

Why Hard Caps and Fixed Targets for Managing Bycatch of Alaskan Chinook Salmon in the Bearing Sea Pollock Fishery Can Jeopardize Chinook and the Alaskan Economy.

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History:

While most fisheries harvests have an accidental non-target species catch rate (bycatch) of around 25%, the Bearing Sea pollock fleet does remarkably well with a typical bycatch rate of less than half a percent. The problem is that part of this low bycatch rate is composed of chinook salmon, an emblematic species for Western Alaska.

In 2000, chinook salmon bycatch was only several thousand fish, but in 2007, with efforts at spatial avoidance (rolling hotspot closures) this number spiked uncontrollably to nearly 128,000 individual chinook. This created an understandable outcry from salmon interests and a call for a limit or “hard cap” to be placed on the number of chinook the pollock industry should be allowed to take (pollock fishing is shut down if the annual limit is exceeded). This is a reasonable response as it lowers the total bycatch. But unfortunately, it can also put chinook populations in greater danger of collapse.

Here we briefly summarize how hardcaps work, showing the conditions where they are appropriate, and where they will produce unintended harmful results.

Hardcaps: when do they work and when are they harmful?

-Hard caps set a fixed limit on allowable bycatch. A hard cap is effective if it protects the bycaught population and saves it from excess mortality that lowers production (both this year and future harvests). But is this true for Alaskan chinook?

-Fixed hard caps can work when the underlying population level of the bycatch species is the same (or predictable) from year to year¹. If salmon populations were steady, with bycatch numbers of say 100,000 every year, then a hard cap of 45,000 would reduce the effect of pollock fishing every year by about 55%. A fixed hard cap could be effective.

¹ *If a hard cap is expressed as a fraction of the next season's underlying population (no longer a fixed absolute quantity of salmon), and if it is possible to skillfully forecast next year's chinook population, such a system could be effective. However, this is not currently possible.*

-However, chinook population levels are not stable from year to year² and indeed vary widely and unpredictably. They can exhibit low abundance and low bycatch levels (eg, 4k bycatch in 2000) to high abundance and high bycatch (eg 128k bycatch in 2007). This means that a hard cap of say 45,000 that would limit bycatch in 2007 would not limit bycatch in 2000.

-Hard caps only protect chinook populations when they are abundant (when chinook needs the least protection). A hard cap of 45,000 would have a large impact in a year where the normal bycatch might have been 128,000 (it would reduce bycatch by 65%). But this is when chinook are relatively abundant, and need less protection. The large apparent reduction could have little impact on current or future productivity of chinook.

-So what about the millennial year 2000, when total chinook bycatch was about 4,000?

-A hard cap will not protect chinook when they are rare (during population bottlenecks as in 2000 and 2001). When chinook populations are rare and closest to extinction, they are most vulnerable biologically (eg. lowest genetic diversity); the population is forced to put all of its eggs in just a few baskets. ***Low abundance population bottlenecks are perhaps the greatest hazard to maintaining the viability of a wild capture fishery like chinook salmon.***

-If chinook are not protected when they are rare, their numbers can be severely reduced so that future hard caps become less relevant. A hard cap of 45,000 means there is no significant penalty for catching salmon up to that hard cap. To reduce future chinook populations there is strong group incentive to drive bycatch up to the 45,000 limit when chinook are rare (eg. when the normal bycatch would have been ~4k as in 2000).

- A fixed hard cap will harm the chinook fishery because it offers no protection and can encourage potential over-exploitation when chinook are rare and most vulnerable.

-From the standpoint of the pollock industry, hard caps will produce economic hardship as a result of potentially leaving 100's of millions of dollars of uncaught pollock TAC in the sea. This will certainly have significant direct repercussions on the people employed by the industry and indirectly to those people downstream within the State of Alaska, as well as to shrinking State Tax revenues.

² The link between current chinook bycatch by the Pollock fleet and subsequent river returns is a scientific problem that needs to be better understood. Current bycatch is an expression of fishing effort for Pollock and is a proxy for current underlying abundance (not subsequent river returns). Evidence from other systems with fishery independent data suggest that this is reasonable approximation. Our concern is with bottlenecks in the underlying population. We need to better understand how this propagates into river returns.

-Managing bycatch with simple hard caps and fixed performance targets is harmful to everyone in the Alaskan pollock/chinook debate. These management measures are punitive at the wrong times, and represent a counter-productive approach to this difficult problem.

- ***Setting aggressively low hardcaps can backfire*** because they increase incentives to harm chinook at their most vulnerable times. They create financial stress within and around the pollock industry that can lead to harmful collective actions that undermine sustainability or other environmental concerns. Excessively punitive hardcaps can strengthen incentives to band together for retaliatory actions (especially when competition is lacking).

In summary, the basic problem is that hard caps are fixed, but that chinook populations vary unpredictably. Hardcaps offer no protection when salmon are rare and need it most. Aggressive hardcaps can backfire and encourage over-exploitation when rare.

What will work for chinook?

-Ideally, limits for managing chinook salmon bycatch must: 1) be adaptive to varying chinook abundance and/or 2) be accompanied by significant incentives to avoid bycatch more strongly when salmon are rare (for example, as in Legacy allocations and Dynamic Salmon Savings).

-Clearly, there must be a bycatch avoidance incentive program in addition to any hard cap.

-Any incentive system that can help to manage bycatch at low levels is better than none.

-A fixed hardcap with no incentive system that addresses variability in chinook abundance is the most harmful alternative for both sides of this debate.

-Scientific research into the population dynamics of chinook salmon is required to determine acceptable levels of bycatch in different conditions of rarity, to limit impacts on future populations.