Annual Report 2014

NMFS IPA No. 2

Chinook Salmon Bycatch Reduction

Incentive Plan

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IPA Representative

Stephanie Madsen
At-sea Processors Association
P.O. Box 32817
Juneau, AK 99803
(907) 523-0970
smadsen@atsea.org

Technical Representative

Karl Haflinger
Sea State, Inc.,
P.O. Box 74
Vashon, WA 98070
(206) 463-7370
karl@seastateinc.com

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Introduction

Amendment 91 to the Bering Sea and Aleutian Islands Groundfish Fishery Management Plan (BSAI FMP) limits Chinook salmon bycatch in the eastern Bering Sea (EBS) pollock fishery. The rules and regulations implementing Amendment 91 came into force at the start of the 2011 fishery. Amendment 91 is an innovative approach to managing Chinook salmon bycatch in that it combines a prohibited species catch (PSC) limit on the amount of Chinook salmon that may be caught incidentally by the fishery with an incentive plan agreement (IPA) and performance-standard requirement designed to minimize bycatch to the extent practicable in all years. The approach is designed to motivate fishery participants to avoid Chinook salmon bycatch at the individual vessel level under any condition of pollock and Chinook abundance in all years. The vessel-level incentives are created through contracts among the fishery participants.

The 50 CFR 679.21(f)(13) stipulates that IPA entities report annually on the following:

- Incentive measures in effect in the previous year;
- How incentive measures affected individual vessels;
- How incentive measures affected salmon savings beyond current levels;
- IPA amendments approved by NMFS since the last annual report and the reasons for amendments;
- Sub-allocation to each participating vessel;
- Number of Chinook PSC and amount of pollock (mt) at the start of each fishing season;
- Number of Chinook PSC and amount of pollock (mt) caught at the end of each season;
- In-season transfers among entities of Chinook salmon PSC or pollock among AFA cooperatives;
- Transfers of Chinook salmon PSC and pollock allocations among IPA vessels.

CP IPA Overview

The Catcher-Processor--Chinook salmon bycatch reduction--Incentive Plan Agreement (CP IPA) is designed to provide the incentives necessary to achieve the goals and objectives of Amendment 91. The plan builds on experience gained in the development and refinement of time-and-area-based, rolling hot-spot avoidance programs. The plan creates incentives to avoid salmon bycatch by restricting the pollock fishing opportunities of vessels with poor Chinook bycatch performance while allowing vessels with good performance increased access to the fishing grounds. Losing access to good pollock fishing raises vessel operating costs and reduces product values. Avoiding grounds restrictions reduces operating costs and allows for the production of higher-valued products (especially during the A-season), thus increasing profits.

The IPA is designed to incentivize good vessel Chinook bycatch performance under any condition of pollock and Chinook salmon abundance. The Chinook bycatch limits depend on whether the fishery participants develop IPAs. If IPAs are developed, then the annual PSC limit is 60,000 Chinook during any two-out-of-seven years, and 47,591 Chinook in other years. During 2014 all pollock vessels participated in an IPA and the catcher-processor (CP) sector IPA participants included vessels harvesting the American Fisheries Act (AFA) CP Sector and Community Development Quota (CDQ) pollock allocations. For the CP sector, the Chinook PSC limit is 17,040 fish (under the 60,000 fish annual limit) and the pollock quota is 36 percent of the non-CDQ directed fishing allocation. For the CDQ sector, the Chinook PSC limit is 4,896 fish (under the 60,000 fish annual limit) and the pollock quota is 10 percent of the annual directed fishing allocation. Each year the CP IPA participants manage Chinook bycatch using the lower 47,591 performance standard. Under the performance standard, the CP sector Chinook quota is 13,516 fish and the CDQ sector Chinook quota is 3,883 fish. These pollock and Chinook quotas are further allocated among the seasons and the participating vessels. Table 1 shows the CP IPA “day-one” allocations of pollock and Chinook salmon PSC quota for 2014.

Primary IPA components include: (1) data gathering, monitoring, reporting, and information sharing; (2) identification of bycatch avoidance areas (BAA); and (3) fishing-area prohibitions for vessels with poor bycatch performance. Additional components include: (4) an A-season closed area of approximately 755 square nautical miles on the northern flank of the Bering Canyon; and (5) a set of conditional, B-season closed areas of approximately 1,295 square miles along the outermost EBS shelf. Vessels are prohibited from fishing in the B-season areas beginning on October 15th and continuing through the end of the season during years when the aggregate bycatch of all plan vessels during the month of September exceeds a preset threshold.

Incentive Measures

THE ROLLING HOT-SPOT (RHS) PROGRAM

One of the most practical and direct methods to create incentives to avoid Chinook salmon bycatch is to limit the pollock fishing opportunities of a vessel when bycatch performance is poor. This simple approach works especially well for catcher-processors because efficient processing requires an uninterrupted flow of fish, and this can be achieved most reliably with unrestricted access to the grounds. Because experience has shown that high, local concentrations of pollock may often be found where concentrations of Chinook are also high (the vessels can "see" the pollock but not the Chinook), limiting access to local areas of relatively high Chinook bycatch is an efficient way to create a financial incentive to avoid Chinook salmon bycatch. This is because losing access to good pollock fishing grounds increases vessel operating costs and reduces the amount of products that can be produced during a day of fishing. A vessel that retains nearly unrestricted access to good pollock fishing opportunities avoids costs associated with moving and finding pollock in other areas, and so the vessel can produce higher volumes of higher valued products each day.

The RHS accomplishes this in two steps. The first step is to employ data gathering, reporting, and information sharing to identify local areas of relatively high Chinook abundance on the pollock grounds. Pollock catch and Chinook bycatch records from all fishery participants are gathered, compiled, evaluated, and distributed to IPA participants each week during which an IPA vessel catches pollock. With this information, areas of relatively high Chinook bycatch are identified (hot-spots, or bycatch avoidance areas; BAA). Should vessels continue to fish in these areas, high Chinook bycatch is likely to occur because local concentrations of Chinook routinely persist in time and space for several weeks. Access to this information in real time allows vessels to decide where or where not to fish based on where Chinook are likely to be concentrated. Data shows that CP vessels are using the information provided through this program to voluntarily avoid fishing in Chinook hot spot areas, even when not required to do so under the provisions of the IPA. This is demonstrated in more detail under 'Effects of Incentive Measures' below.

The second step is to evaluate vessel Chinook bycatch performance relative to a grounds-wide index of Chinook abundance (the base rate), and restrict access to Chinook hot spot areas for vessels that do not meet the performance standard. This base rate fluctuates depending on average vessel performance to reflect the "base" level of Chinook abundance on the grounds. The base rate is calculated as the grounds-wide number of Chinook caught per ton of pollock caught. More information about the methods used to identify the base rate is in the IPA agreement (available at: https://alaskafisheries.noaa.gov/sustainablefisheries/bycatch/salmon/chinook/ipa/chinook_salmon_ipa_2010.pdf).

Because the base rate fluctuates depending on pollock and Chinook salmon abundance, benchmarking vessel performance against this rate establishes and maintains incentives to avoid Chinook bycatch under any condition of pollock and Chinook abundance. The bycatch performance of an IPA vessel must remain below 75%

of the base rate in any given week in order for it to maintain unrestricted access to the fishing grounds (i.e. to not be prohibited from fishing in any BAA).

Vessel performance (number of Chinook per ton of pollock caught) is measured both currently (most recent two weeks) and cumulatively (over the entire fishing season), relative to the base rate. Vessel performance over these time periods is used to create two different incentives. To evaluate current performance, vessel performance is measured during the prior two weeks and compared to the base rate. A two-week period is used because experience has shown that day-to-day vessel bycatch performance is influenced by random factors associated with changes in weather, winds, water temperatures, and currents, and measuring performance over a two-week period dampens the effects of these random influences. This increases the usefulness of the performance measure in the creation of an incentive for the individual vessel to avoid bycatch.

The IPA rules stipulate that if the current bycatch performance of an IPA vessel is not lower than 75% of the base rate, then the vessel is prohibited from fishing in the identified BAA for seven days (i.e. the following week). If during the following week the current bycatch rate of a vessel operating under a fishing prohibition remains higher than 75 percent of the base rate, then the vessel is prohibited again from fishing in the BAA for an additional seven days. A seven-day fishing prohibition is called a weekly fishing prohibition.

The cumulative Chinook bycatch performance of a vessel is measured as the total amount (number) of Chinook salmon bycatch by the vessel during the fishing year relative to the pollock allocation assigned to that vessel (Table 1 shows the "day-one" assignments for 2014). So the measure of cumulative vessel performance accumulates from the first day of fishing through to the last, and is evaluated against a standard designed to magnify the incentive to avoid salmon bycatch during years when the baseline abundance of Chinook is medium and high. Based on analysis of more than a decade of CP catch records, an annual bycatch of 8,500 Chinook indicates a year when Chinook abundance on the grounds traditionally fished by CP vessels is at a medium level, and this number of bycatch Chinook is the basis for the cumulative performance incentive.

Cumulative bycatch performance is evaluated only for those vessels that receive a weekly fishing prohibition. For these vessels, if cumulative Chinook bycatch is higher than the medium-abundance standard, then the vessel is prohibited from fishing in the BAA for two weeks. This standard is called the vessel cumulative bycatch amount, and a fourteen-day fishing prohibition is called an extended fishing prohibition. If vessel Chinook bycatch is greater than its cumulative amount, then it is subject to the extended fishing prohibition. Additional information about how the vessel cumulative amount is determined is in the IPA agreement.

CHINOOK SALMON CONSERVATION AREAS

Chinook salmon feeding migrations produce concentrations of Chinook in discrete, local areas along the EBS outer continental shelf, and many of these areas are well known to pollock fishermen. The areas are known to pollock fishermen because more often than not high concentrations of pollock are found in the areas. However, the precise times during which pollock and Chinook may be concentrated in any local area depends on a host of environmental and physical-oceanographic conditions that change with the seasons and the weather, such that it is not generally possible to know precisely where and when pollock and Chinook are concentrated together before going fishing for pollock.

Analysis of catch records over a decade or more has revealed the existence of one area along the outer continental shelf within which it seems that high concentrations of Chinook salmon exist almost every year during the winter fishery. Based on this analysis, an A-season fishing prohibition within an approximately 735 square mile area is included in the plan as a means to reduce bycatch. The area is called the A-season Chinook Salmon Conservation Area (CSCA; maps and the latitude and longitude coordinates of all CSCA boundaries are provided in the IPA agreement). Figure 1 shows the boundaries of the A-season CSCA.

Analysis of B-season catch records over two decades shows that when migrating Chinook arrive on the outer continental shelf in sufficient numbers during September, the odds that high concentrations of Chinook will be encountered by the fishery in October appear to increase. To create an incentive to reduce bycatch during the latter portion of the B-season, the CP IPA includes "triggered" fishing prohibitions for three areas of approximately 1,295 square miles along the outermost shelf. These areas are called the B-season Chinook Salmon Conservation Areas (Figure 2). To implement the incentive, all vessels are prohibited from fishing in the areas beginning on October 15th and continuing through to the end of the season during those years when the aggregate bycatch rate for all vessels during the month of September exceeds 0.015 Chinook per metric ton of pollock catch. The CP IPA also specifies the penalties levied on a vessel for violating a BAA prohibition or for fishing in a CSCA when fishing there is prohibited. These penalties are $10,000 for the first violation, $15,000 for a second violation, and $20,000 for the third and each subsequent violation during the fishing year, with every trawl inside a prohibited area considered a separate violation.

Figure 1. A-season Chinook Conservation Area.

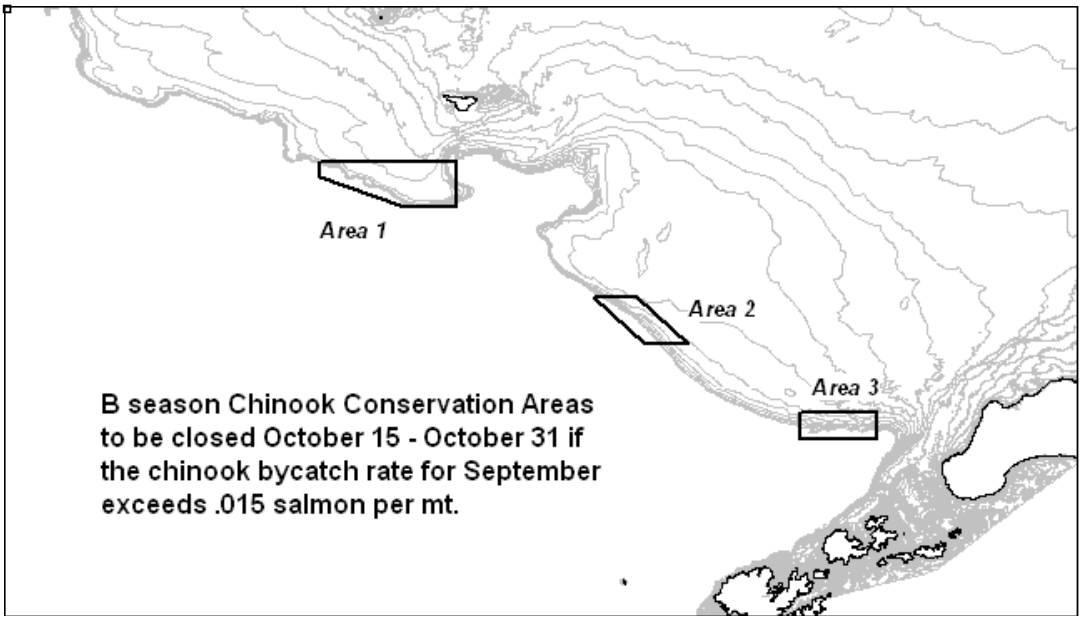


Figure 2. B-season Chinook Conservation Areas.

Management of Vessel Allocations

As discussed in the overview of the CP IPA, Amendment 91 establishes a total Chinook salmon cap of 60,000, with a performance standard of 47,591 Chinook. If the performance standard is met or exceeded in 3 of 7 consecutive years, then AFA vessels are held to the lower performance standard in perpetuity. Therefore the CP IPA is structured so that the absolute cap of 60,000 is never allocated among companies and vessels, unless the CP Salmon Corporation calls a vote and that vote is unanimously in favor. Instead, the allocation to companies and vessels always starts with the CP portion of the 47,591 performance standard, or 13,516 Chinook. First buffers are subtracted from this 13,516 Chinook, and then the remaining Chinook are allocated by the entity to companies who must then allocate them to their respective vessels before the start of fishing for the year.

The CP IPA is designed to work in concert with the bycatch allocation management activities of the entities authorized within Amendment 91 to perform this task. For example, the plan includes a requirement for the constitution of a limit buffer to ensure that the sector bycatch limits established by Amendment 91 are conserved. The buffer is made up of contributions from all plan vessels in amounts equal to at least two-thirds of one percent of the vessel Chinook allocation. Because the limit buffer is planned to address some unexpected, unknown event, it is anticipated that the Chinook salmon allocations in the buffer will not be used to harvest the pollock allocation.

The plan also includes a requirement that the Technical Representative notify the allocation management entity when the Chinook bycatch of any plan vessel reaches 95 percent of its Chinook allocation. This requirement was included in the plan to ensure that the entities managing the bycatch allocations of plan vessels have sufficient time to assess the need for and-or timing of stop fishing orders.

CP IPA allocations and catches for 2014

Table 1 shows the CP IPA 2014 “day-one” allocations of pollock and Chinook salmon PSC by vessel for 2014 A- and B-seasons. Table 2 shows transfers of pollock between CP IPA vessels in 2014. Note there were no transfers of Chinook salmon between CP IPA vessels in 2014. Table 3 shows 2014 CP IPA pollock catch and Chinook PSC by season and vessel for 2014.

Table 1. CP IPA Day-One Allocations of Pollock and Chinook Salmon, 2014, including CDQ pollock and Chinook allocated to the CP fleet from CDQ partners.

	A-season		B-season	
Vessel	Pollock (mt)	Chinook (n)	Pollock (mt)	Chinook (n)
American Dynasty	18,163	1,068	27,391	311
American Triumph	18,163	1,068	27,391	311
Northern Eagle	18,163	1,068	27,391	311
Northern Jaeger	18,163	1,068	27,391	311
Ocean Rover	18,163	1,068	27,391	311
Arctic Fjord	16,273	885	24,507	281
Arctic Storm	17,175	938	25,869	294
Northern Hawk	16,758	870	25,177	286
Alaska Ocean	21,326	1,247	32,124	400
Pacific Glacier	17,448	1,020	26,284	327
Starbound	14,528	743	27,291	210
Island Enterprise	11,238	603	15,147	153
Kodiak Enterprise	11,238	603	15,147	153
Seattle Enterprise	11,238	603	15,147	153
Ocean Peace	887	53	1,339	13
Katie Ann	0	0	0	0
Northern Glacier	0	0	0	0
Total 2014 Allocation			573,911*	16,728
Allocation Buffer			0	671**

* Total includes reallocation of the Aleut Corporation's pollock 7,750 mt DFA and 1,900 mt CDQ DFA (01/27/14)
** Total includes an additional CDQ buffer

Table 2. Transfers of pollock between CP IPA vessels in 2014. There were no transfers of Chinook salmon during 2014.

Date	From vessel	To vessel	Amount (mt)	Species
2/7/14	Northern Jaeger	Katie Ann	50	CP Sector pollock
3/1/14	Pacific Glacier	Alaska Ocean	1,145	Coop pollock
3/7/14	Northern Jaeger	American Dynasty	609	Coop pollock
3/7/14	American Triumph	Ocean Rover	511	Coop pollock
3/13/14	Kodiak Enterprise	Seattle Enterprise	116	Coop pollock
3/13/14	Kodiak Enterprise	Island Enterprise	35	Coop pollock
3/15/14	Starbound	Alaska Ocean	248	Coop pollock
3/21/14	Arctic Storm	Arctic Fjord	3	Coop pollock
3/24/14	Northern Jaeger	Ocean Rover	6	Coop pollock
3/24/14	Northern Jaeger	Northern Eagle	274	Coop pollock
6/10/14	Kodiak Enterprise	Seattle Enterprise	4,985	Coop pollock
6/12/14	Kodiak Enterprise	Arctic Fjord	271	Coop pollock
7/27/14	Kodiak Enterprise	Island Enterprise	103	Coop pollock
8/23/14	Northern Hawk	Arctic Fjord	56	Coop pollock
8/25/14	Ocean Rover	Northern Eagle	50	Coop pollock
8/25/14	Ocean Rover	American Triumph	637	Coop pollock
9/1/14	Starbound	Northern Eagle	1,650	Coop pollock
9/2/14	American Dynasty	American Triumph	174	Coop pollock
9/4/14	Northern Jaeger	Northern Eagle	1,022	Coop pollock
9/4/14	American Dynasty	Northern Jaeger	155	Coop pollock
9/4/14	American Triumph	Northern Jaeger	8	Coop pollock
9/6/14	Arctic Storm	Arctic Fjord	83	Coop pollock
9/12/14	Alaska Ocean	Northern Eagle	150	Coop pollock
10/3/14	Kodiak Enterprise	Starbound	2	Coop pollock
2/1/14	Arctic Storm	Arctic Fjord	2,699	CDQ pollock
3/22/14	Kodiak Enterprise	Starbound	11	CDQ pollock
3/24/14	Northern Jaeger	Northern Eagle	28	CDQ pollock
3/24/14	Pacific Glacier	Alaska Ocean	3	CDQ pollock
3/25/14	American Triumph	Ocean Rover	73	CDQ pollock
3/25/14	American Triumph	American Dynasty	43	CDQ pollock
6/15/14	Arctic Storm	Arctic Fjord	3,004	CDQ pollock
9/2/14	American Triumph	Northern Jaeger	306	CDQ pollock
9/4/14	Ocean Rover	Northern Jaeger	187	CDQ pollock
9/4/14	American Dynasty	Northern Jaeger	128	CDQ pollock
9/4/14	Northern Eagle	Northern Jaeger	98	CDQ pollock
9/5/14	Pacific Glacier	Alaska Ocean	6	CDQ pollock

Table 3. CP IPA Pollock Catch and Chinook Bycatch Performance by Season and Vessel, 2014.

	A-season			B-season		
Vessel	Pollock (mt)	Chinook (n)	Rate (n/mt)	Pollock (mt)	Chinook (n)	Rate (n/mt)
Alaska Ocean	22,721	318	0.014	31,961	30	0.001
American Dynasty	18,815	294	0.016	27,058	24	0.001
American Triumph	17,498	392	0.022	27,802	19	0.001
Arctic Fjord	18,974	350	0.018	27,922	66	0.002
Arctic Storm	14,391	282	0.020	22,843	26	0.001
Island Enterprise	11,284	238	0.021	15,250	35	0.002
Kodiak Enterprise	11,050	310	0.028	9,760	3	0.000
Northern Eagle	18,464	388	0.021	30,277	29	0.001
Northern Hawk	16,687	477	0.029	25,189	14	0.001
Northern Jaeger	17,085	320	0.019	27,357	21	0.001
Ocean Rover	18,752	410	0.022	26,384	14	0.001
Pacific Glacier	16,295	277	0.017	26,267	58	0.002
Seattle Enterprise	11,342	330	0.029	20,132	83	0.004
Starbound	14,265	260	0.018	25,649	179	0.007
Northern Glacier	0	0		0	0	
Katie Ann	50	0	0.000	0	0	
Ocean Peace	831	7	0.008	1371	2	0.001
Forum Star	0	0		0	0	
American Challenger	0	0		0	0	
Ocean Harvester	0	0		0	0	
Tracy Anne	0	0		0	0	
Neahkanie	0	0		0	0	
Sea Storm	0	0		0	0	
Muir Milach	0	0		0	0	
Totals	228,504	4,653	0.020	345,222	603	0.002
Grand Totals	Pollock A+B (mt) 573,726		Chinook A+B (n) 5,254		Rate A+B (n/mt) 0.009	

Table 3 shows the Chinook salmon bycatch performance of the IPA vessels. Performance is shown by season because the Chinook bycatch environment is different during the A-and B-seasons. During the B-season, and when fishing starts quickly, it is almost possible to complete fishing operations before Chinook salmon arrive on the shelf in the fall to feed. In other years they arrive earlier or fishing continues later, and great effort must be concentrated on limiting the bycatch.

Effects of Incentive Measures

This annual report provides a qualitative evaluation and some quantitative information on the effectiveness of the CP IPA in influencing vessel behavior to minimize Chinook bycatch. The CP IPA incentive program is

largely an area-based program, and this evaluation relies heavily on spatial analysis of pollock trawl locations as well as the bycatch performance of the individual vessels. To begin an assessment of the IPA incentives on the individual vessels, the aggregate performance of the vessels in the 2011-2014 fisheries is tabulated and compared to performance during prior years. Table 4 shows the aggregate bycatch performance (number of Chinook per ton of pollock caught) of CP IPA vessels since 2007, comprising the four years prior to, and four years since the implementation of the CP IPA. It is clear from Table 4 that CP Chinook bycatch performance has been better since the implementation of the IPA, as compared with the previous four years, although it cannot be determined what role environmental conditions and salmon abundance played throughout this time period.

Table 4. Chinook Bycatch Rates (n/mt) in the CP Fleet for 2007-2014.

Year	A-season (n/mt)	B-season (n/mt)	A+B-season (n/mt)	A+B season (m/t) four year interval
2007	0.100	0.017	0.066	0.027
2008	0.027	0.002	0.012	
2009	0.021	0.002	0.010	
2010	0.024	0.000	0.009	
2011	0.010	0.006	0.008	0.008
2012	0.013	0.000	0.005	
2013	0.018	0.001	0.008	
2014	0.020	0.002	0.009	

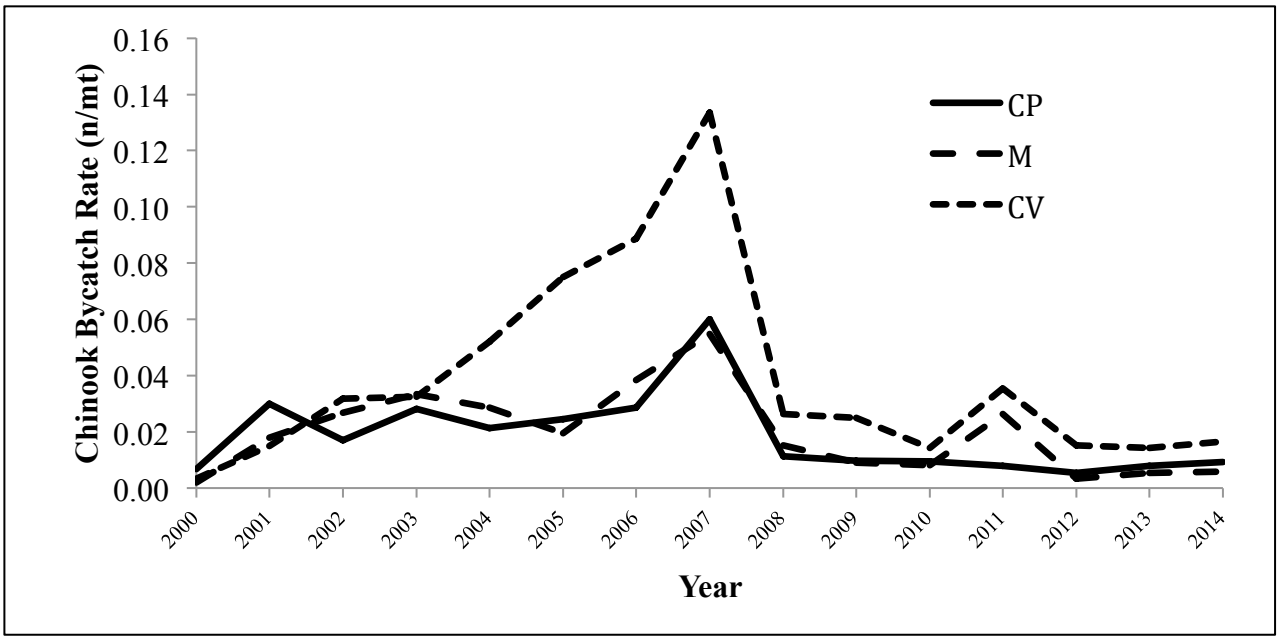


Figure 3. Chinook bycatch rates by year for the Catcher Processor (CP), Catcher Vessel (CV), and Mothership (M) pollock fishing sectors in the Bering Sea.

Figure 3 shows Chinook bycatch rates in the Bering Sea since 2000 by pollock fishing sector. Trends in performance over time are largely consistent among the sectors during the A-season, with the mothership and catcher processors generally having low B-season bycatch since 2000.

Figure 4 shows the range of vessel bycatch performance each year since 2000, during the time period when Chinook are most abundant on the pollock fishing grounds (September-February). In the prior program, the bycatch performance of a pollock cooperative (group of vessels) was evaluated against a performance benchmark, and under some circumstances, incentives to avoid bycatch weakened for an individual vessel. However, if incentive measures are working at the vessel level, one would expect the distribution of Chinook bycatch rates among the vessels to shrink. This is because vessels are accountable for their own Chinook bycatch, and better performers cannot shelter less well performing vessels. Evident from this graph is that, since the IPA began, vessel bycatch rates have been among the lowest on record, and also that the variance of rates among vessels is reduced (has been very small) in the IPA years, even relative to previous years with similar average rates. **In other words, Chinook bycatch rates among vessels display a smaller range of values since 2011 than in previous years, providing evidence of the effectiveness of the vessel-level incentives.**

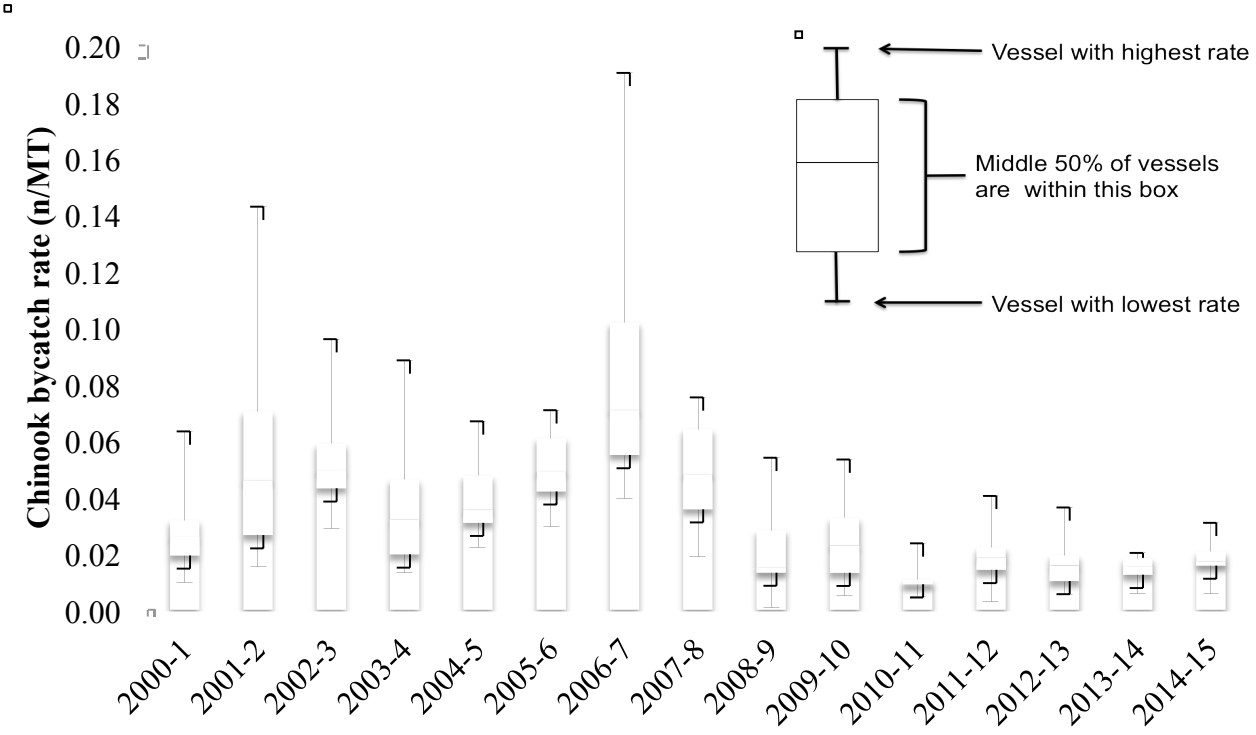


Figure 4. September-February CP Vessel Chinook Bycatch Rate Distribution by year 2000-2015.

Another way to look at how incentives have been working at the individual vessel level is to compare the frequency of different levels of Chinook bycatch rates by individual vessels in the period before and after the implementation of Amendment 91. A narrowing distribution of vessel performance in the period since Amendment 91 indicates that vessels are behaving more similarly to each other, thus are exhibiting vessel-level accountability for their Chinook bycatch. Figure 5 shows the distribution of vessel bycatch rates in the A-seasons of 2008-2010 (pre-Amendment 91; top panel) and the same distribution in the A-seasons of 2011-2014 (post-Amendment 91; bottom panel). This figure shows a lower overall average Chinook bycatch rate in the more recent period, as well as a narrower distribution of vessel performance around this mean, thus demonstrating more vessel-level accountability in the period since Amendment 91 implementation. Figure 6 shows the same information for the 2014 A-season only and a further narrowing of the distribution around the mean. (Note the different scale on the y-axis.)

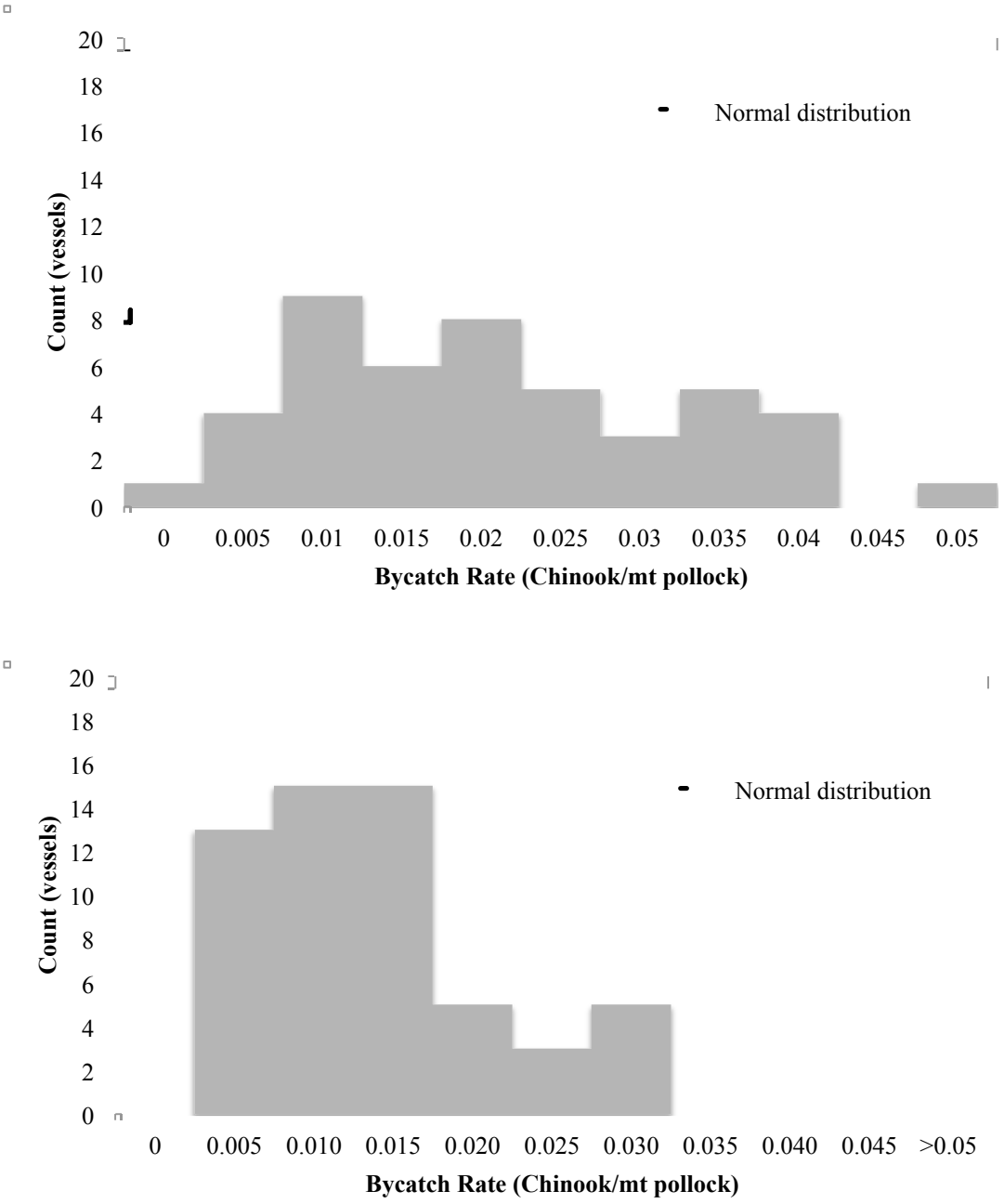


Figure 5. Upper panel: A-Season CP Vessel Chinook Bycatch Rate Frequency Distribution for 2008-2010 with a variance of 0.0022 and Lower panel: Distribution for 2011-2014 with variance equal to 0.000056.

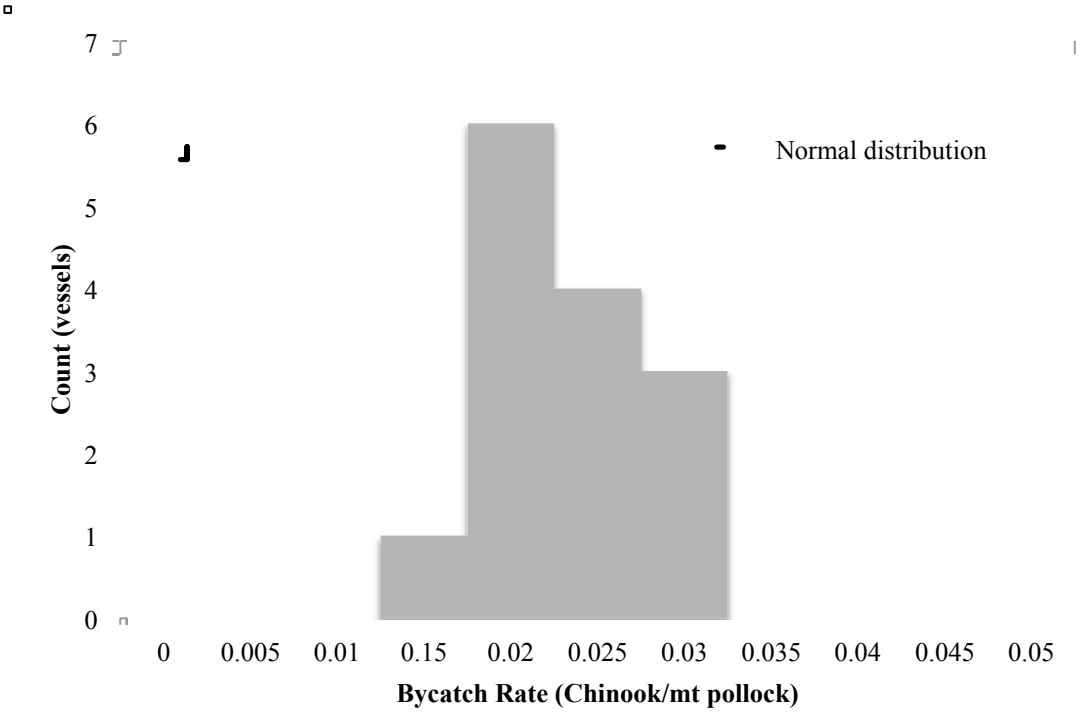


Figure 6. A-Season CP Vessel Chinook Bycatch Rate Frequency Distribution for 2014.

Chinook Bycatch Avoidance Behavior

As mentioned previously, an important element of the CP IPA incentive program is the provision of real-time information to the fleet on areas within the pollock fishing grounds of relatively high Chinook salmon abundance, and designated time-area closures for vessels with Chinook bycatch rates higher than 75% of the base rate in a given week. Over time, data on Chinook bycatch rates on the fishing grounds has revealed certain patterns, with the highest bycatch rates occurring in predictable areas at certain times of the year. Figure 7 shows all CP fishing locations between 2000 and 2015 during the time period where Chinook are present on the EBS shelf (September-February), color coded according to Chinook bycatch rate. The blue crosses indicate trawls made between 2000 and 2010—the years prior to Amendment 91. The orange crosses indicate tows taken between 2011 and 2014—the years since Amendment 91. It is clear from this figure that CP pollock vessels are now avoiding grounds with the highest Chinook bycatch rates (darkest blue) historically. The presence of blue crosses in these areas means these are productive pollock fishing grounds, and the absence of orange crosses indicates these areas are now being avoided in order to avoid Chinook.

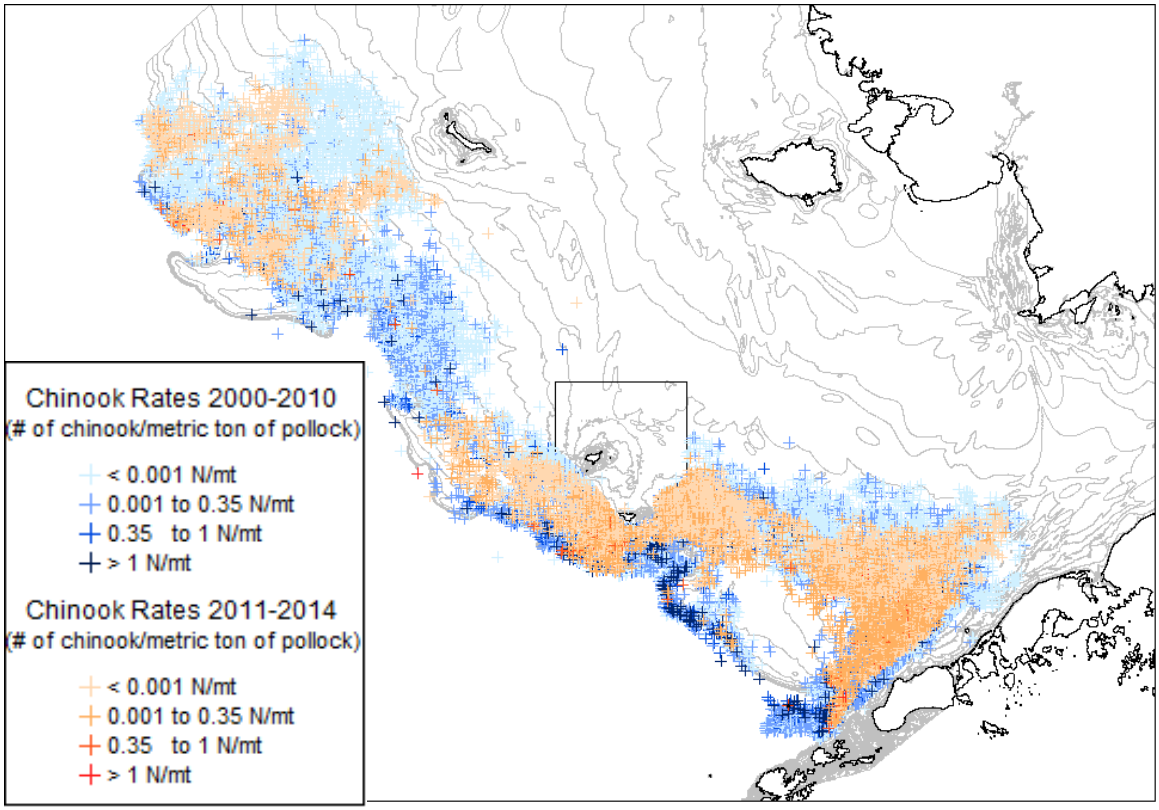


Figure 7. Pollock CP trawl locations between September 1st and February 28th for the years 2000-2010 (blue), 2011-2014 (orange). Darker color indicates higher Chinook bycatch rates.

A close examination of the trawl locations in space and time, their bycatch rates, and the bycatch performance of all CP IPA vessels shows clearly that the vessels have changed their fishing strategy to avoid Chinook bycatch. The most salient feature of this changed approach was for vessels to locate initial fishing operations away from the outer margins of the shelf. Depending on the locations of pollock concentrations, any profitable movement of fishing to deeper water has been accomplished via a deliberate, slow, and cautious progression while maintaining awareness of information about Chinook concentrations within the area. Evidence of local Chinook concentrations generally caused vessels fishing in deep water to move fishing to more shallow grounds. This behavior was most pronounced during the A-season and occurred in multiple areas when trawl bycatch rates showed high concentrations of salmon, as e.g., when schools of Chinook salmon move into a local area to feed.

As mentioned in the above paragraph, an important component of changing CP fishing behavior subsequent to Amendment 91 is fishing depth, because Chinook salmon are known to occur in deeper areas along the EBS shelf. Comparing effort, pollock and Chinook catches in the three years prior to and three years since Amendment 91, there has been a clear reduction in the amount of fishing effort at depths greater than 130 fathoms, where a large portion of Chinook bycatch has typically been encountered.

Under the RHS program, several BAAs were designated for the CP fleet during the 2014 A-season (Figure 8). The BAAs are made known to all vessels on a weekly basis; only those vessels with a Chinook bycatch rate of greater than 75% of the base rate are required to avoid these closure areas. However, because the closure designations indicate where Chinook bycatch has been highest over a given week, even vessels who are not required to fish outside the closures often voluntarily do so, in order to avoid Chinook bycatch (Figure 9). It is important to remember that, due to the way the base rate is calculated, there must be pollock fishing in an area in

order for it to become a bycatch avoidance area, so those areas where CPs avoided fishing entirely will not contain any BAAs.

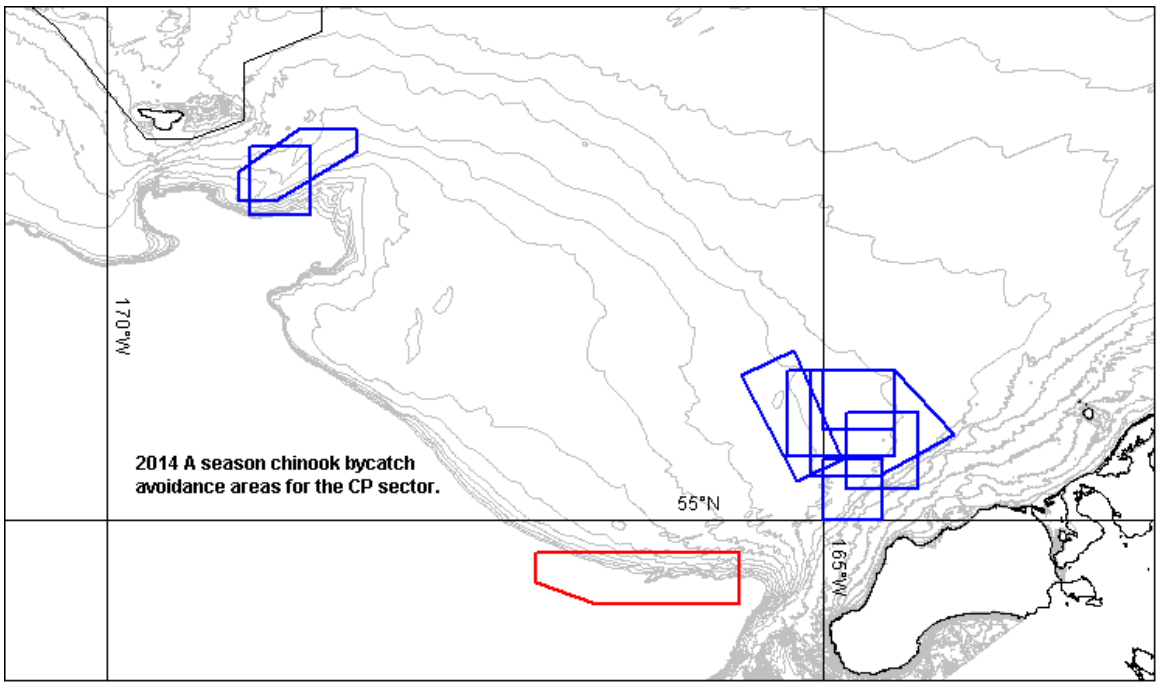
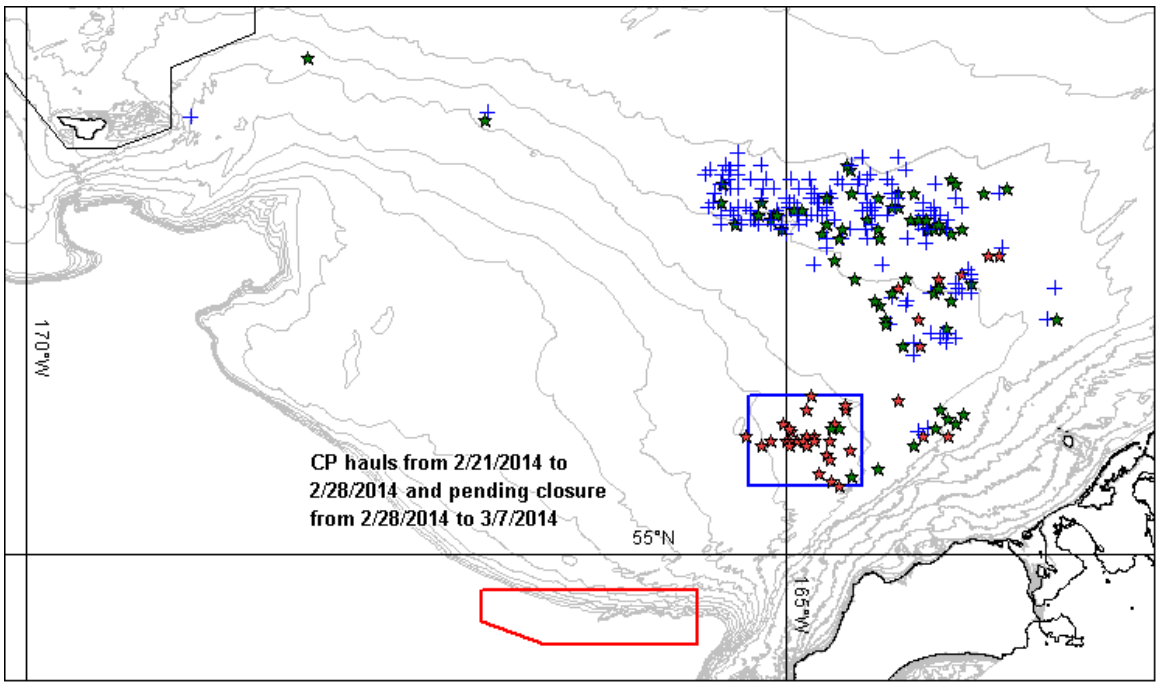
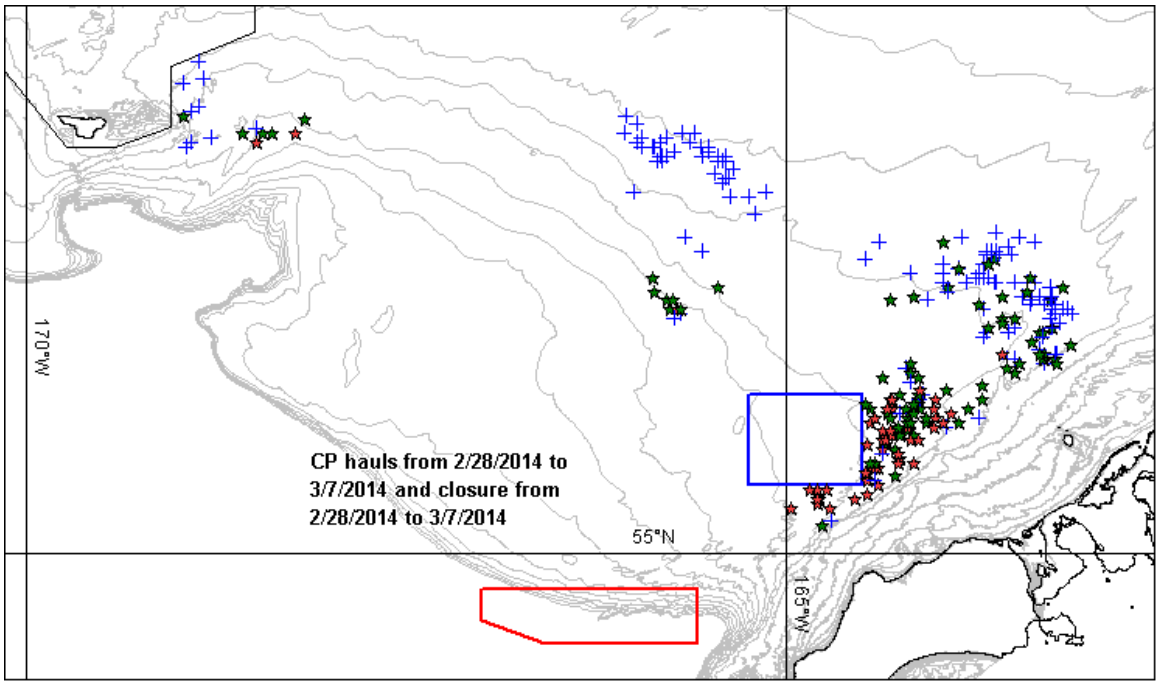


Figure 8. Chinook bycatch avoidance areas for the CP sector, A-season, 2014.


170°W
CP hauls from 2/21/2014 to
2/28/2014 and pending closure
from 2/28/2014 to 3/7/2014
55°N
165°W


170°W
CP hauls from 2/28/2014 to
3/7/2014 and closure from
2/28/2014 to 3/7/2014
55°N
165°W

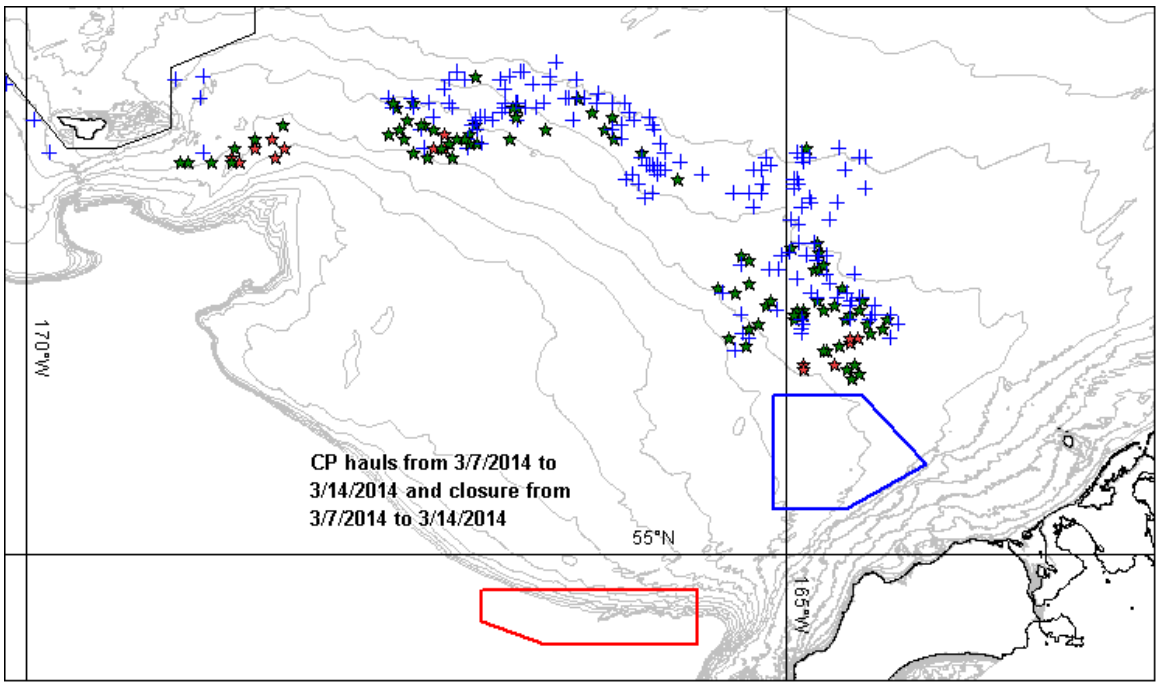


Figure 9. Shows CP movement caused by two subsequent BAAs for the week of 2/28/14 and 3/7/14. Top panel: Only 27 trawls triggered BAA. Mid Panel: Only 6 vessels were required to fish outside the BAA, however all 14 did. Bottom Panel: Only 6 vessels were required to fish outside the BAA, however all 14 vessels moved significantly to the North and West.

Table 5 shows the A-season weeks of 2014 and the number of vessels excluded from designated bycatch avoidance areas during each week. There were a total of eight CP BAAs during the 2014 A-season and two CP closures for the B-season, however no vessels were subject to the B-season closures. There were also no vessels subjected to extended (2-week) fishing prohibitions during 2014.

Table 5. Number of CP vessels excluded from designated bycatch avoidance areas during the 2014 A-season.

Week	1/30	2/6	2/13	2/20	2/27	3/6	3/13	3/20	3/27
Number of CPs excluded from BAAs	0	5	0	0	6	6	2	4	6

IPA Amendments

There were no new CP IPA amendments for the 2014 fishing year; however, the CP IPA was amended in December 2014 for implementation in 2015. Primary changes include an additional vessel outlier provision and the required use of a salmon excluder.

Use of New Gear Technologies

During 2014 vessel crew and Pollock Conservation Cooperative staff continued an at-sea monitoring program to evaluate the design and rigging of the salmon-excluder trawls used by IPA vessels. Monitoring is accomplished using deploy-and-retrieve video cameras placed in the trawl net. Initial efforts were directed at observing pollock

escapement when the trawl is short-wired and during trawl haul-backs. These efforts were somewhat successful although the initiative was hampered by technical limitations (poor image quality and short run time) and poor reliability of the latest generation of trawl cameras. As such, efforts during the second half of 2014 were directed at the design and production of a reliable and rugged trawl camera. A prototype is expected to be available for testing during May, 2015. The limited observations that were made during trawl haul-backs and while the trawl was short-wired did not indicate that these portions of the trawl could be relied on to increase Chinook escapement. An exception could be for the specific circumstance where Chinook enter the trawl during the haul-back and so arrive near the escape port when the cod-end is full and the trawl is close to the surface and moving very slowly through the water.

During the A-season efforts were directed at: 1) a preliminary evaluation of pollock and Chinook escapement from a new over-under (O-U) excluder design; and 2) the evaluation of an underwater LED light designed to mimic jellyfish bioluminescence. The design of the light was developed in collaboration with WESMAR in Woodinville, Washington, and is based on bioluminescent lures designed to capture the giant, deep-sea squid (kracken) on film. Two O-U excluder designs fabricated by Hampidjan USA were trialed: one with no "overlap" and a second design with a 10-mesh "overlap." The O-U design with no overlap provides a very short path for both pollock and Chinook to escape the trawl.

Initial observations of the O-U excluders indicated that the flotation and weighting of both were not well matched to the speed at which the vessel customarily trawls, and so the shape of the escape ports were somewhat distorted when compared to that intended by the design. These distortions made it easier for pollock to escape the trawl. Observations over several trawls showed the no-overlap design with pollock escapement that was not acceptable to the vessel master. Pollock escapement from the 10-mesh overlap design was less, and more intermittent, and the trials were continued over an entire trip. Due in part to the rigging of the trawl, and in part to low Chinook abundance in the areas fished, no Chinook escapement was observed. During a second fishing trip the 10-mesh overlap O-U design was used as a platform to investigate methods to increase escapement of pollock as a proxy for the potential to catalyze increased Chinook salmon escapement. These efforts focused on the creation of areas of slow water just aft of the escape port, and several trials seemed to indicate that pollock escapement could be increased by placing objects that obstructed water flow in the escape path. Many prior observations have revealed that after entering the trawl both Chinook and pollock (especially small pollock) seem to be attracted to local areas of still water (eddies) inside the trawl.

The "jellyfish" lights were evaluated for their brightness, ability to mimic bioluminescence, their ruggedness and their run-times. The lights were developed using the same "chassis" that WESMAR uses for its cod-end catch sensors, and stood up well under fishing conditions. The trials indicated that longer run-times, with duration close to that of the catch sensors, would make routine use easier. During the summer and fall WESMAR redesigned the lights, adding a salt-water switch to eliminate run-time while the trawl is on deck, and seven programmable modes that allow the user to modulate brightness to increase run-time. Plans are to evaluate the durability and reliability of the redesigned lights and obtain preliminary indications of their usefulness to increase salmon escapement during 2015.

During the B-season efforts were directed at developing methods to routinely evaluate salmon escapement from a Swan-design excluder trawl by trawl. These efforts occurred during August when bycatch of chum salmon was elevated. Methods were developed to observe escapement, but efforts were again hampered by poor trawl camera reliability and run-times too short to observe escapement during trawls of duration greater than about 200 minutes. Observations indicated that chum salmon are attracted to artificial light, and a new flapper design intended to be used with a light was developed and is slated for evaluation during the 2015 B-season.

The development of a video-based guide to salmon-excluder trawl-net component rigging such that the "as-designed-functioning" of the excluders can be evaluated and optimized routinely at the beginning of each fishing

season remains ongoing, as do efforts to evaluate salmon escapement during the fishery. Both of these initiatives depend on the development of a new generation of compact, rugged, and dependable trawl cameras.