Report to the North Pacific Fishery Management Council on the 2011 Bering Sea Pollock Intercooperative Salmon Avoidance Agreement

Karl Haflinger, Sea State Inc. - Intercoop Monitor
John Gruver, AFA Catcher Vessel Intercooperative Manager

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 B season fishery, the pollock Intercoop closed 67 areas to fishing based on high bycatch rates of chum salmon experienced by vessels working in the area. 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. Estimated number of salmon avoided as demonstrated by the movement of fishing effort away from salmon hot-spots.
2. 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 non-Chinook salmon taken 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	B season pollock*	B season other salmon bycatch
1993	740,569	242,473
1994	718,582	89,117
1995	647,865	17,625
1996	633,639	77,028
1997	546,988	64,504
1998	539,432	60,040
1999	511,211	44,261
2000	631,755	57,228
2001	813,022	50,948
2002	866,034	83,033
2003	876,784	170,688
2004	858,799	427,234
2005	878,618	637,957
2006	874,435	276,779
2007	775,261	82,641
2008	572,384	14,453
2009	469,128	38,040
2010	471,983	13,585
2010	681,480	191,517

** 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)

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 $Ri = \sum yi / \sum xi$, 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

Locations of the 2011 closures are shown in Figure 1.

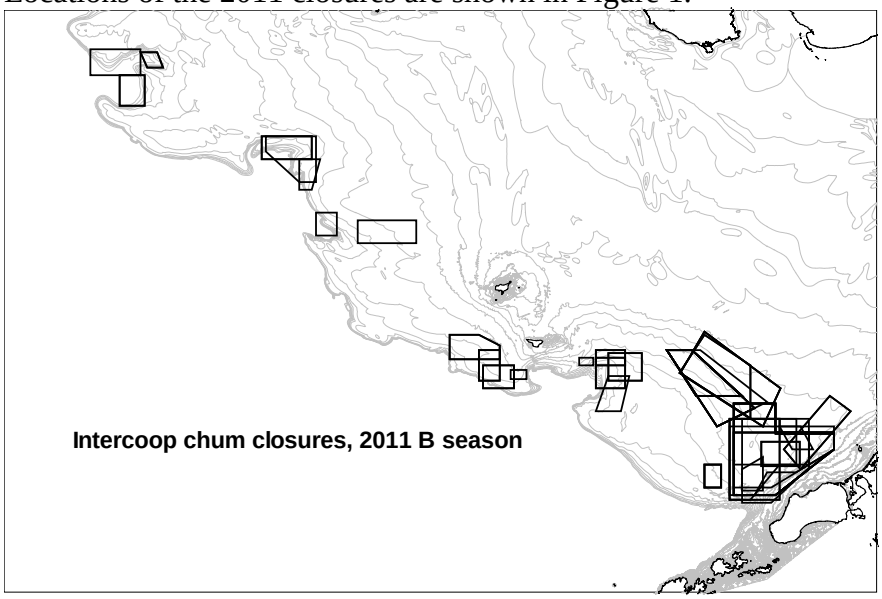

Figure 1. 2011 IC chum closures

Table 2 summarize of the results for both chum and chinook savings resulting from these closures (Appendix Tables A1a-c show the underlying data, by closure, with associated standard errors). An estimated 86,338 mt of observed groundfish was associated with boats that fished inside areas before they were closed. These same vessels caught an estimated 146,846 mt of groundfish in the five day interval following the respective closure. An estimated 79,657 fewer chum were taken outside the closures than would have been expected had the same amount of pollock been taken inside the closures, based on the comparison of rates inside and outside closure areas. Chinook reduction were minimal: 76 chinook fewer taken than the estimated 1,154 that would have been caught at within-closure rates. These bycatch reductions represent a 63% decrease in expected chum bycatch, and a 7% decrease in expected chinook bycatch.

Table 2. Chum salmon closure effectiveness

Closure statistic	Bycatch species	
	Chinook	Chum
Pollock catch (inside, before closures)	86,338	86,338
Pollock catch (outside, after closures)	146,846	146,846
Actual bycatch (outside closures)	1,078	46,939
Expected bycatch (at pre-closure rate)	1,154	126,596
Savings	76	79,657
% reduction	7%	63%

A comparison with results from chum closures from previous years is shown in Table 3. The "After-closure pollock" column shows the total tonnage of pollock harvested by vessels that fished inside closures in the 5-day interval before they closed. This amount of pollock can be viewed as having been moved from inside the closure area to outside due to the closures. The 2011 amount (146,846 mt) is larger as an absolute amount, and much larger as a percentage of the B season harvest, than we have seen in any other year since the program began. The number is higher than in any previous year partly because the ICA approved under the original Amendment 84 regulations was intended to protect both Chinook and chum salmon, with Chinook bycatch reduction being the higher priority. Therefore, chum RHS closures were discontinued once Chinook RHS closures were triggered. The implementation of Amendment 91 removed all Chinook elements of the original Amendment 84 regulations, thereby eliminating the replacement of chum RHS closures for those protecting Chinook salmon. Consequently the number of chum RHS closures, and therefore the associated pollock catch moved as a result of these closures, has increased in 2011.

Table 3. Comparison of the effects of chum closures across years.

Year	After-closure pollock	% of harvest affected	Chinook savings	Chinook % reduction	Chum savings	Chum % reduction
2006	23,049	3%	-97	-21%	65,299	64%
2007	107,646	14%	2007	56%	75,970	82%
2008	3,448	1%	53	82%	768	73%
2009	5,701	1%	52	50%	6,270	76%
2010	12,537	3%	61	85%	1,808	84%
2011	146,846	22%	73	7%	79,657	63%

Compliance/ Enforcement

Ten apparent violations were referred to coops on November 2, 2009. The coops to which these vessels belong have until May 28, 2012 to meet and decide on the validity of these apparent violations.

An audit of Sea State compliance monitoring has again been awarded to ABR Inc of Fairbanks, Alaska. ABR reviewed 10% of the coop fishing records and associated VMS information. The draft 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"

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

Date	"Before" closure pollock	"After" closure pollock catch	"After" closure chinook	Estimated chinook catch without closure	Chinook reduction (estimate-actual)	Std Err chinook estimate	"After" closure chum catch	Estimated chum catch without closure	Chum reduction (estimate-actual)	Std Err chum estimate	Number of samples prior to closure	Number of samples after closure
06/17/11	5,600	10,392	19	7	-11	1.7	6,309	9,803	3,494	492.2	37	41
06/21/11	22,103	10,576	10	18	8	2.3	3,452	6,833	3,381	392.6	138	45
06/24/11	3,207	5,600	3	9	6	1.5	1,805	3,294	1,489	271.2	31	24
06/28/11	326	2,035	1	6	5	1.0	1,599	2,170	571	103.8	7	7
07/01/11	1,249	1,352	0	2	2	0.2	114	1,813	1,699	36.8	23	4
07/05/11	403	1,499	1	6	5	1.1	250	2,352	2,102	169.2	8	8
07/05/11	670	3,619	0	0	0	0.0	120	3,556	3,436	79.1	11	4
07/08/11	3,003	3,506	3	9	6	2.4	2,405	5,252	2,847	737.2	20	18
07/12/11	746	2,178	5	0	-5	0.0	383	4,696	4,313	700.9	9	10
07/15/11	1,283	1,832	0	4	4	2.2	1,677	1,856	180	336.6	11	13
07/15/11	4,674	12,428	8	8	-1	1.0	2,436	6,147	3,710	209.0	56	36
07/19/11	382	77	0	0	0	0.0	883	329	-555	295.1	5	2
07/22/11	4,420	5,352	17	2	-15	1.0	751	2,190	1,438	247.8	32	29
07/22/11	5,519	13,104	10	2	-8	0.2	1,140	1,522	382	45.7	57	13
07/26/11	908	2,211	16	3	-13	0.6	158	397	239	21.5	12	9
07/26/11	720	5,150	19	0	-19	0.0	2,229	1,894	-335	182.9	7	6
07/29/11	420	1,176	11	14	3	3.3	327	288	-39	26.9	6	6
07/29/11	4,220	9,747	4	9	5	0.6	1,094	10,787	9,693	270.7	47	9
08/02/11	24	22	0	1	0		53	10	-44		1	1
08/02/11	30	152	1	1	0		17	6	-11		1	2
08/05/11	666	3,517	4	0	-4	0.0	630	2,624	1,994	312.0	8	6
08/09/11	2,889	4,420	7	14	7	2.4	1,980	7,465	5,485	934.5	32	28
08/12/11	3,276	6,977	53	7	-46	1.8	2,927	3,250	324	268.6	31	35
08/12/11	886	5,597	10	13	3	0.7	188	8,240	8,052	317.1	19	9
08/16/11	2,572	3,996	28	1	-28	0.2	1,026	2,021	995	61.7	48	16
08/19/11	5,220	4,419	56	22	-34	2.6	1,403	3,168	1,765	200.0	65	34
08/23/11	277	536	4	6	2	1.0	23	353	330	37.8	7	6
08/26/11	1,614	4,089	36	53	17	4.4	2,394	2,224	-170	119.3	28	19
08/30/11	1,985	3,235	49	10	-39	1.1	1,116	4,976	3,860	489.5	25	13
09/02/11	653	2,933	33	80	47	3.6	188	7,018	6,830	133.1	15	5
09/06/11	197	150	5	0	-5	0.0	87	590	502	44.4	2	1
09/09/11	86	294	27	1	-26		152	1,040	889		1	2
09/13/11	56	69	19	2	-18	1.5	34	89	55	2.9	2	2
09/16/11	1,861	1,679	234	231	-3	29.0	1,241	1,683	442	179.7	25	18
09/16/11	399	1,327	41	80	39	3.2	138	239	101	10.9	7	2
09/20/11	241	719	114	165	52	6.9	151	709	557	69.2	5	5
09/20/11	689	229	2	1	-1	0.6	979	485	-494	125.9	15	4
09/27/11	830	1,263	2	50	48	1.8	37	5,306	5,269	252.3	24	6
09/30/11	94	1,325	63	56	-7	3.2	214	1,815	1,601	24.4	4	4
09/30/11	582	775	8	5	-3	0.7	24	1,157	1,133	115.4	10	3
10/04/11	196	2,509	30	141	111	5.3	793	1,949	1,156	30.6	4	4
10/07/11	174	1,521	43	96	53	5.5	253	1,029	776	18.4	3	3
10/11/11	23	346	4	0	-4		38	90	52		1	1
10/11/11	860	1,929	49	4	-45	0.6	77	2,475	2,398	129.7	11	5
10/14/11	60	397	3	0	-3		17	173	156		1	1
10/21/11	43	588	24	14	-10	0.7	3,628	1,235	-2,393	24.7	2	2
	86,338	146,846	1,078	1,154	76		46,939	126,596	79,657			

Appendix 2: Dirty 20 list appearances

Number of times each vessel was on a 2011 chum weekly dirty 20 list

Vessel	N times on list	Vessel	N times on list	Vessel	N times on list
AJ	0	Golden Alaska	0	PACIFIC CHALLENGER - MS	4
Alaska Ocean	3	GOLDEN DAWN	5	PACIFIC EXPLORER	3
ALASKA ROSE	3	GOLDEN PISCES	1	PACIFIC FURY	6
ALASKAN COMMAND	8	GREAT PACIFIC	4	Pacific Glacier	0
ALDEBARAN	3	GUN-MAR	5	PACIFIC KNIGHT	0
ALEUTIAN CHALLENGER	1	HALF MOON BAY	0	PACIFIC MONARCH	0
ALSEA	5	HAZEL LORRAINE	0	PACIFIC PRINCE	5
ALYESKA	0	HICKORY WIND	1	PACIFIC RAM	0
AMERICAN BEAUTY - INSHORE	2	Highland Light	0	PACIFIC VIKING	6
AMERICAN BEAUTY - MS	1	INTREPID EXPLORER	0	PAPADO II	0
AMERICAN CHALLENGER	0	Island Enterprise	4	PEGASUS	3
American Challenger	0	Katie Ann	0	PEGGY JO	0
American Dynasty	3	Kodiak Enterprise	4	PERSEVERANCE	0
AMERICAN EAGLE	4	LESLIE LEE	1	POSEIDON	2
American Enterprise	0	LISA MELINDA	0	PREDATOR	1
American Triumph	1	MAJESTY	0	PROGRESS	4
ANITA J	3	MARCY J	1	PROVIDIAN	0
ARCTIC EXPLORER	9	MARGARET LYN	0	RAVEN	0
Arctic Fjord	1	MAR-GUN	0	ROYAL AMERICAN	4
Arctic Storm	0	MARK I	7	ROYAL ATLANTIC	2
ARCTIC WIND	6	MESSIAH	0	SEA STORM	0
ARCTURUS	7	MISS BERDIE	0	Sea Storm	0
ARGOSY	4	MISTY DAWN	3	SEA WOLF	1
AURIGA	3	MORNING STAR	6	SEADAWN	6
AURORA	4	MS AMY	0	Seattle Enterprise	2
BERING ROSE	6	MUIR MILACH	0	SEEKER	2
BLUE FOX	4	Muir Milach	0	SOVEREIGNTY	6
BRISTOL EXPLORER	5	NEAHKAHNIE	0	Starbound	3
CAITLIN ANN	5	Neahkahnie	0	STARFISH	6
CALIFORNIA HORIZON	3	NORDIC EXPLORER	0	STARLITE	3
CAPE KIWANDA	2	NORDIC FURY - INSHORE	1	STARWARD	4
CHELSEA K	7	NORDIC FURY - MS	5	STORM PETREL	1
COLLIER BROTHERS	6	NORDIC STAR	6	SUNSET BAY	0
COLUMBIA	3	Northern Eagle	2	TOPAZ	0
COMMODORE	2	Northern Glacier	0	TRACY ANNE	0
DEFENDER	5	Northern Hawk	2	Tracy Anne	0
DESTINATION	3	Northern Jaeger	3	TRAVELER - INSHORE	0
DOMINATOR	3	NORTHERN PATRIOT	9	TRAVELER - MS	3
DONA MARTITA	0	NORTHWEST EXPLORER	0	US Enterprise	0
ELIZABETH F	1	OCEAN EXPLORER	2	VANGUARD - INSHORE	0
Endurance	0	OCEAN HARVESTER	0	VANGUARD - MS	2
EXCALIBUR II	2	Ocean Harvester	0	VESTERAALEN	7
Excellence	0	OCEAN HOPE 3	0	VIKING	8
EXODUS	0	OCEAN LEADER - INSHORE	1	VIKING EXPLORER	6
FIERCE ALLEGIANCE	3	OCEAN LEADER - MS	5	WALTER N	2
FORUM STAR	0	Ocean Phoenix	0	WESTERN DAWN - INSHORE	1
Forum Star	0	Ocean Rover	2	WESTERN DAWN - MS	1
GLADIATOR	2	OCEANIC	5	WESTWARD I	3
GOLD RUSH	1	PACIFIC CHALLENGER - INSHORE	0		