockfish, Northern						1	1					
Rockfish, Quillback	15	16			145	92	2		2	2		
Rockfish, Red Banded	99	99	14						17	17		
Rockfish, Redstripe					1							
Rockfish, Rosethorn	3	3										
Rockfish, Silvergray	1	1			3	3						
Rockfish, Small Red unidentified		2				2	1			4	3	
Rockfish, Tiger	1	1			6	6						
Rockfish, Yelloweye	207	210	4		68	48			27	27		
Rockfish, Rougheye	27	3			7				394	247	2	
Rockfish, Shortraker	28	16	4		12	7			96	67	1	
Rockfish, Shortraker/Rougheye unidentified		38	3			2				173	6	
Rockfish, Shortraker/Rougheye Total	55	57	7		19	9			490	487	9	
Rockfish, Longspine Thornyhead										1		
Rockfish, Shortspine Thornyhead	135	35	2						1,825	620	25	
Rockfish, Thornyhead unidentified		102	13						740	1,945	143	
Rockfish, Thornyheads Total	135	137	15						2,565	2,566	168	

Table 6, cont. Counts of landed (dockside monitor), and video recorded retained and discarded catch.

Species	Longline Halibut				Longline Pacific Cod				Longline Sablefish			
	<u>Dockside</u>	<u>Video</u>		Unknown	<u>Dockside</u>	<u>Video</u>		Unknown	<u>Dockside</u>	<u>Video</u>		
	Monitor	Retained	Discarded		Monitor	Retained	Discarded		Monitor	Retained	Discarded	
	Retained	Retained	Discarded	Unknown	Retained	Retained	Discarded	Unknown	Retained	Retained	Discarded	Unknown
Sablefish	NA	681	59			6	7			19,340	670	
Pacific halibut	NA	1,605	1,564	1		563	1,403			393	481	
Pacific cod	NA	148	34			3,634	69			14	7	
Lingcod	NA	93	17			1	6			11	4	
Flatfish												
Flatfish - unidentified	NA		4			5	13				2	
Flounder, Arrowtooth	NA		17			18	87			2	114	
Flounder, Kamchatka	NA		7				9			1	17	
Flounder, Kamchatka/Arrowtooth - unidentified	NA	2	33			41	155	2		7	89	
Flounder, Kamchatka/Arrowtooth Total												
Sole, Dover	NA						1				1	
Sole, Flathead	NA		1			2	3					
Sole, Petrale	NA		1									
Sole, Rock Sole unidentified	NA	2	4									
Other Fish												
Pollock (Walleye Pollock)	NA					38	105	1				
Grenadier (Rattail), Giant	NA									2	261	
Grenadier, (Rattail) - unidentified	NA	1	10							21	3,820	
Flatnose, Pacific (Codling)	NA										3	
Greenling - unidentified	NA					1	2					
Ratfish, Spotted	NA	1	7								3	
Ronquil/Searcher - unidentified	NA					1	2					
Roundfish - unidentified	NA	1				3	8				29	
Sculpin - Myoxocephalus unidentified	NA						15					
Sculpin - unidentified	NA					5	28					
Sculpin, Bigmouth	NA						1					
Sculpin, Great	NA						2					
Sculpin, Irish Lord - unidentified	NA					1	1					
Sculpin, Red Irish Lord	NA						1					
Sculpin, Yellow Irish Lord	NA					8	9					
Fish head /lips or parts	NA		4			1	2			25	458	
Fish - unidentified	NA						6				4	

Table 6, cont. Counts of landed (dockside monitor), and video recorded retained and discarded catch.

Species	Longline Halibut				Longline Pacific Cod				Longline Sablefish			
	Dockside Monitor Retained	Video			Dockside Monitor Retained	Video			Dockside Monitor Retained	Video		
		Retained	Discarded	Unknown		Retained	Discarded	Unknown		Retained	Discarded	Unknown
Shark												
Shark, Pacific Sleeper (Mud)	NA				NA		7	NA				
Shark, Spiny Dogfish	NA	5	236		NA	30	88	NA			158	
Skate												
Ray, (Skate) - unidentified	NA		1		NA	1	8	NA				4
Skate - Soft Snout unidentified	NA		15		NA	42	109	NA	2		29	
Skate - Stiff Snout unidentified	NA				NA		2	NA				
Skate, Alaska	NA				NA	2	6	NA				
Skate, Aleutian	NA	1	5		NA	5	28	NA			1	
Skate, Bering	NA	1	5		NA	15	18	NA				
Skate, Big	NA	2	100		NA		256	NA			1	
Skate, Longnose	NA	6	322		NA	97	185	NA			87	
Skate, Roughtail	NA		4		NA			NA	11		99	
Crab												
Crab - unidentified (Family Unknown)	NA				NA		1	NA				
Crab, King - unidentified	NA				NA			NA			1	
Crab, King, Couesi	NA				NA			NA			1	
Crab, Tanner - Unidentified	NA		2		NA		1	NA	1		13	
Coral												
Bryozoans/Coral Unid	NA	1			NA		1	NA	5		41	
Coral, Red Tree	NA	3	2		NA			NA	1			
Invert												
Invertebrate - unidentified	NA				NA		1	NA	2		122	
Sand Dollars, Sea Urchins	NA				NA			NA			10	
Sea Anemone - unidentified	NA		2		NA	1	2	NA			1	
Sea Whip, Sea Pen - unidentified	NA	2	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	1	2		NA	11	13	NA				
Starfish - unidentified	NA		3		NA	4	27	NA			7	
Starfish, Basket	NA		2		NA			NA	2		5	
Starfish, Brittle	NA				NA			NA	4		300	
Starfish, Sunstar	NA		11		NA	8	410	NA			9	
Bird												
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												
Unknown	NA				NA		3	NA	1		4	
Miscellaneous - unidentified (rocks, mud, garbage, etc)	NA	1	30		NA	1	10	NA	6		33	

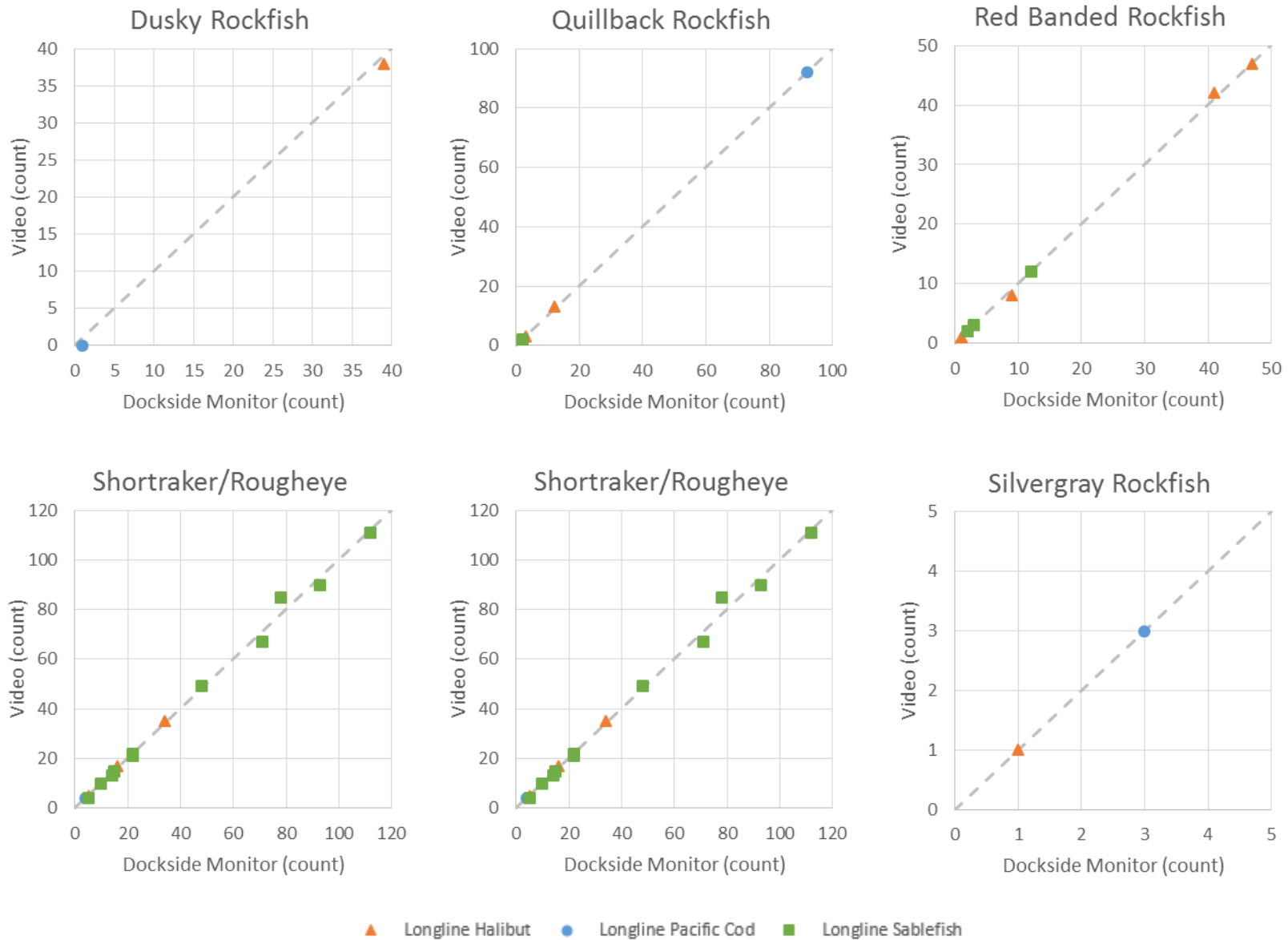


Figure 2. Comparison of dockside monitor and video retained rockfish counts aggregated to the trip level. The dashed grey line is the video = dockside monitor line. If video and dockside monitor counts agreed, the point would fall on the dashed line.

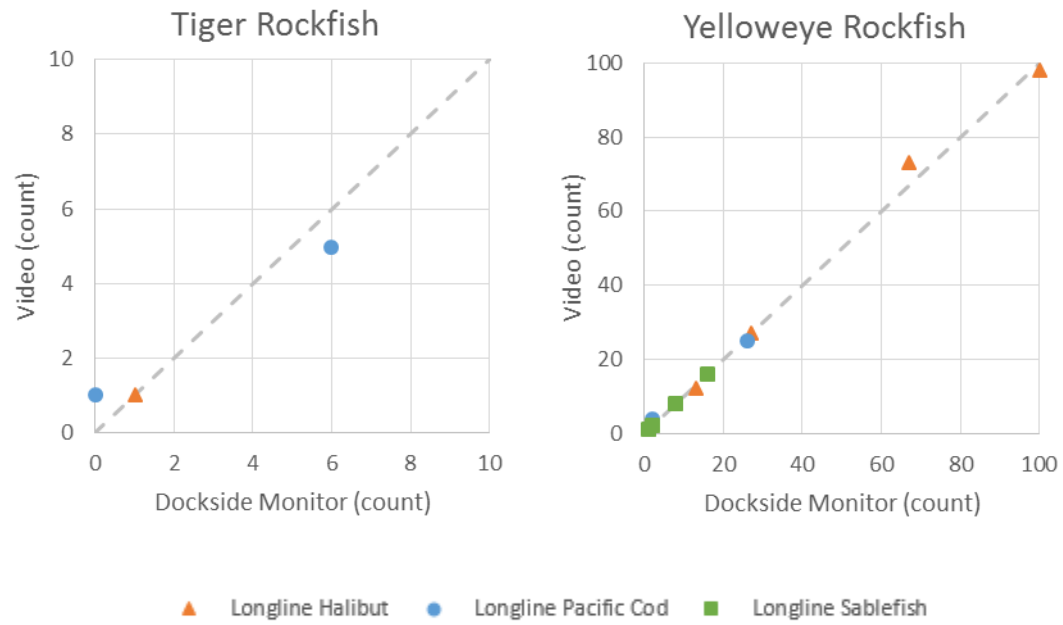


Figure 2, cont. Comparison of dockside monitor and video retained rockfish counts aggregated to the trip level.

Table 7. Counts of discarded catch divided as whether the fish interacted with the vessel or crew before discarding occurred.

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					3			3				
Rockfish, Dusky (was Light Dusky)	5			5								
Rockfish, Northern					1			1				
Rockfish, Quillback						2		2				
Rockfish, Red Banded	12	2		14								
Rockfish, Small Red unidentified					1			1	2	1		3
Rockfish, Yelloweye		4		4								
Rockfish, Rougheye									2			2
Rockfish, Shortraker	3	1		4					1			1
Rockfish, Shortraker/Rougheye unidentified	3			3					6			6
Rockfish, Shortspine Thornyhead	2			2					23	2		25
Rockfish, Thornyhead unidentified	11	2		13					112	31		143
Sablefish	56	2	1	59	7			7	548	122		670
Pacific halibut	1,557	7		1,564	1,397	6		1,403	481			481
Pacific cod	25	2	7	34	53	16		69	7			7
Lingcod	15	2		17	6			6	2	2		4
Flatfish												
Flatfish - unidentified	4			4	13			13	2			2
Flounder, Arrowtooth	9		8	17	73		14	87	114			114
Flounder, Kamchatka	2		5	7	4		5	9	17			17
Flounder, Kamchatka/Arrowtooth - unidentified	27		6	33	117		38	155	88	1		89
Sole, Dover					1			1	1			1
Sole, Flathead	1			1	3			3				
Sole, Petrale	1			1								
Sole, Rock Sole unidentified	4			4								
Other Fish												
Pollock (Walleye Pollock)					78		27	105				
Grenadier (Rattail), Giant									253	8		261
Grenadier, (Rattail) - unidentified	10			10					3,714	106		3,820
Flatnose, Pacific (Codling)									3			3
Greenling - unidentified					2			2				
Ratfish, Spotted	7			7					3			3
Ronquil/Searcher - unidentified					2			2				
Roundfish - unidentified					7	1		8	24	5		29
Sculpin - Myoxocephalus unidentified					15			15				
Sculpin - unidentified					28			28				
Sculpin, Bigmouth					1			1				
Sculpin, Great					2			2				
Sculpin, Irish Lord - unidentified					1			1				
Sculpin, Red Irish Lord					1			1				
Sculpin, Yellow Irish Lord					9			9				
Fish head /lips or parts	4			4	2			2	458			458
Fish - unidentified					1	5		6	2	2		4

Table 7, cont. Counts of discarded catch divided as intentional or unintentional discards.

Species	Longline Halibut				Longline Sablefish				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
Shark												
Shark, Pacific Sleeper (Mud)					5	2		7				
Shark, Spiny Dogfish	234	2		236	88			88	156	2		158
Skate												
Ray, (Skate) - unidentified		1		1	6	2		8	4			4
Skate - Soft Snout unidentified	15			15	107	2		109	29			29
Skate - Stiff Snout unidentified					2			2				
Skate, Alaska					6			6				
Skate, Aleutian	5			5	28			28	1			1
Skate, Bering	5			5	18			18				
Skate, Big	98	2		100	253	3		256	1			1
Skate, Longnose	320	2		322	181	4		185	86	1		87
Skate, Roughtail	4			4					98	1		99
Crab												
Crab - unidentified (Family Unknown)						1		1				
Crab, King - unidentified									1			1
Crab, King, Couesi									1			1
Crab, Tanner - Unidentified	2			2	1			1	13			13
Coral												
Bryozoans/Coral Unid					1			1	39	2		41
Coral, Red Tree	2			2								
Invert												
Invertebrate - unidentified					1			1	122			122
Sand Dollars, Sea Urchins									10			10
Sea Anemone - unidentified	2			2	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	6	7		13				
Starfish - unidentified	3			3	26	1		27	7			7
Starfish, Basket	2			2					5			5
Starfish, Brittle									300			300
Starfish, Sunstar	9	2		11	384	26		410	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					1	2		3	2	2		4
Miscellaneous - unidentified (rocks, mud, garbage, e	30			30	10			10	33			33

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” along with “Other careful release” and “Other non-careful release”. The majority (80%) of released P. halibut were released carefully using the Hook twisting and shaking method (Table 8 and 9). The next largest release methods (5%) was recorded as “Unknown”. In the P. cod target fishery, hand release was the second most frequently used method of discard.

Table 8. Pacific halibut counts for each type release method 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		1	
General	Gaff	Unknown	17		
General	Hand release	Minor	15	216	2
General	Hand release	Dead/Sand Fleas/Bleeding	1	2	
General	Hand release	Unknown	7	34	10
General	Hit the roller	Minor	4	3	
General	Hit the roller	Moderate			1
General	Hit the roller	Severe	1		
General	Hit the roller	Unknown	12	5	
General	Hook twisting and shaking	Minor	699	504	249
General	Hook twisting and shaking	Moderate	12	2	8
General	Hook twisting and shaking	Severe	1	1	1
General	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	41	6	2
General	Hook twisting and shaking	Unknown	611	433	176
General	Other careful release	Minor	12		
General	Other careful release	Unknown	2	1	1
General	Other non-careful release	Minor	1	25	
General	Other non-careful release	Moderate	2		
General	Other non-careful release	Dead/Sand Fleas/Bleeding	2		1
General	Other non-careful release	Unknown	14	34	5
General	Unknown	Minor	4	49	2
General	Unknown	Moderate	1		
General	Unknown	Dead/Sand Fleas/Bleeding		2	
General	Unknown	Unknown	16	73	10
Damaged	Crucifying	Dead/Sand Fleas/Bleeding			1
Damaged	Hand release	Dead/Sand Fleas/Bleeding	2	3	
Damaged	Hook twisting and shaking	Minor			1
Damaged	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	19	3	4
Damaged	Other careful release	Dead/Sand Fleas/Bleeding			1
Damaged	Other non-careful release	Dead/Sand Fleas/Bleeding	1		
Drop-off Above Water	Hook twisting and shaking	Minor			1
Drop-off Above Water	No Selection	Unknown	5	5	
Drop-off Below Water	No Selection	Unknown	2		
Total			1564	1403	481

Table 9. Pacific halibut counts for each type of discard, release method, and release condition for the three target fisheries.

Release Method	Longline Halibut		Longline Pacific Cod		Longline Sablefish		Total	% of total
Crucifying	50	3%		0%	6	1%	56	2%
Cut the gangion	1	0%		0%		0%	1	0%
Drop-off	7	0%	6	0%		0%	13	0%
Gaff	26	2%	1	0%	1	0%	28	1%
Hand release	25	2%	255	18%	12	2%	292	8%
Hit the roller	17	1%	8	1%	1	0%	26	1%
Hook twisting and shaking	1383	88%	949	68%	441	92%	2773	80%
Other careful release	14	1%	1	0%	2	0%	17	0%
Other non-careful release	20	1%	59	4%	6	1%	85	2%
Unknown	21	1%	124	9%	12	2%	157	5%
Grand Total	1564	100%	1403	100%	481	100%	3448	100%

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 44% of the discarded halibut in all three fisheries (Table 10). 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 10. 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	742	47%	798	57%	254	53%	1794	52%
Moderate	28	2%	2	0%	10	2%	40	1%
Severe	3	0%	1	0%	2	0%	6	0%
Dead/Sand Fleas/Bleeding	67	4%	17	1%	9	2%	93	3%
Unknown	717	46%	580	41%	206	43%	1503	44%
No Selection	7	0%	5	0%		0%	12	0%
Grand Total	1564	100%	1403	100%	481	100%	3448	100%

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					

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