

Alaska Fixed Gear Electronic Monitoring Report for the 2023 Season

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Publication Date: April 2024

Contents

Introduction.....	3
Vessel Participation	3
Electronic Monitoring Systems.....	3
Effort Logs.....	3
Electronic Monitoring Video Review	4
Results	5
Table 1. Summary of EM monitored fishing activity for 2023.....	5
Table 2. Logbook submissions.....	5
Figure 1. Video and sensor completeness in relation to the number of trips the electronic monitoring system had been on a specific vessel.....	6
Table 3. Data quality including video and sensor completeness, data quality, and image quality.....	6
Table 4. Review rate by target fishery. Review of both retained and discarded catch included.....	8
Table 5. Presence of streamer lines on EM monitored longline trips.....	8
Table 6. Pacific halibut counts for each release method by target fishery.....	9
Table 7. Pacific halibut counts for each release condition by target fishery.....	9
References.....	11
Appendix 1. Longline and Pot effort logs given to skippers to fill out on each trip.....	12
Appendix 2. Counts of video recorded retained and discarded catch.....	14
Appendix 3. Pacific halibut counts for each type of discard, release method, and release condition for the three target fisheries.....	21

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) established an intent to incorporate electronic monitoring (EM) as a tool of the North Pacific Observer Program for catch estimation in the fixed gear groundfish and halibut fisheries. In 2018, the NPFMC EM program fully incorporated EM in regulation as a monitoring option for fixed gear vessels in the partial coverage category of the North Pacific Observer Program.

The Pacific States Marine Fisheries Commission (PSMFC) began developing the Electronic Monitoring program in 2012 to evaluate the efficacy of using EM in the West Coast Trawl Rationalization Program. This effort ultimately led to the implementation of the current West Coast EM regulatory program in 2024. PSMFC has participated in the NPFMC working group and has conducted EM data review for the Alaska fixed gear EM program since 2014.

The vessels in the partial coverage category using EM are small boats (<60' LOA) fishing with longline or pot gear and targeting sablefish (*Anoplopoma fimbria*), Pacific cod (*Gadus macrocephalus*) and Pacific halibut (*Hippoglossus stenolepis*). Archipelago Marine Research (AMR) and Saltwater Inc. (SWI) provided and installed the EM systems, and PSMFC conducted the EM data review. This report outlines the EM data collected throughout 2023.

Vessel Participation

Vessels in the partial coverage category that use fixed gear have the option to use EM instead of carrying an onboard observer. Vessel operators must register each fishing trip in ODDS before departure and will receive notification via ODDS if the trip is selected for EM trip coverage and review. Vessels made landings in ports including Homer, Kodiak, Sand Point, and Sitka.

Electronic Monitoring Systems

AMR and SWI were contracted to provide and install EM systems, and to provide technical and logistical support. The on-board systems included a sensor to capture hydraulic pressure activity; a GPS to capture locations from which the speed of the vessel was calculated; and 3-5 cameras.

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 two 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).

Effort Logs

Effort logs were distributed to all of the participating vessels. Images of effort logs were transmitted to PSMFC. Longline and Pot effort log examples are provided in [Appendix 1](#).

Electronic Monitoring Video Review

PSMFC reviewers used FishVue Interpret™ 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. A configuration of this software allows review of both the AMR and SWI EM data.

The start and end locations, dates, 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 longline gear trip. Reviewers would randomly check at least 2 setting events to determine if streamer lines were used or not, and would record use as 'partial' if streamer lines were used on one haul, but not the other.

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 quality and image quality for each haul. "Data Quality" was defined as the overall ability of the reviewer to effectively quantify and accurately identify catch data. Data quality 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 a subset of hauls. In 2023, one of every three hauls were reviewed for trips with three or more hauls, and all hauls were reviewed for trips with less than three hauls. Catch was defined as anything seen by an EM reviewer, excluding free-moving marine birds and mammals alongside the vessel. The reviewers were instructed to record species to the lowest identifiable taxonomic level or grouping as required by the Alaska region.

Catch that was kept on the vessel (excluding use as bait or food) was considered retained; otherwise, catch was recorded as discarded¹. 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 roller) was defined as unintentional. All other discards were categorized as intentional. If a halibut was discarded, reviewers assessed the release method and condition when longline gear was used, and the condition only when pot gear was used.

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.

¹ 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.

Results

In 2023, there were 103 fixed gear vessels that participated in the EM program, completing 149 longline trips and 62 pot trips. By target species, there were 107 halibut trips, 32 Pacific cod trips, and 72 sablefish trips ([Table 1](#)). The data spanned 541 halibut sea days, 147 Pacific cod sea days, and 410 sablefish sea days for a total of 1,098 sea days with trips averaging 5.3 days across all fisheries.

There were 7,190 total hauls that comprised the reviewed trips, with 2,429 of these hauls reviewed for catch-level data collection. All catch data presented is from this subset of hauls.

Table 1. Summary of EM monitored fishing activity for 2023.

	Halibut Target		Pacific Cod Target		Sablefish Target				All Fisheries
	Fixed Hook Longline	Snap Longline	Snap Longline	Single Pot - Rigid	Fixed Hook Longline	Snap Longline	String Pot - Rigid	String Pot - Slinky	
Vessels	37	38	7	9	8	7	5	21	103
Trips	55	52	19	13	14	9	9	40	211
Hauls	700	379	273	5,004	67	82	190	495	7,190
Reviewed Hauls	240	138	91	1,668	32	24	63	173	2,429
Sea Days	329	212	92	55	59	51	70	230	1,098
Average Trip Length (Days)	6.0	4.1	4.8	4.2	4.2	5.7	7.8	5.8	5.3

Effort Log

A complete logbook (either the EM effort log, or an alternative such as the IPHC logbook) was submitted with the video data for 209 of the 211 trips (99%; [Table 2](#)). The remaining 2 trips had no logbook submitted.

Table 2. Logbook submissions.

Logbook Submitted	Halibut Target		Pacific Cod Target		Sablefish Target				Total	%
	Fixed Hook Longline	Snap Longline	Snap Longline	Single Pot - Rigid	Fixed Hook Longline	Snap Longline	String Pot - Rigid	String Pot - Slinky		
Yes	55	50	19	13	14	9	9	40	209	99%
No	-	2	-	-	-	-	-	-	2	1%
Total	55	52	19	13	14	9	9	40	211	100%

Data quality

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

Video gaps were present in 18% of fixed gear trips, and 3% of hauls had video gaps that occurred during fishing activity; most often these gaps resulted from video ending before catch handling ended, video starting after catch handling had begun, one or more cameras not working, or from intermittent gaps in video coverage. All of these issues suggest technical problems relating to the set-up of the EM system. In the past, video data was somewhat more likely to be incomplete on the first trip that a boat took with an EM system ([Figure 1](#)), though that was not the case in 2023.

Data quality was rated as high or medium for 86% of the 2,429 reviewed hauls. The most common reason for low data quality was video completeness, followed by glare.

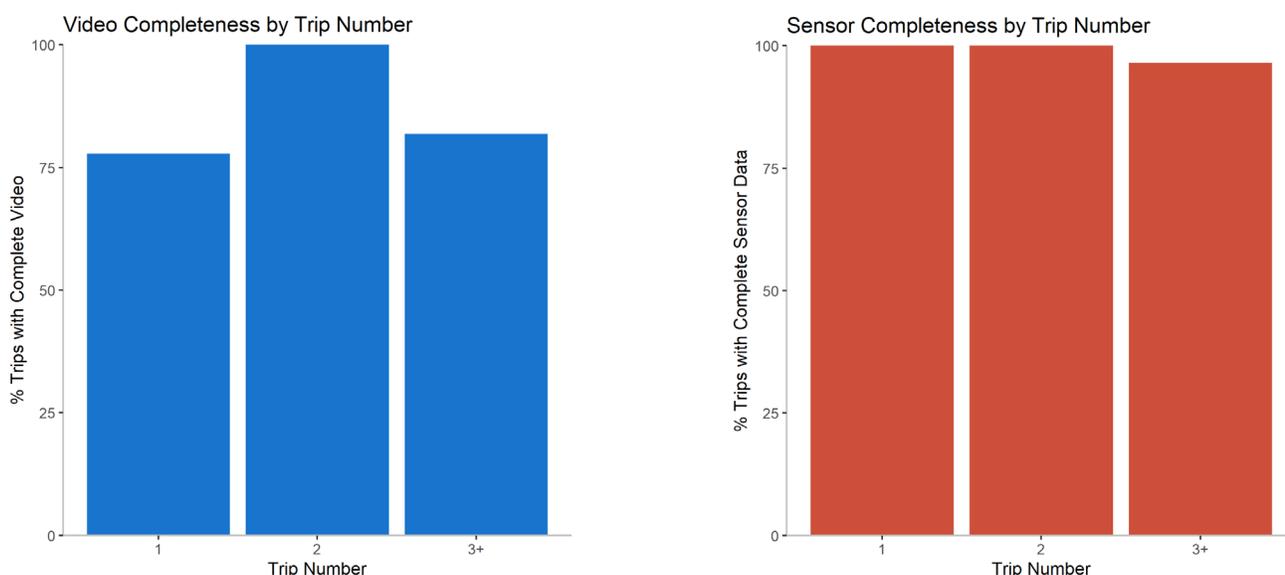


Figure 1. Video and sensor completeness in relation to the number of trips the electronic monitoring system had been on a specific vessel

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

Trip Level Data Quality

	Halibut Target		Pacific Cod Target		Sablefish Target				Total
	Fixed Hook Longline	Snap Longline	Snap Longline	Single Pot - Rigid	Fixed Hook Longline	Snap Longline	String Pot - Rigid	String Pot - Slinky	
Video Complete									
Number of trips	39	43	18	10	10	7	8	38	173
Percent of trips	71%	83%	95%	77%	71%	78%	89%	95%	82%
Sensor Data Complete									
Number of trips	52	52	18	13	12	8	9	40	204
Percent of trips	95%	100%	95%	100%	86%	89%	100%	100%	97%

Table 3, cont. Data quality.

Haul Level Data Quality

Haul Video Completeness (number of hauls)	Halibut Target		Pacific Cod Target		Sablefish Target				Total
	Fixed Hook Longline	Snap Longline	Snap Longline	Single Pot - Rigid	Fixed Hook Longline	Snap Longline	String Pot - Rigid	String Pot - Slinky	
Video complete - Entire haul recorded	209	126	90	1,371	28	20	62	171	2,077
Intermittent gaps in video	2	1	-	-	2	-	-	1	6
Video starts after haul start	1	-	-	-	-	-	-	-	1
Video ends before catch handling ends	10	1	-	3	-	-	-	1	15
Video ends before fish stowed (handling complete)	18	7	1	-	1	1	1	-	29
1+ cameras not working	-	3	-	294	1	3	-	-	301

**Catch Video Completeness
(number of hauls)**

Complete - All catch recorded	239	138	91	1,668	28	24	61	158	2,407
Incomplete	1	-	-	-	4	-	2	15	22

**Data Quality from Video
(Number of Hauls)**

High	206	122	67	1,314	24	21	59	152	1,965
Medium	26	15	18	53	3	-	2	3	120
Low	7	1	6	301	1	3	-	3	322
Unusable	1	-	-	-	4	-	2	15	22
No Video	-	-	-	-	-	-	-	-	-

**Image Quality
(Number of Hauls)**

High	199	114	49	1,215	20	19	48	155	1,819
Medium	32	22	30	127	8	2	14	15	250
Low	8	2	12	326	1	3	-	2	354
Unusable	1	-	-	-	3	-	1	1	6
No Video	-	-	-	-	-	-	-	-	-

**Primary Reason for
Medium Image Quality
(Number of Hauls)**

Banding/Scrambling/Color	-	1	2	-	-	-	2	-	5
Condensation	3	1	2	-	-	-	8	-	14
Dirty Cameras	-	2	10	1	-	1	1	2	17
Glare	-	1	1	85	2	-	-	-	89
Night Lighting	1	-	1	18	2	-	-	-	22
Obstruction	-	-	-	-	-	-	-	2	2
Out of Focus	4	5	-	-	-	-	-	1	10
Poor Camera Angles	-	-	-	-	-	-	-	-	-
Video completeness	17	5	-	1	1	-	1	-	25
Water Spots	7	7	16	22	5	1	2	10	70

**Primary Reason for
Low Image Quality
(Number of Hauls)**

Condensation	5	-	2	-	-	-	-	-	7
Dirty Cameras	-	-	4	-	-	-	-	-	4
Glare	1	-	3	27	1	-	-	1	33
Night Lighting	-	-	1	-	-	-	-	-	1
Obstruction	-	-	-	2	-	-	-	2	4
Out of Focus	-	2	-	-	-	-	-	-	2
Video Completeness	-	-	-	294	-	3	-	-	297
Water Spots	2	-	2	3	-	-	-	-	7

Review Rate

Review rate for halibut and sablefish target fisheries ranged from 0.62 to 0.79 minutes of review per minute of video ([Table 4](#)). The review rate in the Pacific cod target 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 longline 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.

	Halibut Target		Pacific Cod Target		Sablefish Target			
	Fixed Hook Longline	Snap Longline	Snap Longline	Single Pot - Rigid	Fixed Hook Longline	Snap Longline	String Pot - Rigid	String Pot - Slinky
Haul Count	240	138	91	1,668	32	24	63	173
Average Sort Min/Haul	115	126	98	4	164	146	104	121
Average Review Min/Haul	86	77	83	4	126	97	68	76
Average Review Min/Sort Min	0.79	0.65	0.87	0.99	0.75	0.71	0.64	0.62

Seabird Deterrents

Streamer lines are used as seabird deterrents during longline gear deployment. In 2023, 65% of longline trips were confirmed to have used a streamer line. No streamer line was used for 22% of longline trips, and streamers were partially deployed for 3% of longline trips. The presence or absence of a streamer line could not be determined for 10% of longline trips.

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

Streamer Line Status	Halibut Target		Pacific Cod Target	Sablefish Target		Total
	Fixed Hook Longline	Snap Longline	Snap Longline	Fixed Hook Longline	Snap Longline	
Streamer Line Present	32	33	12	13	7	97
No Streamer Line	13	12	6	-	2	33
Partial	2	2	-	-	-	4
Unknown	8	5	1	1	-	15
NA	-	-	-	-	-	0
<i>Percent Trips with Streamer Line</i>	58%	63%	63%	93%	78%	65%

Catch summary

Since total catch accounting is the goal for EM in the SE AK fixed gear sectors, all species of retained or discarded marine organisms were reported and summarized to the target fishery level ([Appendix 2](#)). Video reviewers identified a high proportion of retained and discarded catch to species. Exceptions were primarily those species that reviewers have been instructed to identify to a group level because they are too similar to reliably differentiate (e.g., shortraker/rougeye rockfishes, and arrowtooth/Kamchatka flounders). There were also a small proportion of rockfish that were recorded as “Rockfish – unidentified”.

For most discarded species, the majority were discarded after interaction with the vessel or a crew member ([Appendix 2](#)). 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.

Pacific halibut

Reviewers recorded the method of release (longline only) 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 (86%) of Pacific halibut were released carefully using the “Hook twisting and shaking” method ([Table 6](#) and [Appendix 3](#)). The next largest release method (10%) was a “Other non-careful release” method.

Table 6. Pacific halibut counts for each release method by target fishery.

Release Method	Pacific Halibut Target				Pacific Cod Target				Sablefish Target				All Fisheries					
	Fixed Hook Longline Count	%	Snap Longline Count	%	Snap Longline Count	%	Single Pot Count	%	Fixed Hook Count	%	Snap Longline Count	%	Pot Rigid Count	%	Slinky Pot Count	%	Total	% of total
Crucifying	200	3%	1	>1%	-	>1%	-	>1%	1	>1%	1	>1%	-	>1%	8	1%	211	2%
Cut the gangion	1	>1%	13	>1%	-	>1%	-	>1%	3	1%	-	>1%	-	>1%	-	>1%	17	>1%
Gaff	87	1%	5	>1%	-	>1%	-	>1%	2	1%	-	>1%	-	>1%	3	>1%	97	1%
Hand release	19	>1%	44	1%	4	>1%	3	3%	-	>1%	9	3%	31	21%	56	5%	166	1%
Hit the roller	239	3%	27	1%	27	1%	-	>1%	3	1%	1	>1%	-	>1%	19	2%	316	2%
Hook straightening	1	>1%	-	>1%	-	>1%	-	>1%	-	>1%	-	>1%	-	>1%	-	>1%	1	>1%
Hook twisting and shaking	5,114	71%	3,112	94%	1,913	97%	-	>1%	332	94%	248	95%	-	>1%	722	68%	11,441	86%
No Selection	14	>1%	2	>1%	1	>1%	86	89%	1	>1%	-	>1%	63	43%	143	14%	310	2%
Other careful release	26	>1%	23	1%	-	>1%	2	2%	1	1%	-	>1%	12	8%	18	2%	82	1%
Other non-careful release	1,058	15%	86	3%	29	1%	4	4%	10	3%	1	>1%	42	28%	52	5%	1,282	10%
Unknown	481	7%	7	>1%	8	>1%	2	2%	2	0%	-	>1%	-	>1%	38	4%	538	4%
Grand Total	7,240		3,320		1,982		97		355		260		148		1,059		13,254	

Table 7. Pacific halibut counts for each release condition by target fishery.

Release Condition	Pacific Halibut Target				Pacific Cod Target				Sablefish Target				All Fisheries					
	Fixed Hook Longline Count	%	Snap Longline Count	%	Single Pot Count	Snap Longline Count	%	%	Fixed Hook Count	%	Snap Longline Count	%	String Pot Count	%	Slinky Pot Count	%	Total	% of total
Dead/Sand Fleas/Bleeding	212	3%	194	6%	26	1%	3	3%	10	3%	14	5%	2	1%	25	2%	461	3%
Minor	1,598	22%	1,022	31%	452	23%	22	23%	147	41%	50	19%	-	>1%	5	>1%	3,291	25%
Moderate	8	>1%	7	>1%	5	>1%	-	>1%	-	>1%	-	>1%	-	>1%	3	>1%	20	>1%
Severe	65	1%	3	>1%	-	>1%	-	>1%	2	1%	-	>1%	-	>1%	-	>1%	70	1%
Unknown	5,343	74%	2,092	63%	1,498	76%	72	74%	193	54%	196	75%	146	99%	1,025	97%	9,540	71%
No Selection	14	>1%	2	>1%	1	>1%	-	>1%	3	1%	-	>1%	-	>1%	1	>1%	20	>1%
Grand Total	7,240		3,320		1,982		97		355		260		148		1,059		13,402	

Most halibut were judged to have minor damage at the time of release, of those that could be assessed (83% of those assessed; [Table 7](#)). 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 halibut was 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. A release condition was not possible to capture for 71% of the discarded halibut across all fisheries.

Review Turnaround Time

In 2022, the AK fixed gear EM review team was expanded from two full-time staff to three full-time staff in an effort to improve review turnaround time. An additional full-time reviewer will be added to the review team in 2024, bringing the total to four full-time review staff for the AK fixed gear EM program, to further improve turnaround time.

References

EM Workgroup (2017) Final 2017 Electronic Monitoring Pre-Implementation Plan. https://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/Final2017EMPre-impPlan.pdf

Appendix 1. Longline and Pot effort logs given to skippers to fill out on each trip.

Longline EM Effort Logbook

Vessel Name:		Start Port:
ADF&G Number:	Trip Start Date (mm/dd):	Offload Port:
Operator Name:	Offload Date (mm/dd):	ODDS Trip Number:

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		Marine Mammals Feeding on Catch?	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	Y N			
				Y N	Y N	Y N			
				Y N	Y N	Y N			
				Y N	Y N	Y N			

Pot EM Effort Logbook

Vessel Name:	Did you use string pots/slinky pots? Y N	Start Port:
ADF&G Number:	Trip Start Date (mm/dd):	Offload Port:
Operator Name:	Offload Date (mm/dd):	ODDS Trip Number:
Did you set pots at night? Y N	Did you retrieve pots at night? Y N	How much gear did you fish? (e.g., 60 pots)

Did the EM system function normally the entire trip? Y N If no, please describe any problems:	Other Trip Comments:
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Set		Retrieval		# of Pots Set	# of Pots Retrieved
Date (mm/dd)	Start Time	Date (mm/dd)	Start Time		

Appendix 2. Counts of video recorded retained and discarded catch.

Species		Pacific Cod Target							
		Single Pot			Snap Longline				
		Retained	Discarded		Unknown	Retained	Discarded		Unknown
	Interacted w/ Vessel or Crew	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard		
Rockfish and Thornyheads	Rockfish - unidentified	-	3	-	-	42	5	-	-
	Rockfish, Black	-	1	-	-	55	1	-	-
	Rockfish, Dusky (was Light Dusky)	-	2	-	-	1	1	-	-
	Rockfish, Northern	-	-	-	-	8	-	-	-
	Rockfish, Quillback	-	-	-	-	88	9	1	-
	Rockfish, Red Banded	-	-	-	-	1	-	-	-
	Rockfish, Shortraker/Rougheye unidentified	-	1	-	-	26	6	-	-
	Rockfish, Silvergray	-	-	-	-	1	-	-	-
	Rockfish, Tiger	-	-	-	-	4	-	-	-
	Rockfish, Widow	-	2	-	1	4	-	-	-
	Rockfish, Yelloweye	-	1	-	-	84	2	-	-
Sablefish	Sablefish (Black Cod)	1	99	-	1	1	220	-	-
Halibut	Halibut, Pacific	-	97	-	-	9	1,980	1	-
Pacific Cod	Cod, Pacific	36,687	152	-	13	18,987	379	192	-
Lingcod	Lingcod	1	29	-	-	1	47	-	-
Flatfish	Flatfish - unidentified	-	46	-	-	1	48	1	-
	Flounder, Kamchatka/Arrowtooth - unidentified	-	72	-	-	-	536	-	3
	Sole, Flathead	-	-	-	-	-	12	-	-
	Sole, Rock Sole unidentified	-	1	-	-	-	7	-	-
	Sole, Yellowfin	-	-	-	-	-	1	-	-
Other Fish	Fish - unidentified	-	-	-	-	-	2	-	-
	Greenling - unidentified	-	-	-	-	-	1	-	-
	Mackerel, Atka	-	20	-	-	-	-	-	-
	Pollock (Walleye Pollock)	5	35	-	-	91	30	-	1
	Prowfish	-	1	-	-	-	-	-	-
	Ratfish, Spotted	-	-	-	-	-	1	-	-
	Ronquil/Searcher - unidentified	-	-	-	-	-	1	-	-
	Roundfish - unidentified	-	5	-	-	-	7	-	-
	Sculpin - Myoxocephalus unidentified	-	6	-	-	-	9	-	-
	Sculpin - unidentified	-	74	-	-	-	6	-	-
	Sculpin, Bigmouth	-	1	-	-	-	2	-	-
Sculpin, Irish Lord - unidentified	-	193	-	-	-	74	-	-	
Wrymouth Unidentified	-	-	-	-	-	31	-	-	
Shark	Shark, Pacific Sleeper (Mud)	-	-	-	-	-	1	-	-
	Shark, Spiny Dogfish	-	-	-	-	-	403	-	-
Skate	Skate - Soft Snout unidentified	-	-	-	-	-	397	-	-
	Skate - Stiff Snout unidentified	-	-	-	-	1	12	-	-
	Skate, Big	-	-	-	-	73	854	3	-
	Skate, Longnose	-	-	-	-	155	611	1	1

Appendix 2, continued. Counts of video recorded retained and discarded catch.

Species		Pacific Cod Target							
		Single Pot			Snap Longline				
		Retained	Discarded		Unknown	Retained	Discarded		Unknown
	Interacted w/ Vessel or Crew	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard		
	Crab - unidentified (Family Unknown)	-	2	-	1	-	-	-	-
	Crab, Box	-	2	-	-	-	-	-	-
	Crab, Lyre - unidentified	-	7	-	-	-	-	-	-
	Crab, Tanner - Unidentified	-	157	-	-	-	-	-	-
Coral	Bryozoans/Coral Unid	-	-	-	-	-	1	-	-
Invertebrate	Crinoids - unidentified	-	-	-	-	-	1	-	-
	Jellyfish - unidentified	-	13	-	1	-	-	-	-
	Octopus - unidentified	25	4	87	-	-	13	3	5
	Oysters, Clams, Mussels, Scallops	-	-	-	-	-	1	-	-
	Sand Dollars, Sea Urchins	3	73	-	6	-	-	-	-
	Sea Anemone - unidentified	1	3	-	-	-	48	-	-
	Sea Whip, Sea Pen - unidentified	-	-	-	-	-	72	-	-
	Snail - unidentified	-	44	-	5	-	2	-	-
	Sponge - unidentified	-	-	-	-	-	1	-	-
	Starfish - unidentified	-	10	-	1	-	543	-	-
	Starfish, Basket	-	17	-	-	-	7	-	-
	Starfish, Brittle	-	2	-	2	-	-	-	-
	Starfish, Sunstar	1	121	-	3	-	85	-	-
Misc.	Miscellaneous - unidentified (rocks, mud, garbage, etc.)	-	12	-	1	1	11	-	-
Unknown	Unknown	-	2	-	-	-	2	-	-

Appendix 2, continued. Counts of video recorded retained and discarded catch.

Species		Pacific Halibut Target									
		Fixed Hook Longline					Snap Longline				
		Retained	Interacted w/ Vessel or Crew	Discarded Drop-off	Utilized Onboard	Unknown	Retained	Interacted w/ Vessel or Crew	Discarded Drop-off	Utilized Onboard	Unknown
Rockfish and Thornyheads	Rockfish - unidentified	43	28	2	-	-	25	10	1	-	-
	Rockfish, Black	81	105	-	-	1	5	19	-	-	-
	Rockfish, China	4	-	-	-	-	2	1	-	-	-
	Rockfish, Copper	4	-	-	-	-	-	1	-	-	-
	Rockfish, Dusky (was Light Dusky)	2	1	-	-	-	2	2	-	-	-
	Rockfish, Northern	26	3	-	-	-	-	21	-	-	-
	Rockfish, Quillback	312	177	-	-	1	185	47	-	-	-
	Rockfish, Red Banded	169	41	-	-	-	65	27	-	-	-
	Rockfish, Rosethorn	3	-	1	-	-	2	1	-	-	-
	Rockfish, Shortraker/Rougheye unidentified	927	274	10	-	-	160	185	1	4	-
	Rockfish, Silvergray	12	2	-	-	-	3	-	-	-	-
	Rockfish, Thornyhead unidentified	340	42	3	-	-	207	142	-	-	-
	Rockfish, Tiger	28	13	-	-	-	-	-	-	-	-
	Rockfish, Widow	-	3	-	-	-	1	3	-	-	-
	Rockfish, Yelloweye	1,117	304	3	1	-	778	70	3	-	-
Sablefish	Sablefish (Black Cod)	2,497	1,766	24	-	1	1,485	1,694	2	3	-
Halibut	Halibut, Pacific	7,785	7,205	35	-	1	3,312	3,311	9	-	-
Cod	Cod, Pacific	1,607	4,264	20	1,473	45	406	568	6	748	43
Lingcod	Lingcod	131	413	1	-	-	62	262	1	-	-
Flatfish	Flatfish - unidentified	-	9	-	-	-	-	6	-	-	-
	Flounder, Kamchatka/Arrowtooth - unidentified	2	667	1	53	-	32	406	-	112	-
	Sole, Dover	-	8	-	1	-	-	4	-	1	-
	Sole, Flathead	-	-	-	-	-	-	4	-	1	-
	Sole, Rock Sole unidentified	-	5	-	1	-	-	1	-	2	-
	Sole, Yellowfin	-	-	-	-	-	1	-	-	-	-
	Turbot, Greenland	-	-	-	1	-	-	-	-	-	-
Other Fish	Eelpout - unidentified	-	1	-	-	-	-	-	-	-	-
	Fish - unidentified	-	-	1	-	-	-	1	-	-	-
	Fish head /lips or parts	-	5	-	-	-	-	9	-	-	-
	Greenling - unidentified	-	-	-	1	-	-	1	-	-	-
	Grenadier (Rattail), Giant	-	11	-	-	-	-	-	-	-	-
	Grenadier, (Rattail) - unidentified	-	288	6	3	-	-	115	-	-	-
	Mackerel, Atka	-	1	-	-	-	-	-	-	-	-

Appendix 2, continued. Counts of video recorded retained and discarded catch.

Species		Pacific Halibut Target									
		Fixed Hook Longline				Snap Longline					
		Retained	Interacted w/ Vessel or Crew	Discarded Drop-off	Utilized Onboard	Unknown	Retained	Interacted w/ Vessel or Crew	Discarded Drop-off	Utilized Onboard	Unknown
	Pollock (Walleye Pollock)	9	47	-	19	-	7	12	-	6	-
	Ratfish, Spotted	-	122	-	-	-	-	19	-	8	-
	Ronquil/Searcher - unidentified	-	1	-	-	-	-	-	-	-	-
	Roundfish - unidentified	-	1	-	-	-	-	2	-	-	-
	Sculpin - Myoxocephalus unidentified	-	1,165	-	-	-	-	105	-	-	-
	Sculpin - unidentified	-	92	-	2	-	-	104	-	22	-
	Sculpin, Irish Lord - unidentified	1	795	-	11	1	1	245	-	60	-
	Wolf-eel	-	5	-	-	-	-	-	-	-	-
	Wolffish, Bering	-	1	-	-	-	-	-	-	-	-
	Wrymouth Unidentified	-	6	-	-	-	-	6	-	-	-
Shark	Shark, Blue	-	4	-	-	-	-	-	-	-	-
	Shark, Pacific Sleeper (Mud)	-	17	-	-	-	-	3	-	-	-
	Shark, Salmon	-	1	-	-	-	-	-	-	-	-
	Shark, Spiny Dogfish	-	5,773	11	211	-	1	1,895	-	138	5
Skate	Ray, (Skate) – unidentified	-	2	-	-	-	-	1	-	-	-
	Skate - Soft Snout unidentified	9	889	3	-	-	-	245	-	-	-
	Skate - Stiff Snout unidentified	-	-	-	-	-	-	1	-	-	-
	Skate, Big	5	475	-	-	-	-	689	2	1	-
	Skate, Longnose	28	1,000	4	1	-	5	754	2	-	-
Crab	Crab - unidentified (Family Unknown)	-	1	-	-	-	-	-	-	-	-
	Crab, King - unidentified	-	4	-	-	-	-	4	-	-	-
	Crab, Lyre - unidentified	-	-	-	-	-	-	1	-	-	-
	Crab, Tanner - Unidentified	-	2	-	-	-	-	5	-	-	-
Coral	Bryozoans/Coral Unid	1	52	-	-	-	-	17	-	-	-
Invertebrate	Barnacles	-	-	-	-	-	-	2	-	-	-
	Crinoids - unidentified	-	15	-	-	-	-	-	-	-	-
	Invertebrate - unidentified	-	1	-	-	-	-	1	-	-	-
	Jellyfish - unidentified	-	3	-	-	-	-	1	-	-	-
	Octopus - unidentified	-	92	10	32	-	1	20	4	4	-
	Oysters, Clams, Mussels, Scallops	-	-	-	-	-	-	1	-	-	-
	Sand Dollars, Sea Urchins	-	12	-	-	-	-	16	-	-	-

Appendix 2, continued. Counts of video recorded retained and discarded catch.

Species		Pacific Halibut Target								
		Fixed Hook Longline				Snap Longline				
		Retained	Discarded		Unknown	Retained	Discarded		Unknown	
	Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard		Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			
Sea Anemone - unidentified	-	40	-	-	-	-	27	-	-	
Sea Cucumber - unidentified	-	3	-	-	-	-	1	-	-	
Sea Whip, Sea Pen - unidentified	-	9	-	-	-	-	17	-	-	
Snail - unidentified	-	241	1	3	-	1	61	-	-	
Sponge - unidentified	-	15	-	-	-	-	9	-	-	
Starfish - unidentified	5	1,232	6	1	-	-	328	2	-	
Starfish, Basket	-	34	-	1	-	-	36	-	-	
Starfish, Brittle	-	1	-	-	-	-	-	-	-	
Starfish, Sunstar	-	922	9	-	-	-	219	1	-	
Worm - unidentified (flatworms, ribbon worms)	-	1	-	-	-	-	-	-	-	
Bird	Petrel/Shearwater - unidentified	-	-	-	-	-	1	-	-	
Misc.	Miscellaneous - unidentified (rocks, mud, garbage, etc.)	2	140	-	-	2	30	-	-	
Unknown	Unknown	1	11	2	-	-	-	1	-	

Appendix 2, continued. Counts of video recorded retained and discarded catch.

		Sablefish Target																
		Fixed Hook Longline			Snap Longline				String Pot Rigid				String Pot Slinky					
Species		Retained	Discarded		Retained	Discarded		Utilized Onboard	Retained	Discarded		Unknown	Retained	Discarded		Unknown		
			Interacted w/ Vessel or Crew	Drop-off		Interacted w/ Vessel or Crew	Drop-off			Interacted w/ Vessel or Crew	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off		Utilized Onboard	
Rockfish and Thornyheads	Rockfish - unidentified	7	-	-	-	-	-	-	-	-	-	-	16	11	-	-	1	
	Rockfish, Black	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	
	Rockfish, Northern	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Rockfish, Pacific Ocean Perch (POP)	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	
	Rockfish, Quillback	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	
	Rockfish, Red Banded	7	1	-	38	-	-	-	-	-	-	-	141	55	1	-	-	
	Rockfish, Rosethorn	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Rockfish, Shortraker/Rougheye unidentified	1,752	201	9	145	5	2	-	16	-	-	-	745	79	-	1	-	
	Rockfish, Silvergray	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rockfish, Thornyhead unidentified	767	129	4	245	79	4	-	10	1	-	-	117	30	-	-	1	
Rockfish, Yelloweye	1	-	-	4	1	-	6	-	-	-	-	13	2	-	-	-		
Sablefish	Sablefish (Black Cod)	20,287	1,032	23	5,353	308	6	-	32,166	105	1	36	62,576	696	4	1	-	
Halibut	Halibut, Pacific	168	352	3	293	260	-	-	55	148	-	-	748	1,057	2	-	6	
Cod	Cod, Pacific	-	-	-	64	3	-	3	-	-	-	-	17	-	-	-	17	
Lingcod	Lingcod	-	1	-	2	3	-	-	-	-	-	-	15	7	-	-	-	
Flatfish	Flatfish - unidentified	-	-	-	-	-	-	-	-	5	-	-	1	85	-	-	-	
	Flounder, Kamchatka/Arrowtooth - unidentified	-	89	-	9	48	-	1	-	158	2	-	-	565	-	2	-	
	Sole, Dover	-	6	-	-	1	1	-	-	9	-	-	-	147	-	2	-	
	Sole, Flathead	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
	Turbot, Greenland	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	
Other Fish	Fish - unidentified	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	
	Fish head /lips or parts	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	
	Flatnose, Pacific (Codling)	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	
	Grenadier (Rattail), Giant	1	3	-	-	-	-	-	-	-	-	-	-	14	-	-	-	
	Grenadier, (Rattail) - unidentified	1	542	6	-	716	1	293	-	39	40	-	-	472	-	32	1	
	Lamprey - unidentified	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
	Pollock (Walleye Pollock)	-	1	-	-	-	-	-	-	-	-	-	-	3	-	-	-	
	Ratfish, Spotted	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Sculpin - unidentified	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	
	Snailfish - unidentified	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	
Wrymouth Unidentified	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-		
Shark	Shark, Blue	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Shark, Spiny Dogfish	-	394	-	-	212	1	-	-	-	-	-	-	1,308	1	-	-	
Skate	Egg Case, Skate	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Ray, (Skate) - unidentified	-	-	-	-	-	-	-	-	-	-	-	-	17	1	-	-	
	Skate - Soft Snout unidentified	-	34	1	-	194	-	-	-	-	-	-	-	47	-	-	-	

Appendix 2, continued. Counts of video recorded retained and discarded catch.

Species		Sablefish Target														
		Fixed Hook Longline			Snap Longline				String Pot Rigid			String Pot Slinky				
		Retained	Discarded		Retained	Discarded			Retained	Discarded		Unknown	Retained	Discarded		Unknown
			Interacted w/ Vessel or Crew	Drop-off		Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard		Interacted w/ Vessel or Crew	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	
Skate - Stiff Snout unidentified	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Skate, Big	-	-	-	-	8	-	-	-	-	-	-	-	2	-	-	-
Skate, Longnose	-	67	-	-	101	-	-	-	-	-	-	-	131	-	-	-
Crab	Crab - unidentified (Family Unknown)	-	-	-	-	-	-	-	1	-	-	-	12	-	-	-
	Crab, King - unidentified	-	2	-	-	-	-	2	2	-	-	-	14	-	-	-
	Crab, Lyre - unidentified	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
	Crab, Rhinoceros	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Crab, Tanner - Unidentified	-	4	-	-	-	-	-	3	-	-	-	23	-	-	-
Coral	Bryozoans/Coral Unid	-	32	-	-	6	-	-	1	-	-	2	6	-	-	-
Invertebrate	Crinoids - unidentified	-	-	-	-	-	-	-	323	-	-	-	106	-	-	-
	Invertebrate - unidentified	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
	Jellyfish - unidentified	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
	Octopus - unidentified	-	-	-	1	1	-	2	3	-	-	-	7	-	-	-
	Oysters, Clams, Mussels, Scallops	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
	Sand Dollars, Sea Urchins	-	-	-	-	-	-	-	2	-	-	-	25	-	-	5
	Sea Anemone - unidentified	-	8	-	-	1	-	-	2	-	-	-	8	-	-	-
	Sea Whip, Sea Pen - unidentified	-	5	-	-	2	-	-	-	-	-	-	2	-	-	-
	Snail - unidentified	-	4	-	-	1	-	-	17	-	-	-	1,060	-	-	-
	Snail, Empty Shell	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
	Sponge - unidentified	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-
	Starfish - unidentified	1	15	-	-	5	-	-	11	-	-	1	75	-	-	1
	Starfish, Basket	-	18	-	-	-	-	-	11	-	-	-	170	-	-	-
	Starfish, Brittle	-	-	-	-	3	-	-	19	-	-	-	16	-	-	-
	Starfish, Sunstar	-	1	-	-	-	-	-	-	-	-	-	4	-	-	-
	Tunicates, Ascidians, Sea Squirts	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Bird	Fulmar, Northern	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Misc.	Miscellaneous - unidentified (rocks, mud, garbage, etc.)	-	25	-	1	9	-	-	1	5	-	1	18	-	-	-
Unknown	Unknown	-	-	1	-	-	-	-	-	-	-	-	4	-	-	-

Appendix 3. Pacific halibut counts for each type of discard, release method, and release condition for the three target fisheries.

Discard Type	Release Method	Release Condition	Halibut Target		Pacific Cod Target		Sablefish Target			
			Fixed Hook Longline	Snap Longline	Snap Longline	Single Pot Rigid	Fixed Hook Longline	Snap Longline	String Pot Rigid	String Pot Slinky
DepredatedDiscarded	Crucifying	Dead/Sand Fleas/Bleeding	34	0	0	0	1	0	0	3
	Gaff	Dead/Sand Fleas/Bleeding	4	0	0	0	0	0	0	1
		Unknown	1	0	0	0	0	0	0	0
	Hand release	Dead/Sand Fleas/Bleeding	0	2	0	0	0	0	0	0
	Hit the roller	Dead/Sand Fleas/Bleeding	3	0	0	0	0	0	0	0
	Hook straightening	Dead/Sand Fleas/Bleeding	1	0	0	0	0	0	0	0
	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	71	118	12	0	1	13	0	4
		Moderate	0	1	0	0	0	0	0	0
		Severe	0	1	0	0	0	0	0	0
	Unknown	Unknown	2	0	0	0	0	0	0	0
		Dead/Sand Fleas/Bleeding	0	0	0	3	0	0	1	0
	Other careful release	Dead/Sand Fleas/Bleeding	1	1	0	0	0	0	0	0
Other non-careful release	Dead/Sand Fleas/Bleeding	5	0	0	0	0	0	0	0	
Unknown	Dead/Sand Fleas/Bleeding	3	0	0	0	0	0	0	0	
DiscardedDamaged	Crucifying	Dead/Sand Fleas/Bleeding	4	0	0	0	0	0	0	0
	Gaff	Moderate	2	0	0	0	0	0	0	0
		Severe	59	1	0	0	2	0	0	0
		Unknown	2	1	0	0	0	0	0	0
	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	2	3	0	0	1	0	0	0
		Minor	2	0	0	0	0	0	0	0
	Other careful release	Dead/Sand Fleas/Bleeding	0	1	0	0	0	0	0	0
	Other non-careful release	Dead/Sand Fleas/Bleeding	3	2	0	0	0	0	0	0
		Severe	2	0	0	0	0	0	0	0
		Unknown	1	0	0	0	0	0	0	0
	Unknown	Dead/Sand Fleas/Bleeding	1	1	0	0	0	0	0	0
	DiscardedGeneral	Crucifying	Dead/Sand Fleas/Bleeding	1	0	0	0	0	0	0
Minor			2	0	0	0	0	0	0	0
Moderate			1	0	0	0	0	0	0	0
Unknown			154	1	0	0	0	1	0	5
Cut the gangion		Minor	1	0	0	0	1	0	0	0
		Unknown	0	13	0	0	2	0	0	0
Gaff		Dead/Sand Fleas/Bleeding	0	0	0	0	0	0	0	2
		Moderate	2	2	0	0	0	0	0	0
		Severe	3	0	0	0	0	0	0	0
		Unknown	10	1	0	0	0	0	0	0
Hand release		Dead/Sand Fleas/Bleeding	1	0	0	0	0	0	1	5
		Minor	1	16	2	0	0	8	0	0
		Unknown	17	24	2	3	0	1	30	46
Hit the roller		Minor	18	1	1	0	0	0	0	1
		Moderate	2	0	0	0	0	0	0	0
		Unknown	211	26	26	0	2	1	0	18
Hook twisting and shaking		Dead/Sand Fleas/Bleeding	7	4	0	0	0	0	0	0
		Minor	1565	1005	449	0	145	42	0	0
		Moderate	1	3	3	0	0	0	0	3
		Severe	0	1	0	0	0	0	0	0
Unknown		Unknown	3423	1918	1434	0	179	192	0	715
		Minor	0	0	0	22	0	0	0	3
No Selection		Unknown	0	0	0	61	0	0	62	135
		Dead/Sand Fleas/Bleeding	1	0	0	0	0	0	0	0
		Minor	0	0	0	0	1	0	0	1
Unknown		Unknown	24	21	0	2	0	0	12	16
		Dead/Sand Fleas/Bleeding	1	0	0	0	0	0	0	0
		Minor	2	0	0	0	0	0	0	0
Other non-careful release		Moderate	0	1	2	0	0	0	0	0
		Unknown	1013	76	26	4	8	1	42	52
		Minor	5	0	0	0	0	0	0	0
Unknown		Severe	1	0	0	0	0	0	0	0
	Unknown	466	4	8	2	2	0	0	38	
	NA	12	1	1	0	1	0	0	0	
DropOffAboveWater	Other careful release	Dead/Sand Fleas/Bleeding	0	0	0	0	0	0	1	
	Other non-careful release	Minor	2	0	0	0	0	0	0	
	Unknown	15	4	0	0	2	0	0	0	
	Unknown	Unknown	0	1	0	0	0	0	0	
DropOffBelowWater	No Selection	NA	2	1	0	0	0	0	1	
	Other non-careful release	Unknown	3	2	0	0	0	0	0	
	Unknown	Unknown	1	0	0	0	0	0	0	
DropOffBelowWater	Hook twisting and shaking	Unknown	0	0	0	2	0	1	2	
	No Selection	NA	12	0	0	6	3	0	1	
	Other careful release	Unknown	2	0	0	0	0	0	2	
SandFleasPredatedDiscarded	Crucifying	Dead/Sand Fleas/Bleeding	4	0	0	0	0	0	0	
	Gaff	Dead/Sand Fleas/Bleeding	4	0	0	0	0	0	0	
	Hand release	Dead/Sand Fleas/Bleeding	0	2	0	0	0	0	5	
	Hit the roller	Dead/Sand Fleas/Bleeding	5	0	0	0	1	0	0	
	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	41	58	13	0	6	1	0	
		Unknown	0	0	1	0	0	0	0	
	No Selection	Dead/Sand Fleas/Bleeding	0	0	0	0	0	0	4	
	Other non-careful release	Dead/Sand Fleas/Bleeding	11	1	1	0	0	0	0	
Unknown	Dead/Sand Fleas/Bleeding	4	1	0	0	0	0	0		
TOTAL			7,129	3,197	1,969	102	356	248	151	1,058