

Report to the North Pacific Fishery Management Council  
on the 2012  
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 B season fishery, the pollock Intercoop closed 32 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 Figure 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 “other” salmon in the directed pollock fishery B season, 1993 – 2012..*

| 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                        |
| 2011 | 681,480           | 191,517                       |
| 2012 | 705,716           | 22,149                        |

*\* 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  $R_i = \sum y_i / \sum x_i$ , 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, 8<sup>th</sup> Edition, p 452).

**Avoidance results from the 2010 Intercoop Agreement**

Locations of the 2012 closures are shown in Figure 1.

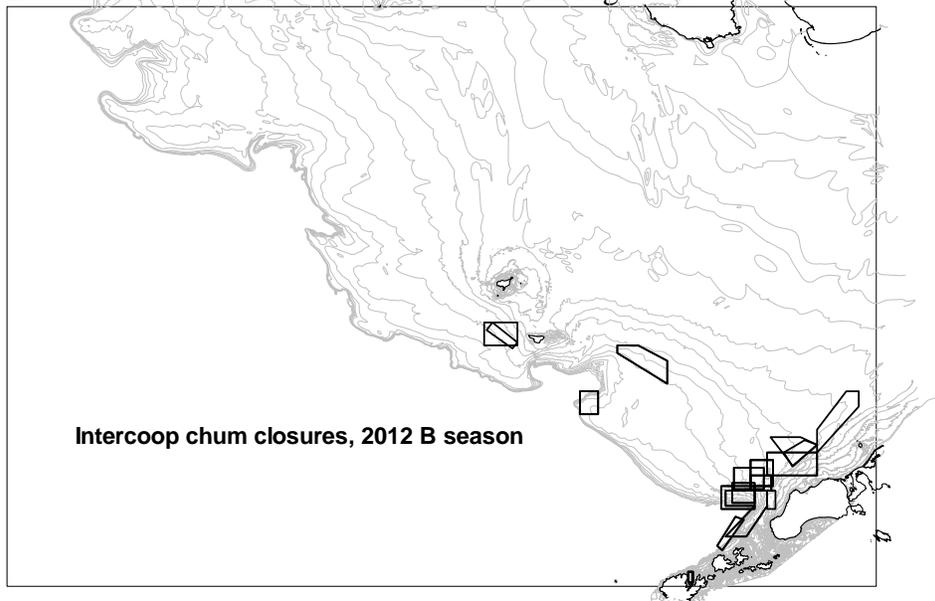


Figure 1. 2012 IC chum closures

Table 2 summarizes the results for both chum and chinook savings resulting from these closures (Appendix Table A1 shows the underlying data, by closure, with associated standard errors). An total of 12,246 mt of observed groundfish was associated with boats that fished inside areas before they were closed. These same vessels caught 19,388 mt of groundfish in the five day interval following the respective closure. An estimated 3,530 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 was minimal: 48 chinook fewer taken than the estimated 455 that would have been caught at within-closure rates. These bycatch reductions represent a 50% decrease in expected chum bycatch (for boats that fished in closures, for the 3 or 4 day period after the closure), and an 11% decrease in expected chinook bycatch.

Table 2. Chum salmon closure effectiveness for the 2012 B season

| Closure statistic                       | Bycatch species |        |
|---|-----------------|--------|
|   | Chinook         | Chum   |
| Pollock catch (inside, before closures) | 12,246          | 12,246 |
| Pollock catch (outside, after closures) | 19,388          | 19,388 |
| Actual bycatch (outside closures)       | 407             | 3,474  |
| Expected bycatch (at pre-closure rate)  | 455             | 7,004  |
| Savings                                 | 48              | 3,530  |
| % reduction                             | 11%             | 50%    |

A comparison with results from chum closures from previous years is shown in Table 3. The “Displaced pollock” column shows the total tonnage of pollock harvested after closures 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 2012 amount (12,246 mt) is fairly typical of the small percentage of pollock catch that is affected in low-bycatch years. Chum-related closures continued through October 12, at which point chum encounters were almost non-existent. This corresponds well with the October 15<sup>th</sup> date at which the old Chum Salmon Savings Area ceased to be in effect if it had been triggered in the first place.

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

| Year | Displaced pollock | % of harvest affected | Chinook savings | Chinook % reduction | Chum savings | % reduction | Total (actual) chum catch |
|------|-------------------|-----------------------|-----------------|---------------------|--------------|-------------|---------------------------|
| 2006 | 23,049            | 3%                    | -97             | -21%                | 65,299       | 64%         | 276,779                   |
| 2007 | 107,646           | 14%                   | 2007            | 56%                 | 75,970       | 82%         | 82,641                    |
| 2008 | 3,448             | 1%                    | 53              | 82%                 | 768          | 73%         | 14,453                    |
| 2009 | 5,701             | 1%                    | 52              | 50%                 | 6,270        | 76%         | 38,040                    |
| 2010 | 12,537            | 3%                    | 61              | 85%                 | 1,808        | 84%         | 13,585                    |
| 2011 | 146,846           | 22%                   | 73              | 7%                  | 79,657       | 63%         | 191,517                   |
| 2012 | 12,246            | 2%                    | 48              | 11%                 | 3,530        | 50%         | 22,149                    |

## Compliance/ Enforcement

No apparent violations were found in the 2012 B season fishery.

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 report for this audit states that:

“ABR agreed with the determinations of Sea State for the 10% sample that we examined, and we found no closure zone violations. Of points examined, our determination agreed with Sea State for all 14,846 locations in our subsample. We also found one vessel that fished for a short period, but which provided no VMS data. There were no closures during the period they were fishing, so location data wasn’t necessary to assess their compliance.”

**Appendix 1. Table A1. Before-and-after closure fishing comparisons, by closure.**

| Date     | "Before" closure pollock | "After" closure pollock | "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 | Bycatch rate inside closures before closed | Actual bycatch rate in days following closure |
|----------|--------------------------|-------------------------|--------------------------|---|---------------------------------------|--------------------------|----------------------------|--------------------------------------|------------------------------------|-----------------------|------------------------------------|---------------------------------|--|---|
| 07/06/12 | 127                      | 399                     | 1                        | 0                                       | 0                                     | 0.2                      | 29                         | 5                                    | -24                                | 1                     | 4                                  | 5                               | 0.01                                       | 0.07  |
| 07/10/12 | 1,127                    | 2,202                   | 0                        | 7                                       | 7                                     | 1.6                      | 74                         | 389                                  | 315                                | 23                    | 12                                 | 10                              | 0.18                                       | 0.03  |
| 07/13/12 | 38                       | 303                     | 0                        | 0                                       | 0                                     |                          | 8                          | 0                                    | -8                                 |                       | 1                                  | 1                               | 0.00                                       | 0.03  |
| 07/24/12 | 885                      | 1,580                   | 0                        | 0                                       | 0                                     | 0.1                      | 30                         | 157                                  | 127                                | 18                    | 14                                 | 9                               | 0.10                                       | 0.02  |
| 07/24/12 | 334                      | 1,395                   | 0                        | 0                                       | 0                                     | 0.0                      | 14                         | 1,312                                | 1,298                              | 12                    | 3                                  | 2                               | 0.94                                       | 0.01  |
| 07/27/12 | 272                      | 721                     | 0                        | 0                                       | 0                                     | 0.0                      | 42                         | 124                                  | 82                                 | 14                    | 6                                  | 4                               | 0.17                                       | 0.06  |
| 08/07/12 | 730                      | 1,330                   | 1                        | 10                                      | 9                                     | 1.2                      | 10                         | 761                                  | 751                                | 70                    | 13                                 | 8                               | 0.57                                       | 0.01  |
| 08/07/12 | 10                       | 94                      | 0                        | 0                                       | 0                                     |                          | 2                          | 288                                  | 286                                |                       | 1                                  | 1                               | 3.06                                       | 0.02  |
| 08/10/12 | 29                       | 119                     | 1                        | 0                                       | -1                                    |                          | 1                          | 51                                   | 50                                 |                       | 1                                  | 1                               | 0.43                                       | 0.01  |
| 08/24/12 | 927                      | 2,324                   | 3                        | 3                                       | 0                                     | 0.4                      | 6                          | 51                                   | 45                                 | 4                     | 10                                 | 4                               | 0.02                                       | 0.00  |
| 08/28/12 | 1,005                    | 1,405                   | 19                       | 11                                      | -8                                    | 6.6                      | 223                        | 1,139                                | 917                                | 170                   | 13                                 | 14                              | 0.81                                       | 0.16  |
| 08/31/12 | 21                       | 96                      | 3                        | 0                                       | -3                                    | 0.0                      | 7                          | 170                                  | 163                                | 2                     | 2                                  | 1                               | 1.77                                       | 0.07  |
| 09/07/12 | 264                      | 494                     | 9                        | 10                                      | 2                                     | 2.0                      | 200                        | 124                                  | -76                                | 47                    | 7                                  | 8                               | 0.25                                       | 0.41  |
| 09/11/12 | 861                      | 1,099                   | 42                       | 12                                      | -31                                   | 2.9                      | 1,100                      | 362                                  | -737                               | 84                    | 8                                  | 9                               | 0.33                                       | 1.00  |
| 09/14/12 | 195                      | 523                     | 45                       | 48                                      | 3                                     | 2.8                      | 192                        | 172                                  | -20                                | 2                     | 3                                  | 5                               | 0.33                                       | 0.37  |
| 09/14/12 | 95                       | 146                     | 18                       | 9                                       | -9                                    | 3.4                      | 122                        | 234                                  | 111                                | 81                    | 5                                  | 3                               | 1.60                                       | 0.84  |
| 09/18/12 | 200                      | 381                     | 28                       | 35                                      | 7                                     | 2.0                      | 152                        | 126                                  | -26                                | 1                     | 4                                  | 5                               | 0.33                                       | 0.40  |
| 09/18/12 | 370                      | 498                     | 29                       | 20                                      | -9                                    | 7.3                      | 417                        | 472                                  | 56                                 | 153                   | 5                                  | 5                               | 0.95                                       | 0.84  |
| 09/21/12 | 1,973                    | 564                     | 61                       | 44                                      | -17                                   | 10.5                     | 100                        | 260                                  | 161                                | 88                    | 19                                 | 10                              | 0.46                                       | 0.18  |
| 09/21/12 | 1,110                    | 1,277                   | 0                        | 0                                       | 0                                     | 0.1                      | 10                         | 24                                   | 14                                 | 2                     | 9                                  | 3                               | 0.02                                       | 0.01  |
| 09/25/12 | 606                      | 91                      | 6                        | 8                                       | 2                                     | 6.3                      | 63                         | 64                                   | 1                                  | 53                    | 10                                 | 5                               | 0.70                                       | 0.70  |
| 09/28/12 | 378                      | 806                     | 42                       | 98                                      | 56                                    | 16.7                     | 525                        | 131                                  | -393                               | 19                    | 9                                  | 9                               | 0.16                                       | 0.65  |
| 10/05/12 | 351                      | 1,005                   | 81                       | 65                                      | -16                                   | 6.9                      | 116                        | 477                                  | 361                                | 94                    | 8                                  | 10                              | 0.47                                       | 0.12  |
| 10/09/12 | 189                      | 256                     | 12                       | 19                                      | 7                                     | 4.1                      | 21                         | 20                                   | -1                                 | 3                     | 3                                  | 3                               | 0.08                                       | 0.08  |
| 10/12/12 | 148                      | 279                     | 5                        | 55                                      | 50                                    | 9.4                      | 10                         | 88                                   | 78                                 | 6                     | 6                                  | 3                               | 0.32                                       | 0.04  |
| Totals   | 12,246                   | 19,388                  | 407                      | 455                                     | 48                                    |                          | 3,474                      | 7,004                                | 3,530                              |                       |                                    |                                 |  |   |



## Appendix 2: Dirty 20 list appearances

Number of times each vessel was on a 2012 chum weekly dirty 20 list

| Vessel                    | N times on list | Vessel                       | N times on list | Vessel                 | N times on list |
|---------------------------|-----------------|------------------------------|-----------------|------------------------|-----------------|
| AJ                        | 0               | GOLD RUSH                    | 2               | PACIFIC EXPLORER       | 10              |
| ALASKA OCEAN              | 0               | GOLDEN DAWN                  | 2               | PACIFIC FURY           | 0               |
| ALASKA ROSE               | 1               | GOLDEN PISCES                | 6               | PACIFIC GLACIER        | 0               |
| ALASKAN COMMAND           | 1               | GREAT PACIFIC                | 4               | PACIFIC KNIGHT         | 0               |
| ALDEBARAN                 | 7               | GUN-MAR                      | 0               | PACIFIC MONARCH        | 0               |
| ALEUTIAN CHALLENGER       | 1               | HALF MOON BAY                | 0               | PACIFIC PRINCE         | 1               |
| ALSEA                     | 0               | HAZEL LORRAINE               | 1               | PACIFIC RAM            | 0               |
| ALYESKA                   | 0               | HICKORY WIND                 | 4               | PACIFIC VIKING         | 8               |
| AMERICAN BEAUTY - INSHORE | 3               | HIGHLAND LIGHT               | 0               | PAPADO II              | 0               |
| AMERICAN BEAUTY - MS      | 0               | INTREPID EXPLORER            | 0               | PEGASUS                | 1               |
| AMERICAN CHALLENGER       | 0               | ISLAND ENTERPRISE            | 0               | PEGGY JO               | 1               |
| AMERICAN CHALLENGER       | 0               | KATIE ANN                    | 0               | PERSEVERANCE           | 0               |
| AMERICAN DYNASTY          | 0               | KODIAK ENTERPRISE            | 1               | POSEIDON               | 6               |
| AMERICAN EAGLE            | 6               | LESLIE LEE                   | 6               | PREDATOR               | 1               |
| AMERICAN ENTERPRISE       | 0               | LISA MELINDA                 | 0               | PROGRESS               | 3               |
| AMERICAN TRIUMPH          | 0               | MAJESTY                      | 3               | PROVIDIAN              | 0               |
| ANITA J                   | 6               | MARCY J                      | 1               | RAVEN                  | 0               |
| ARCTIC EXPLORER           | 9               | MARGARET LYN                 | 3               | ROYAL AMERICAN         | 4               |
| ARCTIC FJORD              | 0               | MAR-GUN                      | 0               | ROYAL ATLANTIC         | 3               |
| ARCTIC STORM              | 0               | MARK I                       | 0               | SEA STORM              | 0               |
| ARCTIC WIND               | 0               | MESSIAH                      | 0               | SEA STORM              | 0               |
| ARCTURUS                  | 11              | MISS BERDIE                  | 0               | SEA WOLF               | 2               |
| ARGOSY                    | 0               | MISTY DAWN                   | 0               | SEADAWN                | 1               |
| AURIGA                    | 0               | MORNING STAR                 | 0               | SEATTLE ENTERPRISE     | 1               |
| AURORA                    | 0               | MS AMY                       | 0               | SEEKER                 | 0               |
| BERING ROSE               | 2               | MUIR MILACH                  | 0               | SOVEREIGNTY            | 7               |
| BLUE FOX                  | 0               | MUIR MILACH                  | 0               | STARBOUND              | 1               |
| BRISTOL EXPLORER          | 4               | NEAHKAHNNIE                  | 0               | STARFISH               | 0               |
| CAITLIN ANN               | 1               | NEAHKAHNNIE                  | 0               | STARLITE               | 1               |
| CALIFORNIA HORIZON        | 0               | NORDIC EXPLORER              | 0               | STARWARD               | 0               |
| CAPE KIWANDA              | 3               | NORDIC FURY - INSHORE        | 0               | STORM PETREL           | 7               |
| CHELSEA K                 | 1               | NORDIC FURY - MS             | 0               | SUNSET BAY             | 0               |
| COLLIER BROTHERS          | 0               | NORDIC STAR                  | 3               | TOPAZ                  | 0               |
| COLUMBIA                  | 7               | NORTHERN EAGLE               | 0               | TRACEY ANNE            | 0               |
| COMMODORE                 | 7               | NORTHERN GLACIER             | 0               | TRACY ANNE             | 0               |
| DEFENDER                  | 1               | NORTHERN HAWK                | 0               | TRAVELER - INSHORE     | 3               |
| DESTINATION               | 1               | NORTHERN JAEGER              | 0               | TRAVELER - MS          | 0               |
| DOMINATOR                 | 4               | NORTHERN PATRIOT             | 8               | US ENTERPRISE          | 0               |
| BERING DEFENDER           | 0               | NORTHWEST EXPLORER           | 3               | VANGUARD - INSHORE     | 3               |
| ELIZABETH F               | 2               | OCEAN EXPLORER               | 6               | VANGUARD - MS          | 1               |
| ENDURANCE                 | 0               | OCEAN HARVESTER              | 0               | VESTERAALEN            | 0               |
| EXCALIBUR II              | 2               | OCEAN HOPE 3                 | 4               | VIKING                 | 1               |
| EXODUS                    | 0               | OCEAN LEADER - INSHORE       | 0               | VIKING EXPLORER        | 6               |
| FIERCE ALLEGIANCE         | 1               | OCEAN LEADER - MS            | 3               | WALTER N               | 0               |
| FORUM STAR                | 0               | OCEAN ROVER                  | 0               | WESTERN DAWN - INSHORE | 1               |
| FORUM STAR                | 0               | OCEANIC                      | 1               | WESTERN DAWN - MS      | 0               |
| GLADIATOR                 | 5               | PACIFIC CHALLENGER - INSHORE | 0               | WESTWARD I             | 0               |
|                           |                 | PACIFIC CHALLENGER - MS      | 3               |                        |                 |