

# Alaska Pre-Implementation Electronic Monitoring Final Report for the 2016 Season

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## **Introduction**

Electronic monitoring (EM) programs use video monitoring to track fishery activities. EM can be a practical alternative to carrying an on-board observer, particularly when the space or cost of an observer is prohibitive. The North Pacific Fisheries Management Council (NPFMC) has established an intent to incorporate electronic monitoring (EM) as a tool of the North Pacific Observer Program for the fixed gear groundfish and halibut fisheries. The intent is to develop EM as a tool for collecting catch estimation data.

A pre-implementation plan for EM has been developed by a working group of NPFMC. The goals of pre-implementation are to determine the efficacy of EM for catch accounting of retained and discarded catch and to identify key decisions that will be need to made in order to integrate EM systems into the Observer Program. Results of the pre-implementation work will be used to inform future council decisions.

Pacific States Marine Fisheries Commission (PSMFC) developed a program beginning in 2012 to test the use of EM for the Trawl Rationalization Program on the West coast. This program led to a regulation recommendation for the whiting and fixed gear fleets by the Pacific Fishery Management Council; ongoing work is evaluating the possibility of using EM for other groundfish fisheries. PSMFC has participated in the NPFMC working group and has reviewed EM data for Alaska longline vessels since 2014.

In 2016, the NPFMC EM pre-implementation plan deployed EM systems on small boat longline vessels targeting sablefish (*Anoplopoma fimbria*), Pacific cod (*Gadus macrocephalus*) and Pacific halibut (*Hippoglossus stenolepis*). EM systems were provided and installed by Archipelago Marine Research (AMR) and reviewed by PSMFC. This report details EM data collected during pre-implementation in 2016.

## **Vessel Participation**

Vessels were selected for participation in the pre-implementation program from a pool of volunteer vessels. Vessels made landings in ports including Homer, Kodiak, Seward, and Sitka. For each of four time periods (Jan-Feb, Mar-Jun, Jul-Oct & Nov-Dec), participants were selected randomly from the pool to carry EM equipment.

## **Electronic Monitoring Systems**

AMR was contracted to provide and install EM systems, collect data drives from the vessels, collect logbooks, and provide logistical support. 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, on some vessels, 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 past the last point when pressure was above the trigger threshold. Initially video recording continued for half an hour after the threshold but this was not always adequate to cover all sorting so the time was increased to two hours.

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).

AMR support staff reviewed video clips from each vessel after the data retrieval to assess video quality, camera placement, and system function. Adjustments to the installation were made as necessary.

## **Effort Logs**

Effort logs developed by AMR were distributed to all of the participating vessels. Images of effort logs were transmitted to PSMFC and entered into an excel spreadsheet. The effort log is provided in Appendix 1.

## **Electronic Monitoring Video Review**

PSMFC reviewers used EM Interpret™ Pro (EMI) software from AMR. The software integrates the hydraulic sensor and GPS data with the synced video output. GPS data, dates and times are automatically recorded and reviewers added annotations to identify trips, hauls, and catch data.

The start and end locations and times of all trips and hauls were annotated. Other metadata such as the vessel information, ports, and fishery were either recorded by the hardware or annotated by the reviewer.

Reviewers recorded whether a streamer line, used as a seabird deterrent, was present or absent for each trip.

Reviewers recorded whether sensor and video data were complete for each haul based on the quantitative data from the sensor readings. Reviewers also assessed data confidence and image quality for each haul. “Data Confidence” was defined as the overall ability of the reviewer to effectively quantify catch data. Data confidence could be impacted by a diversity of factors such as the image quality, catch handling, and camera angles or operation. Reviewers also gave specific ratings of the image quality and reasons for decreases in image quality (e.g. water spots on the camera, night lighting, etc.)

Species and counts of catch were recorded for all hauls (unless video was missing). Catch was defined as anything seen by an EM reviewer, excluding free-moving marine birds and mammals alongside the vessel. 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.

Catch that was kept on the vessel (excluding use as bait or food) was considered retained; otherwise, catch was recorded as discarded<sup>1</sup>. Discards included marine organisms that fell off or out of fishing gear before it came onboard the vessel, or that were free-floating on the surface. 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 the gear (i.e., without visible shaking or other interaction by a crew member, or without hitting the

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<sup>1</sup> 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.

roller) was defined as unintentional. All other discards were categorized as intentional. If a halibut was discarded, reviewers assessed the release method and condition for each fish.

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**

Twenty-five longline vessels participated in the 2016 pre-implementation EM project. EM data was collected on 34 halibut trips, 12 Pacific cod trips, and 31 sablefish trips containing 230, 160 and 167 hauls respectively (Table 1). Some vessels participated in more than one fishery. The data spanned 165 halibut sea days, 49 Pacific cod sea days, and 143 sablefish sea days for a total of 357 sea days with trips averaging 4.9, 4.1 and 4.6 days respectively.

**Table 1.** Summary of EM monitored fishing activity for 2016.

<b>Data Summary</b>	<b>Longline Halibut</b>	<b>Longline Pacific Cod</b>	<b>Longline Sablefish</b>	<b>All Fisheries</b>
Vessels	17	3	12	<b>25</b>
Trips	34	12	31	<b>77</b>
Hauls	230	160	167	<b>557</b>
Sea Days	165	49	143	<b>357</b>
Average Trip Length	4.9	4.1	4.6	<b>4.6</b>

## **Effort Log**

Seventy-two of the 77 trips (94%) had a complete logbook submitted with the video data (Table 2). Five (6%) had no logbook submitted.

**Table 2.** Logbook submissions.

<b>Effort Log Completed</b>	<b>Longline Halibut</b>	<b>Longline Pacific Cod</b>	<b>Longline Sablefish</b>	<b>Total</b>	<b>Percent Total</b>
Yes	32	10	30	<b>72</b>	<b>94%</b>
No	2	2	1	<b>5</b>	<b>6%</b>
Total	34	12	31	<b>77</b>	<b>100%</b>

## Data quality

Aspects of data quality including video and sensor completeness, overall data confidence, and image quality were noted by reviewers for every haul (Table 3).

About half of trips and about a third of hauls had video gaps during fishing activity, but in only one case was video missing for an entire haul. Incomplete video generally resulted from video ending before catch handling ended (47% of hauls with incomplete video) or from intermittent gaps in video coverage (42% of hauls with incomplete video). Both of these issues suggest technical problems relating to the set-up of the EM system. Some of the specific problems noted by reviewers were incorrect sensor settings and the video set to shut off too soon after the haul was completed; these issues were reported to AMR technicians and resolved during the course of the year. In general, video data was somewhat more likely to be incomplete on the first trip that a boat took with an EM system (Figure 1). The current EMI software does not allow PSMFC to quantify the length of video gaps, however AMR is currently working on changes that will allow this quantification.

Data confidence was rated as high or medium for 98% of the 557 reviewed hauls. The Pacific cod fishery had a higher proportion of hauls of medium or low quality (39% and 4% respectively), than the halibut fishery (5% medium and >1% low quality hauls) or the sablefish fishery (7% medium and 2% low quality hauls). All of the hauls with low confidence were due to image quality.

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

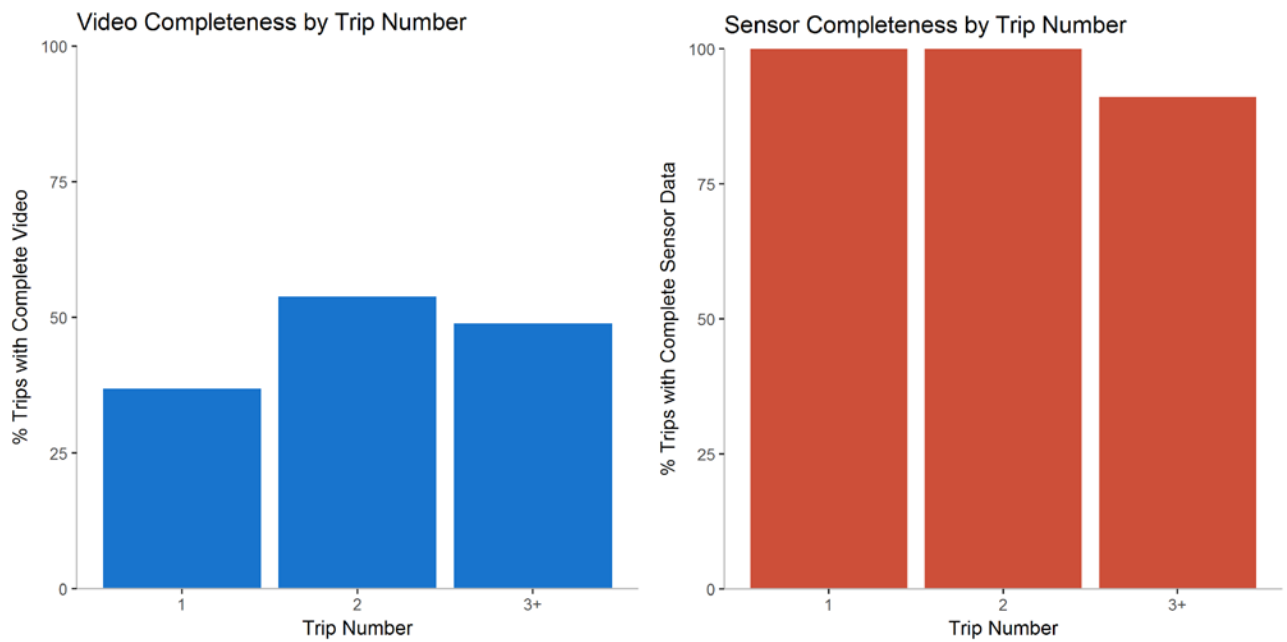
### Trip Level Data Quality

	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total
<b>Video Complete</b>				
Number of trips	14	4	18	<b>36</b>
<i>Percent of trips</i>	41%	33%	58%	<b>47%</b>
<b>Sensor Data Complete</b>				
Number of trips	34	9	30	<b>73</b>
<i>Percent of trips</i>	100%	75%	97%	<b>95%</b>

**Table 3, cont.** Data quality.

**Haul Level Data Quality**

	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total
<b>Haul Video Completeness (number of hauls)</b>				
Video complete - Entire haul recorded	177	97	142	416
Intermittent gaps in video coverage	2	55	2	59
Video ends before catch handling ends	46	4	16	66
Video starts after haul start	5	3	7	15
No video		1		1
<b>Catch Video Completeness (number of hauls)</b>				
Complete - All catch brought onboard was recorded	227	101	166	494
Incomplete - Part of catch not recorded	3	59	1	63
<b>Data Confidence from Video (Number of Hauls)</b>				
High	217	90	153	460
Medium	12	63	11	86
Low	1	6	3	10
Unusable				
No Video		1		1
<b>Image Quality (Number of Hauls)</b>				
High	202	97	147	446
Medium	27	45	17	89
Low	1	17	3	21
Unusable				
No Video		1		1
<b>Primary Reason for Medium Image Quality (Number of Hauls)</b>				
Banding/Scrambling/False Color	2			2
Glare			3	3
Dirty Cameras	3	2		5
Night Lighting	5	5	1	11
Obstruction			3	3
Intermittent Gaps in Video Coverage	11	27	2	40
<b>Primary Reason for Low Image Quality (Number of Hauls)</b>				
One or more cameras not working		11	3	14
Intermittent Gaps in Video Coverage	1	6		7



**Figure 1.** Video and sensor completeness in relation to the number of trips the electronic monitoring system had been on a specific vessel.

### 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 just under 30 minutes). The review rate in the Pacific cod fishery was slower and close to real time (e.g., one hour of catch handling could be reviewed in just under an hour).

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	230	160	167
Average Sort Min/Haul	143	117	219
Average Review Min/Haul	64	107	103
Average Review Min/Sort Min	0.48	0.93	0.48



## Seabird Deterrents

Streamer lines are used as deterrents to seabirds on longline vessels. In 2016, 77% of trips were confirmed to have used a streamer line. For 14% of trips no streamer line was used, while in the remaining 8% of trips the presence or absence of a streamer line could not be determined.

**Table 5.** Presence of streamer lines on EM monitored trips.

<b>Streamer Line Status</b>	<b>Longline Halibut</b>	<b>Longline Pacific Cod</b>	<b>Longline Sablefish</b>	
Streamer Line Present	29	9	27	<b>65</b>
No Streamer Line	4	1	0	<b>12</b>
Unknown	1	2	4	<b>7</b>
Percent Trips with Streamer Line	85%	75%	87%	<b>77%</b>

## 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 6). Video reviewers identified a high proportion of retained and discarded catch to species. Exceptions were generally species groups that are known to be problematic, such as shortspine and longspine thornyheads, shortraker and roughey rockfishes, and arrowtooth and Kamchatka flounders. There were also 7 rockfish that were recorded as “Rockfish – unidentified”, 6 that were recorded as “Rockfish, Dark unidentified” and 70 that were recorded as “Rockfish – Small Red unidentified” out of the total 17,150 recorded rockfish.

For most discarded species, the majority of discards were discarded after interaction with the vessel or a crew member (Table 6). Interactions included the crew member throwing the fish overboard after the fish came onboard; a crew member shaking the line or manipulating the hook to release the fish before the fish came onboard; or the fish hitting the vessel and falling back into the water while no crew was attending the line. Seventeen percent of the sablefish discards in the sablefish fishery occurred with no interaction with the vessel or crew (dropped off the line).

**Table 6.** Counts of video recorded retained and discarded catch.

Species	Longline Halibut					Longline Pacific Cod					Longline Sablefish				
	Retained	Discarded			Unknown	Retained	Discarded			Unknown	Retained	Discarded			Unknown
		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	
<b>Sablefish</b>	3,482	785	29	-	-	10	176	1	-	1	44,977	1,731	351	-	2
<b>Pacific halibut</b>	11,647	10,338	219	-	-	210	4,184	26	-	1	861	2,183	28	-	1
<b>Pacific cod</b>	870	381	10	663	-	37,779	465	186	-	1	92	12	1	6	-
<b>Lingcod</b>	209	227	4	-	-	3	25	1	-	-	10	1	1	-	-
<b>Flatfish</b>															
Flatfish - unidentified	-	1	2	-	-	-	159	3	-	2	-	7	-	-	-
Flounder, Arrowtooth	17	81	-	26	-	5	202	1	2	-	16	178	3	3	-
Flounder, Kamchatka	3	1	-	3	-	-	8	-	-	-	1	4	-	-	-
Flounder, Kamchatka/Arrowtooth - unidentified	51	254	10	83	-	7	500	7	-	-	*	347	5	98	-
Flounder, Kamchatka/Arrowtooth Total	71	336	10	112	-	12	710	8	2	-	13	529	8	101	-
Sole, Dover	-	2	-	-	-	-	-	-	-	-	-	13	-	-	-
Sole, Flathead	-	1	-	-	-	*	120	1	-	1	-	2	-	-	-
Sole, Petrale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sole, Rock Sole unidentified	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-
<b>Other Fish</b>															
Pollock (Walleye Pollock)	1	2	-	-	-	1,181	-	14	-	-	-	-	-	-	-
Grenadier (Rattail), Giant	-	8	1	-	-	-	-	-	-	-	5	1,897	96	83	-
Grenadier, (Rattail) - unidentified	1	115	6	1	-	-	1	-	-	-	103	11,967	478	1,636	-
Flatnose, Pacific (Codling)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Greenling - unidentified	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ratfish, Spotted	2	76	-	-	-	-	2	-	-	-	-	6	-	-	-
Ronquil/Searcher - unidentified	2	2	-	-	-	-	17	-	-	-	-	-	-	-	-
Roundfish - unidentified	-	2	4	-	-	10	70	12	-	1	-	28	21	-	-
Sculpin - Myoxocephalus unidentified	2	45	-	9	-	-	41	2	-	-	-	-	-	-	-
Sculpin - unidentified	4	897	1	56	-	3	2,634	8	-	2	-	-	-	-	-
Sculpin, Bigmouth	-	1	-	-	-	-	1	1	-	-	-	-	-	-	-
Sculpin, Great	-	50	1	2	-	1	100	-	-	-	-	-	-	-	-
Sculpin, Irish Lord - unidentified	-	73	-	5	-	-	78	-	-	-	-	-	-	-	-
Sculpin, Red Irish Lord	-	29	-	2	-	-	14	-	-	-	-	-	-	-	-
Sculpin, Yellow Irish Lord	-	236	-	5	-	3	905	-	-	-	-	-	-	-	-
Fish head /lips or parts	1	16	-	-	-	-	7	-	-	-	4	102	1	-	-
Fish - unidentified	-	1	4	-	-	6	57	2	-	-	-	1	1	-	-

\*The count recorded as retained and later discarded for this species exceeded the number that were recorded as initially retained resulting in a negative number; this type of error can occur if one of the fish is either identified at a different taxonomic level, misidentified, or not recorded. The number retained is considered to be zero.

**Table 6, cont.** Counts of video recorded retained and discarded catch.

Species	Longline Halibut				Longline Pacific Cod				Longline Sablefish				
	Retained	Discarded			Retained	Discarded			Retained	Discarded			Unknown
		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	
<b>Rockfish and Thornyheads</b>													
Rockfish - unidentified	-	3	1	-	-	3	-	-	-	-	-	-	-
Rockfish, Black	83	8	-	-	34	1	-	-	1	-	-	-	-
Rockfish, Canary	23	2	1	-	1	-	-	-	-	1	-	-	-
Rockfish, Dark unidentified	1	5	-	-	-	-	-	-	-	-	-	-	-
Rockfish, Dusky (was Light Dusky)	30	23	-	-	4	8	-	-	15	4	-	-	-
Rockfish, Northern				-									
Rockfish, Quillback	299	85	3	-	-	20	1	-	-	-	-	-	-
Rockfish, Red Banded	235	51	1	-	4	1	-	-	8	55	1	-	-
Rockfish, Redstripe	-	-	-	-	-	-	-	-	1	-	-	-	-
Rockfish, Rosethorn	1	1	-	-	-	-	-	-	-	-	-	-	-
Rockfish, Silvergray	15	14	-	-	13	1	-	-	-	1	-	-	-
Rockfish, Small Red unidentified	5	18	5	-	10	1	-	-	20	6	5	-	-
Rockfish, Tiger	10	-	-	-	1	1	-	-	-	-	-	-	-
Rockfish, Yelloweye	1,116	320	9	-	-	7	-	-	88	8	-	-	-
<i>Rockfish, Rougheye</i>	79	18	1	-	15	-	-	-	472	185	6	-	-
<i>Rockfish, Shortraker</i>	65	159	8	-	9	2	-	-	629	150	8	-	-
<i>Rockfish, Shortraker/Rougheye unid.</i>	226	52	3	-	33	1	-	-	984	208	23	-	-
Rockfish, Shortraker/Rougheye Total	370	229	12	-	57	3	-	-	2,085	543	37	-	-
<i>Rockfish, Longspine Thornyhead</i>				-									
<i>Rockfish, Shortspine Thornyhead</i>	246	12	1	-	2	-	-	-	1,734	361	23	-	-
<i>Rockfish, Thornyhead unidentified</i>	797	113	8	-	1	-	-	-	6,118	1,569	136	-	-
Rockfish, Thornyheads Total	1,043	125	9	-	3	-	-	-	7,852	1,930	159	-	-

**Table 6, cont.** Counts of video recorded retained and discarded catch.

Species	Longline Halibut				Longline Pacific Cod				Longline Sablefish					
	Retained	Discarded			Unknown	Retained	Discarded			Unknown	Retained	Discarded		
		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
<b>Shark</b>														
Shark, Pacific Sleeper (Mud)	-	38	12	-	-	-	5	-	-	-	-	-	-	
Shark, Spiny Dogfish	2	4,717	13	1	-	-	237	4	-	-	3	1,228	22	
<b>Skate</b>														
Ray, (Skate) - unidentified	-	1	2	-	-	1	17	5	-	-	-	-	-	
Skate - Soft Snout unidentified	1	253	-	-	-	7	287	2	-	-	1	155	2	
Skate - Stiff Snout unidentified	-	-	-	-	-	-	6	-	-	-	-	-	-	
Skate, Alaska	-	15	-	-	-	-	45	-	-	-	-	10	-	
Skate, Aleutian	-	47	-	-	-	6	35	-	-	-	-	14	1	
Skate, Bering	-	2	-	-	-	-	32	-	-	-	-	-	-	
Skate, Big	*	609	24	-	-	312	706	10	-	1	-	12	1	
Skate, Longnose	1	985	5	-	-	263	447	9	-	-	-	214	4	
Skate, Roughtail	-	1	-	-	-	-	-	-	-	-	1	162	-	
<b>Crab</b>														
Crab - unidentified (Family Unknown)	1	1	-	-	-	-	-	-	-	-	-	1	-	
Crab, King - unidentified	-	-	-	-	-	-	-	-	-	-	-	1	-	
Crab, King, Couesi	-	-	-	-	-	-	-	-	-	-	-	2	-	
Crab, Tanner - Unidentified	-	1	-	-	-	-	-	-	-	-	-	16	1	
<b>Coral</b>														
Bryozoans/Coral Unid	-	12	1	-	-	-	3	-	-	-	13	53	1	
Coral, Red Tree	-	6	-	-	-	-	1	-	-	-	-	3	-	
<b>Invertebrate</b>														
Invertebrate - unidentified	-	22	1	-	-	-	96	2	-	-	1	51	1	
Sand Dollars, Sea Urchins	-	95	1	-	-	-	9	-	-	-	-	2	-	
Sea Anemone - unidentified	-	32	-	-	-	-	84	-	-	-	-	10	-	
Sea Whip, Sea Pen - unidentified	-	16	-	-	-	2	697	3	-	-	2	224	-	
Snail - unidentified	-	78	-	-	-	-	5	2	-	-	-	-	-	
Snail, Empty Shell	-	-	-	-	-	-	4	-	-	-	-	-	-	
Sponge - unidentified	-	4	-	-	-	-	1	-	-	-	-	4	-	
Seaworm - unidentified	-	-	-	-	-	-	-	-	-	-	-	87	2	
Octopus - unidentified	3	39	7	-	-	13	8	19	-	-	1	5	1	
Starfish - unidentified	-	84	6	-	-	2	62	2	-	-	-	13	2	
Starfish, Basket	-	43	1	-	-	1	8	-	-	-	3	79	-	
Starfish, Brittle	-	6	-	-	-	-	-	-	-	-	1	533	2	
Starfish, Sunstar	4	1,078	31	-	-	4	3,028	193	-	4	3	25	-	
<b>Bird</b>														
Albatross, Black-footed	-	4	-	-	-	-	-	-	-	-	-	-	-	
Fulmar, Northern	-	-	-	-	-	-	2	-	-	-	-	-	-	
Gull - unidentified	-	-	-	-	-	-	-	-	-	-	-	2	-	
<b>Misc. - rocks, mud, garbage, etc.</b>	4	-	-	-	-	-	174	1	-	-	6	119	2	

\* The count recorded as retained and later discarded for this species exceeded the number that were recorded as initially retained resulting in a negative number; this type of error can occur if one of the fish is either identified at a different taxonomic level, misidentified, or not recorded. The number retained is considered to be zero.

## Pacific halibut

Reviewers recorded the method of release and the condition of each individual halibut at the time of release. These release methods and condition ratings were identical to those used by the observer program with the addition of three new release methods after consulting with the observer program: “Hand release”, “Other careful release” and “Other non-careful release”. The majority (88%) of Pacific halibut were released carefully using the “Hook twisting and shaking” method (Tables 7 and 8). The next largest release method (5%) was the “Hand Release” method.

**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	0	0	1
		Moderate	0	0	1
		Severe	1	0	0
		Unknown	2	0	4
	Cut the gangion	Dead/Sand Fleas/Bleeding	2	0	0
		Minor	21	4	4
		Moderate	0	1	0
	Gaff	Unknown	7	13	2
		Dead/Sand Fleas/Bleeding	1	0	3
		Moderate	49	0	1
	Hand release	Severe	3	1	0
		Unknown	184	0	30
		Dead/Sand Fleas/Bleeding	4	0	0
		Minor	479	4	90
	Hit the roller	Moderate	0	0	1
		Severe	1	0	0
		Unknown	175	8	11
		Dead/Sand Fleas/Bleeding	2	0	0
	Hook straightening	Minor	42	1	6
		Moderate	17	0	0
		Unknown	45	17	35
	Hook twisting and shaking	Minor	20	0	0
		Unknown	15	0	1
		Dead/Sand Fleas/Bleeding	44	33	14
		Minor	5680	2053	1064
	Other careful release	Moderate	25	18	8
		Severe	9	2	1
		Unknown	3024	1895	768
		Minor	1	0	1
	Other non-careful release	Unknown	2	2	0
Minor		28	10	17	
Moderate		4	8	1	
Unknown	Severe	0	1	0	
	Unknown	38	38	5	
	Dead/Sand Fleas/Bleeding	5	0	0	
	Minor	20	8	8	
Damaged	Cut the gangion	Moderate	0	2	0
		Unknown	84	58	20
	Gaff	Dead/Sand Fleas/Bleeding	6	0	0
		Dead/Sand Fleas/Bleeding	9	0	21
	Hand release	Dead/Sand Fleas/Bleeding	30	0	6
	Hit the roller	Dead/Sand Fleas/Bleeding	0	0	1
	Hook straightening	Minor	2	0	0
		Dead/Sand Fleas/Bleeding	239	5	56
	Hook twisting and shaking	Minor	4	0	0
		Moderate	1	0	0
		Severe	2	0	0
		Unknown	4	1	0
Other careful release	Dead/Sand Fleas/Bleeding	1	0	0	
Other non-careful release	Dead/Sand Fleas/Bleeding	6	0	2	
Unknown	Dead/Sand Fleas/Bleeding	0	1	0	
DropOffAboveWater	No Selection	No Selection	205	24	25
DropOffBelowWater	No Selection	No Selection	14	2	3
<b>TOTAL</b>			<b>10,557</b>	<b>4,210</b>	<b>2,211</b>

**Table 8.** Pacific halibut counts for each release method by target fishery.

Release Method	Longline Halibut		Longline Pacific Cod		Longline Sablefish		All Fisheries	
	Count	%	Count	%	Count	%	Total	% of total
Crucifying	3	> 1%			6	> 1%	9	> 1%
Cut the gangion	36	> 1%	18	> 1%	6	> 1%	60	> 1%
Gaff	246	2%	1	> 1%	55	2%	302	2%
Hand release	689	7%	12	> 1%	108	5%	809	5%
Hit the roller	106	1%	18	> 1%	42	2%	166	1%
Hook straightening	37	> 1%			1	> 1%	38	> 1%
Hook twisting and shaking	9,032	86%	4,007	95%	1,911	86%	14,950	88%
No Selection	219	2%	26	1%	28	1%	273	2%
Other careful release	4	> 1%	2	> 1%	1	> 1%	7	> 1%
Other non-careful release	76	1%	57	1%	25	1%	158	1%
Unknown	109	1%	69	2%	28	1%	206	1%
<b>Grand Total</b>	<b>10,557</b>		<b>4,210</b>		<b>2,211</b>		<b>16,978</b>	

**Table 9.** Pacific halibut counts for each release condition by target fishery.

Release Condition	Longline Halibut		Longline Pacific Cod		Longline Sablefish		All Fisheries	
	Count	%	Count	%	Count	%	Total	% of total
Dead/Sand Fleas/Bleeding	349	3%	39	1%	103	5%	491	3%
Minor	6,297	60%	2,080	49%	1,191	54%	9,568	56%
Moderate	96	1%	29	1%	12	1%	137	1%
Severe	16	> 1%	4	> 1%	1	> 1%	21	> 1%
Unknown	3,580	34%	2,031	48%	876	40%	6,487	38%
No Selection	219	2%	27	1%	28	1%	274	2%
<b>Grand Total</b>	<b>10,557</b>		<b>4,210</b>		<b>2,211</b>		<b>16,978</b>	

Most halibut were judged to have minor damage at the time of release (56%; Table 9). 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 40% of the discarded halibut in all three fisheries. 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.

## **References**

EM Workgroup (2016) Draft 2016 Electronic Monitoring Pre-Implementation Plan. [http://www.npfmc.org/wp-content/PDFdocuments/conservation\\_issues/Observer/EM/EM2016Plan915.pdf](http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/EM2016Plan915.pdf)

## Appendix 1. Effort log given to skippers to fill out on each trip

2016 EM Program Effort Logbook

<b>Vessel Name:</b>		<b>Start Port:</b>
<b>ADF&amp;G Number:</b>	<b>Trip Start Date (mm/dd):</b>	<b>Offload Port:</b>
<b>Operator Name:</b>	<b>Offload Date (mm/dd):</b>	<b>Did you haul at night?</b> Y   N

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

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