

Draft Report

Alaska Track 1:

Review of the 2014 Spring Season

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Overview

Pacific States Marine Fisheries Commission (PSMFC) launched the Electronic Monitoring (EM) program in 2012 in anticipation of the Pacific Fishery Management Council (PFMC) considering EM as a compliance monitoring tool in the newly implemented Pacific Trawl Rationalization Program. In 2014, PSMFC expanded its EM program 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.

Camera systems were installed on nine vessels beginning in March of 2014 by Archipelago Marine Research (AMR) and Saltwater, Inc. The vessels were all longline vessels targeting sablefish (*Anoplopoma fimbria*) and/or Pacific halibut (*Hippoglossus stenolepis*).

The information presented in this document pertain to the work completed to date on Track 1 - Operationalizing Deployment of EM Systems.

Definition of Catch

For the purposes of EM review, catch is defined as anything that we see that breaks the surface, excluding sea birds and marine mammals that are swimming freely alongside the vessel. If catch is kept on the vessel, it is recorded as retained, if not, it is recorded as discard. Discard 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 makes it on the vessel, or are free floating on the surface.

Some of the vessels only had rail cameras with no deck overview cameras. In those instances, fish were recorded as retained or discarded based on whether they were retained or discarded at the rail. It is important to note that it is likely that some fish brought onboard and recorded as retained were later discarded out of view of the rail cameras. In those instances where fish were initially retained and later discarded in view of the rail cameras, a discard record was created.

Providers

PSMFC contracted with both Archipelago Marine Research (AMR) and Saltwater, Inc. (Saltwater) to provide and install EM systems on the nine volunteer fishing vessels, collect data drives from the vessels, collect dockside monitoring data, collect logbooks, and provide logistical support. The vessels primarily fished out of Sitka and Homer.

Archipelago Marine Research

The on-board AMR system included a sensor to capture hydraulic pressure, a GPS to capture locations from which the speed of the vessel was calculated, and 1-4 cameras. To aid in review and interpretation of the video data, AMR provided Electronic Monitoring 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. Sensor and GPS location data were recorded every ten seconds when the system was powered on. Gaps were expected when the vessel was in port, the vessel was powered down or when the on-board software was programmed to go into sleep mode to prevent the system from draining the vessel's battery when in port or anchored overnight. Unexpected gaps includes when the vessel was turned off manually during a trip or the system lost power during a trip.

The installed systems were configured to trigger recording video when the hydraulic pressure exceeded a threshold that was set by the technician that installed the equipment and was specific to each vessel. Imagery recording would then continue for 30 minutes past the last use of those hydraulics to allow for all catch handling to be captured for each haul.

When the raw sensor and video data were received by PSMFC, annotations were made using EMI to capture start and end dates, times, and locations for trips and hauls as well as gear and catch information. The sensor and catch annotation data were imported into a Microsoft Access Database for analysis.

Saltwater, Inc.

The on-board Saltwater system included a sensor for hydraulic pressure, a GPS for location data which was stamped on the video of one of the cameras, an independent GPS data logger, and 2 cameras. One camera was situated high above to capture the entire deck in a single view, while the second camera was positioned closer to the fishing activity to get a better view for the identification of retained and discarded fish. The cameras were capable of initializing and recording either 100% of the time or only when the hydraulic sensor achieved a pressure level preset by the technician and for 15 minutes after the pressure dropped below that set level. The sensor and video data were not integrated and there was no time series recorded for the hydraulic sensor. The lack of a time series from a sensor directly integrated with fishing gear/activity made it impossible, independent of fisherman reported data (i.e. logbooks), to determine whether video was captured for all hauls completed on the trip.

One vessel carrying a Saltwater system did not have GPS locations stamped on the video images for their first delivery. This issue was corrected for subsequent deliveries.

When the raw sensor and video data were received by PSMFC, Mobotix software was used to identify trips and hauls. Since no data capture tool was provided, video reviewers recorded all information on sheets of paper that were then data entered into a database created by PSMFC. Start and end dates, times, and locations, for trips and hauls as well as gear and catch information were captured.

Dockside Monitoring

Dockside monitors were deployed 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 two providers gave slightly different instructions to the dockside monitors. The instructions, as they were given to PSMFC by the providers, are provided below.

AMR

- Document piece counts and weights of landed rockfish only.
[Comment: Skippers were not directly asked whether they discarded rockfish on each individual trip]

Saltwater

- Ask them if they discarded any rockfish.
- Top priority goes to boats which did not discard. If they did discard rockfish to stay below the MRB [*Maximum Retainable Bycatch*], ask them if the discards occurred in front of the camera. 2nd priority for a dockside unload.
- Monitor the offload to ensure no home pack escapes un-noticed. When all rockfish are off, ID to species in separate bins and count numbers by species. You can let the grader sort as long as you monitor for correct species id.

- Have plant weigh totes by species and record weight. Collect the EM set log for effort data and generally do some QA/QC with the skipper.

Dockside monitor data were transmitted by each provider to PSMFC where a spreadsheet was maintained with all dockside monitor data received. Moving forward having a single dockside monitoring process would likely make the data collected more consistent and more valuable.

Logbooks

Logbooks were distributed to all of the participating vessels by the providers. The two providers gave slightly different logbooks to the skippers of the vessels. Both providers asked skippers to report vessel name, trip number and trip start date, set number, hook size, hook spacing, skate length, and number of skates per set. Saltwater also requested trip start time, trip end date and time, the date of each haul, the number of hooks on each haul, and the begin and end times of fishing for each day. The logbooks are provided in Appendices 1 and 2. Moving forward having a single logbook would likely make the data collected more consistent and more valuable.

Logbook data are in the process of being entered, therefore video to logbook gear comparisons are not available for this report.

Review Rules

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

The rules of review were as follows:

- a. For all trips: capture #1-3 below (Metadata, Initial review and Trip data).
- b. If the video data is complete: add #4 Haul data (Metadata, Initial review and Trip data + Haul data).
- c. If the video and sensor data are both complete and dockside monitoring was conducted: add #5 Complete video review (Metadata, Initial review, Trip data and Haul data + Complete video review)

There were 5 levels of information identified:

- 1) Metadata
 - a. ADFG permit #
 - b. Date drive retrieved
 - c. Field assessment notes (Saltwater/Archipelago notes when drive was picked up)
 - d. Logbook: Y/N
- 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 data
 - a. Port code
 - b. Date/time/location start of trip
 - c. Date/time/location end of trip
- 4) Haul data
 - a. Date/time/location start of haul
 - b. Date/time/location end of haul

- c. Imagery quality:
 - i. Useful or
 - ii. Something else
- 5) Complete video review: If useful haul data (4c) and complete video & sensor (2a) and there was dockside monitoring (3b) then review capturing the following data:
 - a. Time to review
 - b. All fish species IDs to lowest level
 - c. All fish counts
 - d. All fish disposition (discarded at rail; retained at rail)
 - e. All other species
 - i. Birds, inverts, mammals
 - f. Hook counts (including empty hooks)
 - g. Skate/segment counts
 - h. For halibut:
 - i. Injury key/Release condition
 - ii. Release method

Video Review

The PSMFC video reviewers were trained by the North Pacific Groundfish Observer Program (NPGOP) on Alaska species reporting conventions including species names and species that are reported within a species grouping and not reported as individual species. These groupings were: Kamchatka/Arrowtooth flounder, northern/southern rocksole, shortraker/rougheyed rockfish, all thornyheads, all *Bathyraja* species, all *Myoxocephalus* species, all Irish lord species, all tanner crab species, all king crab species, and all grenadier species.

Video reviewers received data from AMR starting in July 2014 making feedback to the provider about camera placement, focus, and fisher behavior impossible for trips made between March and July. Saltwater began sending data drives to PSMFC soon after drives were pulled from the vessel. Feedback was provided by the video reviewers for one Saltwater vessel.

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 along with whether or not dockside monitoring was successfully completed. In the case of AMR vessels, the time series on the sensor and location data made us confident in our assessment of trips as having complete or incomplete video. For Saltwater vessels, as noted above, the lack of time series information on the sensor data made us less confident of the assessment of video as 'complete'. To assess completeness of Saltwater video, reviewers:

- 1) Assessed completeness of those hauls for which some video was captured, and
- 2) Relied on their knowledge of the fishery practices to identify video as complete for a trip.

Regardless of EM provider equipment, 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.

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.

Results

Data summary

To date, PSMFC has received EM data for 32 halibut trips and 17 sablefish trips containing 235 and 81 hauls respectively from 9 fishing vessels (Table 1). Sixteen of the halibut trips and nine of the sablefish trips had the landing monitored by a dockside monitor.

Table 2 describes the number of trips prescribed to each level of review based on the review rules, and the number of trips where review has been completed or remain to be reviewed. For all of the 7 halibut trips and 4 sablefish trips that have not been completed for catch annotation (review level 5), data has been collected through review level 4 (haul data).

For trips where video was assessed as incomplete, no pattern emerged for the reason of video failure. The reasons varied widely and in length for all of the failed trips (Table 3).

Catch summary

For the 8 trips with completed catch annotation, retained and discarded catch were also summarized to the target fishery level (Table 4). It is important to note that the dockside monitor was asked to only record landed rockfish bycatch. Given these instructions landed catch of all other species were inconsistently recorded by the dockside monitor causing the appearance of much lower or absent numbers of retained catch by the dockside monitor than the video reviewer. In the interest of presenting all available data given to PSMFC, these sporadic data were included in this report.

Results indicate that EM can be used to effectively quantify and speciate bycatch of rockfishes or rockfish groups. Video reviewers were given instruction to report thornyheads, and shortraker/rougheye rockfish at the grouping levels.

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 with more than one trip with a record of the rockfish between the two target fisheries (Figure 1). 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.

Pacific halibut

The data collected for track 1 included Pacific halibut release information. Data collected included the method of release and the condition of each individual fish at time of release (Table 5). These release methods and condition ratings were identical to those used by the observer program. The majority of released P. halibut were released carefully (Hook twisting and shaking). The next largest release method was recorded as "Unknown". Typically this method would be used to identify an unknown release method either due to the fish coming on board and going out of camera view and later released, or the video reviewer not getting a good view of the halibut as it is being removed from the hook. That accounts for 63 of the 352 "Unknown" fish released in the halibut fishery. In this instance however, the majority of fish in this category (289 of 352 fish in the halibut fishery) were carefully released by manually removing the hook by hand, but the hook was not twisted and shaken. This release method was not provided on the list of options given by the observer program and consequently were captured as "Unknown".

Tables and Figures

Table 1. Summary of data including: number of vessels, number of trips, number of hauls, haul level distribution of confidence in data from video, and reasons for low confidence or no confidence (unusable).

	Longling Halibut	Longline Sablefish
Number of Vessels		
Total	9	4

Trips

Number of Trips		
Review Level Prescribed		
1-3	11	4
1-4	11	4
1-5	10	9
Total	32	19

Hauls

Number of Hauls		
Video	235	81
Reviewed for catch in this report	24	18

Confidence in Data from Video (Number of Hauls)

High	4	9
Medium	19	9
Low	1	
Unusable		
No Video		

Reason for Low Confidence in Data from Video (Number of Hauls / Number of Vessels)

Corrupt Video Files		
Crew Catch Handling - Not in Camera View		
Poor Image Quality - Glare		
Poor Image Quality - Night Lighting	1 / 1	
Poor Image Quality - Out of Focus		
Poor Image Quality - Poor Camera Angles		
Poor Image Quality - Poor Camera Resolution		
Poor Image Quality - Water Spots		
Unclosed Video Files		
Total	1 / 1	

Table 2. 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.

Numbers of Trips (Hauls)

Review Complete?	Review Level Prescribed						Grand Total
	Longline Halibut			Longline Sablefish			
	1-3	1-4	1-5	1-3	1-4	1-5	
No			7 (83)			4 (17)	11 (100)
Yes	11 (47)	11 (81)	3 (24)	4 (25)	4 (21)	5 (18)	38 (216)
Grand Total	11 (47)	11 (81)	10 (107)	4 (25)	4 (21)	9 (35)	49 (316)

Table 3. Reason for incomplete video assessment for trips prescribed review level 1-3. The “Portion of System” that failed can either be “Video Only”, which means that the system was recording GPS and hydraulic pressure data but no video during a haul, or “Whole System Failure” which means that there was a complete lack of data from the system including missing GPS and hydraulic pressure.

Fishery	Partial or Full Trip	Reason for failed video	Portion of System	Trip Count	Duration of longest occurrence of problem for each failed trip
Longline Sablefish	Full trip	No video present/not recorded	Video Only	1	
	Partial trip	Intermittent gaps in video coverage	Whole System Failure	1	4 minutes
		No video present/not recorded	Whole System Failure	2	33 minutes - 3 days
Longline Halibut	Full trip	Intermittent gaps in video coverage	Whole System Failure	2	
		No video present/not recorded	Video Only	4	
	Partial trip	Intermittent gaps in video coverage	Video Only	1	17 minutes
		No video present/not recorded	Video Only	1	2 hours
			Whole System Failure	2	40 minutes - 10.5 hours
	Video ends before catch handling ends	Video Only	1	40 minutes	

Table 4. Counts of landed (dockside monitor), and video recorded retained and discarded catch. Gear was not assessed a disposition (No Fate). The dockside monitor was tasked with recording rockfish bycatch only. Non-rockfish species information is included for completeness. The shaded rows indicate species groupings that video reviewers were specifically given instruction to report at the grouping level.

Species	Longling Halibut				Longline Sablefish			
	Dockside Monitor	Video		Dockside Monitor	Video		No Fate	
	Retained	Retained	Discarded	Retained	Retained	Discarded		
Rockfish and Thornyheads								
Rockfish - unidentified		1						
Rockfish, Canary				1	1			
Rockfish, Quillback				2	2			
Rockfish, Red Banded	72	70	4	3	3			
Rockfish, Rose thorn	3	3		1	1			
Rockfish, Rougheye	10			11				
Rockfish, Shortraker	150			11				
Rockfish, Shortraker/Rougheye		158	8		209	10		
Rockfish, Silvergray				5	5			
Rockfish, Yelloweye	14	14		41	41			
Rockfish, Shortspine Thornyhead	66			38				
Rockfish, Thornyheads		71	33		429	58		
Sablefish	9	60	4	NA	8,765	1,079		
Pacific halibut	NA	2,185	1,860	NA	259	194		
Pacific cod	199	536	335	NA	10	3		
Lingcod	NA	27	2	4	6			
Flatfish								
Flatfish - unidentified	NA		55	NA	1	1		
Flounder, Kamchatka/Arrowtooth	NA	1	378	NA	18	54		
Sole, Dover	NA			NA		2		
Sole, Flathead	NA		6	NA				
Turbot, Greenland	NA		14	NA				
Gear								
Broken Gangion	NA			NA			66	
Empty hook	NA			NA			22,209	
Other Fish								
Fish - unidentified	NA	2		NA			4	
Fish head /lips or parts	NA		8	NA	1	36		
Grenadier, (Rattail)	NA		1	NA	1	353		
Pollock (Walleye Pollock)	NA		1	NA				
Ratfish, Spotted	NA			NA			3	
Sculpin - unidentified	NA		109	NA				
Shark								
Shark, Spiny Dogfish	NA		199	NA	154	934		
Skate								
Skate - Soft Snout unidentified	NA		37	NA	9	33		
Skate, Big	NA		238	NA		3		
Skate, Longnose	NA		290	NA	3	50		
Coral								
Bryozoans/Coral Unid	NA	1	1	NA			2	
Coral - unidentified	NA	1		NA				
Crab								
Crab, Hermit - unidentified	NA		5	NA				
Crab, Tanner	NA			NA			2	
Invert								
Invertebrate - unidentified	NA	1	1	NA				
Octopus - unidentified	NA	6	2	NA	1	1		
Oysters, Clams, Mussels, Scallops	NA		2	NA				
Sand Dollars, Sea Urchins	NA		1	NA				
Snail - unidentified	NA		9	NA				
Sponge - unidentified	NA		128	NA				
Starfish - unidentified	NA		13	NA			7	
Starfish, Basket	NA	1	1	NA				
Starfish, Brittle	NA	1	2	NA				
Starfish, Sunstar	NA		6	NA			2	
Miscellaneous - unidentified (rocks, mud, garbage, etc)	NA	1	28	NA				

Table 5. Pacific halibut counts for each type of discard, release method, and release condition for the two target fisheries.

Discard Type	Release Method	Release Condition	Longline Halibut	Longline Sablefish
General	Crucifying	Minor	16	
General	Crucifying	Moderate	21	
General	Crucifying	Severe	4	
General	Crucifying	Dead/Sand Fleas/Bleeding	2	
General	Crucifying	Unknown	11	
General	Cut the gangion	Minor	1	1
General	Gaff	Minor	4	
General	Gaff	Moderate	41	
General	Gaff	Severe	5	
General	Gaff	Dead/Sand Fleas/Bleeding	19	
General	Gaff	Unknown	8	
General	Hit the roller	Minor	19	3
General	Hit the roller	Moderate	5	1
General	Hit the roller	Severe	1	
General	Hit the roller	Dead/Sand Fleas/Bleeding	1	
General	Hit the roller	Unknown	28	
General	Hook twisting and shaking	Minor	904	163
General	Hook twisting and shaking	Moderate	53	2
General	Hook twisting and shaking	Severe	1	
General	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	33	1
General	Hook twisting and shaking	Unknown	309	
General	Unknown	Minor	195	5
General	Unknown	Moderate	11	
General	Unknown	Severe	3	
General	Unknown	Dead/Sand Fleas/Bleeding	12	
General	Unknown	Unknown	131	4
Damaged	Crucifying	Dead/Sand Fleas/Bleeding	1	
Damaged	Gaff	Dead/Sand Fleas/Bleeding		1
Damaged	Hook twisting and shaking	Minor		1
Damaged	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	3	7
Damaged	Unknown	Minor		1
Damaged	Unknown	Dead/Sand Fleas/Bleeding		1
Drop-off Above Water	Drop-off	Minor		1
Drop-off Above Water	Drop-off	Unknown	17	2
Drop-off Below Water	Drop-off	Unknown	1	

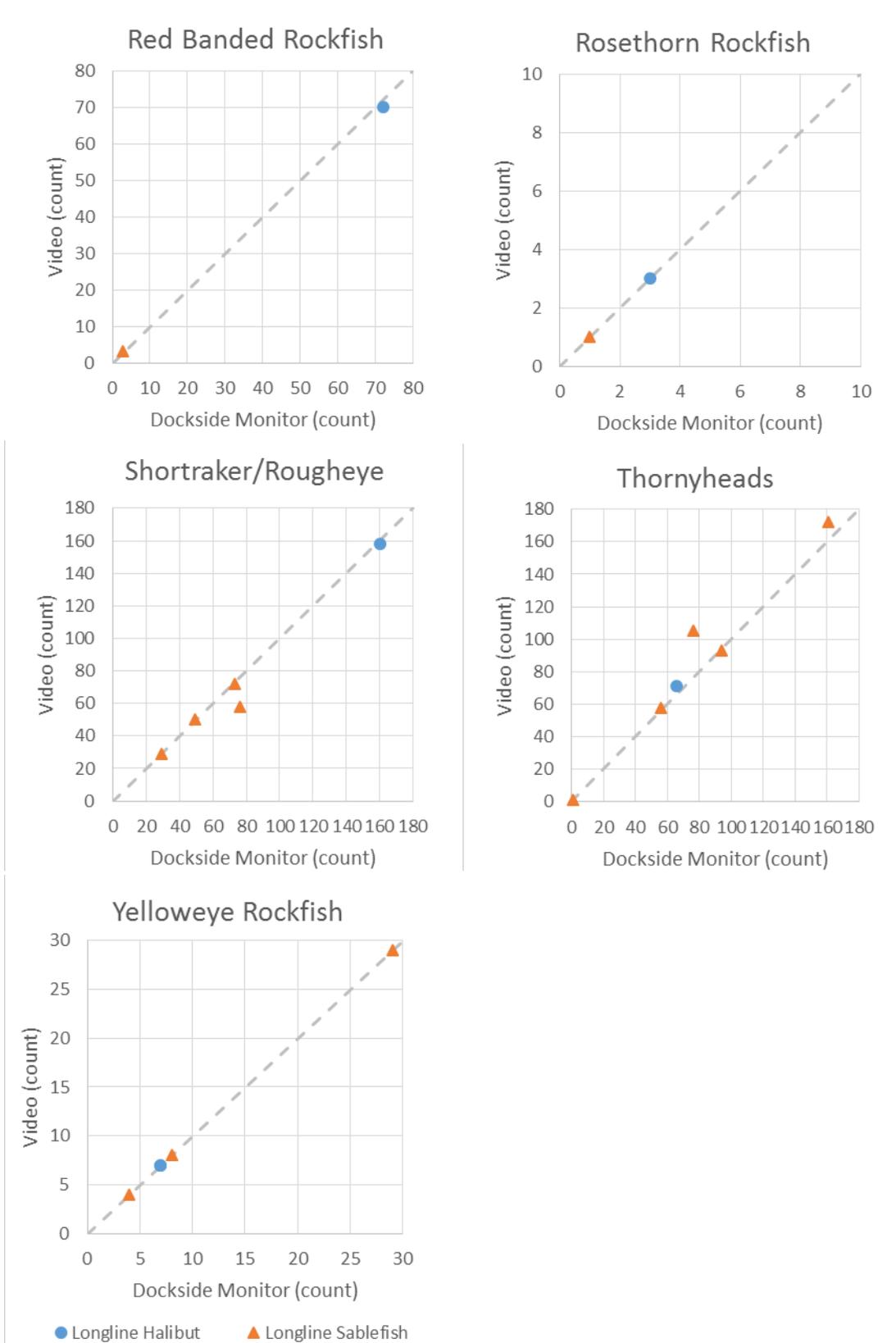


Figure 1. Comparison of dockside monitor and video retained rockfish counts aggregated to the trip level. The dashed grey line is the video = dockside monitor line. If video and dockside monitor counts agreed, the point would fall on the dashed line.

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. Archipelago Marine Research vessel logbook

EM Set Data

Vessel _____

Trip # ____ Date _____

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Trip # ____ Date _____

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Appendix 2. Saltwater vessel logbook

EM Fishing Effort Form

Vessel _____

Port departure date/time _____ Port return date/time _____

Trip # ____ Date _____
 Fishing start time _____ Fishing end time _____

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set

Trip # ____ Date _____
 Fishing start time _____ Fishing end time _____

Set #	Hook Size	Hook Spacing	Skate Length	# Skates set