



**Summary of the BS and GOA Pelagic Pollock Trawl Electronic Monitoring EFP for
years 2020 and 2021 (through April 2021 or as noted)**

EFP Report to North Pacific Council June 2021

Trawl EM EFP Team

Industry Participants

- Catcher Vessels
- Tenders
- Processors

EM Providers and Data Reviewers

- Archipelago Marine Research
- Saltwater, Inc.
- Pacific States Marine Fisheries Commission

Shoreside Monitoring - Observers

- Saltwater, Inc.
- AOI, Inc.

Agency Partners

- NMFS AKRO, Observer Program, AFSC, NPFMC, OLE

EFP Principle Investigators:

- Ruth Christiansen:
United Cather Boats
- Julie Bonney
Alaska Groundfish Data Bank
- Charlotte Levy
Aleutians East Borough

Presentation Report Contents

I. Introduction/Goals/Participant Stats

II. Approved EM EFP Fishery Metrics Summary (2020 and A Season 2021)

- A. EM equipment reliability/functionality of feedback loop
- B. Video review and discard estimates
- C. Cost metrics (EM v. human observers)
- D. GOA pollock trip limits and MRAs – performance standards
- E. Impacts to shoreside monitoring
- F. WGOA tendering operations
- G. Collection of biologicals

III. Issues and modifications made for 2021

IV. EFP Summary Conclusions

I. Goals

- EFP intended to test the feasibility of EM for compliance monitoring
- EFP encompasses two separate pollock trawl EM projects:
 1. Catcher vessels (CVs) delivering to shoreside processors in the BS and (primarily Central) GOA
 2. Catcher vessels delivering (primarily) to tender vessels in the Western GOA
- Goals of EM/EFP:
 - Improve salmon bycatch accounting for catcher vessels, especially for those delivering to tender vessels (replace estimates derived from at-sea observer samples with shoreside census counts)
 - Demonstrate that EM camera systems can capture discard events and video can be used to verify vessel logbook discard information
 - Improve monitoring data for catch accounting and compliance
 - Demonstrate that maximized retention can be achieved
 - Demonstrate that at-sea observers can be replaced with plant observers and data streams can be maintained
 - Reduce monitoring costs

I. EFP Participants and Fishery Stats

BS/CGOA	BS only	GOA only	BS/GOA	Total		
				Vessels	No. Plants	
2020	10	8	11	29	8	
2021	29	10	13	52	10	
Diff	19	2	2	23	2	
WGOA	WGOA only	W/CGOA	Total CVs	Total Tenders	Total Vessels	No. Plants
2020	10	6	16	11	27	1
2021	10	8	18	11	29	1
Diff	0	2	2	0	0	0

BS/GOA	Vessels (PTR Poll)	EFP Vessels	No. Landings	No. EM Landings	PTR Poll Catch (mt)	EM Poll Catch (MT)
2020 Annual	120	41 (34%)	3,323	1,041 (31.3%)	701,986	142,003 (20.2%)
2021 A	98	48 (49%)	1,290	626 (48.5%)	316,565	151,474 (47.8%)

B. Approved EFP Metrics

Metric	Category	Metric
A.1	Electronic monitoring equipment reliability and malfunctions	# and type of EM equipment malfunctions
A.2	Functionality of vessel feedback loop between the vessel operator and the EM service provider/third party reviewer	Frequency and type of communications How system malfunctions encountered were addressed
B	Discrepancies between vessel logbook and video discard estimates	# and scale of occurrences Comparison to 2019 observer estimates from Pilot Phase
C	Cost metrics between EM and human observers	Cost comparison of EM vs. human observer onboard a vessel
D	Changes in vessel fishing behavior due to a relief from current discard requirements	# of occurrences and amount of significant changes in deliveries of: MRA species; PSC species (other than salmon); trips in excess of 300,000 lbs (in GOA)
E	Impacts to shoreside monitoring	Time and cost of additional shoreside observers
F	Impacts to tendering operations	# of EFP trips affected (unable to count as EFP) # operations changed to accommodate EFP vessels
G	Impacts to the current collection of biological samples for pollock	Time associated with shoreside pollock sampling responsibility Comparison of current vs. EFP shoreside biological data collected
H	Impacts to marine mammal monitoring	Identify what data EM can provide Identify potential impacts to management
I	Challenges in meeting the terms of the EFP	Issues addressed as they were identified and modifications made for 2021

A. EM Equipment & Feedback Loop

Equipment performance and Issues Reporting (AMR)

- Equipment performing as expected and issues are getting resolved quickly.
- Vessels doing a good job at identifying and reporting malfunctions and working with the remote support team to resolve
- Redundant camera views and backup sensors are helping reduce critical data loss
- Vessel Operators new to the EM program are up to speed with system operation and able to resolve minor issues on their own.

A. EM Equipment & Feedback Loop

Feedback Loops and Drive Report Summaries (AMR)

- Feedback loops are critical and working well
 - ✓ New vessels/relief operators up to speed quickly
 - ✓ Fewer instances of repeat issues
- Data quality and EFP reporting requirements continually improving
 - ✓ No issues or only minor issues on drive reports are on the rise!

A. EM Equipment & Feedback Loop

Equipment performance and Issues Reporting (SWI)

- EM systems performed very well with minimal loss of data throughout 2020
- SWI provides extensive training to vessel operators, so most EM system issues were able to be resolved remotely and did not require a service call to the vessel
- Tenders are successfully able to install/uninstall Mobile Systems (MBS) over the phone; MBS have not had any issues beyond a normal EM system.
- Vessel-initiated contact was primarily general questions about the EM program or EFP rules (70%); 13% of calls were questions about EM systems; only 11% were calls regarding actual EM system issues; the remainder were EFP issues e.g. how to fill out logbooks

A. EM Equipment & Feedback Loop

Feedback Loops and Drive Report Summaries (SWI)

- Feedback loops are critical and working well
 - ✓ Most common issue reported was discarding outside of designated VMP point = learning new behaviors
 - ✓ Another notable issue was discarding not allowed under EFP at the time; specifically < 6ft. skates that didn't fit through the pump.

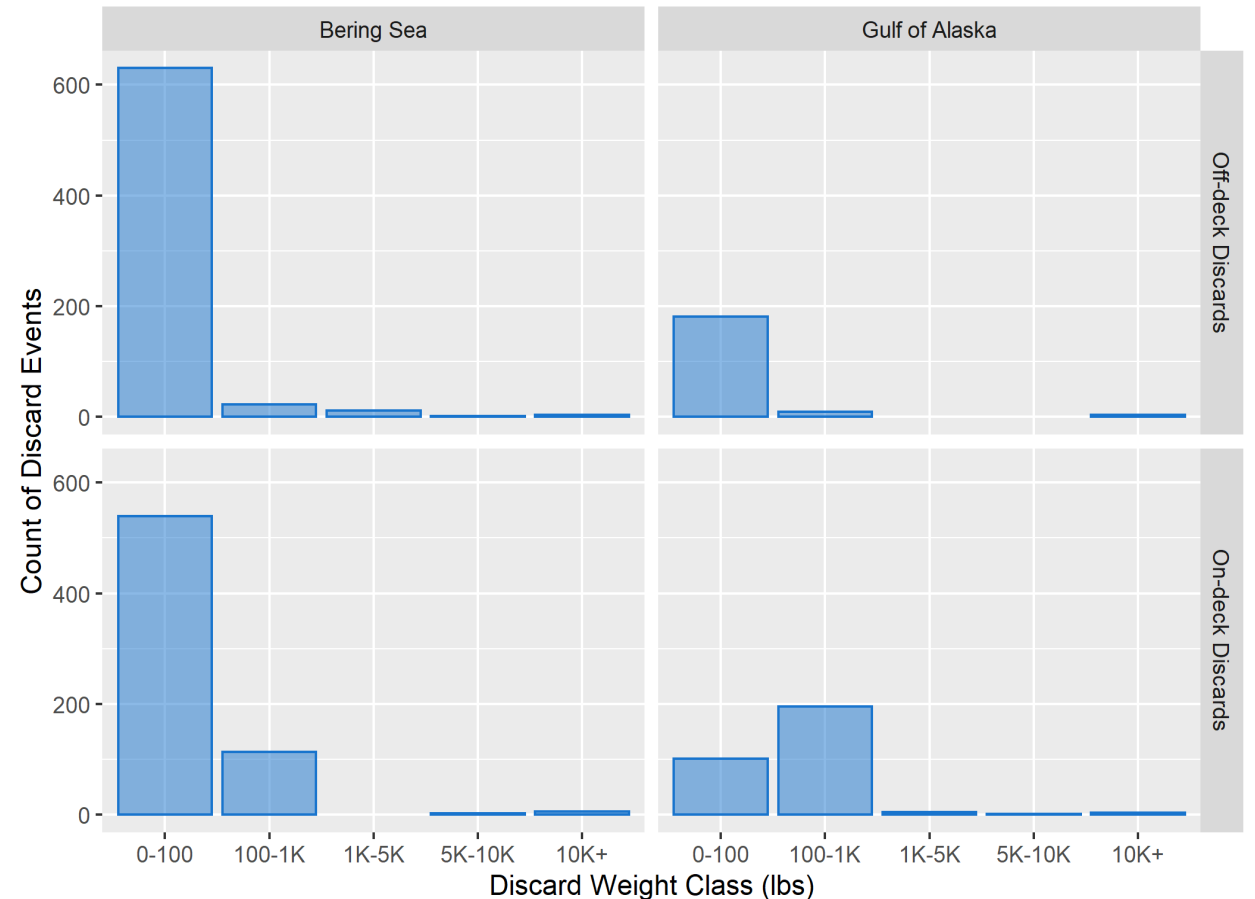
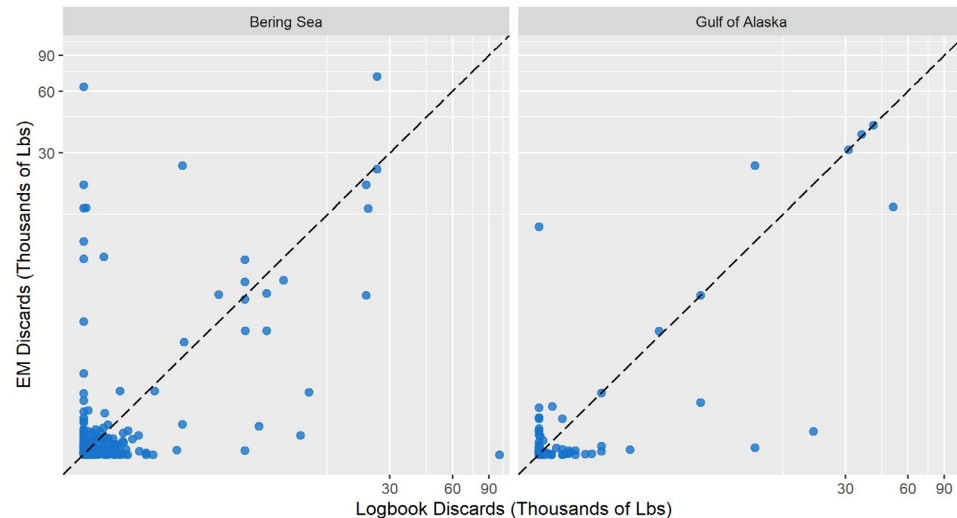
Data quality and EFP reporting requirements continually improving

- Minor issues that impacted data quality included water spots and adjusting camera angles
- Reviewers observed a continual increase in the care, maintenance, and cleaning of cameras by vessel operators

B. Video Review & Discard Estimates

2020 Discard Summaries (PSMFC) - Discards were compared between EM review and logbook records at the trip level.

- Majority of discards seen by EM reviewers were small (<100 lbs)
- Overall, discards reported in the logbooks were greater than EM reviewer estimates
- Higher logbook estimates totaled ~555K lbs of discards over 756 trips across both regions (an average of 734 pounds per trip)
- There were many trips with no discards reported by either EM or logbook (256 trips representing 34% of trips)



EM versus logbook estimates of discards by delivery in the Alaska pollock trawl fisheries, 2020

B. Video Review & Discard Estimates

Large Marine Organisms and Salmon Bycatch

- Logbooks reported a total of 70,144 pounds of shark discards while EM reported a total of 116,812 pounds of shark discards.
- Counts were not consistently reported on logbooks, but EM reviewers reported a total of 141 individual shark discards.
- EM reviewers recorded two salmon as fate 'unknown'. These salmon were taken out of view of the cameras by crew and were not seen retained in the hold or discarded. No logbooks reported discarded salmon.

Offload Review

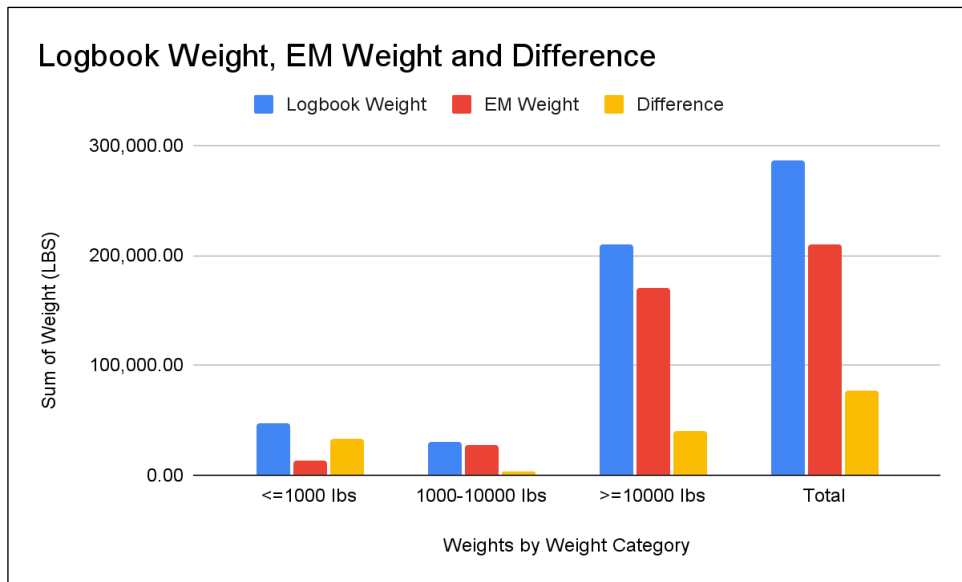
- Time needed to review offloads was 1.5 times greater than that needed to review hauls at-sea.
- Discards at the dock consisted mainly of large sharks (14,944 lbs, or ~92% of the total at-dock discard weight). At-dock discards occurred for a total of 57 trips (out of 773).

2021 data (through April 15th) similar to 2020 but with fewer shark discards and no unknown salmon.

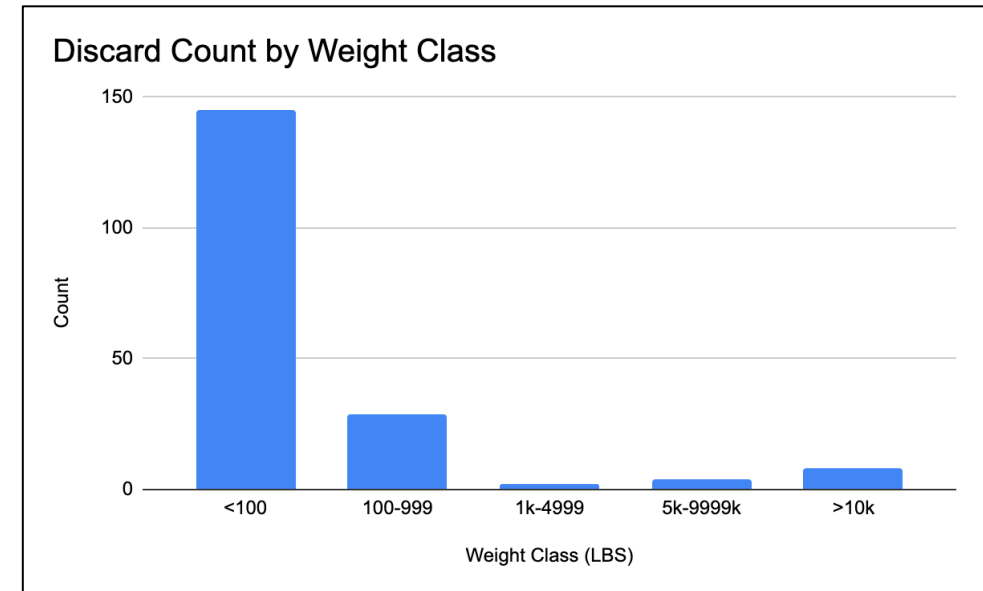
B. Video Review & Discard Estimates

2020 Discard Summaries (Saltwater Inc.) - Discards were compared between EM review and logbook records at the trip level.

- Majority of discards seen by EM reviewers were small (<100 lbs)
- Logbook submission continues to improve each year (CVs went from **NO logbooks** > 61.45% in 2019 > 97.6% in 2020 > 100% in 2021).
- Overall, discards reported in the logbooks were greater than EM reviewer estimates
- Higher logbook estimates totaled 286K lbs of discards over 271 trips (average of 1055 pounds per trip); lower EM estimates totaled 210K lbs over 271 trips (average of 774lbs per trip).
- Most discards (63.75%) occurred during gear retrievals with the remaining 36.25% occurring outside of retrievals. Onboard observers would likely not be on deck to see and report discards between gear retrievals.



EM versus logbook estimates of discards by delivery in the WGOA pollock trawl fisheries, 2020



Sizes of EM discards by individual discard event in the WGOA pollock fishery in 2020

B. Video Review & Discard Estimates

Large Marine Organisms and Salmon Bycatch

- Logbooks reported a total of 149 sharks while EM reported a total of 245 shark discards.
- Counts were not consistently reported on logbooks, this is likely due to confusion about who is responsible for reporting shark discards (offloads at plant are plant responsibility).
- A total of 8 salmon were discarded in two separate events: one event was a tender new to the pollock fishery that sorted 7 salmon (no longer in EFP); the second event was a new crew member that discarded one salmon – the Captain immediately educated the crew member and reported it to Saltwater/PI.

Offload Review

- In 2020, 19.2% of total time was spent monitoring offloads
- Discards at the dock included personal consumption catch, shark reviews and skates pulled out of the tanks, net/deck cleaning, etc. Seventy - nine (79) skates and sharks were pulled out at offloads of 271 completed trips.

Due to low quota there was no A season in 610; only 4 trips reviewed by WGOA vessels delivering in Kodiak. A season data will be rolled into B season analysis.

C. Cost metrics (human observers)

- AKRO helped with developing an estimate for number of days a participating vessels would have carried an at-sea observer based on the number of days for the set of EM trips and suggested daily costs for the pay-as-you-go system (\$400) and the ODDS system (\$1,381).
- **Using pay-as-you-go and partial coverage observer costs, total at-sea observer costs in 2020 for both BS and GOA would have been about \$1,375,379 had they not been participating in the EFP.**

C. Cost metrics (EM)

Total realized shoreside observer costs for EM observers deployed to processing plants under the EFP in 2020.

Shoreside Processor	Total Shoreside EM Observer Days	Observer Cost/Day	Total Shoreside Observer Costs
Akutan	332	\$400	\$132,800
Unisea	216	\$400	\$86,400
Icicle/Northern Victor	232	\$400	\$92,800
Kodiak - All Plants	390	\$400	\$156,000
Trident – Sand Point	167	\$400	\$66,800
Totals	1,337		\$534,800

Approximate EM system and installation costs for vessels participating in the EFP.

EM Equipment Costs/Vessel	EM Installation Costs/Vessel	Total Cost (Equipment & Installation)/Vessel	2020 Participating Vessel Costs (56 vessels)	2021 Participating Vessel Costs (23 vessels)	Total EFP Equipment and Installation Costs
\$11,750	\$5,750	\$17,500	\$980,000	\$402,500	\$1,382,500

For 2020, total video review costs were estimated to be \$82 per trip which does not include logbook entry.

With 1,041 EM trips in 2020, total estimate is \$85,362. This total cost includes all video review, project management, analysis, report writing, supplies, etc.

Average EM video review costs for 2020.

Average Cost per Trip	\$ 82
Average Cost per Haul	\$ 26 – 41*
Average Cost per Sea Day	\$ 23 – 35*

*Average cost is dependent upon number of hauls per trip as well as number of sea days.

Cost Comparison (EM v. human observers)



<i>2020 BS/CGOA/WGOA</i>	Cost \$
Plant Observers	\$534,800
EM Equipment Costs	\$980,000
Video Review (AMR/SWI)	\$85,362
Misc. EM Provider Fees	\$313,500
Total Estimate for 2020	\$1,913,662

Vessel observer costs for all EM vessels had they not been participating in the EFP in 2020*	\$1,375,379
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Net in 2020	(\$538,283)
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*Average of estimated days based on fishing period on fish ticket plus 1 or 2 days

Based on these estimates for the first EFP year, including the one-time cost of the EM equipment, EM cost about \$538,000 more than what at-sea observers would have cost.

Cost Comparison (EM v. human observers)



<i>2020 BS/GOA</i>	Cost \$
Plant Observers	\$534,800
EM Equipment Costs (one-time, not included as annual cost)	\$0
Video Review (AMR/SWI) (based on avg \$ /trip)	\$85,362
Misc. EM Provider Fees	\$313,500
Total Estimate for 2020	\$933,662

Vessel observer costs for all EM vessels had they not been participating in the EFP in 2020*	\$1,375,379
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Net in 2020	\$441,717
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*Average of estimated days based on landing date plus 1 or 2 days

Based on these estimates for the first EFP year, excluding one-time equipment/installation costs, EM cost about \$442,000 less than what at-sea observers would have cost.

D. Performance Standards: GOA pollock trip limits and MRAs

Performance standards were set in 2019 so the vessels would not abuse the lack of MRAs and pollock trip limits.

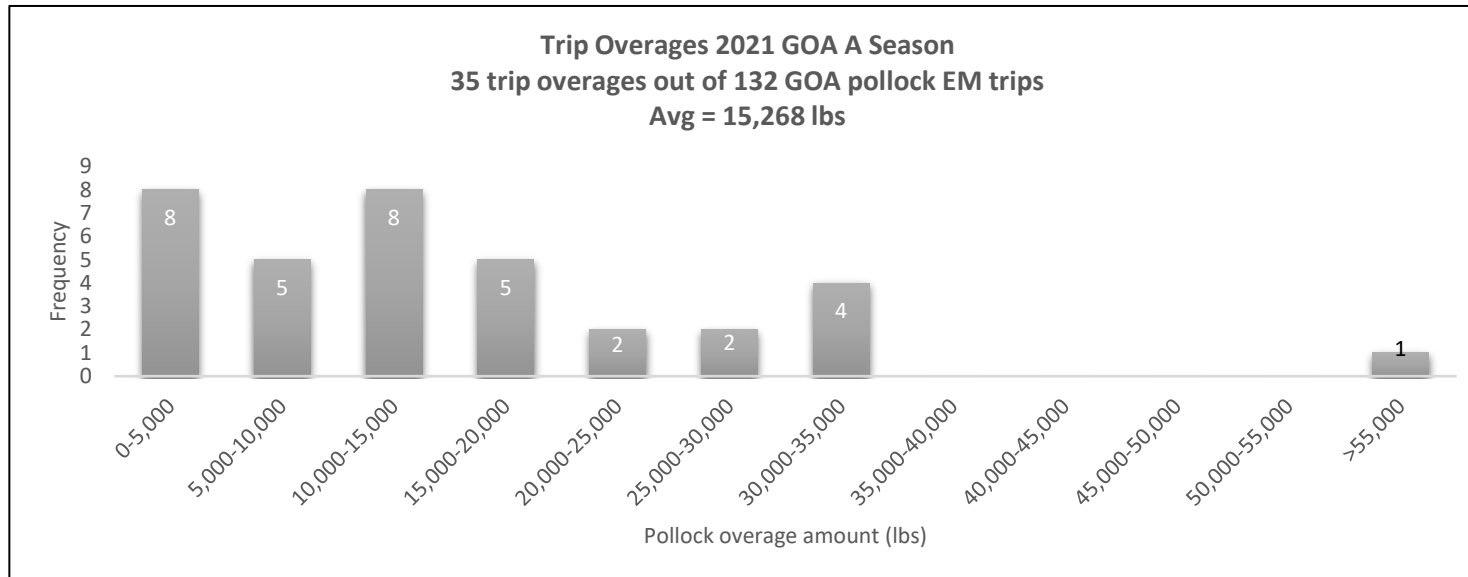
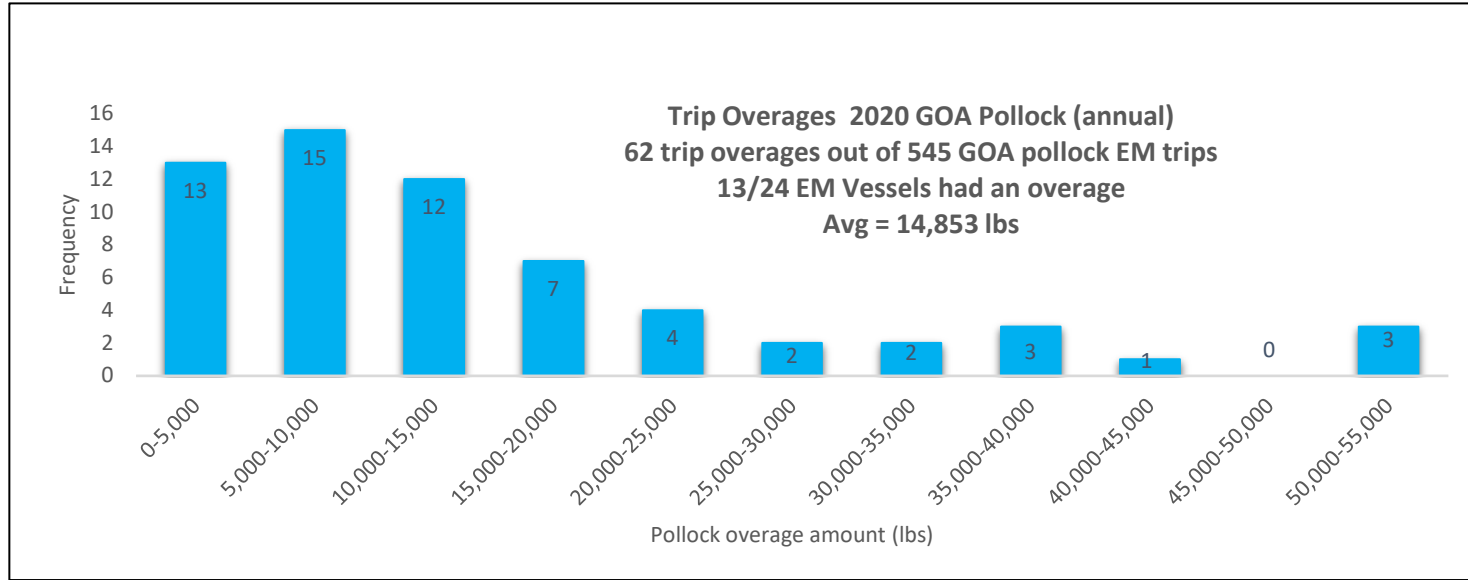
Needed to control behavior so vessels mostly stay under the limits with the understanding that additional flexibility is needed due to the full retention requirement of the EFP.

EFP trip data was examined to detect any increases in MRA and/or GOA trip overages when compared to historical trends and non-EM trips.

Pollock Trip Limits: Penalty if >345,000 lbs. (egregious overage) or exceeding an average of 300,000 lbs. over 4-trips. Proceeds of overages were donated to NPFRF to help fund the EFP.

- **2020.** 7 vessels received one offense, three of which were based on egregious overage (>345,000 lbs). Others due to the average of four trips exceeding 300,000 pounds. There were 62 individual trip overages out of 545 GOA trawl EM trips (11.4%).
- **2021 A.** One vessel received one offense for an egregious overage and one other vessel received two offenses for twice exceeding the 4-trip average of 300,000 pounds. There were 35 individual trip overages out of 132 GOA trawl EM trips (26.5%) compared to 47/208 trips or 22.6% of GOA EM trips over the same time period in 2020.

D. Performance Standards: GOA pollock trip limits



D. Performance Standards: MRAs

2020 (annual)

- 25 MRA overages: 13 in the GOA and 12 in the Bering Sea
- 20 of the 25 MRA overages for aggregated rockfish, three for forage fish, one for sablefish, and one for Atka mackerel
- Seven of those 25 MRA overages were valued at >\$250 so were therefore considered an official “overage”
- Three vessels had two official MRA overages each, which were considered “offenses” under the EFP performance standards
- A vessel is allowed up to 4 MRA “offenses” per year before being expelled from the project.

A GIS analysis for the 2020 fishing year showed there was no difference between the location of catch between EM EFP vessels and non-EM EFP vessels in both the BS and GOA.

2021 (through 4-21-21)

- 5 MRA overages in the Gulf committed by 4 vessels and zero overages in the BS
- Four of the five MRA overages were for forage fish (capelin/eulachon) with no value and one for aggregated rockfish (mostly POP) which also had no value since all the POP was sent to fish meal.

Conclusion: Vessel behavior did not change when at-sea discard requirements were removed

E. Impacts to Shoreside Monitoring (BS/GOA)

- For 2020, Saltwater observers were deployed to Trident Kodiak, APS, OBI Seafoods, Trident Akutan, Trident Sand Point, Northern Victor, Unisea, and Peter Pan King Cove.
- At the Peter Pan facility, AFA observers were used to support the EM project; at the other facilities specific project observers were deployed.
- For 2021, Alyeska and Silver Bay Kodiak were added. Saltwater provided observers for Trident Akutan and all plants in Kodiak while Alaska Observers, Inc. (AOI) provided observers for Unisea, Northern Victor, and Alyeska.
- For 2020, the project forecast 1,027 shoreside observer days would be needed. A total of 1,170 days were actually invoiced, an overage of 143 days.

E. Impacts to Shoreside Monitoring (BS/GOA)

- Mitigation measures due to Covid had impacts to shoreside monitoring and was the main reason why forecasted observer days exceeded actual days.
- More observer days were required in Kodiak than anticipated. In addition to Covid, fishing effort in this region is difficult to forecast with the unpredictable race for fish, variable effort, three different federal management areas plus the State of Alaska Prince William Sound pollock fishery, fish grade, salmon bycatch, stand downs, and weather.
- There were multiple communication issues between plant personnel and observers in Kodiak at the start of the 2021 A season. To mitigate these communication issues and to help facilitate notification and planning, plant observers were issued a phone to be shared by the plant observer team such that GOA vessels could call the observer directly to provide them with the necessary information. Because this “call in” protocol for GOA participants was implemented halfway through the season, it was initially not followed consistently. February was the most challenging month as the issues were worked through, but by early March communications had improved.

E. Impacts to Shoreside Monitoring (BS/CGOA)

BS Pollock (relatively smooth)

- AFA rationalized fishery with regular delivery schedule
- Plants have CMCP and are accustomed to on-site observers
- 100% coverage - all EM deliveries sampled

GOA Pollock (observer challenges continue)

- Race for fish with unpredictable effort and season length
- Delivery schedule that can change at a moment's notice
- EFP vessels can opt out of EM on a trip-by-trip basis through ODDS
- 30% of the EM deliveries are sampled (vs. 100% of BS deliveries)
- Unpredictable stand-downs due to salmon bycatch

E. Impacts to Shoreside Monitoring (WGOA)

- Saltwater, Inc. (SWI) provided observers at the Trident Sand Point plant, which is the only WGOA plant that participated in 2020.
- For 2020, the project initially forecast that 64 shoreside observer days would be required but 167 days were actually invoiced.
 - This discrepancy is partially due to underestimation of observer days needed, but largely due to COVID-19, which significantly impacted the shoreside observer component of the program.
- As a possible solution for maximizing cost-effectiveness, a model was tested where one shoreside observer was fully trained in EM data review and was provided a secure station to review data during downtime. This concept is promising, however more work needs to be done to demonstrate feasibility.
- Observers experienced some similar issues as CGOA; observers were issued phones and fleet directly contacted observers with required information; observer survey reported good communication and cooperation with Sand Point plant staff. No observer notable issues reported relating to tenders, except a few observers who contacted the PI directly to get clarification on tender participation and sampling.
- For 2021, due to low quota there was no A Season in Area 610 and no observers were deployed for the WGOA project; two WGOA CVs did participate in the CGOA fishery and delivered to shoreside processors in Kodiak, which was covered under the BS/GOA project.

E. Impacts to Shoreside Monitoring (BS/CGOA/WGOA)

Improvements are constantly being discussed and implemented by the EFP team through regular teleconferences

- Removed labels for observers (AIS, EFP, AFA) to allow everyone to work together to meet monitoring objectives for all deliveries
- Communications improved when observers were equipped with project-only cell phones and vessels were requested to communicate with plant observers directly
- CMCP required for GOA plants in 2021

COVID-19

- Inability to freely move observers in and out of an area in response to fishing effort since processors wanted to maintain a closed campus.
- Costs incurred for 14-day quarantine period, private transportation, etc.
- Keeping observers in the field longer (before and between seasons to avoid upfront COVID mitigation costs).
- Inability to move vessel observers into the plants to assist with salmon monitoring.

F. WGOA Tendering Operations

Key Takeaway: Tender vessels can successfully carry EM for compliance, complete Chain of Custody logbooks, and adhere to tender-specific catch handling protocols. However, there were instances where tenders or CVs deviated from normal operations to stay within the EFP which reduced efficiency.

Concerns included:

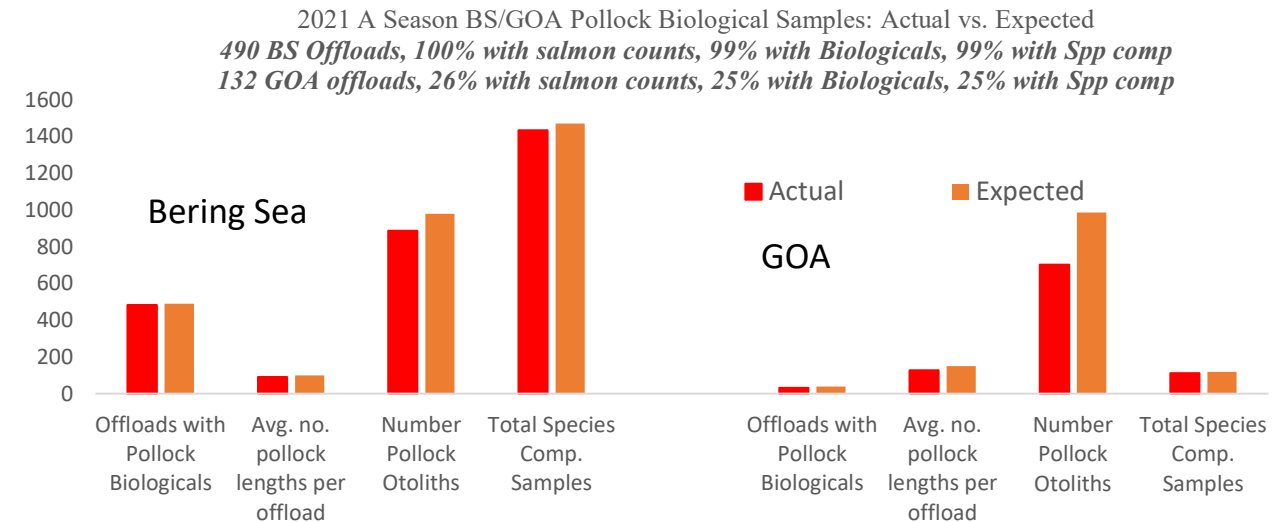
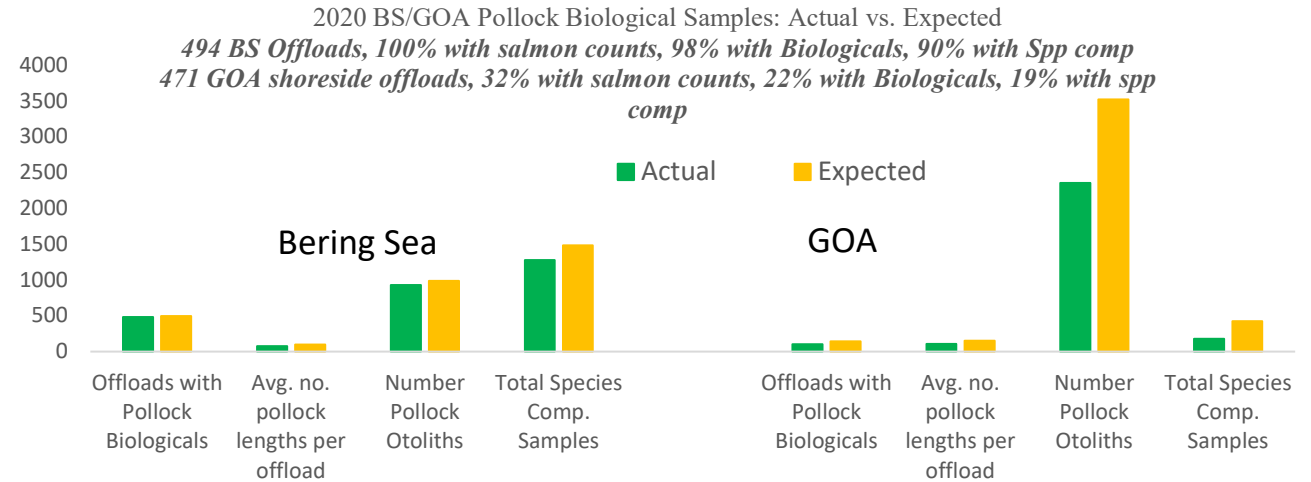
1. Is there enough tender coverage? Having enough tenders equipped with EM to be able to accept EFP/EM catch, without using a non-EM tender and losing EM data. Solution: Mobile Systems and supplying extra backup systems to processors.
2. Can the process of changing/adding tenders support fishery operations? Processors require the flexibility to change tenders last-minute. Under the EFP tenders are required to have an approved VMP, and adding new tenders would require developing a VMP and having it approved by NMFS, which takes time. Solution: processors provide list of tenders most likely to participate; VMP's developed in advance, NMFS approvals typically within 24 hrs.
3. Can new tenders follow catch handling requirements? Tenders that are new to the pollock fishery and EFP are less familiar with regulations, creates potential for violations. Solution: work with processors to develop training material, possible verification of training?
4. Can CVs split offloads between tenders? CVs often split offloads between tenders to maximize tender capacity before returning to processor. Solution: can work from data review perspective, need to work with NMFS to understand flow of data; can likely allow for split offloads.

G. Observer Collection of Biologicals

	Bering Sea 2020 (annual)	Bering Sea 2021 (A Season)		GOA 2020 (annual)	GOA 2021 (A Season)
Total Number EM Offloads	494	490		471	132
No. w/ Salmon Counts	494	490		151	34
% w/ Salmon Counts	100	100		32	26
Offloads with Pollock Biologicals	483	483		102	33
% offloads with Pollock Biologicals	98	99		22	25
Expected Offloads with Pollock Biologicals	494	490		141	40
No. w/ Pollock Lengths	37,375	44,381		10,707	4,205
Expected Pollock Lengths	49,400	49,000		21,195	5,940
Avg. no. pollock lengths per offload	77.4	91.9		105	127.4
Target no. pollock lengths per offload	100	100		150	150
Number Pollock Otoliths	929	888		2,354	703
Expected no. w/ Pollock Otoliths	988	980		3,518	986
Avg. no. pollock otoliths per offload	1.92	1.84		23.08	21.3
Target no. pollock otoliths per offload	2	2		25	25
No. Offload's w/ Species Comp.	446	486		89	33
% w/ Species Comp.	90	99		19	25
Total Species Comp. Samples	1,275	1,434		178	113
Expected Species Comp. Samples	1,482	1,470		424	119

G. Observer Collection of Biologicals

BS 100% Sampling Rate 2020	Actual	Expected
Offloads with Pollock Biologicals	483	494
Avg. no. pollock lengths per offload	77.4	100.0
Number Pollock Otoliths	929	988
Avg. no. pollock otoliths per offload	1.92	2.00
Total Species Comp. Samples	1,275	1,482
GOA 30% sampling Rate 2020	Actual	Expected
Offloads with Pollock Biologicals	102	141
Avg. no. pollock lengths per offload	105	150.0
Number Pollock Otoliths	2,354	3,518
Avg. no. pollock otoliths per offload	23.08	25
Total Species Comp. Samples	178	424
BS 100% Sampling Rate 2021 A	Actual	Expected
Offloads with Pollock Biologicals	483	490
Avg. no. pollock lengths per offload	91.9	100.0
Number Pollock Otoliths	888	980
Avg. no. pollock otoliths per offload	1.84	2.00
Total Species Comp. Samples	1,434	1,470
GOA 30% sampling Rate 2021 A	Actual	Expected
Offloads with Pollock Biologicals	33	40
Avg. no. pollock lengths per offload	127	150.0
Number Pollock Otoliths	703	986
Avg. no. pollock otoliths per offload	21.8	25
Total Species Comp. Samples	113	119



G. Observer Collection of Biologicals

Key Takeaway

- Shoreside sampling for AFA Bering Sea vessels was as expected (nearly 100%). Gulf deliveries with an expected 30% sampling rate for biologicals and species comp was higher to date in 2021 (25-26% of the offloads vs. 19-22% in 2020), but the percent of deliveries censused for salmon was a bit lower (26% in 2021 vs. 32% in 2020), which is likely due to initial communication issues (observer uncertain if a Gulf delivery was EM or non-EM, at times sampling non-EM deliveries by mistake). The number of Gulf offloads sampled for species composition, number of otoliths collected, and the average number of lengths collected per offload was closer to expected in 2021.

Better observer preparation, more experience with the EFP for both the vessels and the processors, CMCPs in Gulf plants, and constant improvements to communications allowed for more comprehensive sampling of offloads in 2021.

H. Issues and modifications made for 2021

- ***Regular meetings with PIs, NMFS, Observer Program, EM providers, reviewers, observer providers were essential in identifying and resolving issues in near real time, including the following:***

- ***Seabirds.*** When some spectacled eider and a Steller's eider flew onto a couple of vessels, a handout was developed and distributed outlining steps to take when an injured or dead seabird is encountered during an EFP trip, including placing the bird in the camera's view for at least three seconds in different positions as well as completing U.S. Fish & Wildlife form.
- ***Sharks.*** EM reviewers reported that large sharks brought up on deck and discarded at-sea were frequently either not being reported in the logbooks or incorrectly identified with inaccurate weight estimates. For 2021, the EFP requirements were modified to allow discards of large individual marine organisms (>6ft) and all sharks regardless of size (except Pacific spiny dogfish).

Video reviewers noticed large sharks and skates delivered shoreside placed on the deck of the vessel during the offload. Some were not offloaded by the plant, weighed, or reported on the fish ticket as required by regulation. Oversight corrected through outreach.

- ***Jellyfish.*** Retention of jellyfish can affect belt systems, RSW pumps, and quality of pollock and difficult to record accurate weight in logbook. Discards of jellyfish at-sea allowed with notation in logbook.
- ***Swapping out of vessel hard drives during offload and EM function test.*** After complaints from operators, EFP drive swap requirement was modified so function tests were allowed after leaving dock and at least two hours before deploying the net. Additionally, an interruption of up to 15 minutes of video recording during offload was allowed for hard drive exchanges, equipment servicing, and repairs. Both improved efficiency and flexibility.
- ***Vessel Monitoring Plans.*** For 2021 a single uniform catcher vessel VMP was created for both projects and included a universal EM EFP logbook. In 2020, each EM provider developed different VMP's.
- ***Communications between shoreside observers, processing plant personnel, and pollock vessels.*** In the Bering Sea, communications are good given that all deliveries from participating vessels are EM trips (100% coverage). Issues persist in the GOA but improvements have continued to be made overtime.

I. Lessons Learned

- Weekly/biweekly EFP team meetings were invaluable for identifying and resolving issues.
- Strong education and outreach programs need to be in-place and regularly delivered to all vessel and processing participants.
- Clear and timely communication between all parties is critical
- The use of EM for compliance monitoring functions better in a rationalized fishery with an established and well-defined fishing/processing schedule
- Vessel operators tend to overestimate discard amounts.

I. Summary Conclusions – EFP Objectives Met

☐ *Maximized retention can be achieved (EFP Objective 1)*

- Vessel behavior did not change when at-sea discard requirements were removed (e.g., pollock trip limit, MRAs, and non-salmon PSC)

☐ *EM can capture discard events and video data can be used to verify vessel logbook discard entries (EFP Objective 3)*

☐ *At-sea observers can be replaced with observers at shoreside processing plants; data needs are maintained (EFP Objective 2)*

- Full halibut census occurs at the plant vs. less accurate estimates from at-sea samples
- Maximized retention allows for accurate accounting at the processor vs. at sea observer estimates of discarded fish.
- At-sea discards amounts are based on verified operator logbook data

☐ *Salmon bycatch accounting improved (EFP Objective 4)*

- Observer effect for GOA deliveries is removed since trips are monitored by EM and randomly sampled for salmon bycatch at the plant
- For tender deliveries, salmon census counts became possible whereas estimates were previously based on at-sea observer samples
- EM can be used on tender vessels to maintain the Chain of Custody

I. Summary Conclusions – EFP Objectives Met

- ❑ *Initial comparisons indicate that EM is more cost-effective* for compliance monitoring in pelagic pollock fisheries, especially in the Bering Sea, when compared to at-sea observers (observer costs for vessel at-sea days vs. observer costs for shoreside days).
- ❑ *The use of EM for compliance monitoring functions better in a rationalized fishery* with an established and well-defined fishing/processing schedule.

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