Final Report to NMFS

Exempted Fishing Permit # 2019 – 02

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November 23rd , 2020

EFP # 2019 - 02 authorized vessels participating in the 2019 and 2020 Aleutian Islands (AI) pollock fishery to conduct experimental fishing to provide information on methods to reduce bycatch of Pacific ocean perch (POP). This report includes a summary of project objectives, statistical areas fished, vessels used, a detailed description of activities, any problems and successes, the results of the hypotheses tested, and how well EFP objectives were accomplished.

Summary of project objectives (Purpose and Goals) -

The purpose of the EFP was to test an alternative management framework for limiting POP bycatch in the AI pollock fishery which could potentially provide an opportunity for the Aleut Corporation to develop an economically viable AI pollock fishery while improving safety at sea and reducing the potential overall POP bycatch mortality.

Goals included:

- Prosecuting the Aleut Corporation's AI pollock allocation while testing methods to minimize POP catch.
- Limiting POP bycatch mortality and waste in a fully prosecuted AI pollock fishery through full retention and accounting of POP bycatch while limiting of overall POP catch to 500 tons.
- Improving safety at sea by reducing the amount of time necessary to stow catch by eliminating the need to sort POP from the catch on deck.
- Gathering relevant data on timing and location of POP bycatch during the EFP AI pollock fishery that may be examined for correlations to determine means of reducing bycatch rates.

Statistical areas fished

During the 2019 EFP fishery all hauls occurred on the northwest side of Atka Island. In the 2020 A season, EFP fishing expanded west into Kanaga Sound in area 542 and east into Nazan Bay in area 542. All hauls were within the area of the 2007 Aleutian Islands Cooperative Acoustic Survey Study (AICASS). Figure 1, below shows the area of the 2007 AICASS. Figure 2 shows 2020 haul locations plotted on Google Maps.

Figure 1 – Study Area from 2007 AICASS

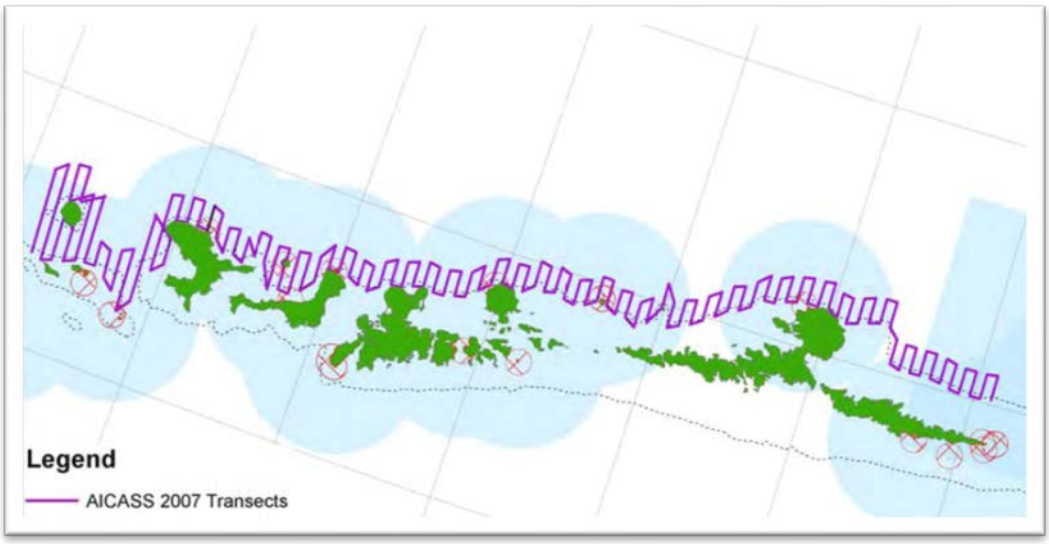


Figure 2 – Locations of Hauls for 2020 EFP (coloured by vessel)

Vessels used

Three vessels were approved to participate under the EFP permit.

Figure 3 – Muir Milach

The Muir Milach is a 102' trawler. Its hydro-acoustic gear includes: a Simrad ES-60 down sounder with 38kHz split beam transducer, a Furuno 1100 down sounder, a Wesmar 860 sonar and a Wesmar 770 3rd wire netsounder

The vessel has a sorting belt on the main working deck.

Figure 4 - FV Bristol Explorer

Figure 5 - FV Northwest Explorer

The Bristol Explorer is a 180' trawler. Its hydro-acoustic gear includes: a Furuno 1200 down sounder, a Simrad ES-80 down sounder, a Simrad SN-90 sonar and a Simrad FS-70 3rd wire net sounder.

The vessel is configured such that the codend is emptied onto the deck, and from there directly into the tanks. Any sorting would have to be done on deck, put into baskets and carried to the side of the vessel for discard.

The Northwest Explorer is a 162' trawler. Its hydro-acoustic gear includes: a ES-60 down sounder, a Furuno 50kz down sounder, a Simrad FS 90 3rd wire net sounder and a CH15 sonar.

The vessel is configured with a below deck sorting area and discard chute, where the crew can work out of the weather to separate bycatch before fish go into the tanks.

Detailed description of activities

The Muir Milach commenced Pollock fishing under the EFP February 25th 2020, and suspended fishing March 10th due to mechanical problems. The Northwest Explorer fished from March 16th to the 28th. The Bristol Explorer fished from March 18th to the 31st.

The participating vessels were provided with log books (see attachment 1 for an example) to record potentially relevant correlative variables. Location, time, and depth data, along with other environmental variables and Captains' estimated haul weight and POP percentages, were recorded in each vessel's log book detailing each haul (see Tables 3 and 4 for transcribed data).

Observers on the vessels sampled each haul and provided extrapolated estimates of the amounts of POP and other incidental bycatch (see Table 7). The observer extrapolated estimates can be compared to the Captains' estimates and to actual weights taken weights taken under the supervision of the observers at the processing plant (see Table 5).

Problems and successes

We were not as successful in maximizing the amount of hauls made as part of the EFP as we had hoped for the 2020 A season. In part this was a function of the conflict between processing cod from the statewater cod fishery, which is a 'derby' fishery, and taking deliveries of Pollock under the EFP. The processing plant prioritized the use of its capacity for cod, and held off on beginning taking EFP Pollock. When the Muir Milach suffered mechanical problems there was a week gap before the Explorer boats arrived.

None the less, we were successful in gathering substantially more data from more hauls than in 2019.

We were also successful in having the vessels collect hydro-acoustic data from their Simrad down-sounders, which is being forwarded to AFSC for review and potential further analysis.

Summary of the results of the hypotheses

The underlying hypotheses being tested was whether it is possible that POP can be avoided or minimized based on recognition of distinctions in hydro-acoustic sign or by correlations with time of day, time of year, depth of net, depth of bottom, characteristics of the thermocline, net modifications, etc. The objective was to gather sufficient relevant data that could be examined for correlations. Additionally, we wanted determine the extent to which discard waste could be reduced by shifting from a 5% retention limit to a seasonal cap.

The 2019 data set from fishing under the EFP consisted of just 5 hauls (see attachment 2 - *"Initial Report to NMFS, Exempted Fishing Permit # 2019 – 02").*

During the 2020 EFP fishery the 3 vessels made a total of 28 hauls, for a total of 702 tons of Pollock and 107 tons of POP.

We were able to collect relevant data on timing, depth, and location, of POP bycatch during the EFP AI pollock fishery for cross referencing to environmental variables such as tide, current, weather, sea conditions, time of day, etc.

While we were successful in gathering a substantially larger data set during the 2020 season, given the variability in the rates of POP bycatch ranging from 0% to 100%, it remains challenging to examine the data rates using statistical tests for correlations that might identify means of reducing POP bycatch. We have done the following series of regression analyses for most of the variables for which we have data, all of which resulted in very low R^2 values.

Figure 6 - Bottom depth:

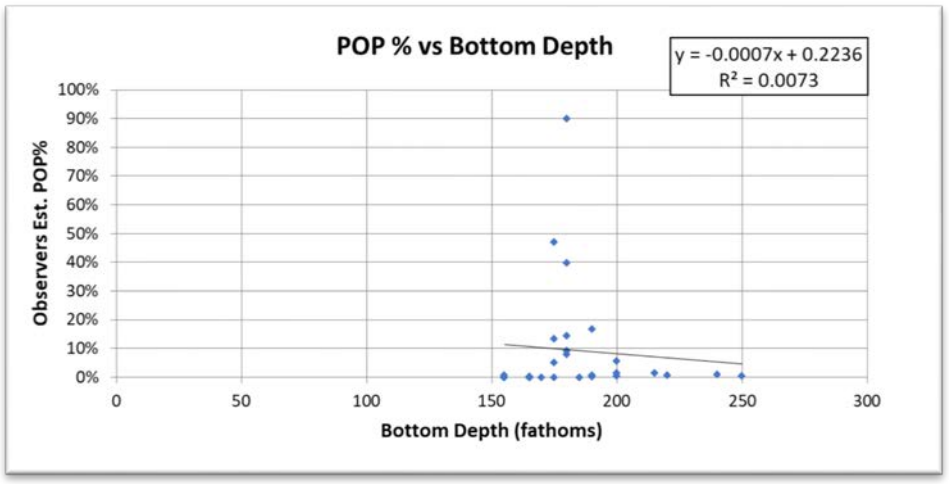


Figure 7 - Fishing depth:

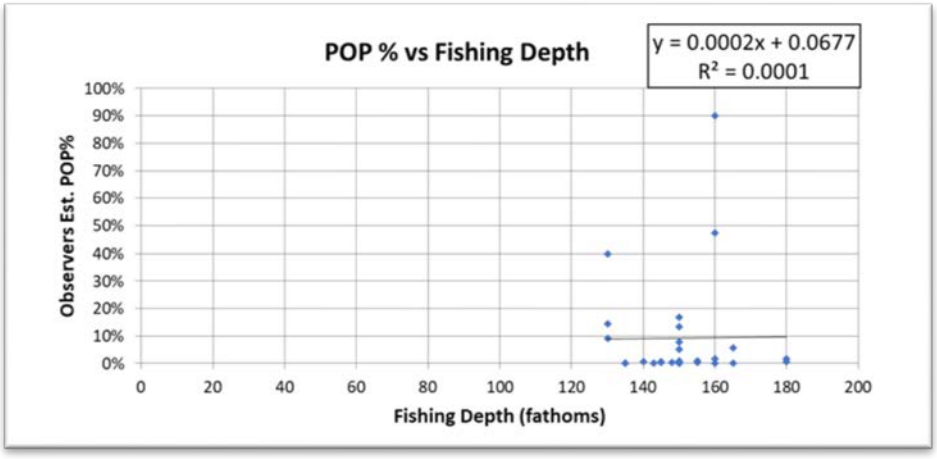


Figure 8 - Difference between bottom and net depth:

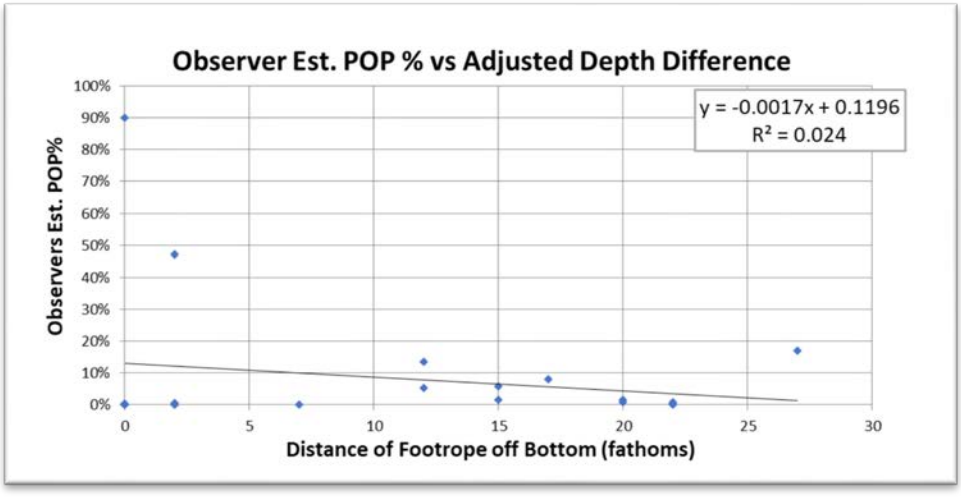


Figure 9 - Time of day:

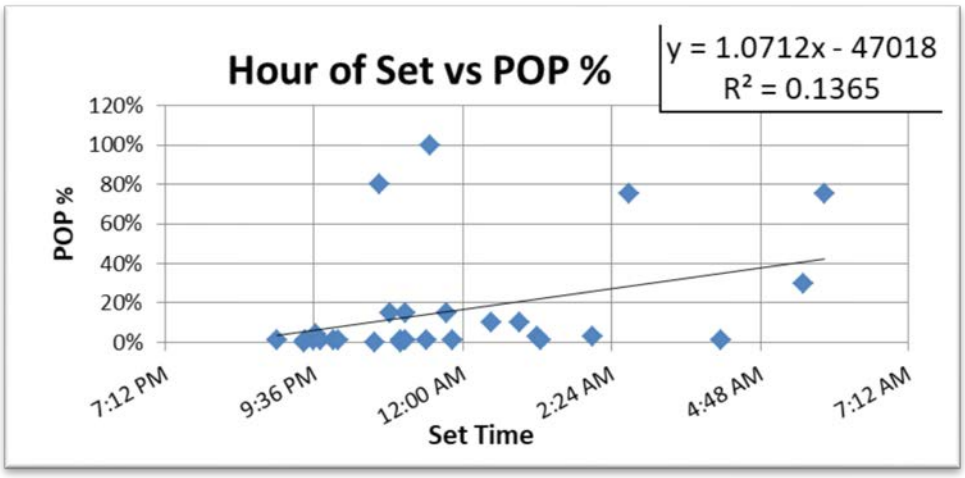


Figure 10 - Duration:

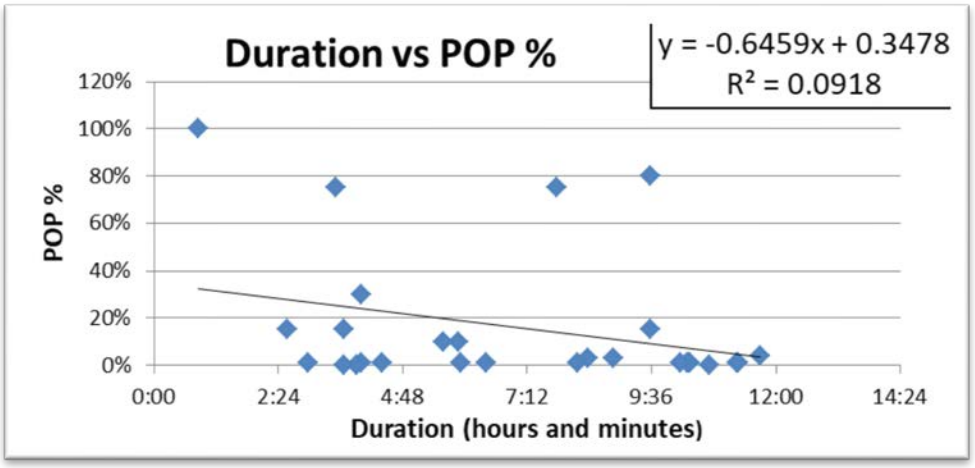


Figure 11 - Current direction:

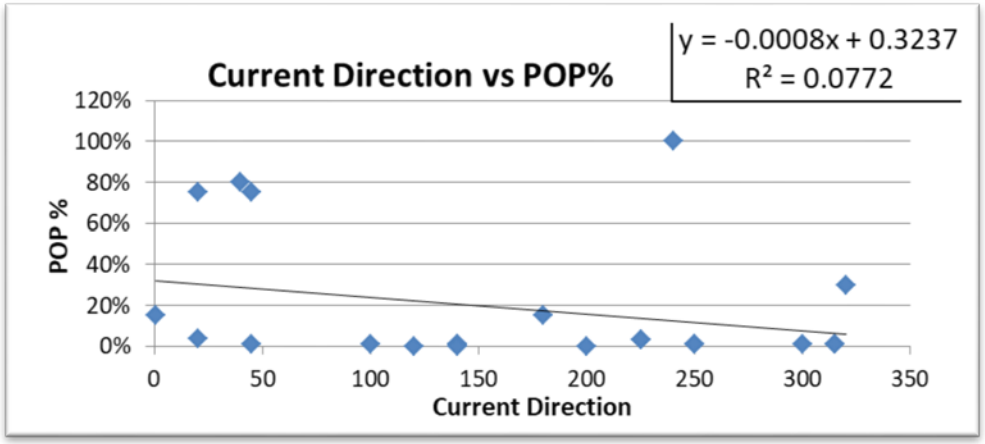


Figure 12 - Current speed:

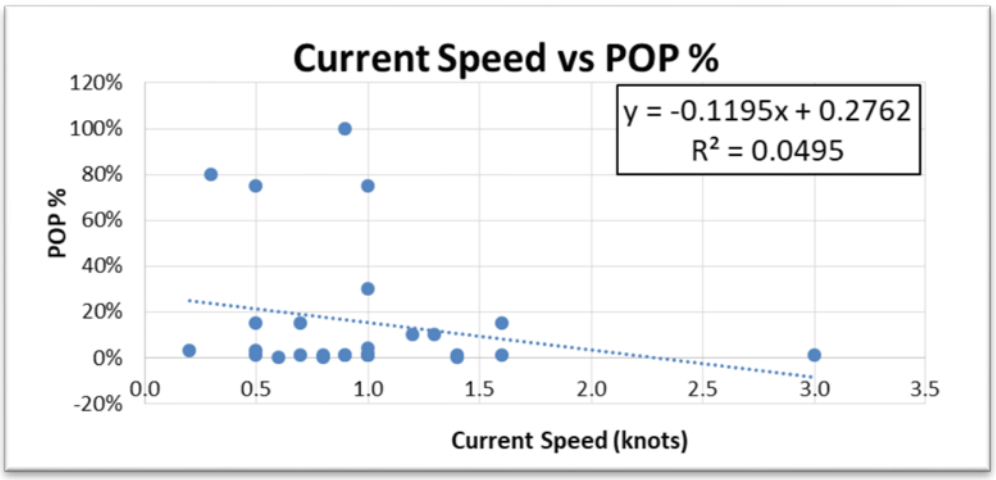


Figure 13 - Weather:

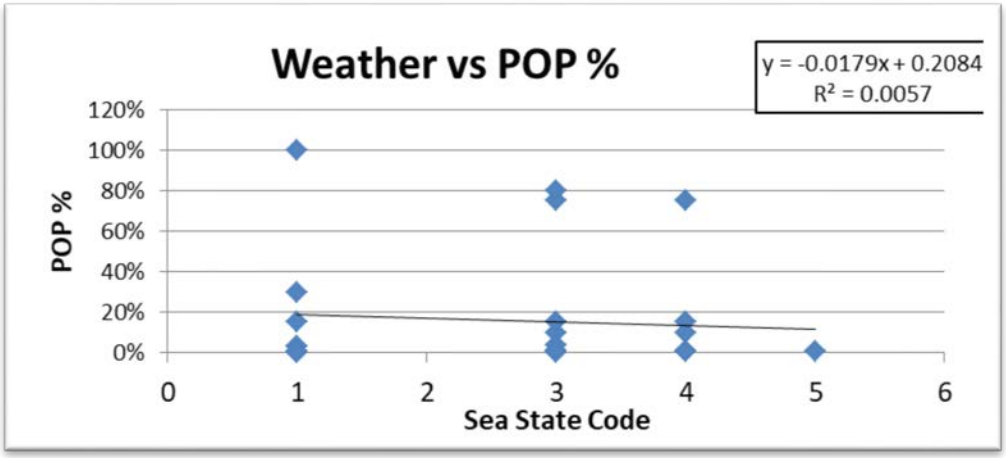
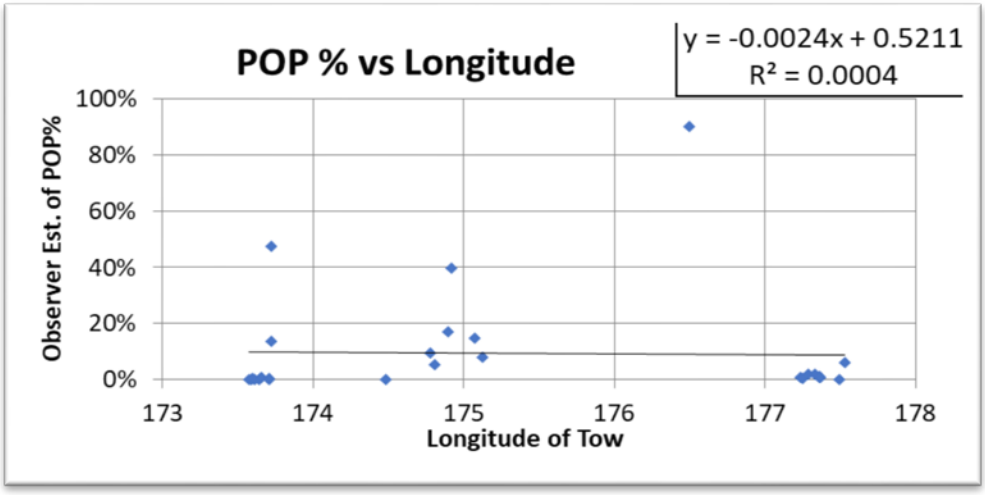


Figure 14 - "Longitude" of Tow:



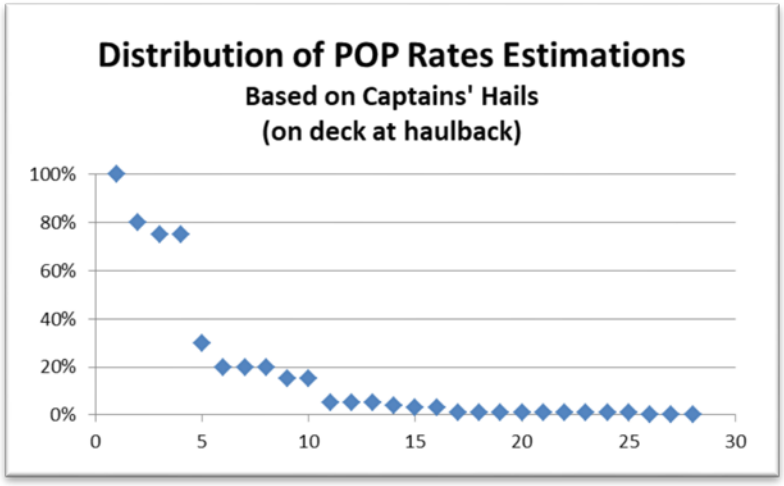
In an alternative approach, the captains of the three vessels were interviewed after the season and provided their insights as to the factors that may correlate with the rate of POP bycatch in the Aleutian Island Pollock fishery, as well as their opinions on the viability of a retained rate versus a cap based management approach to regulating POP bycatch. (see attachment 3 – "*Post-season Interviews with Captains* ").

Based on the responses of the Captains in their experience, they assigned a low probability that most of the variables held much promise for avoiding POP. One exception was the combination of depth of net and bottom together with knowledge of the area from prior experience. The other exception noted by all three Captains was the fishing at night was cleaner as Pollock lifted off bottom, though they "could only find/catch Pollock during hours of darkness." The Captains also expressed skepticism about the ability to consistently distinguish POP from Pollock based on hydro-acoustic sign.

Given the low R^2 values, it is difficult to draw any statistically significant conclusions about correlations with the variables for which data was collected. We have attempted to visualize the data graphically in the following series of figures.

The first figure (fig. 6) shows the range of bycatch rates as estimated by the Captains once the net had been retrieved and the codend was emptied on deck. The estimates ranged from 0% POP bycatch to 100% POP.

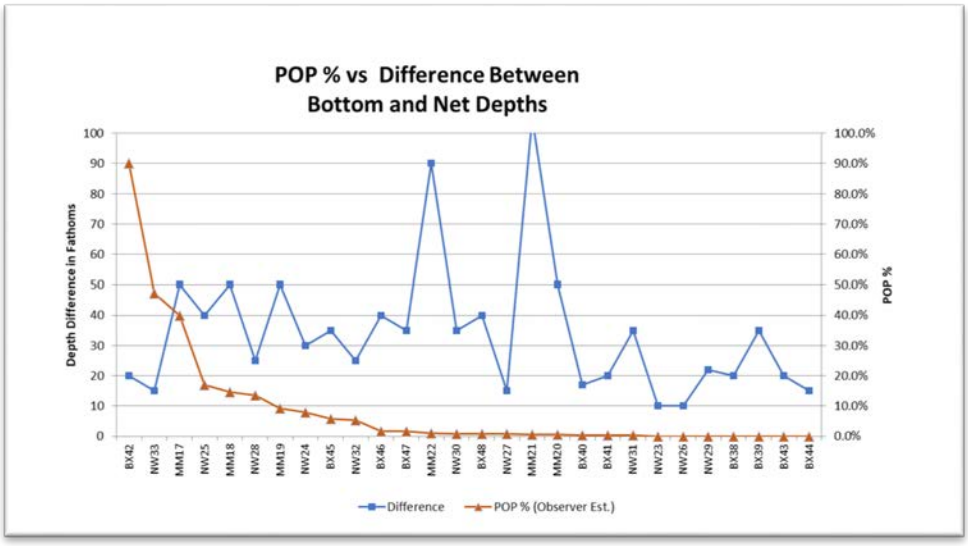
Figure 15 – Range of POP Rate Estimations



While the Captains identified the differences between fishing depths and bottom depths as a factor that they felt was useful in avoiding POP bycatch, as with the regression analysis, the following graph (fig.16) doesn't show a clear pattern. This apparent lack of correlation could be a reflection of the recorded depth data being a single point in a tow. It could also be a function of the extremely steep bathymetry in the Aleutians. One of the captains noted that while the footrope of the "inside " wing of

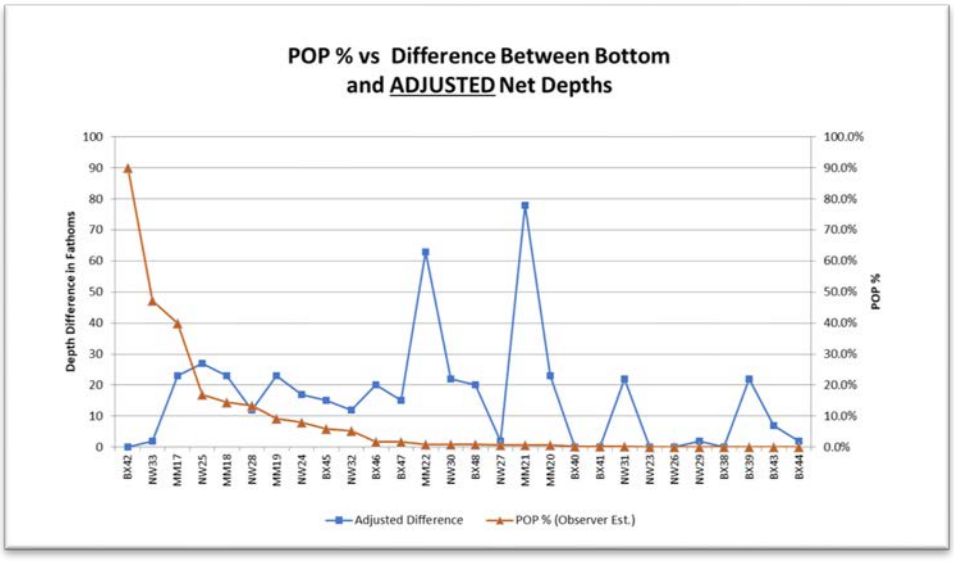
the net may be only a couple fathoms of bottom, the center off the footrope of the net could be 10 to 15 fathoms off bottom.

Figure 16 - POP Bycatch Rates vs Difference between Net and Bottom Depths



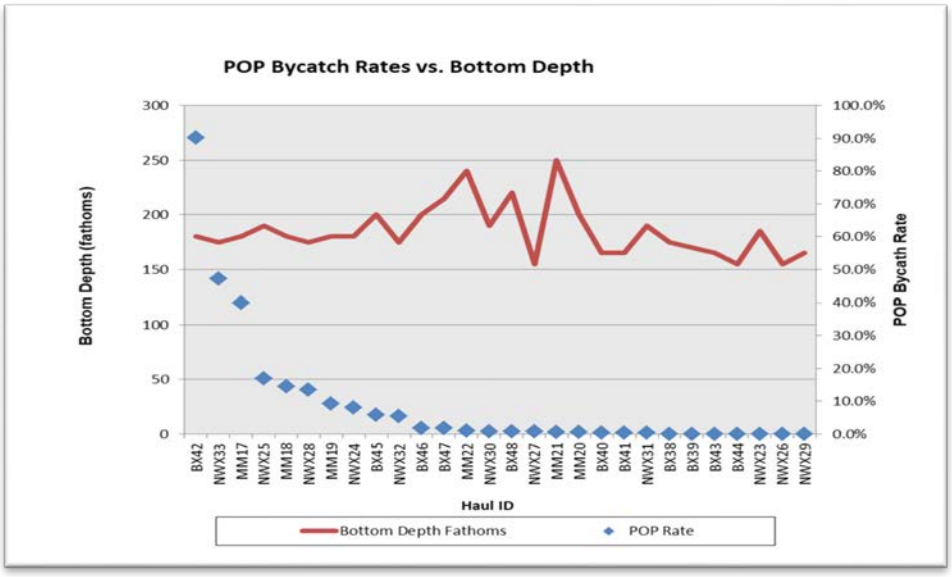
The "Net Depth" for a pelagic trawl as recorded in the Captains' Log and in the observer data, is generally the headrope depth. Because there is a substantial variation in the vertical openings of the nets among vessels, the depth of the headrope is not a reliable surrogate for the calculating the distance off bottom of the foot rope. The Captains provided the information on the opening of the nets they used in this fishery (MM - 27 fathoms, BX - 20 fathoms, NWX - 13 fathoms). Figure 17 re-plots the fishing depth with the adjustment to footrope depth. Again, this may simply reflect the same issue of characterizing depth for an entire tow with a single data point.

Figure 17 – POP Bycatch Rates vs Adjusted Net Depth



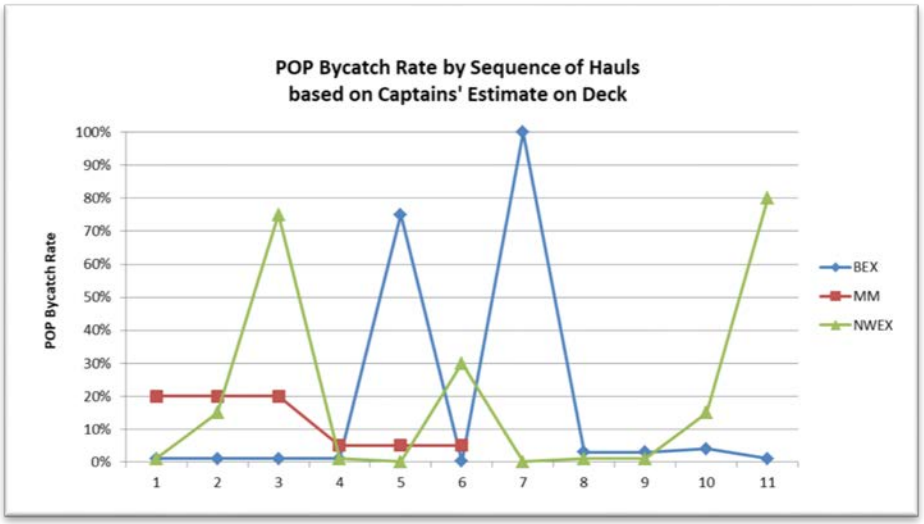
The next graph (fig. 18) looks directly at bottom depth. As with the difference in bottom vs net depth, there is no clear pattern.

Figure 18 – POP Bycatch Rates vs Bottom Depth



The next graph (fig. 19) looks at the Captains' estimates of POP rates sequentially to examine whether POP rates were reduced from trip to trip as more local knowledge was garnered. The results were mixed.

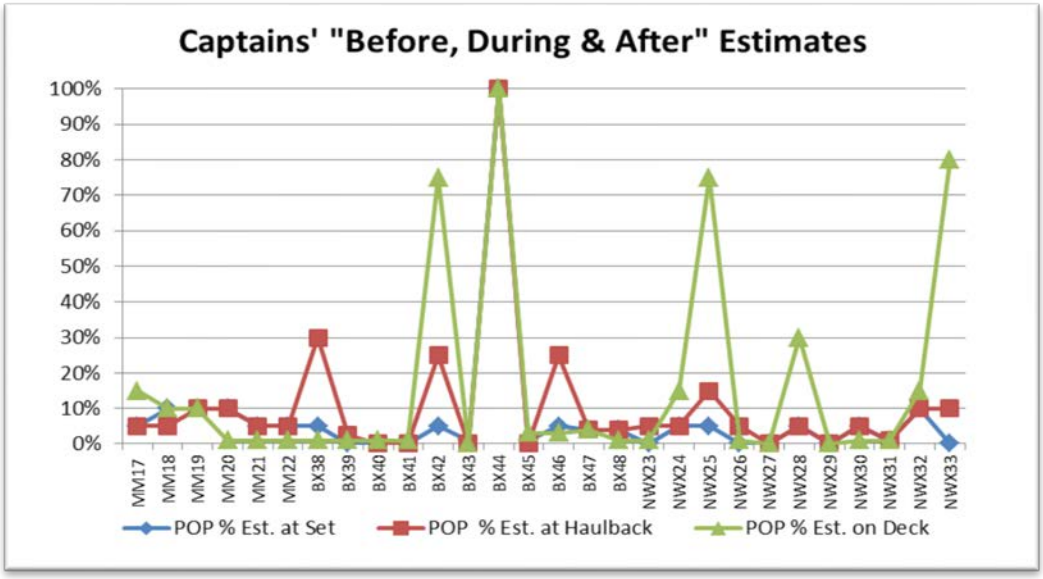
Figure 19 – POP Bycatch Rates Over Time



In order to explore whether Captains were able to predict whether POP would be encountered based on their interpretation of down sounder and/or net sounder displays, they were asked to estimate the percentage of POP they expected in the catch at the time they set the net, at the time they began to

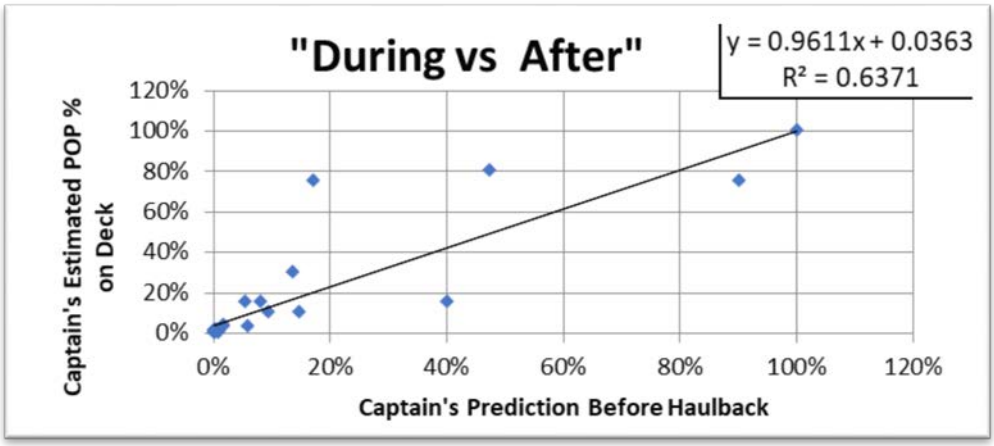
haul back, and once the codend was brought on deck. The assumption was that if POP could be reliably distinguished from Pollock based on the hydro-acoustic signal, then high bycatch rates of POP should not come as a surprise. The following graph of Captains' predictions (fig.20) shows several "surprises". (See "*Post-season Interviews with Captains*" for their comments).

Figure 20 – Predictions



The prediction graph (above) shows some of the highest POP %s were associated with pre- and mid-tow predictions of higher than average POP %s. The 'surprises' related to the magnitude of the bycatch. The regression analysis below suggests that something the captains become aware of during the tow is somewhat helpful in predicting POP bycatch. This is consistent with the comments the captains made regarding the use of net sounders and down sounders to identify POP.

Figure 20 – Predictions



The one variable that had the greatest impact on POP bycatch rates was where the vessels fished. The CPUE for the Pollock target was about 50% greater in 542 (Kanaga Sound) than in 541 (Atka east and west of North Cape), while the POP CPUE was 23 time higher in 541. These differences in CPUE were reflected in the POP bycatch rates by area which were 20 times lower that the rates in the portion of 542 fished than the rates portions of 541 fished. (It would be inappropriate to generalize from Kanaga Sound rates to all of 542, or from Atka to all of 541, however the areas fished under the EFP have been the focus of effort in the past.)

Table 1 - CPUE by Area

CPUE by Area - Summarized from Observer Data					
Area	Sum of Duration (Hours)	Sum of Pollock MT	Sum of POP MT	Pollock CPUE MT/Hour	POP CPUE MT/Hour
542	77.2	350.2	3.7	4.5	0.05
541	117.6	387.3	132.0	3.3	1.12

Figure 21(a) shows the location of hauls in area 541 on east (Nazan Bay) and west (Koniuji) sides of Atka Island. Hauls in green were 5% or less POP, with increasing rates in yellow and orange, with the highest rates in red.

Figure 21(a) – 541 POP rates by haul locations

Figure 21(b) plots the locations of hauls in Kanaga Sound, all of which had POP rates of less than 5%. Also shown is a single haul in Sitkin Sound (area 541) which the observer estimated to be 90% POP.

Figure 21(b) – 542 Kanaga Sound POP rates by haul locations

The statistical tests did not provide compelling evidence of variables that correlate with avoiding POP. However, the experience of the Captains, as related in the interviews concerning depth stratification of POP and Pollock by depth and time of day, should be given weight. Together with the local knowledge of POP by area, these two factors are the most meaningful for successfully limiting POP bycatch in the Aleutian Island Pollock fishery.

How well EFP objectives were accomplished

Full harvest of the A season DFA limit of 10,361 tons within the 500 ton POP constraint was identified in the permit as the best metric of success.

While only 702 tons of Pollock and 107 tons of the 500 POP limit were caught during the 2020 EFP fishery, the overall average rate of POP to Pollock was 15.3% based on the landed scale weight at the fish plant (see table 2). If fishing had continued at that rate, only 3,273 tons of Pollock could have been harvested within the 500 ton constraint.

By contrast, if the Aleutian Island Pollock fishery could hypothetically be conducted at the 1.7% bycatch rate experienced in Kanaga Sound, the A season DFA limit of 10,361 tons of Pollock could have been taken with 180 tons of POP. This assumes sufficient Pollock biomass in the area to support sustainable CPUEs. As shown in Table 1, CPUEs for Pollock in 542 averaged about 4.5 mt/hr, which is far lower than Bering Sea CPUEs for Pollock.

Table 2 - POP Rates by Area

POP Rates Summaized by Area From Fish Ticket Weights (Lbs)						
Vessel	Area	Fish TIcket Pollock + POP Lbs	Fish Ticket Pollock Lbs	Fish Ticket POP Lbs	POP as % of Pollock Lbs	POP as % of Total Lbs
Fleet	All	1,785,185	1,548,221	236,492	**15.3%**	13.2%
Fleet	541	755,585	632,094	220,581	**34.9%**	29.2%
Fleet	542	1,029,600	916,127	15,911	**1.7%**	1.5%
MM	All	316,358	306,040	9,846	3.2%	3.1%
MM	541	55,365	46,740	8,576	18.3%	15.5%
MM	542	260,993	259,300	1,270	0.5%	0.5%
BEX	All	977,238	850,348	126,890	14.9%	13.0%
BEX	541	585,287	472,236	113,051	23.9%	19.3%
BEX	542	391,951	378,112	13,839	3.7%	3.5%
NWX	All	491,589	391,833	99,756	25.5%	20.3%
NWX	541	114,933	113,118	98,954	87.5%	86.1%
NWX	542	376,656	278,715	802	0.3%	0.2%

Another primary objective was to reduce the waste of POP that would have been discarded without the EFP. All POP was retained and processed.

If the EFP exemption from the 5% MRB standard had not been in effect, at least 82%, or 87 tons, of the POP would have been wasted as discard in order to meet the an overall 5% retention limit on a trip by trip basis. (See table 6 for the calculation of POP discard that would have been required in excess of the MRA by trip.)

Summary

- Only 7% of the Aleut Corporation's Aleutian Island A-season pollock allocation was harvested. (CPUEs were far lower than Bering Sea A-season Pollock CPUEs.)

- Regression analyses did not reveal any significance influence on the POP bycatch rate to the variables for which we tested, with the exception of area fished (Kanaga vs Atka).

- The Captains' interviews indicated that they do feel that in their experience there is a correlation between POP % and the distance of the net off bottom, and that local knowledge is important.

- Discard waste was avoided as a result of the exemption from the 5% MRA.

- Safety was enhanced by avoiding prolonged time on deck for crew that would have been required to sort and discard POP under an MRA.

- All three vessels collected hydro-acoustic data which was forwarded to the Alaska Fisheries Science Center.

Our thanks to the three Captains: Ray Haddon, David Willmore, and Brian Haley. Thanks also to Steve Barbeaux for his help with the design of this project.

Tables

Table 3 – Captains' Logbook Records of Variables by Haul.

Muir Milach Captain's Logbook Tow Data													
Haul Number	Latitude set	Longitude set	Deploy Date Time	Latitude haul	Longitude haul	Retrieve Date Time	Duration	Net depth	Bottom depth	Current Speed	Current Direction	WX code	Sea State Code
MM17 EFP1	52 13.9	174 54.9	2/25/2020 23:45	52 13.9	174 54.9	2/26/2020 2:20	2:35	130	180	1.6	-	2	4
MM18 EFP2	52 12	175 04.6	3/3/2020 0:28	52 12	175 04.6	3/3/2020 6:20	5:52	130	180	1.3	-	1	4
MM19 EFP3	52 18.7	174 46.4	3/4/2020 0:55	52 18.7	174 46.4	3/4/2020 6:30	5:35	130	180	1.2	-	1	3
MM20 EFP4	51 49.9	177 24.5	3/6/2020 23:25	51 49.9	177 24.5	3/7/2020 3:25	4:00	150	200	.8 to 1.0	-	1	3
MM21 EFP5	51 49.9	177 21.4	3/7/2020 22:00	51 49.9	177 21.4	3/8/2020 4:25	6:25	145	250	.8 to 1.0	-	1	3
MM22 EFP6	51 50.1	177 21.4	3/9/2020 21:00	51 50.1	177 21.4	3/9/2020 23:59	2:59	150	240	0.7	-	1	3

Bristol Explorer Captain's Logbook Tow Data													
Haul Number	Latitude set	Longitude set	Deploy Date Time	Latitude haul	Longitude haul	Retrieve Date Time	Duration	Bottom depth	Net depth	Current Speed	Current Direction	WX code	Sea State Code
BEX EFP1	52 16.9	173 33.2	3/18/2020 4:10	51 17.2	173 34.3	3/18/2020 10:05	5:55	175	165	1.6	315	3	5
BEX EFP2	52 17	173 31.8	3/18/2020 21:36	52 20.8	174 42.3	3/19/2020 8:51	11:15	165	148	1.0	315	2	4
BEX EFP3	52 20	173 42.6	3/20/2020 21:55	51 17.2	173 35.5	3/21/2020 8:15	10:20	190	150	1.4	140	1	3
BEX EFP4	52 17.1	173 33.5	3/21/2020 21:28	52 19.8	173 42.3	3/22/2020 7:46	10:18	165	145	3.0	140	1	3
BEX EFP5	52 17	176 32	3/23/2020 2:41	52 00.8	176 29.8	3/23/2020 10:27	7:46	200	180	1.0	20	2	4
BEX EFP6	52 25	173 43	3/25/2020 21:27	52 17.1	173 35.4	3/26/2020 8:10	10:43	165	140	1.4	140	1	1
BEX EFP7	51 49.9	174 22.8	3/26/2020 23:29	51 49	174 28.9	3/27/2020 0:20	0:51	155	145	0.9	240	1	1
BEX EFP8	51 47.9	177 32.2	3/28/2020 1:12	51 48 .6	177 31.9	3/28/2020 9:34	8:22	200	160	0.5	225	1	1
BEX EFP9	51 51	177 17.3	3/29/2020 2:06	51 50.9	177 17	3/29/2020 10:58	8:52	215	180	0.2	225	3	1
BEX EFP10	51 56.3	177 36.8	3/29/2020 21:38	51 49.3	177 21.6	3/30/2020 9:20	11:42	215	180	1.0	20	3	3
BEX EFP11	51 50.1	177 24.6	3/30/2020 21:43	51 54.6	177 14	3/31/2020 9:00	11:17	220	180	1.0	100	3	1

NW Explorer - Captain's Logbook Tow Data													
Haul Number	Latitude set	Longitude set	Deploy Date Time	Latitude haul	Longitude haul	Retrieve Date Time	Duration	Bottom depth	Net depth	Current Speed	Current Direction	WX code	Sea State Code
NWEX 23 EFP1	51 49	177 23	3/15/2020 23:50	51 49	177 29	3/16/2020 4:14	4:24	185	150	0.8	45	2	3
NWEX 24 EFP2	52 21	173 41	3/16/2020 22:50	52 14	175 07	3/17/2020 2:30	3:40	180	150	0.7	1	1	1
NWEX 25 EFP3	52 25	173 43	3/17/2020 5:50	52 16	174 49	3/17/2020 9:21	3:31	190	150	0.5	45	3	3
NWEX 26 EFP4	52 18	173 39	3/19/2020 1:15	52 18	173 38	3/19/2020 9:25	8:10	155	135	1.0	300	3	4
NWEX 27 EFP5	52 21	173 41	3/19/2020 22:35	52 18	173 39	3/20/2020 2:30	3:55	155	135	0.8	200	1	1
NWEX 28 EFP6	52 25	173 43	3/20/2020 5:30	52 24	173 43	3/20/2020 9:30	4:00	175	150	1.0	320	1	1
NWEX 29 EFP7	52 17	173 34	3/21/2020 23:00	52 17	173 34	3/22/2020 2:40	3:40	165	150	0.6	120	0	3
NWEX 30 EFP8	51 50	177 23	3/22/2020 23:00	51 50	177 21	3/23/2020 9:20	10:20	155	190	1.0	250	3	4
NWEX 31 EFP9	51 49	177 29	3/23/2020 23:05	51 52	177 15	3/24/2020 9:15	10:10	155	190	0.5	250	3	3
NWEX 32 EFP10	52 12	175 04	3/26/2020 23:05	52 17	174 48	3/27/2020 8:40	9:35	175	150	0.5	180	2	3
NWEX 33 EFP11	52 17	173 32	3/27/2020 22:40	52 25	173 43	3/28/2020 8:15	9:35	175	160	0.3	40	1	3

Table 4 - POP % and Lbs Estimates "Before and After" from Captains' Logbooks

Captain's Estimates for Hauls MM EFP1 to MM EFP6						
Fish ticket E20 #	Haul Number	Captain's Hail Weight LBS	POP as % of Total Wt. at Set	POP as % of Total Wt. at Haulback	POP as % of Total Wt. at on deck	POP Wt. estimate based on deck
444668	MM17 EFP1	30,000	5%	5%	15%	4,500
445207	*MM18 EFP2*	25,000	10%	5%	10%	2,500
445207	MM19 EFP3	20,000	10%	10%	10%	2,000
445381	MM20 EFP4	130,000	10%	10%	1%	1,300
445488	MM21 EFP5	70,000	5%	5%	1%	700
445646	MM22 EFP6	40,000	5%	5%	1%	400
	Total (in lbs)	**315,000**	-	-	**4%**	***11,400***

Captain's Estimates for Hauls BEX EFP1 to EFP11						
Fish ticket E20 #	Haul Number	Captain's Hail Weight LBS	POP as % of Total Wt. at Set	POP as % of Total Wt. at Haulback	POP as % of Total Wt. at on deck	POP Wt. estimate based on deck
446643	BEX EFP1	66,138	5%	30%	1%	661
446643	BEX EFP2	176,368	0%	3%	1%	1,764
447091	BEX EFP3	132,276	0%	0%	1%	1,323
447091	BEX EFP4	66,138	0%	0%	1%	661
447091	BEX EFP5	242,506	5%	25%	75%	181,880
447268	BEX EFP6	55,115	1%	0%	0.0%	-
447268	BEX EFP7	1,102	100%	100%	100%	1,102
447268	BEX EFP8	44,092	1%	0%	3%	1,323
447418	BEX EFP9	66,138	5%	25%	3%	1,984
447418	BEX EFP10	154,322	4%	4%	4%	6,173
447418	BEX EFP11	165,345	4%	4%	1%	1,653
	Total (in lbs)	**1,169,540**			**17%**	***198,524***

Captain's Estimates for Hauls NWEX EFP1 to EFP11						
Fish ticket E20 #	Haul Number	Captain's (Observer's) "Hail" Weight LBS	POP as % of Total Wt. at Set	POP as % of Total Wt. at Haulback	POP as % of Total Wt. at on deck	POP Wt. estimate based on deck
446470	NWEX 23 EFP1	40,270	0%	5%	1%	403
446470	NWEX 24 EFP2	40,270	5%	5%	15%	6,040
446470	NWEX 25 EFP3	48,325	5%	15%	75%	36,244
446717	NWEX 26 EFP4	118,012	0%	5%	1%	1,180
446717	NWEX 27 EFP5	6,437	0%	0%	0%	-
446717	NWEX 28 EFP6	42,913	5%	5%	30%	12,874
447094	NWEX 29 EFP7	1,889	0%	0%	0%	-
447094	NWEX 30 EFP8	94,461	5%	5%	1%	945
447094	NWEX 31 EFP9	18,935	1%	1%	1%	189
447324	NWEX 32 EFP10	40,010	10%	10%	15%	6,002
447324	NWEX 33 EFP11	80,211	0%	10%	80%	64,169
	Total (in lbs)	**531,734**			**24%**	**128,045**
	Grand Totals	**2,016,274**			**17%**	**337,969**

Table 5 - Vessel Summaries by Captains, Fish Tickets & Observers

Captain's Estimates					
Vessel Summaries	Captain's Hail Wt. total (LBS)	Pollock Hail Wt. based on deck est.	POP Hail WT. based on deck est.	POP as % of Pollock Wt. on deck est.	POP as % of Total Wt. on deck est.
MM	315,000	303,600	11,400	3.8%	3.6%
BEX	1,169,540	971,016	198,524	20.4%	17.0%
NWEX	531,734	403,689	128,045	31.7%	24.1%
Grand Totals	**2,016,274**	**1,678,305**	**337,969**	**20.1%**	**19.3%**

Fish Ticket Data					
Vessel Summaries	Fish TIcket Pollock + POP Wt.	Fish Ticket Pollock Wt.	Fish Ticket POP Wt.	POP as % of Pollock Wt.	POP as % of pollock + POP
MM	316,358	306,040	9,846	3.2%	3.1%
BEX	977,238	850,348	126,890	14.9%	13.0%
NWEX	491,589	391,833	99,756	25.5%	20.3%
Grand Totals	**1,785,185**	**1,548,221**	**236,492**	**15.3%**	**13.2%**

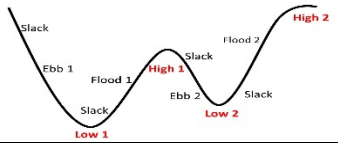
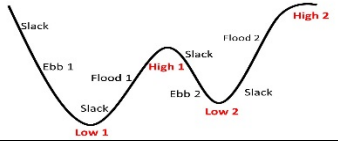
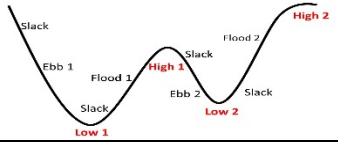
Observer Extrapolations					
Vessel Summaries	Observer Pollock + POP Wt.	Observer Pollock Wt	Observer POP Wt	POP as % of Pollock Wt.	POP as % of Total pollock + POP
MM	315,289	298,423	16,382	5.5%	5.2%
BEX	1,083,036	858,247	224,789	26.2%	20.8%
NWEX	531,730	469,187	58,016	12.4%	10.9%
Grand Totals	**1,930,055**	**1,625,857**	**299,187**	**18.4%**	**15.5%**

Table 6 - Calculation of POP excess of MRA by trip

Fish ticket E20 #	Fish Ticket Pollock Wt.	Fish Ticket POP Wt.	MRA	POP Est > MRA	Mandatory discard
444668	23,339	6,385	1,167	TRUE	5,218
445207	23,401	2,191	1,170	TRUE	1,021
445381	136,813	246	6,841	FALSE	
445488	81,660	419	4,083	FALSE	
445646	40,827	605	2,041	FALSE	
446643	234,418	293	11,721	FALSE	
447091	237,818	112,758	11,891	TRUE	100,867
447268	67,447	5,093	3,372	TRUE	1,721
447418	310,665	8,746	15,533	FALSE	
446470	107,999	20,943	5,400	TRUE	15,543
446717	115,887	11,387	5,794	TRUE	5,593
447094	113,118	1,815	5,656	FALSE	
447324	54,829	65,611	2,741	TRUE	62,870
Lbs	1,548,221	236,492	77,411	TRUE	192,832
MT	**702**	**107**	**35**		**87**

Table 7– Observer data

Observer Data (extrapolated weights in metric tons)																	
Harvesting Vessel	Haul Date	Deploy DateTime	Retrieve DateTime	Duration	Reporting Area	Haul Number	Fish Depth Fathoms	Bottom Depth Fathoms	Latitude	Longitude	Pollock Wt	Pacific Ocean PerchWt	Pacific Cod Wt	Atka Mackerel Wt	Rock Sole Wt	Arrow-tooth Wt	Kamchatca Wt
Muir Milach	26-Feb-20	2/25/20 11:35 PM	2/26/20 2:30 AM	2.92	541	17	130	180	52.23167	-174.915	8.0223	5.3207	0	0	0	0	0
Muir Milach	03-Mar-20	3/3/20 12:28 AM	3/3/20 6:20 AM	5.87	541	18	130	180	52.2	-175.075	4.8550	0.8260	0	0	0	0	0
Muir Milach	04-Mar-20	3/4/20 12:55 AM	3/4/20 6:30 AM	5.58	541	19	130	180	52.31167	-174.7733	5.0855	0.5188	0	0	0	0	0
Muir Milach	07-Mar-20	3/6/20 11:25 PM	3/7/20 3:25 AM	4.00	542	20	150	200	51.83167	-177.3567	61.7874	0.3536	0	0	0	0	0
Muir Milach	08-Mar-20	3/7/20 10:00 PM	3/8/20 4:25 AM	6.42	542	21	145	250	51.83167	-177.3567	37.0290	0.2362	0	0	0	0	0
Muir Milach	10-Mar-20	3/9/20 9:00 PM	3/10/20 12:00 AM	3.00	542	22	150	240	51.835	-177.3567	18.5845	0.1753	0	0	0	0	0
Bristol Explorer	18-Mar-20	3/18/20 5:10 AM	3/18/20 11:05 AM	5.92	541	38	165	175	52.28667	-173.5717	29.0760	0.0000	0	0	0	0	0
Bristol Explorer	19-Mar-20	3/18/20 10:36 PM	3/19/20 9:51 AM	11.25	541	39	160	170	52.34667	-173.705	77.5340	0.0000	0	0	0	0	0
Bristol Explorer	21-Mar-20	3/20/20 9:55 PM	3/21/20 8:15 AM	10.33	541	40	148	165	52.28667	-173.5917	59.8112	0.1888	0	0	0	0	0
Bristol Explorer	22-Mar-20	3/21/20 9:28 PM	3/22/20 7:46 AM	10.30	541	41	145	165	52.33	-173.705	24.9213	0.0787	0	0	0	0	0
Bristol Explorer	23-Mar-20	3/23/20 2:41 AM	3/23/20 10:27 AM	7.77	541	42	160	180	52.01333	-176.4967	10.8982	99.1019	0	0	0	0	0
Bristol Explorer	26-Mar-20	3/25/20 9:27 PM	3/26/20 8:10 AM	10.72	541	43	143	165	52.285	-173.59	23.0876	0.0000	0	0	0	0.05394	0.02248
Bristol Explorer	27-Mar-20	3/26/20 11:29 PM	3/27/20 12:20 AM	0.85	541	44	135	155	51.81667	-174.4817	0.4965	0.0000	0	0	0	0.00116	0.0004834
Bristol Explorer	28-Mar-20	3/28/20 1:12 AM	3/28/20 9:34 AM	8.37	542	45	165	200	51.81	-177.5317	8.7420	0.5380	0	0	0	0	0
Bristol Explorer	29-Mar-20	3/29/20 2:06 AM	3/29/20 10:58 AM	8.87	542	46	160	200	51.84833	-177.2833	24.4343	0.4157	0	0	0	0	0
Bristol Explorer	30-Mar-20	3/29/20 9:38 PM	3/30/20 8:58 AM	11.33	542	47	180	215	51.83	-177.3267	68.8013	1.1706	0	0	0	0	0
Bristol Explorer	31-Mar-20	3/30/20 9:43 PM	3/31/20 8:00 AM	10.28	542	48	180	220	51.91	-177.2333	61.4922	0.4692	0	0	0	0	0
Northwest Explorer	16-Mar-20	3/15/20 11:51 PM	3/16/20 4:14 AM	4.38	542	23	150	185	51.81694	-177.4956	18.2660	0.0000	0	0	0	0	0
Northwest Explorer	17-Mar-20	3/16/20 10:56 PM	3/17/20 2:30 AM	3.57	541	24	150	180	52.24722	-175.1222	16.8141	1.4519	0	0	0	0	0
Northwest Explorer	17-Mar-20	3/17/20 5:49 AM	3/17/20 9:21 AM	3.53	541	25	150	190	52.24222	-174.8922	18.2026	3.7174	0	0	0	0	0
Northwest Explorer	19-Mar-20	3/19/20 1:16 AM	3/19/20 9:25 AM	8.15	541	26	135	155	52.30417	-173.6419	51.4766	0.0000	2.0534	0	0	0	0
Northwest Explorer	20-Mar-20	3/19/20 10:34 PM	3/20/20 2:29 AM	3.92	541	27	140	155	52.30722	-173.6533	2.8992	0.0208	0	0	0	0	0
Northwest Explorer	20-Mar-20	3/20/20 5:32 AM	3/20/20 9:30 AM	3.97	541	28	150	175	52.40444	-173.7242	16.8444	2.6206	0	0	0	0	0
Northwest Explorer	22-Mar-20	3/21/20 11:01 PM	3/22/20 2:43 AM	3.70	541	29	150	165	52.29056	-173.6086	0.8570	0.0000	0	0	0	0	0
Northwest Explorer	23-Mar-20	3/22/20 11:00 PM	3/23/20 9:21 AM	10.35	542	30	155	190	51.83528	-177.3647	42.5062	0.3408	0	0	0	0	0
Northwest Explorer	24-Mar-20	3/23/20 11:03 PM	3/24/20 9:13 AM	10.17	542	31	155	190	51.87722	-177.2517	8.5658	0.0232	0	0	0	0	0
Northwest Explorer	27-Mar-20	3/26/20 11:03 PM	3/27/20 8:43 AM	9.67	541	32	150	175	52.28278	-174.8078	17.1869	0.9614	0	0	0	0	0
Northwest Explorer	28-Mar-20	3/27/20 10:38 PM	3/28/20 8:16 AM	9.63	541	33	160	175	52.41944	-173.7186	19.2032	17.1798	0	0	0	0	0

Haul #	Set L/L Date/Time	Bottom Depth / Fishing Depth	Haul L/L Date/Time	Weather Code	Estimated Current speed and direction	Sea State Code	Tidal State (Indicate period when fished)	%POP		
								Before Set	Haul-back	On Deck
										
										
										
										
										
										
										

Haul Number	

Sea State Code	Wave Height	Characteristics
0	0 meters (0 ft)	Calm (glassy)
1	0 to 0.1 meters (0.00 to 0.33 ft)	Calm (rippled)
2	0.1 to 0.5 meters (3.9 in to 1 ft 7.7 in)	Smooth (wavelets)
3	0.5 to 1.25 meters (1 ft 8 in to 4 ft 1 in)	Slight
4	1.25 to 2.5 meters (4 ft 1 in to 8 ft 2 in)	Moderate
5	2.5 to 4 meters (8 ft 2 in to 13 ft 1 in)	Rough
6	4 to 6 meters (13 to 20 ft)	Very rough
7	6 to 9 metres (20 to 30 ft)	High
8	9 to 14 metres (30 to 46 ft)	Very high
9	Over 14 metres (46 ft)	Phenomenal

Weather Code	Cloud Cover
0	No Clouds/Fog
1	<50% Clouds
2	>50% Clouds
3	100% Clouds/Fog

Note: Please ensure that this form, your logbook, and the observer haul numbers match..

Initial Report to NMFS

Exempted Fishing Permit # 2019 – 02

Prepared by dave fraser and George Pollock – Co-PI's

November 18 , 2019

EFP # 2019 - 02 authorized vessels participating in the 2019 and 2020 Aleutian Islands (AI) pollock fishery to conduct experimental fishing to provide information on methods to reduce bycatch of Pacific ocean perch (POP). This interim report includes a summary of project objectives, statistical areas fished, vessels used, a detailed description of activities, any problems and successes, and how well EFP objectives were accomplished.

Summary of project objectives (Purpose and Goals) -

The purpose of the EFP was to test an alternative management framework for limiting POP bycatch in the AI pollock fishery which could potentially provide an opportunity for the Aleut Corporation to develop an economically viable AI pollock fishery while improving safety at sea and reducing the potential overall POP bycatch mortality.

Goals included:

- Prosecuting the Aleut Corporation's AI pollock allocation while testing methods to minimize POP catch.
- Limiting POP bycatch mortality and waste in a fully prosecuted AI pollock fishery through full retention and accounting of POP bycatch while limiting of overall POP catch to 500 tons.
- Improving safety at sea by reducing the amount of time necessary to stow catch by eliminating the need to sort POP from the catch on deck.
- Gathering relevant data on timing and location of POP bycatch during the EFP AI pollock fishery that may be examined for correlations to determine means of reducing bycatch rates.

Statistical areas fished

All fishing was conducted in the eastern Aleutian Islands area 541. All hauls were within the Atka Study Area of the 2006 Aleutian Islands Cooperative Acoustic Survey Study (AICASS) conducted in March – April 2006.

Figure 1, below shows the Atka Study Area from the 2006 AICASS.

Set and haul locations were plotted on Google Maps, shown in Figure 2.

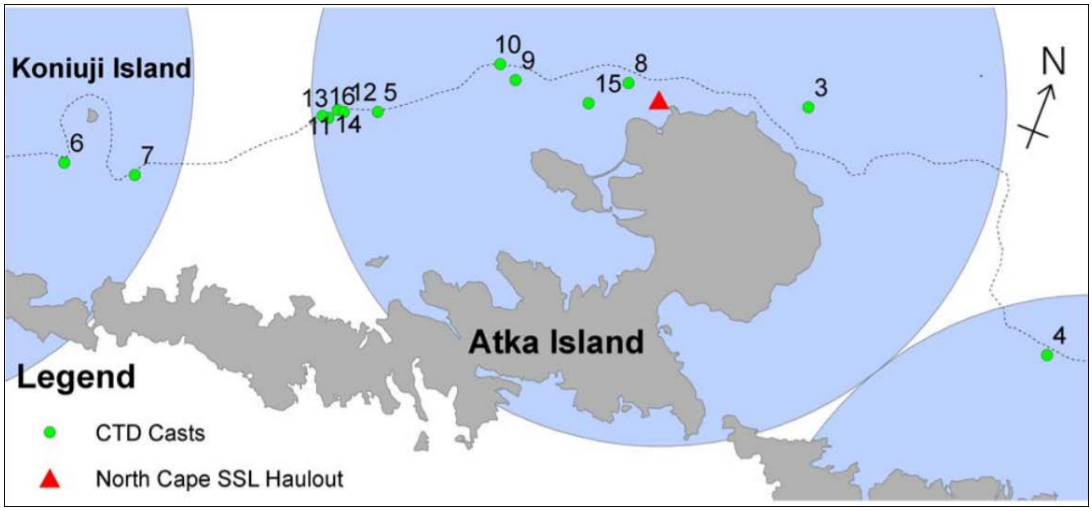


Figure 1 – Adak Study Area from 2006 AICASS

Figure 2 – Locations of Hauls for 2019 EFP

Vessels used

Two vessels were approved to participate under the EFP permit.

One was the 102 foot FV Muir Milach, which had also participated in the 2006 to 2008 AICASS study.

The second vessel was the 58 foot FV Equinox.

Figure 3 - FV Muir Milach

Figure 4 - FV Equinox

Detailed description of activities

The participating vessels were provided with log books to record potentially relevant correlative factors. Location, time, and depth data from Muir Milach's log book detailing each haul are summarized in Table 1. A copy of the logbook is attached as appendix 1.

An observer sampled each haul and provided extrapolated amounts of POP and other incidental bycatch, which can be compared to the Captain's estimates and to actual weights taken at the processing plant in Table 2 (a-d).

Current and tide data for the nearest reference stations are presented in Tables 3 and 4 for the days when tows were made, and are also shown graphically in Figures 5 and 6

Problems and successes

The intent was to commence pollock fishing under the EFP immediately following the closure of A season cod fishing in the AI which occurred on March 16th. Unfortunately a number of factors delayed the start of fishing until March 25th. These included finalizing the processor's CMCP for pollock, getting

observers to Adak for the plant and the Equinox, and the Muir Milach needed to make a trip to Unalaska to pick up their pollock net and an observer.

The Equinox attempted a pollock trip March 28th but the weather was too severe and they did not set a net. Equinox provided notice that they were suspending fishing under the EFP without having made any tows.

After its pollock delivery on the 29th, the Muir Milach switched back to cod gear for the B season opening. Muir Milach intended to make another pollock trip following the B season cod closure, but they had a mechanical problem with their hydraulic auxiliary while fishing cod. The Muir Milach determined it would take too much time needed to get parts and a mechanic to Adak to make repairs. Muir Milach notified NMFS they would not resume operating under the AI pollock EFP during 2019.

Summary of the results of the hypotheses

The underlying hypotheses being tested was whether it is possible that POP catch can be avoided or minimized based on correlations with time of day, time of year, depth of net, depth of bottom, characteristics of the thermocline, net modifications, etc. The objective was to gather sufficient relevant data that could be examined for correlations.

The 2019 data set from fishing under the EFP consists of 5 hauls. Due to the limited amount of data it was not possible to draw any statistically significant conclusions about correlations with the factors for which data were collected.

How well EFP objectives were accomplished

Full harvest of the A season DFA limit of 10,361 tons within the 500 ton POP constraint was identified in the permit as the best metric of success. By that measure the 2019 phase of the EFP was not successful.

We were able to collect relevant data on timing, depth, and location of POP bycatch during the EFP AI pollock fishery and cross reference it to environmental variables such as tide, current and time of day. With a larger data set from the 2020 season we should be able to examine the data for correlations to determine means of reducing bycatch rates.

One of the objectives was to reduce the waste of POP that would have been discarded without the EFP. All POP was retained and processed.

Data Tables:

Table 1 – Muir Milach Tow Data

Captain's Logbook Tow Data									
Haul Number	Latitude set	Longitude set	Deploy Date Time	Latitude haul	Longitude haul	Retrieve Date Time	Duration	Bottom depth	Net depth
MM 47 - EFP1	52 26.1	173 50.3	3/26/2019 2:10:00 AM	52 26.0	173 53.3	3/26/2019 3:00:00 AM	0:50	170	145
MM 48 - EFP2	52 15.6	174 51.0	3/26/2019 11:00:00 PM	52 18.9	174 46.4	3/27/2019 12:40:00 AM	1:40	190	165
MM 49 - EFP3	52 13.6	175 05.0	3/27/2019 3:50:00 AM	52 17.7	175 04.9	3/27/2019 7:00:00 AM	3:10	195	165
MM 50 - EFP4	52 14.3	175 08.5	3/28/2019 6:25:00 PM	52 15.1	175 06.8	3/28/2019 6:55:00 PM	0:30	185	160
MM 51 - EFP5	52 14.9	175 07.5	3/29/2019 1:05:00 AM	52 11.0	175 03.4	3/29/2019 3:50:00 AM	2:45	175	150

Table 2(a-d) - POP Percentage Comparisons

Captain's Estimates for Hauls EFP1 to EFP5					
Haul Number	Hail Weight LBS	POP as % of Total Wt. at Set	POP as % of Total Wt. at Haulback	POP as % of Total Wt. at on deck	POP Wt. estimate based on deck
MM 47 - EFP1	4,000	10%	50%	100%	4,000
MM 48 - EFP2	90,000	10%	15%	100%	90,000
MM 49 - EFP3	160,000	15%	15%	10%	16,000
MM 50 - EFP4	500	10%	30%	30%	150
MM 51 - EFP5	10,000	10%	10%	10%	1,000
Total (in lbs)	**264,500**			**42%**	***111,150***
Fish Ticket Data for Hauls EFP1 to EFP5					
Fish ticket #	Total Fish TIcket Wt.	Fish Ticket Pollock Wt.	Fish Ticket POP Wt.	POP as % of Pollock Wt.	POP as % of Total Wt.
E19-089954	-	-	-	-	-
E19-089954	-	-	-	-	-
E19-089954	234,329	143,991	90,338	63%	39%
E19-090252	-	-	-	-	-
E19-090252	13,081	10,769	2,312	21%	18%
Total (in lbs)	**247,410**	**154,760**	**92,650**	**60%**	**37%**
Observer Extrapolation by Haul					
Haul Number	Total Fmp Groundfish Wt.	Pollock Wt	Pacific Ocean Perch Wt	POP as % of Pollock Wt.	POP as % of Total Wt.
MM 47 - EFP1	1.8	0.2	1.6	994%	91%
MM 48 - EFP2	43.1	2.1	41.0	1952%	95%
MM 49 - EFP3	74.8	69.3	5.6	8%	7%
MM 50 - EFP4	0.2	0.1	0.1	92%	48%
MM 51 - EFP5	4.5	4.4	0.1	3%	**3%**
Total (in lbs)	**274,495**	**167,681**	**106,813**	**64%**	**39%**
Observer Extrapolation by Delivery					
Haul Number	Total Fmp Groundfish Weight	Pollock Wt.	Pacific Ocean Perch Wt.	POP as % of Pollock Wt.	POP as % of Total Wt.
MM 47 - EFP1					
MM 48 - EFP2					
MM 49 - EFP3	*119.7*	*71.5*	*48.2*	67%	*40%*
MM 50 - EFP4					
MM 51 - EFP5	*4.8*	*4.5*	*0.2*	5%	*5%*
Total (in lbs)	**274,495**	**167,681**	**106,813**	**64%**	***39%***

Table 3 – Current Data

Tidal Current Preditions for 1.2 miles SW of Fennimore Rock by Day - (Mean Flood Dir. 10 degrees, Mean Ebb Dir. 140 degrees)													
Date_Time (LST/LDT)	Event	Speed (knots)		Date_Time (LST/LDT)	Event	Speed (knots)		Date_Time (LST/LDT)	Event	Speed (knots)		Date_Time (LST/LDT)	Event	Speed (knots)
3/26/2019 1:40	**ebb**	**-2.36**		**3/27/2019 2:40**	**ebb**	**-1.62**		3/28/2019 0:52	slack	-		**3/29/2019 2:16**	**slack**	**-**
3/26/2019 4:47	slack	-		3/27/2019 5:41	slack	-		3/28/2019 3:52	ebb	-1.08		3/29/2019 5:10	ebb	-0.86
3/26/2019 6:48	flood	2.91		3/27/2019 7:36	flood	2.42		3/28/2019 6:35	slack	-		3/29/2019 7:41	slack	-
3/26/2019 9:16	slack	-		3/27/2019 10:04	slack	-		3/28/2019 8:30	flood	1.99		3/29/2019 9:30	flood	1.68
3/26/2019 12:58	ebb	-3.63		3/27/2019 13:46	ebb	-3.13		3/28/2019 11:04	slack	-		3/29/2019 12:10	slack	-
3/26/2019 17:29	slack	-		3/27/2019 18:23	slack	-		3/28/2019 14:40	ebb	-2.66		3/29/2019 15:46	ebb	-2.33
3/26/2019 19:48	flood	3.2		3/27/2019 20:54	flood	2.86		**3/28/2019 19:23**	**slack**	**-**		3/29/2019 20:23	slack	-
3/26/2019 23:28	**slack**	**-**						3/28/2019 22:18	flood	2.67		3/29/2019 23:42	flood	2.68

Table 4 – Tide Data for Adak and Atka, with Tide & Current Status for Time of Gear Deployment

Adak Tide Preditions					Atka Tide Predictions					Atka Tide Stage at Time of Sets		
Date	**Time (LST/LDT)**	**High/Low**	**Feet**		**Date**	**Time (LST/LDT)**	**High/Low**	**Feet**		**Haul Number**	**Deploy Date Time**	**Atka Tide Stage & feet**
					3/26/2019	0:42	H	2.82		MM 47 - EFP1	3/26/2019 2:10:00 AM	2.78 Ebbing
3/26/2019	4:21	2.64	L		3/26/2019	4:54	L	2.12		MM 48 - EFP2	3/26/2019 11:00:00 PM	2.19 Flooding
3/26/2019	9:23	3.45	H		3/26/2019	9:48	H	2.87		MM 49 - EFP3	3/27/2019 3:50:00 AM	2.68 Ebbing
3/26/2019	17:28	-0.42	L		3/26/2019	17:48	L	-0.77		MM 50 - EFP4	3/28/2019 6:25:00 PM	-0.48 Low Slack
3/27/2019	1:35	3.17	H		3/27/2019	1:42	H	2.62		MM 51 - EFP5	3/29/2019 1:05:00 AM	2.24 Flooding
3/27/2019	5:19	2.84	L		3/27/2019	5:36	L	2.14				
3/27/2019	10:00	3.44	H		3/27/2019	10:18	H	2.72				
3/27/2019	18:19	-0.47	L		3/27/2019	18:30	L	-0.94		**Fennimore Rock Current at Time of Sets**		
3/28/2019	2:41	3.2	H		3/28/2019	2:42	H	2.56		**Haul Number**	**Deploy Date Time**	**Current**
3/28/2019	6:14	2.94	L		3/28/2019	6:30	L	2.23		MM 47 - EFP1	3/26/2019 2:10:00 AM	Ebb 2.46 kt
3/28/2019	10:38	3.39	H		3/28/2019	11:00	H	2.81		MM 48 - EFP2	3/26/2019 11:00:00 PM	Slack to ebb
3/28/2019	19:09	-0.41	L		3/28/2019	19:24	L	-0.63		MM 49 - EFP3	3/27/2019 3:50:00 AM	Ebb 1.62 kn
3/29/2019	3:42	3.16	H		3/29/2019	3:18	H	2.49		MM 50 - EFP4	3/28/2019 6:25:00 PM	Slack to flood
3/29/2019	7:03	2.97	L		3/29/2019	7:24	L	2.1		MM 51 - EFP5	3/29/2019 1:05:00 AM	Slack to ebb
3/29/2019	11:16	3.31	H		3/29/2019	11:42	H	2.54				
3/29/2019	19:57	-0.25	L		3/29/2019	20:06	L	-0.72				

Figure 5- Atka Tide Graph 3/26-3/29

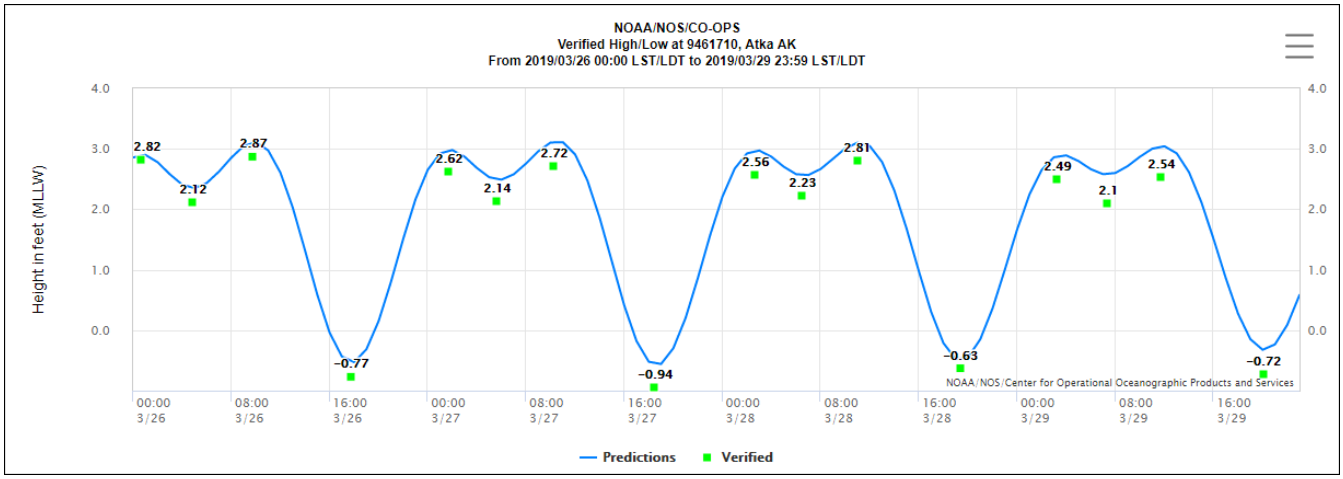


Figure 6 - Fennimore Current Graph 3/26-3/27

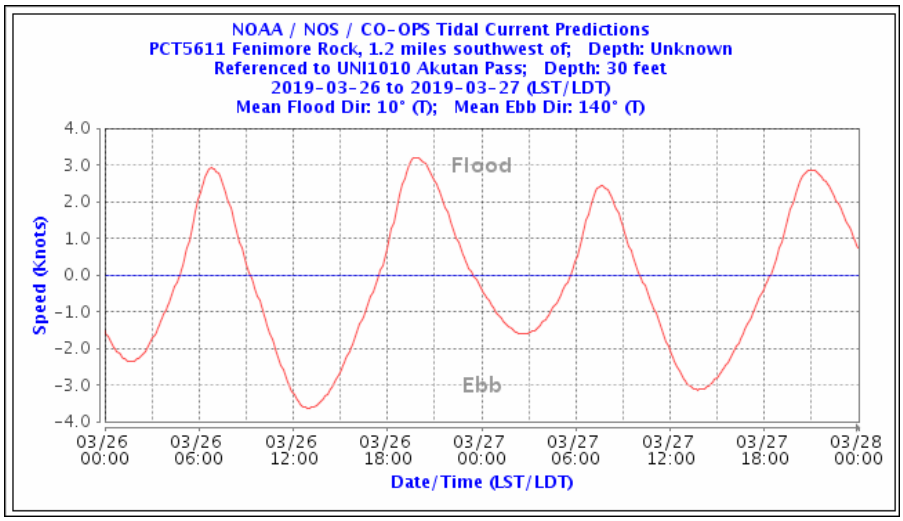
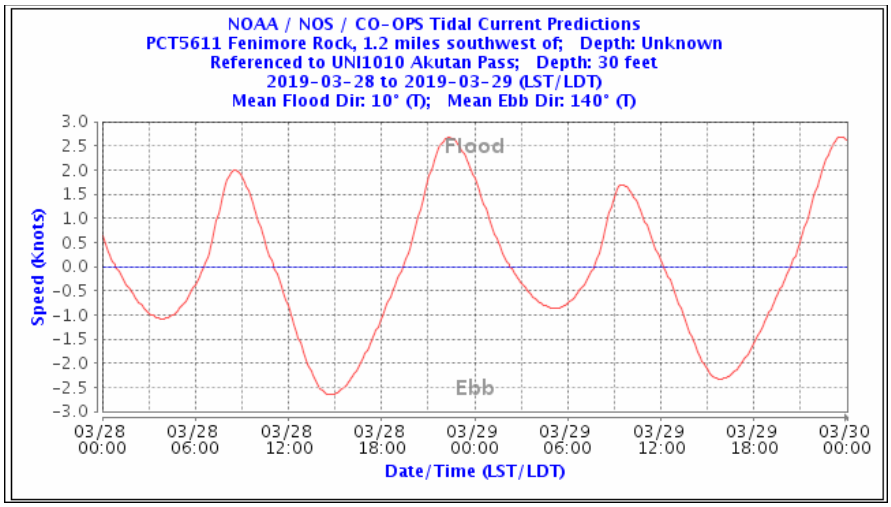
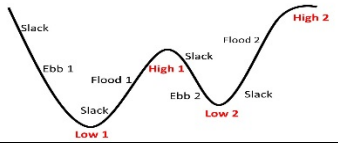
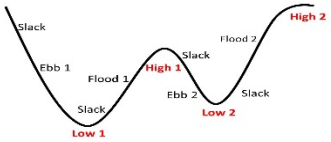
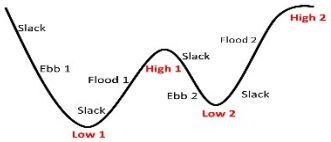


Figure 7- Fennimore Current Graph 3/28-3/29



Haul #	Set L/L Date/Time	Bottom Depth / Fishing Depth	Haul L/L Date/Time	Weather Code	Estimated Current speed and direction	Sea State Code	Tidal State (Indicate period when fished)	%POP		
								Before Set	Haul-back	On Deck
MM48 EFP1	52 26.1 / 173 50.3 3/26/2019 02:10 hr,	170 fm bottom / 145 fm net	52 26.0 / 173 53.3 3/26/2019 03:00 hr	2	0.6knots	5		10%	50%	100%
MM49 EFP 2	52 15.6 / 174 51 3/26/2019 23:00 hr	190 fm bottom / 165 fm net	52 18.9 / 174 46.4 3/27/2019 0:40 hr	1	0.7 knots	4		10%	15%	100%
MM50 EFP 3	52 13.6 / 175 05 3/27/2019 03:50 hr	195 fm bottom / 165 fm net	52 17.7 / 175 04.9 3/27/2019 07:00 hr	1	0.5 knots	4		15%	15%	>10%
MM51 EFP 4	52 14.3 / 175 08.5 3/28/2019 18;25 hr	185 fm bottom / 160 fm net	52 15.1 / 175 06.8 3/28/2019 19:55 hr	2	1.0 knots	4		10%	30%	30%
MM52 EFP 5	52 14.9 / 175 07.5 3/29/2019 1:05 hr	175 fm bottom / 150 fm net	52 11.0 / 175 03.4 3/29/2019 3:50 hr	3	0.8 knots	5		10%	10%	10%
										

Haul Number	Additional Notes
MM48 EFP 1	Short test tow – 4,000 lbs straight POP, no pollock.
MM49 EFP 2	Normally a good pollock spot. POP were concentrated on the bank
MM50 EFP3	Much better, estimate 90% pollock
MM51 EFP4	Sign was too close to the bottom – hauled back
MM52 EFP5	Current and wind were too strong, aborted tow

Sea State Code	Wave Height	Characteristics
0	0 meters (0 ft)	Calm (glassy)
1	0 to 0.1 meters (0.00 to 0.33 ft)	Calm (rippled)
2	0.1 to 0.5 meters (3.9 in to 1 ft 7.7 in)	Smooth (wavelets)
3	0.5 to 1.25 meters (1 ft 8 in to 4 ft 1 in)	Slight
4	1.25 to 2.5 meters (4 ft 1 in to 8 ft 2 in)	Moderate
5	2.5 to 4 meters (8 ft 2 in to 13 ft 1 in)	Rough
6	4 to 6 meters (13 to 20 ft)	Very rough
7	6 to 9 metres (20 to 30 ft)	High
8	9 to 14 metres (30 to 46 ft)	Very high
9	Over 14 metres (46 ft)	Phenomenal

Weather Code	Cloud Cover
0	No Clouds/Fog
1	<50% Clouds
2	>50% Clouds
3	100% Clouds/Fog

Note: Please ensure that this form, your logbook, and the observer haul numbers match..

Post-season Interviews with Captains

Ray Haddon, Northwest Explorer
David Willmore, Muir Milach
Brian Haley, Bristol Explorer

1 – If POP bycatch was not a constraint, do you think there are sufficient amounts of Pollock in the open areas of the Aleutians to support an A season fishery?

RH – Some years yes, this last season "NO". I'm sure there are countless reasons that affect fish movement and this year it appeared there just wasn't a lot of fish around.

DW - Occasionally. It seems that as time goes on and the POP stock rebounds, the pollock ratio drops.

BH - I found a couple of areas that were holding enough Pollock to make a go of an A season fishery. I was figuring out a couple of the areas and feel that there was Pollock to be caught in them, but it might not be in the volumes to be feasible for an 850,000 lb capacity vessel

2 - Do you think it would be feasible to stay under a 5% catch rate of POP in the Aleutian Pollock fishery on:

a) **a trip by trip basis?**
b) **a seasonal basis?**

RH – With what we seen this last season I would say "no" to both a) and b).

DW – No, both a) and b).

BH - On a seasonal basis, probably. Out of my 4 trips I had only the one huge hit of POP in one tow, which put that trip at about 47.4% POP, with knowledge of that area this may be avoidable in the future. The other 3 trips I had an average of 3.45% POP between them and I had one small test tow of 100% POP in those 3 trips.

3 – If not (to the foregoing question), would it be feasible to sort and discard to achieve a RETAINED 5% rate of POP in the Aleutian Pollock fishery?

RH – Yes we could discard enough to get to 5%.

DW - To sort on a consistent basis isn't feasible.

BH - It would be feasible with vessels that have the ability to sort out by-catch, i.e.: boats with sorting belts. But with more knowledge of the fishing areas, you might be able to stay under the 5% as stated in answer 2.

4 – Do you feel that you could recognize POP from your echo sounder when mixed with pollock? If so, how accurately do you feel you could estimate the ratio of POP to Pollock?

RH – I would love to say yes to this, but the sad truth is no. Or at least not on a consistent basis.

DW - It seems that because of the similar bladder size correlation between the larger AI pollock and POP that it is extremely difficult to get a sense of species distribution.

BH - On one test tow it was fairly obvious that I was looking at POP sign under the boat before I set, made the test tow to confirm and once the net was in the fish it was very obvious by the way they were hitting the net, or diving under it that it was all POP. But on the big tow of POP I had 25 tons of Pollock in the back of the bag, and the forward 60-70 tons was clean POP. This was hard to tell a difference as it was going into the net. But with this tow I could see the terrain of the bottom got a lot steeper as I went, so in the future I would avoid that part of the tow.

5 - Do you feel that you could recognize POP during a tow from your netsounder when mixed with pollock? If so, how accurately do you feel you could estimate the ratio of POP to Pollock?

RH – Once again I would love to say yes to this, but no not on a consistent basis.

DW -

BH - Not when mixed with Pollock so much as when it is a higher % of POP then the POP shows itself more readily.

6 – Based on your experience, do you think any of the following environmental factors would potential to correlate with the rate of POP bycatch?

a) **Bottom depth**
b) **Fishing depth**
c) **Difference between bottom and net depth**
d) **Time of day**
e) **Stage of tide**
f) **Current direction and/or speed**
g) **Phase of moon**
h) **Weather**
i) **Other**

RH – Bottom Depth, Fishing depth and Difference between bottom and net for sure. Time of day is a hard one because we only found Pollock at night.

DW –

a) Bottom depth is relevant depending on how close fish is banded to seafloor.
b) The higher fish are off bottom less risk of bycatch.

c) In most instances the more distance off bottom, the better. Unfortunately pollock tend to be bottom huggers
d) My experience suggests during daylight hours POP and pollock are both hard on bottom. I have had better/cleaner fishing at night.
e) Tide doesn't seem to have any relevance in ratio of pollock to POP.
f) Not relevant
g) Not relevant
h) Not relevant
i) At some point in the future, our electronics may progress to the point where we as fishermen can pinpoint species. As of present with our current equipment that, I don't believe, is possible.

BH –

a) No
b) No
c) Yes, up off bottom further seemed to hold less POP in most areas
d) We could only find/catch Pollock during hours of darkness...
e) No
f) No
g) Don't know. I didn't pay attention to the phase of the moon.
h) No
i) Most relevant thing I noticed with POP avoidance was experience/knowledge of each area as to where the POP were holding.

7 - What was the vertical opening of the net you were fishing?

RH – I was fishing with about 13 fathom of vertical opening.

DW – 27 fathoms

BH - My average vertical opening was 18-22 fathoms