

Session M:

Avoidance of bycatch and discards: technical measures, projects and state of data

Title: From mobile closures to individual incentives: Chinook salmon bycatch reduction efforts in the Bering Sea pollock fishery¹

Author: Alan C. Haynie

Abstract:

Bycatch is repeatedly noted as a primary problem in fisheries management and as the foremost negative impact of commercial fishing. In the Bering Sea pollock fishery, salmon bycatch reduction measures have included gear modifications but have principally consisted of area closures. Bycatch levels of chum and Chinook salmon have risen substantially since the beginning of the decade and significant areas of the pollock fishery have been closed at some points between 2002 and 2007. These closures have consisted of both large long-term Salmon Savings Area closures and short-term voluntary rolling hotspot (VRHS) closures. More recently, the North Pacific Fishery Management Council has acted to impose a hard cap on the pollock fishery which would close the fishery if it were reached. In this paper, we consider the effectiveness of different management actions taken to manage salmon bycatch. We examine the effectiveness of spatial closures designed to reduce salmon bycatch in the Bering Sea pollock fishery. We compare the relative effectiveness of spatial management measures that have been implemented with tradable salmon bycatch programs that will be implemented in 2011. We demonstrate the importance of having individual bycatch quota under a hard cap which could otherwise erode benefits in the rationalized fishery.

Keywords: bycatch, incentive programs, spatial closures, bycatch quota.

Contact Author:

Alan C. Haynie
NOAA Fisheries/NMFS, Alaska Fisheries Science Center – F/AKC2
7600 Sand Point Way NE, Bldg 4, Seattle, WA 98115 USA
Phone: (206)526-4253;
Email: Alan.Haynie@noaa.gov

NOTE: This manuscript does not necessarily reflect the views of the National Marine Fisheries Service, the National Oceanic and Atmospheric Administration, or the U.S. Department of Commerce As this work is preliminary, all opinions and errors are those of the author.

¹ A related paper is being presented in ICES Session O, “The design of hybrid individual incentive mechanisms for bycatch reduction.” That paper focuses on the development and implementation of a hybrid system that includes a tradable bycatch allocation and other incentives to reduce bycatch.

From mobile closures to individual incentives: Chinook salmon bycatch reduction efforts in the Bering Sea pollock fishery

Introduction

Bycatch is repeatedly noted as a primary problem in fisheries management and as the foremost negative environmental impact of commercial fishing. The United States Bering Sea pollock fishery has total bycatch that has been at or below 1 percent of total catch, but in recent years Chinook and chum bycatch in the fishery has reached historic highs. Both species are managed under prohibited species catch (PSC) regulations that require that any salmon caught be returned to sea or donated to food banks. Both salmon species have an enormously significant cultural and subsistence value as well as commercial value, though this commercial value is small relative to the value of the pollock fishery.

Here we discuss the various spatial management measures that have been in place in the pollock fishery to reduce Chinook salmon bycatch since the mid-1990s, as well as the recent action that the North Pacific Fishery Management Council (Council) has taken to create individual transferable salmon bycatch allocations (SBA). In the following section, we provide an overview of the spatial management mechanisms that have been in effect in the fishery. We then discuss details of the recently passed policy that will create fleet-wide catch limit or “hard cap,” individual tradable SBA in the pollock fishery, and potentially provide additional incentives for bycatch avoidance at bycatch levels below the hard cap. Finally, we briefly discuss the conditions under which spatial management is likely to be successful and the conditions under which incentive mechanisms may be more effective.

Overview of the Bering Sea Pollock Fishery and Chinook Salmon Bycatch

In this section, we briefly discuss the pollock fishery and Chinook bycatch in the fishery. The Bering Sea pollock (*Theragra chalcogramma*) fishery is the largest fishery in the United States, by volume, with annual total allowable catch (TAC) ranging over the last decades from 0.8 to 1.5 million metric tons per year. The pollock fishery is divided into several sectors. The Western Alaska Community Development Quota (CDQ) fishery takes 10 percent of the quota and the remaining quota is divided so that catcher vessels that deliver to the inshore sector receive 50 percent of the TAC, catcher processors receive 40 percent of the TAC, and the mothership sector and affiliated catcher vessels that deliver to those processors receives 10 percent of the TAC. The quota is allocated to cooperatives proportional to their pollock catch history.

Bycatch levels of chum and Chinook salmon have risen substantially since the beginning of the decade and significant areas of the pollock fishery have been closed at different points since 2001. During the year, pollock fishing occurs in different places that have consistently had different levels of bycatch, although there are trends and persistence of bycatch in different areas. The Western Alaska salmon fisheries are managed by the State of Alaska, but salmon bycatch regulations are handled by the

Council. The Council has taken action several times over the last two decades to attempt to reduce salmon bycatch. At different times, more concern has been focused on Chinook and/or chum bycatch, with the most recent action focused on limiting Chinook bycatch.

Chinook bycatch happens primarily in two periods of the year: in the winter “A season” and at the end of the summer/fall “B season.” Figure 1 shows the changes in bycatch over recent years. Data from winter 2008 are displayed on this graph, but not displayed are the relatively low bycatch levels for summer 2008 and winter 2009. Total Chinook bycatch in the Bering Sea pollock fishery was 19,928 for 2008 and 9,527 for winter 2009.²

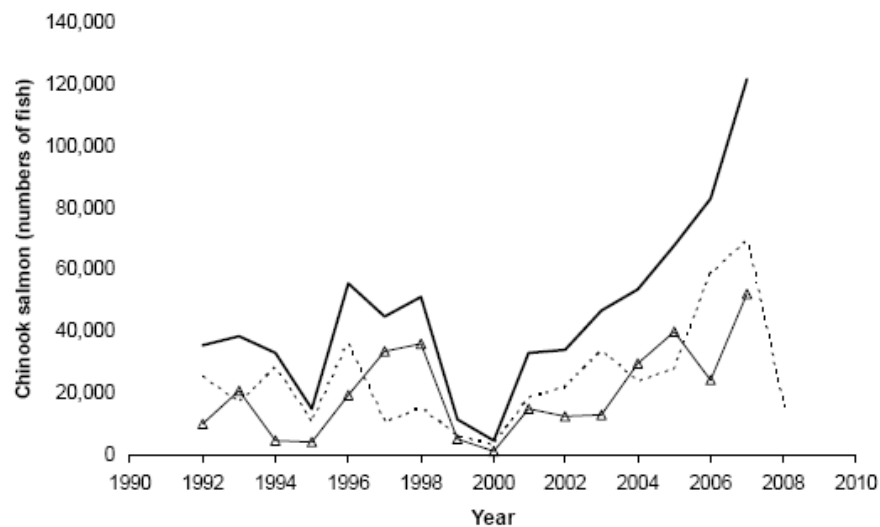


Figure 1: Chinook salmon bycatch in Bering Sea pollock trawl fishery: annually 1992-2007 (solid line), A season 1992-2008 (dotted line), and B season 1992-2007 (triangles). (Source: National Marine Fisheries Service)

Some of the Chinook salmon runs in Western Alaska have had poor returns to the rivers in recent years, which has intensified the pressure from Westerns Alaskans and some environmental groups to restrict or eliminate Chinook bycatch in the pollock fishery. While it is unclear what contribution bycatch has had to the poor health of the salmon subsistence and commercial fisheries, the Council made the decision that action was necessary to ensure that bycatch was not significantly harming these fisheries.

Spatial Management in the Bering Sea Pollock Fishery

While salmon bycatch reduction measures have included gear modifications to reduce the salmon caught by pollock trawl nets, traditional bycatch-reduction measures have principally consisted of area closures. Formal spatial management of salmon bycatch began after Council action in the mid-1990s created the Salmon Savings Areas (SSA), of which the Chinook SSA was created to address Chinook salmon bycatch.

² Salmon bycatch is managed in terms of numbers of fish rather than tonnage.

Figure 2, below, displays the Chinook SSA. The closure was created based on where observed Chinook bycatch rates had been highest in the periods just prior to the creation of the Chinook SSA.

The SSA as implemented in 1995 was a ‘trigger closure’ that went into effect when a bycatch threshold was exceeded. The threshold was initially set at 48,000, but was subsequently lowered by the Council in 1999 for the pollock fishery so that the trigger closure would go into effect if 41,000 Chinook were caught in 2000, 37,000 in 2001, 33,000 in 2002, and 29,000 in 2003. The Chinook closure was triggered in summer 2002-2005, and then in winter and summer of 2006 and the closures were in place for portions of those years.

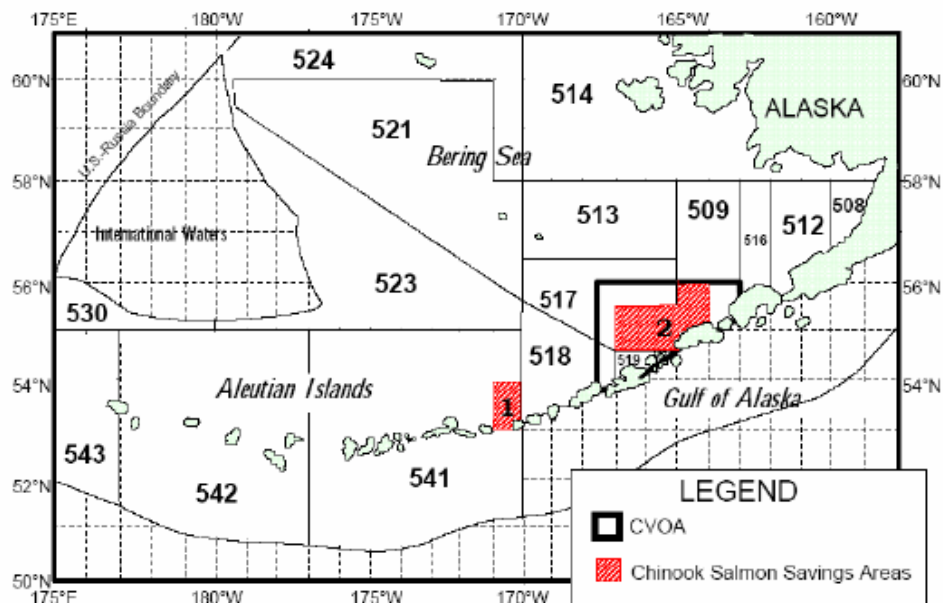


Figure 2: Chinook Salmon Savings Area

Beginning in 2001, through legal agreements within the fleet, vessels began to participate in a program that closed certain areas to pollock fishing. Sea State, Inc., which began a similar process for the Bering Sea flatfish fisheries in the mid-1990s to help that fleet avoid crab and halibut bycatch, receives catch, bycatch, and location data from the National Marine Fisheries Service (NMFS) Observer Program and since 2002, vessel monitoring system (VMS) data from the fleet. During the high-bycatch periods of the year, Sea State issues closures that are in effect for coming days. Figure 3 displays a summary of the fishing from one 5-day period and the closure that was subsequently imposed. In recent years, Sea State has issued reports twice per week during the high-bycatch part of the year, regardless of whether or not a closure was actually imposed.

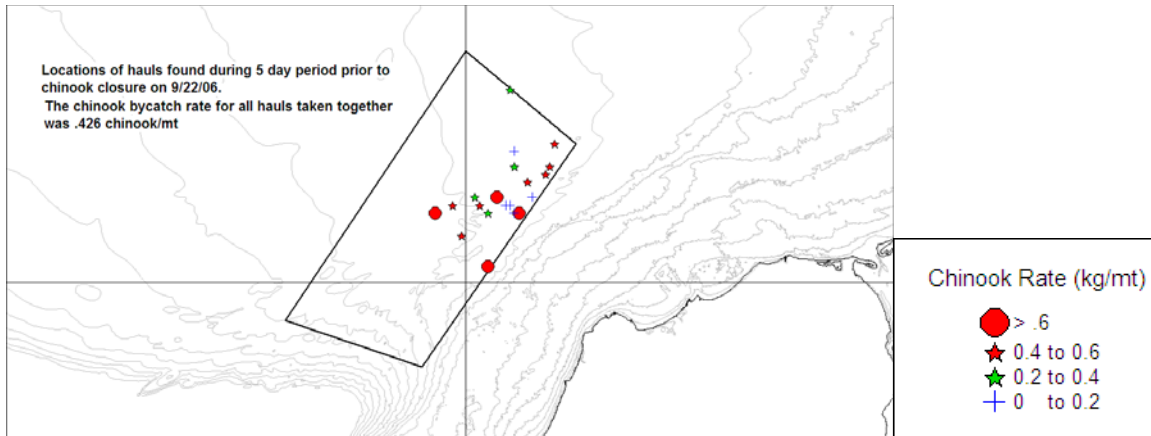


Figure 3: Sea State Summary of September 22, 2006 rolling hotspot closure and fishing in area during previous days. (Source: NMFS.)

Source: Sea State Inc, as displayed by the National Marine Fisheries Service.

The voluntary rolling hotspot (VRHS) system has been refined several times since its creation, but the basic strategy of the program is to prohibit fishing in relatively small areas that have recently had high bycatch. This recognizes that the highest bycatch areas of the fishery are quite dynamic during the year and that a large fixed closure may actually close many of the places with good fishing and low bycatch. As well as communicating information on where high-bycatch occurs, Sea State reports a “Dirty 20” list, which informs the fleet about vessels that systematically have high-bycatch, which has led to transparency about behavior and to peer-pressure to reduce bycatch.

There is significant evidence that the system can be effective at putting the highest bycatch areas out of the fishery at some high-bycatch times of year, but the system was not effective enough to prevent the record bycatch levels that occurred with chum bycatch in 2005 and with Chinook bycatch in 2006 and again in 2007. As can be seen in Figure 4, below, the closures have moved around the fishery significantly, covering most of the fishery at one time or another.

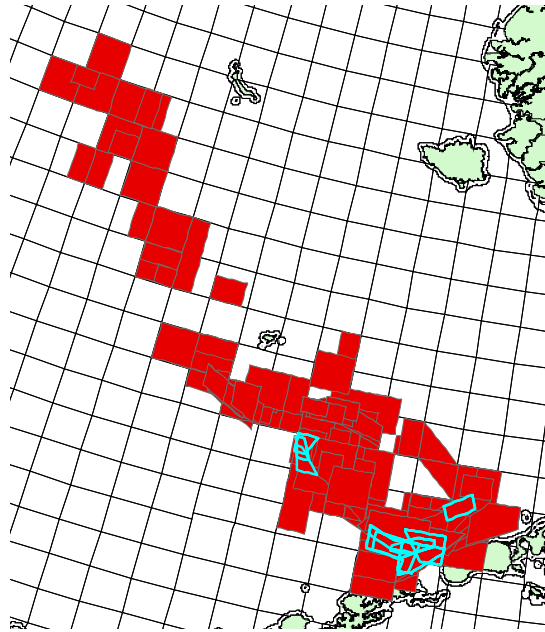


Figure 4: Sea State closure Areas 2001-March 3, 2007

Under the SSA, CDQ fisheries were granted a separate share of the quota that would trigger the Chinook SSA, so vessels with CDQ quota were in several years able to fish inside of the SSA while the rest of the fleet was forced to fish outside of the large closures displayed in Figure 2. During 2004, Council analysis showed that bycatch rates were actually higher for vessels fishing outside of the Chinook SSA during the time it was closed than for those vessels fishing CDQ quota inside the closure (i.e., the closure was potentially raising bycatch). After the VRHS system was revised and expanded, in 2006 the Chinook and chum SSA were suspended for vessels participating in the VRHS system (the entire fleet) and the VRHS closures became the only spatial closures in place for managing bycatch.

Prior to 2008, one of the limitations with the implementation of the VRHS system was that it did not go into effect at the start of the year, but required information on the current year's fishing conditions to define closures. Substantial Chinook bycatch occurred before the first closures of the year were in place in the high-bycatch years of 2006 and 2007. This led to the decision by the pollock industry to implement a "pre-season closure" in 2008 and 2009, which closed some of the highest-bycatch areas from early in the winter A season, as displayed in Figure 5. As mentioned above, bycatch has been much lower throughout 2008 and 2009, but the degree to which this in part the result of the pre-season closure requires further analysis.

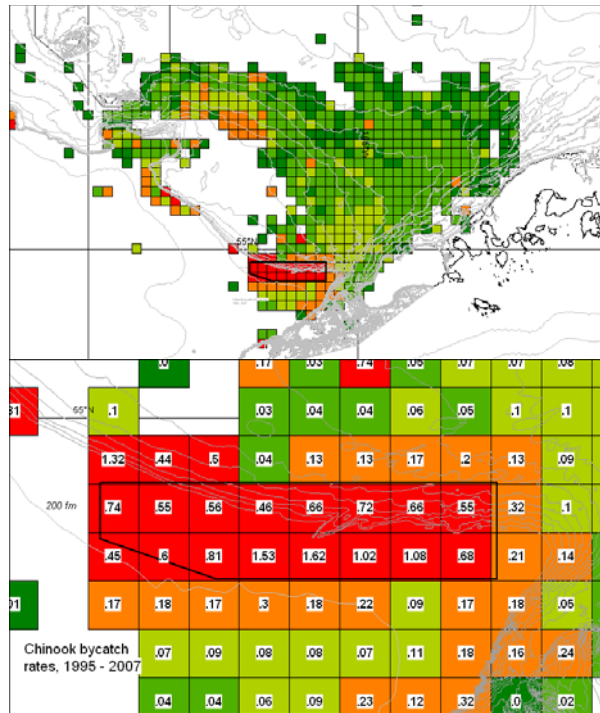


Figure 5: 2008-2009 Sea State Pre-season closure and historic bycatch rates, as cited by the National Marine Fisheries Service.

The Individual Incentive Alternative: A Hard Cap with an Individual Tradable Bycatch Allocation and Other Individual Bycatch-reduction Incentives

As bycatch levels began to rise in early years of the decade, the Council began analyzing whether to take additional action to limit bycatch in the fishery. Since the early 1990s, a substantial portion of the Bering Sea pollock fishery has had government-trained observers on-board. This was originally done to protect endangered Steller sea lions, but this meant the additional cost of having full observer coverage in the pollock fishery was potentially an acceptable burden of moving to a hard cap on the fishery.

Closing fisheries when bycatch hard caps are reached is not a new idea in Alaskan fisheries. In Alaska, there have traditionally been hard cap limits on bycatch in many fisheries, including halibut in the Pacific cod and flatfish fisheries. Importantly, however, halibut has been left until recently as a common pool resource, without individual allocations of bycatch.

Individual SBA allows vessels to carefully decide whether or not to fish in areas which are more likely to have higher bycatch. The vessel directly bears the costs of having high bycatch, as it is forced to exit the fishery if its bycatch exceeds its share of the hard cap or it is unable to purchase additional allocation to cover its bycatch. Individual allocation also ensures that vessels do not “race for bycatch” and attempt to catch their quota as quickly as possible, which would erode the tremendous economic benefits that rationalization (i.e., the creation of catch shares in the pollock fishery) has created.

In April 2009, the Council took action to create a hard cap on the maximum amount of Chinook salmon bycatch that can be caught in the pollock fishery. The

maximum Chinook bycatch per year beginning in 2011 will be 47,591 fish, with one exception. If industry can design an incentive plan agreement (IPA) that will provide incentives to reduce bycatch at all bycatch levels below the hard cap, then in any 2 of 7 years bycatch will be allowed to reach a maximum of 60,000. If bycatch exceeds 47,591 in any 3 of 7 years, it will not be permitted to exceed 47,591 in any subsequent year.

The salmon bycatch cap will be allocated to sectors which are then expected to allocate the salmon to the cooperative and individual vessel level. As is discussed further in the related paper in Session O, a hybrid system ensures that an overall cap is not exceeded, but also continues to apply incentives for vessels to avoid bycatch at levels below the hard cap. Because we do not know if low bycatch in a year like 2008 or 2009 is the result of Chinook having moved off the pollock fishing grounds but still abundant (in which case bycatch management concerns are lower) or if the observed low Chinook bycatch is the result of Chinook abundance being low (in which case managers would want the fishery to work harder than ever to avoid bycatch to minimize adverse biological impacts on Chinook stocks).

Prior to the Council's action in April 2009, several IPA were offered for analysis by the Council's Scientific and Statistical Committee (SSC) and economists at NMFS. Because the final cap changed during final action, it is not known exactly what IPA will be implemented, but these plans must provide incentives below the hard cap that impose costs and/or provide benefits to vessels depending on their bycatch performance. Any IPA developed will be presented to NMFS for approval prior to the 2011 fishing season.³ The Council is now considering how to analyze the effectiveness of the IPA agreements. If bycatch is well below the future hard cap, as it has been over the last two years, how much of this can be attributed to the IPA? This is a topic for future research.

Closures and/or individual bycatch incentives: which policy is preferred?

In the case of salmon bycatch, we have seen that the Council has moved from a system requiring spatial management in the context of an aggregate bycatch quota, to a system that limits total bycatch to a fixed amount and creates individual allocations and other incentives to reduce bycatch at all levels.

What does this imply about the effectiveness of area closures in reducing bycatch? Area closures are most effective under certain conditions. If the bycatch species is limited to a certain habitat or season, for example, then closing access to that habitat or season will substantially reduce bycatch. The mobile nature of Chinook bycatch meant that the fixed Chinook SSA was not able to reduce bycatch sufficiently and may have actually been counter-productive.

During 2006 and 2007, the hotspot system also was not able to adequately restrain bycatch. This high bycatch may have in part been the result of there simply being more salmon on the pollock fishing grounds, but it also stems from the nature of what dynamic spatial management does. It closes one area and allows vessels to then individually decide where to fish alternatively. Because in this situation bycatch is an "externality" and vessel operators do not fully bear the costs of the bycatch, they may still choose to

³ If 92 percent of the fleet agrees, industry could also choose to forgo the 2 years of 60,000 quota and have a quota of 47,591 without an IPA. Industry representatives report that they are working on the structure of a future IPA, but we will not know if an IPA will actually go in place until just prior to 2011.

fish in another, potentially equally high or even higher bycatch area. This is what apparently occurred at many points in 2006 and 2007.

With the pre-season area closure implemented in 2008 and 2009, results suggest that the closure was quite effective in forcing vessels away from a core fishing area with high bycatch. During this time, the political incentives to reduce bycatch were also very strong, as the Council was considering whether to impose a hard cap and if so, how many Chinook would be allocated to the fishery. The degree to which these factors or different salmon abundance on the grounds led to recent low bycatch is a topic for future research.

If the hard cap were biologically based, so that the cap responded to changes in Chinook abundance and so that we believed that the hard cap was set at the “correct” level to catch, then there would be no reason to have spatial management under an individual bycatch allocation system, as we would believe that the Chinook should be caught up to the hard cap.

With salmon bycatch this is not the case, however, so dynamic or fixed spatial management can potentially be utilized to restrict fishing by vessels in high-bycatch areas to help reduce bycatch at levels below the cap. If there are locations with moderate bycatch and very good fishing, there will still be economic incentives for vessels to fish in those locations unless the IPA provides adequate incentives to avoid those areas. Thus there is the possibility that spatial management may be a constructive component of future efforts to limit bycatch at levels below the hard cap.

We would expect that under a hard cap with a strong IPA that vessels will be able to make trade-offs about whether or not to fish in different areas. Under a hard cap with a strong IPA, the value of the information that Sea State currently provides will increase significantly as it will directly lead to the profitability of fishing in areas with small variations in expected salmon bycatch. We would probably expect that under such a situation that more attention would be paid to interpreting and predicting bycatch than to closures.

After the program is implemented in 2011, analysts will attempt to assess how vessels are responding to the hard cap and the IPA. The Council wishes to understand how effective the incentives are at persuading vessel operators to avoid bycatch at different levels below the hard cap and under different pollock fishing conditions. The Council is currently considering if it should collect additional data to better answer these policy questions and considerable attention will be given in coming years to assessing the Council’s salmon bycatch action.