

Report to the North Pacific Fishery Management Council
on the 2010
Bering Sea Pollock Intercooperative Salmon Avoidance
Agreement

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This report is to the North Pacific Fishery Management Council and covers the Bering Sea and Aleutian Islands Management Area (BSAI) Pollock Intercoop Salmon Avoidance Agreement (“ICA”). During the course of the fishery, the pollock Intercoop closed 20 areas to fishing in the 2010A season and 37 areas during the 2010 B season, based on high bycatch rates of chinook or chum salmon experienced by vessels working in the area. In addition, the “Chinook Conservation Area” (approximately 735 sq. miles) was again closed during the 2010 A season. Maps of the closures are shown in Appendix 1.

Under the terms of the ICA, applicants are to submit to the Council a report analyzing:

1. Number of salmon taken by species during the fishery
2. Estimated number of salmon avoided as demonstrated by the movement of fishing effort away from salmon hot-spots.
3. A list of each vessel’s number of appearances on the weekly dirty 20 lists for both salmon species
4. A compliance/enforcement report that will include the results of an external audit designed to evaluate the accuracy of the approach used by Sea State to monitor compliance with the agreement, and a report on the effectiveness of enforcement measures stipulated under the ICA in cases of non-compliance. Examination of a

randomly selected subset of vessel/days representing 10% of the catch during each season will be used as the basis of the audit.

Number of salmon taken by species during the fishery:

For the sake of comparison we have included catch and bycatch amounts running back to 1993. These data are compiled from plant landing information for catcher vessels delivering to shoreside processors, and observer data for mothership catcher vessels and catcher-processors. The “other salmon” category includes all non-chinook salmon. Observer data for both offshore and shoreside deliveries show that only very small numbers of salmon other than chum in this category (for example, 152 unidentified, 31 pinks, and 5 silvers for the 2006B season EFP).

Table 1. Catch and bycatch of pollock and salmon in the directed pollock fishery by season and for full years, 2000 – 2009.

Year	A pollock*	A other salmon	A chinook	B pollock*	B other salmon	B chinook	Full year pollock*	Full year other salmon	Full year chinook
1993	604,118	1,555	17,941	740,569	242,473	21,105	1,344,687	244,028	39,046
1994	611,140	3,555	28,447	718,582	89,117	4,689	1,329,722	92,672	33,136
1995	641,444	1,937	10,921	647,865	17,625	4,421	1,289,308	19,562	15,341
1996	558,033	208	36,063	633,639	77,028	19,560	1,191,672	77,236	55,623
1997	550,891	2,107	10,470	546,988	64,504	34,073	1,097,879	66,611	44,544
1998	482,946	4,002	15,193	539,432	60,040	36,130	1,022,378	64,042	51,322
1999	346,512	349	5,768	511,211	44,261	4,614	857,723	44,610	10,381
2000	418,285	235	3,418	631,755	57,228	1,793	1,050,039	57,463	5,210
2001	538,107	1,867	16,464	813,022	50,948	13,663	1,351,130	52,815	30,126
2002	570,464	387	21,989	866,034	83,033	13,309	1,436,498	83,420	35,298
2003	576,868	3,274	30,981	876,784	170,688	13,444	1,453,651	173,963	44,425
2004	579,816	419	22,011	858,799	427,234	29,238	1,438,615	427,653	51,248
2005	573,887	574	26,678	878,618	637,957	41,499	1,452,505	638,531	68,178
2006	579,112	1,210	57,637	874,435	276,779	24,024	1,453,547	277,989	81,661
2007	544,273	8,038	70,845	775,261	82,641	49,020	1,319,534	90,679	119,866
2008	387,606	344	13,409	572,384	14,453	4,270	959,990	14,797	17,678
2009	313,763	31	10,618	469,128	38,040	2,262	782,891	38,071	12,881
2010	310,999	52	7,166	471,983	13,585	1,842	782,983	13,637	9,008

* For the years 1993-1999, total groundfish from P and B targets, available on files from NMFS site (below), were used instead of pollock.

Estimates of salmon bycatch for 1993-1999 are for all P and B trawl target fisheries, including CDQ, and are available on the NOAA Fisheries, Ak Region web site.

(<http://www.fakr.noaa.gov/sustainablefisheries/catchstats.htm>)

Estimates for 2000 – 2009 (compiled by Sea State, Inc) are for the pollock fishery only and were made using observer data when available and numbers of salmon counted at shore plants and reported on fish tickets for unobserved shoreside vessels.

Evaluation of salmon savings.

The evaluation of the number of salmon saved by the IC program is based on tracking vessels that fished in a closed area before it closed, and then comparing their subsequent bycatch to see if it was lower than expected if the area had not closed. Put more simply, we perform a before-and-after comparison of the bycatch observed and expected from the vessels that triggered the closure. The procedure is as follows:

1. Extract all observer data for haul locations falling inside a closure area, for a 5 day period preceding the closure. For shoreside catcher vessels, aggregate the hauls that have the same “start fishing date” so that hauls with the same bycatch rate are not artificially repeated. As an example, if 2 hauls from the same catcher vessel trip show up in the closed area, they will have the same bycatch rate because observers pro-rate bycatch evenly across all hauls. Consider them a single observation with a value equal to the sum of the two hauls’ pollock and salmon.
2. Consider all of independent offshore sector (C/P and mothership) hauls, and combined “trip-level” hauls to be estimates of the bycatch ratio $R_i = \sum y_i / \sum x_i$, where y are counts of chinook or chum salmon, and x is the pollock catch from individual hauls (offshore sector) or grouped, same-trip hauls (shoreside), and i indicates a separate closure.
3. Extract the same haul or “grouped” haul information, for the same vessels, for the duration of the closure (either 3 or 4 days). Their associated bycatch is available from either observer or plant delivery information. Compute their expected bycatch had they been able to stay and fish inside the now-closed area, by summing the pollock catch of all vessels in this category, and multiplying this summed pollock catch by the matching bycatch ration, R_i above.
4. Compute the standard error of this estimated Y (overall salmon bycatch if vessels had stayed in the area and fished with bycatch rate R) treating R as a ratio estimator (Snedecor and Cochran, Statistical Methods, 8th Edition, p 452).

Avoidance results from the 2010 Intercoop Agreement

The results from these calculations for the 2010 A and B seasons are shown in tables 2a - 2c below. (Charts showing the closures issued for both seasons may be found at the end of this document. Because so many closures were issued, we have not produced a chart for each closure and instead have grouped closures by season and species on three separate charts.) During the A season there were 20 closures in addition to the full-season Chinook Conservation Area closure. Of these, there were 10 for which before-and after-closure observer data could be found from vessels fishing inside the areas before they closed

Table 2a summarizes of the results for both chinook savings resulting from these closures (Appendix Tables A1a-c show the underlying data, by closure, with associated standard errors). The results indicate that for the 19,087 mt of observed groundfish associated with boats that fished inside areas before they were closed, and that also had observers after closures 3,137 chinook were avoided. This represents a reduction of 73% from the bycatch of chinook that would have been expected had the vessels continued to fish in

those closure areas for the duration of those closures. Table 2a also shows observed and expected chum numbers, but since chum bycatch during the A season is such a small part of the overall chum bycatch for the year, these numbers are not particularly significant.

Table 2b shows results obtained in a similar fashion for the B season. Thirty-seven closures were put in place during the B season, and of these, 16 closures had both pre- and post-closure observer data that allowed for an analysis of reductions. As with the A season, some closures were based on shoreside delivery information and VMS track inspection alone, leaving no pre-closure information for analysis. Table 2b indicates that the combination of chinook and chum closures resulted in 15,707 mt of pollock catch that could be tracked, with an associated 53% reduction in expected chinook take and 82% reduction in expected chum bycatch. Table 2c shows that for the entire year the chinook and chum reductions were 72% and 82%. Overall savings of chinook were similar to last year while chum reductions were much less (Table 3). The lower chum reductions could be expected due to the overall lower chum bycatch in 2010 (13,637 chum taken in 2010 vs. 38,071 in 2009).

Table 2a. Summary of 2010A Chinook closure effectiveness

A season results	Chinook closures
Pollock catch (after closure)	19,087
Actual chinook bycatch (in moved tows)	839
Expected chinook bycatch	3,137
Chinook savings	2,298
% reduction	73%
Actual chum bycatch	2
Expected chum bycatch	7
Chum savings	5
% reduction	71%

Table 2b. Summary of 2010B chinook and chum closure effectiveness

B season results	B Chinook closures	B Chum closures	Combined B closures
Pollock catch (after closure)	3,170	12,537	15,707
Actual chinook bycatch (in moved tows)	49	11	60
Expected chinook bycatch	57	72	129
Chinook savings	8	61	69
% reduction	14%	85%	53%
Actual chum bycatch	58	346	404
Expected chum bycatch	107	2,154	2,261
Chum savings	49	1,808	1,857
% reduction	46%	84%	82%

Table 2c. Full year chinook and chum closure effectiveness

Full year results (A + B)	A and B closures
Pollock catch (after closure)	34,794
Actual chinook bycatch (in moved tows)	899
Expected chinook bycatch	3,266
Chinook savings	2,367
% reduction	72%
Actual chum bycatch	406
Expected chum bycatch	2,268
Chum savings	1,862
% reduction	82%

Table 3. Hot spot closure effectiveness, 2006 - 2010.

Year	Pollock harvest moved from closures	% of pollock harvest affected	Chinook savings	% reduction	Chum savings	% reduction
2006B	41,691	7%	1,537	20%	15,419	67%
2007A	102,592	19%	35,550	70%		
2007B	182,111	23%	14,576	54%	86,410	70%
2008A	44,782	12%	4,953	66%		
2008B	7,419	1%	-533	-100%	965	73%
2009A	8,373	3%	2,068	95%		
2009B	11,936	3%	265	64%	7,438	74%
2010A	19,807	6%	2,298	71%		
2010B	15,707	3%	69	53%	1,857	82%

Compliance/ Enforcement

Two apparent violations were referred to the Akutan coop on November 2, 2009. The coop has until April 20, 2011 to meet and decide on the validity of these apparent violations.

An audit of Sea State compliance monitoring was awarded to ABR Inc of Fairbanks, Alaska. ABR is performing an independent review of 10% of the coop fishing records and associated VMS information. The final report for this audit states that:

“We found that our verdicts agreed with Sea State’s determination in all cases. Our 10% subsample did not identify any errors in Sea State’s original determinations, and we did not further investigate locations outside of our subsample”

Comments on the 2010 season

2010 chum bycatch represents the lowest number in the data series presented in Table 1 and Figure 1 below. Despite this very low catch, closures began on June 29 and were in effect sporadically through 9/26/10. After this, chinook closures took precedence. Chum closures were placed over the entire geographic range of the fishery (Appendix Figure A2-2).

Chinook bycatch in 2010 was lower than any year in the 1993 – 2010 series with the exception of 2000 (Table 1, Figure 1). The reduction in bycatch was seen in both seasons (Figure 2). Cold water conditions associated with extensive ice coverage was felt by many to be a contributing factor in the A season. The B season pattern seen in 2009, with most vessels leaving the grounds by October, was also apparent in 2010 and undoubtedly contributed to the low bycatch levels in the B season. In contrast to both A season chinook closures and B season chum closures, the B season chinook closures were confined to a relatively small range of the fishery, concentrated near Unimak Pass.

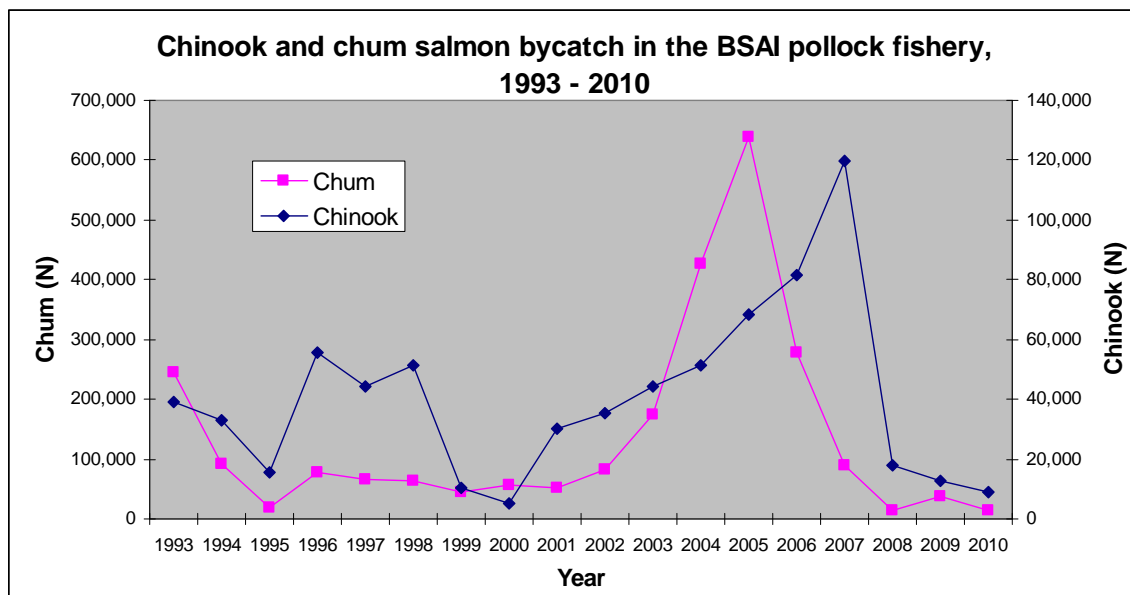


Figure 1. Chinook and chum bycatch in the pollock fishery, 1993 - 2010

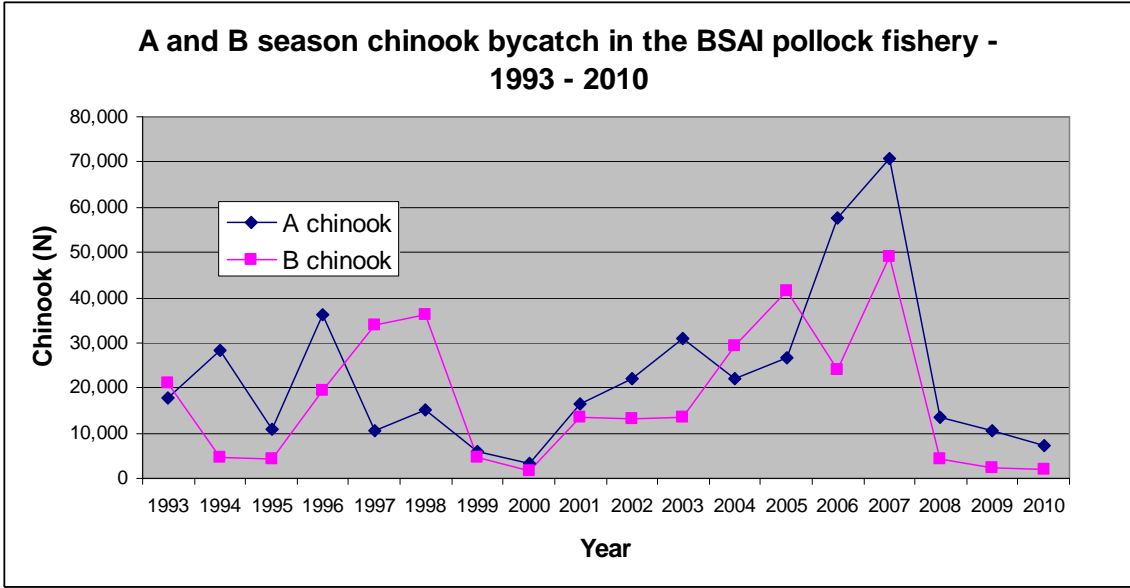


Figure 2. A and B season chinook bycatch in the pollock fishery, 1993 – 2010.

Appendix 1. Before-and-after closure fishing comparisons, by closure.

Table A1a. Chinook and chum salmon closure effectiveness, 2010 A season

Closure Type	Date	"After" closure pollock catch	"After" closure chinook	Estimated closed-area chinook catch	Chinook reduction (estimate - actual)	Std Err chinook	"After" closure chums	Estimated closed-area chum catch	Chum reduction (estimate - actual)	Std Err chum	Number of samples prior to closure	Number of samples after closure
Chinook	2/5/10	1,101	122	77	-45	10	0	0	0	0	17	9
Chinook	2/9/10	1,505	153	80	-73	8	2	0	-2	0	18	10
Chinook	2/12/10	2,461	83	286	203	41	0	5	5	2	12	10
Chinook	2/16/10	630	19	56	37	8	0	3	3	2	3	3
Chinook	2/19/10	8,435	284	2,233	1,949	73	0	0	0	0	26	12
Chinook	2/19/10	404	10	62	52	2	0	0	0	0	4	2
Chinook	3/5/10	2,604	133	160	27	5	0	0	0	0	12	3
Chinook	3/9/10	479	11	180	169		0	0	0		1	1
Chinook	3/12/10	244	0	4	4		0	0	0		1	1
Chinook	3/12/10	1,224	24	0	-24		0	0	0		1	1
Totals		19,087	839	3,137	2,298		2	7				

Table A1b. Chinook and chum salmon closure effectiveness, 2010 B season, by chinook closure.

Closure Type	Date	"After" closure pollock catch	"After" closure chinook	Estimated closed-area chinook catch	Chinook reduction (estimate - actual)	Std Err chinook	"After" closure chums	Estimated closed-area chum catch	Chum reduction (estimate - actual)	Std Err chum	Number of samples prior to closure	Number of samples after closure
Chinook	6/29/10	1,762	0	35	35	4	11	55	44	6	17	9
Chinook	7/2/10	682	0	0	0	0	2	14	12	2	6	3
Chinook	7/9/10	429	0	0	0		12	0	-12		1	1
Chinook	9/14/10	98	0	0	0		4	5	1		1	1
Chinook	9/24/10	159	14	15	1	6	29	33	4	10	8	5
Chinook	10/26/10	40	35	7	-28		0	0	0		1	1
Totals		3,170	49	57	8		58	107	49			

Table A1c. Chinook and chum salmon closure effectiveness, 2010 B season, by chum closure.

Closure Type	Date	"After" closure pollock catch	"After" closure chinook	Estimated closed-area chinook catch	Chinook reduction (estimate - actual)	Std Err chinook	"After" closure chums	Estimated closed-area chum catch	Chum reduction (estimate - actual)	Std Err chum	Number of samples prior to closure	Number of samples after closure
Chum	7/16/10	1,273	0	0	0	0	57	169	112	9	4	3
Chum	7/20/10	996	0	5	5	2	60	339	279	67	19	10
Chum	7/23/10	1,706	1	0	-1	0	136	457	321	28	8	9
Chum	7/27/10	2,014	0	0	0	0	38	66	27	6	4	3
Chum	7/30/10	870	5	0	-5	0	5	418	413	121	6	5
Chum	8/10/10	551	2	0	-2	0	3	111	108	28	6	3
Chum	8/13/10	74	0	0	0	0	2	21	19	26	3	2
Chum	8/27/10	3,303	0	0	0	0	29	409	380	26	9	5
Chum	9/7/10	1,375	0	5	5	1	16	102	86	9	15	6
Chum	9/24/10	375	3	63	60		0	63	63		1	1
Totals		12,537	11	72	61		346	2,154	1,807		75	

Appendix 2: Charts showing closures

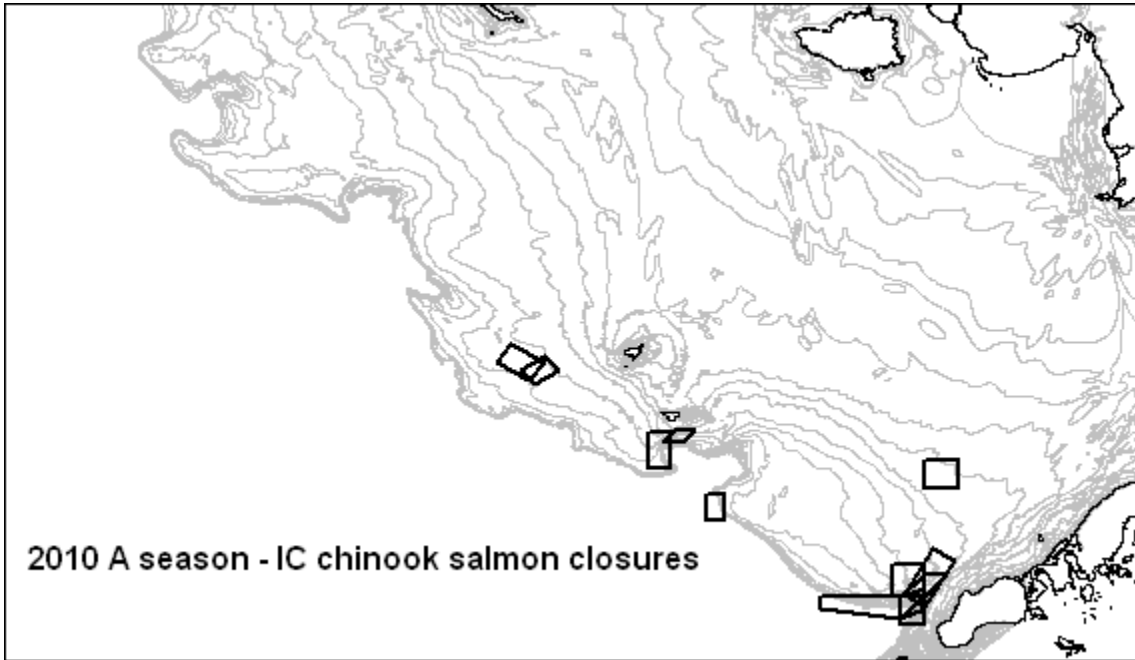


Figure A2-1. A season chinook closures

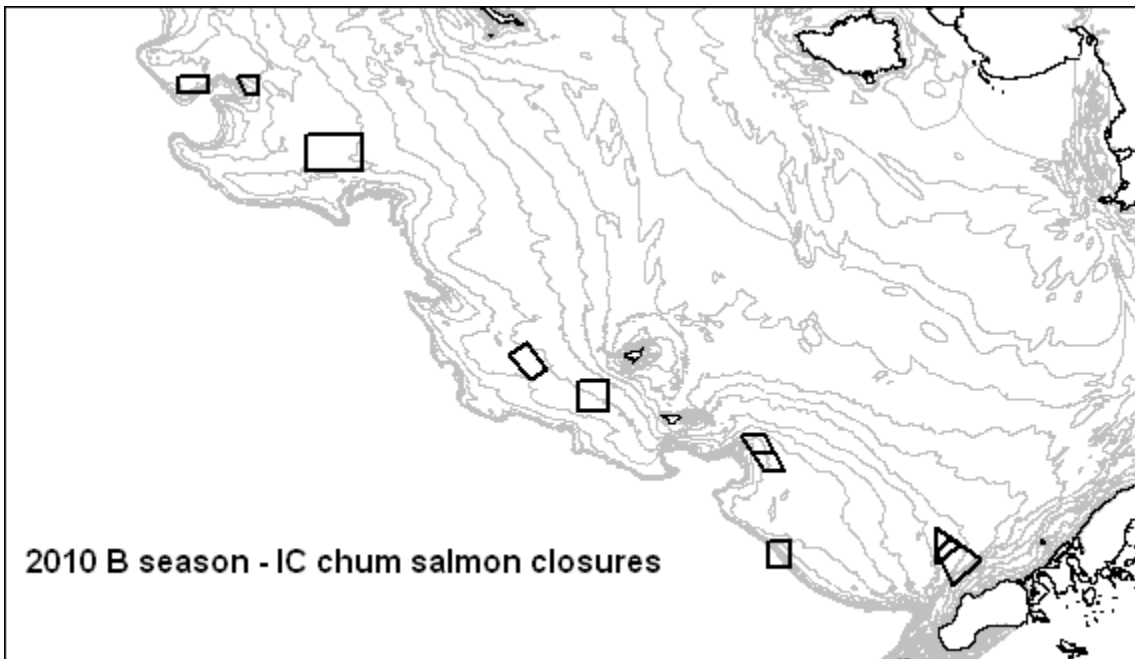


Figure A2-2 B season chum closures

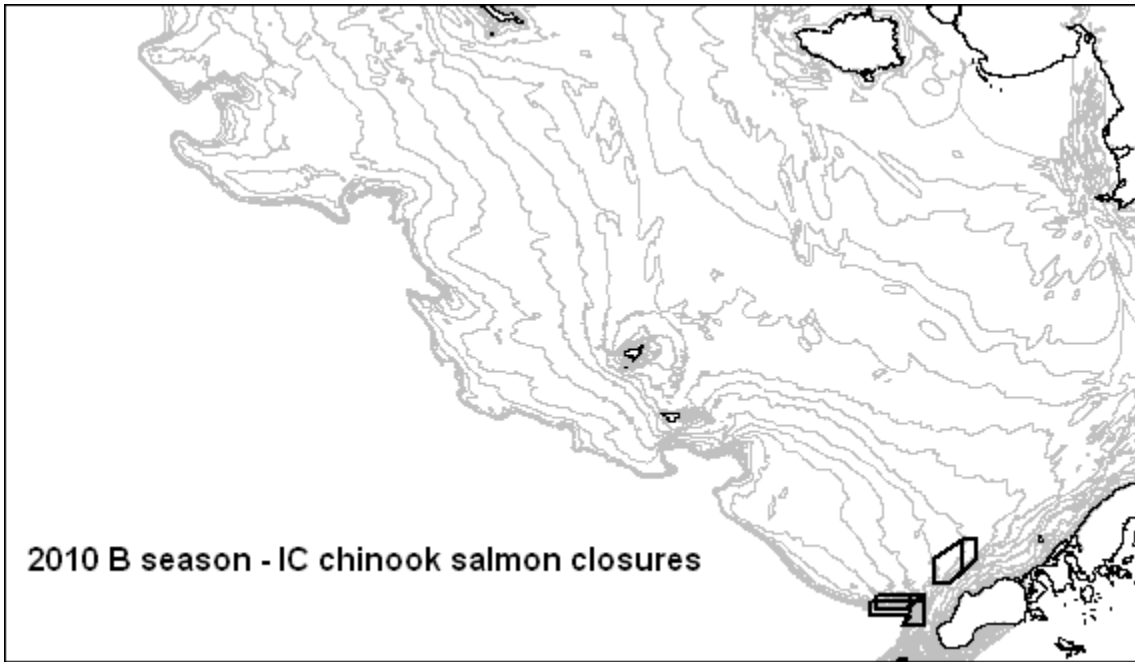


Figure A2-3. B season chinook closures

Appendix 3: Dirty 20 list appearances

Number of times each vessel was on a 2009 Chinook weekly dirty 20 list

Vessel	N times on list	Vessel	N times on list	Vessel	N times on list
AJ	0	GLADIATOR	4	PACIFIC EXPLORER	1
ALASKA OCEAN	4	GOLD RUSH	1	PACIFIC FURY	0
ALASKA ROSE	2	GOLDEN DAWN	6	PACIFIC GLACIER	2
ALASKAN COMMAND	3	GOLDEN PISCES	0	PACIFIC KNIGHT	0
ALDEBARAN	8	GREAT PACIFIC	1	PACIFIC MONARCH	0
ALEUTIAN CHALLENGER	0	GUN-MAR	0	PACIFIC PRINCE	0
ALSEA	2	HALF MOON BAY	1	PACIFIC RAM	0
ALYESKA	0	HAZEL LORRAINE	0	PACIFIC VIKING	6
AMERICAN BEAUTY	3	HICKORY WIND	0	PEGASUS	1
AMERICAN CHALLENGER	0	INTREPID EXPLORER	0	PEGGY JO	0
AMERICAN DYNASTY	1	ISLAND ENTERPRISE	5	PERSEVERANCE	1
AMERICAN EAGLE	2	KODIAK ENTERPRISE	2	POPADO II	0
AMERICAN TRIUMPH	2	LISA MELINDA	0	POSEIDON	3
ANITA J	2	MAJESTY	5	PREDATOR	0
ARCTIC EXPLORER	2	MARCY J	0	PROGRESS	3
ARCTIC FJORD	0	MARGARET LYN	0	PROVIDIAN	0
ARCTIC STORM	3	MAR-GUN	0	RAVEN	3
ARCTIC WIND	0	MARK I	1	ROYAL AMERICAN	1
ARCTURUS	2	MESSIAH	0	ROYAL ATLANTIC	1
ARGOSY	2	MISS BERDIE	0	SEA STORM	0
AURIGA	2	MISTY DAWN	1	SEA WOLF	3
AURORA	0	MORNING STAR	0	SEADAWN	0
BERING ROSE	6	MS AMY	0	SEATTLE ENTERPRISE	3
BLUE FOX	0	MUIR MILACH	0	SEEKER	2
BRISTOL EXPLORER	2	NEAHKAHNE	0	SOVEREIGNTY	4
CAITLIN ANN	1	NORDIC EXPLORER	0	STARBOUND	1
CALIFORNIA HORIZON	0	NORDIC FURY	1	STARFISH	0
CAPE KIWANDA	1	NORDIC STAR	1	STARLITE	1
CHELSEA K	0	NORTHERN EAGLE	2	STARWARD	1
COLLIER BROTHERS	0	NORTHERN GLACIER	0	STORM PETREL	3
COLUMBIA	5	NORTHERN HAWK	6	SUNSET BAY	1
COMMODORE	0	NORTHERN JAEGER	2	TOPAZ	4
DEFENDER	0	NORTHERN PATRIOT	4	TRACY ANNE	0
DESTINATION	2	NORTHWEST EXPLORER	0	TRAVELER	0
DOMINATOR	10	OCEAN EXPLORER	6	VANGUARD	5
DONA MARTITA	0	OCEAN HARVESTER	0	VESTERAALEN	0
ELIZABETH F	2	OCEAN HOPE 3	0	VIKING	1
EXCALIBUR II	1	OCEAN LEADER	1	VIKING EXPLORER	5
EXODUS	0	OCEAN ROVER	0	WALTER N	0
FIERCE ALLEGIANCE	0	OCEANIC	2	WESTERN DAWN	3
FORUM STAR	0	PACIFIC CHALLENGER	2	WESTWARD I	2

Number of times each vessel was on a 2009 chum weekly dirty 20 list

Vessel	N times on list	Vessel	N times on list	Vessel	N times on list
AJ	0	GLADIATOR	2	PACIFIC EXPLORER	4
ALASKA OCEAN	0	GOLD RUSH	2	PACIFIC FURY	0
ALASKA ROSE	2	GOLDEN DAWN	6	PACIFIC GLACIER	0
ALASKAN COMMAND	0	GOLDEN PISCES	5	PACIFIC KNIGHT	0
ALDEBARAN	4	GREAT PACIFIC	3	PACIFIC MONARCH	0
ALEUTIAN CHALLENGER	1	GUN-MAR	0	PACIFIC PRINCE	0
ALSEA	0	HALF MOON BAY	0	PACIFIC RAM	0
ALYESKA	0	HAZEL LORRAINE	2	PACIFIC VIKING	4
AMERICAN BEAUTY	3	HICKORY WIND	2	PEGASUS	0
AMERICAN CHALLENGER	0	INTREPID EXPLORER	0	PEGGY JO	0
AMERICAN DYNASTY	0	ISLAND ENTERPRISE	4	PERSEVERANCE	0
AMERICAN EAGLE	6	KODIAK ENTERPRISE	0	POPADO II	0
AMERICAN TRIUMPH	1	LISA MELINDA	0	POSEIDON	7
ANITA J	2	MAJESTY	7	PREDATOR	0
ARCTIC EXPLORER	4	MARCY J	2	PROGRESS	2
ARCTIC FJORD	1	MARGARET LYN	0	PROVIDIAN	0
ARCTIC STORM	1	MAR-GUN	0	RAVEN	0
ARCTIC WIND	1	MARK I	3	ROYAL AMERICAN	2
ARCTURUS	4	MESSIAH	0	ROYAL ATLANTIC	2
ARGOSY	0	MISS BERDIE	0	SEA STORM	0
AURIGA	0	MISTY DAWN	0	SEA WOLF	1
AURORA	0	MORNING STAR	5	SEADAWN	4
BERING ROSE	3	MS AMY	0	SEATTLE ENTERPRISE	3
BLUE FOX	0	MUIR MILACH	0	SEEKER	5
BRISTOL EXPLORER	3	NEAHKAHNE	0	SOVEREIGNTY	9
CAITLIN ANN	3	NORDIC EXPLORER	0	STARBOUND	2
CALIFORNIA HORIZON	1	NORDIC FURY	1	STARFISH	1
CAPE KIWANDA	0	NORDIC STAR	0	STARLITE	0
CHELSEA K	2	NORTHERN EAGLE	1	STARWARD	2
COLLIER BROTHERS	0	NORTHERN GLACIER	0	STORM PETREL	7
COLUMBIA	3	NORTHERN HAWK	0	SUNSET BAY	0
COMMODORE	4	NORTHERN JAEGER	3	TOPAZ	0
DEFENDER	3	NORTHERN PATRIOT	6	TRACY ANNE	0
DESTINATION	4	NORTHWEST EXPLORER	0	TRAVELER	4
DOMINATOR	3	OCEAN EXPLORER	4	VANGUARD	5
DONA MARTITA	0	OCEAN HARVESTER	0	VESTERAALEN	1
ELIZABETH F	1	OCEAN HOPE 3	0	VIKING	0
EXCALIBUR II	3	OCEAN LEADER	1	VIKING EXPLORER	1
EXODUS	0	OCEAN ROVER	1	WALTER N	1
FIERCE ALLEGIANCE	1	OCEANIC	2	WESTERN DAWN	6
FORUM STAR	0	PACIFIC CHALLENGER	3	WESTWARD I	0