# Summary of Scenarios for Salmon Bycatch Management in Fisheries Managed Under the Pacific Coast Groundfish Fishery Management Plan

At its March 2017 meeting the Council was presented with the results of an analysis of Chinook salmon bycatch in the Pacific Coast groundfish fishery under three different scenarios it adopted in September 2015 (see Agenda Item I.1, NMFS Report 1, March 2017). This analysis is intended to support the Council's final recommendations to NMFS for reinitiating consultation under section 7 of the Endangered Species Act. In making its recommendations the Council will 1) choose a scenario the best represents future conditions in fisheries managed under the Pacific Coast Groundfish Fishery Management Plan, 2) propose Chinook bycatch thresholds that may be used as a basis for reinitiating section 7 consultation in the future, 3) identify measures to manage these bycatch thresholds, and 4) identify measures to minimize bycatch of both listed and unlisted salmonids. Based on final guidance from the Council, NMFS will write a biological opinion to determine if the proposed action meets the requirements of the ESA.

This summary of the analysis is intended to help the Council make recommendations at its April 2017 meeting. The full analysis report is available on the Council's website.

## *Scenario 1A*

For the whiting fishery:

1. Analyze an 11,000 Chinook bycatch threshold for the whiting fishery
2. Assume the whiting fishery's geographic footprint is unchanged
3. Include meaningful opportunity in the tribal fishery. A more southward whiting distribution in recent years has resulted in minimal tribal fisheries, in part because whiting has been concentrated south of the tribal Usual and Accustomed fishing areas (U&A).

### Estimated Chinook Salmon Bycatch

Basis for estimating Chinook bycatch: Recent conditions continue with a similar geographic footprint, similar bycatch rates, and a bigger tribal fishery.

| Projected Catch | Estimated Chinook Bycatch | | |
|---|---|---|---|
| | Min | Mean | Max |
| Min | 2,382 | 4,760 | 7,736 |
| Mean | 3,485 | 6,989 | 11,354 |
| Max | 4,374 | 8,861 | 14,386 |

## Stock Composition of Chinook Salmon Bycatch

*Current Geographic Footprint*

Listed Chinook ESUs (evolutionarily significant units) comprise 13 percent of the bycatch, primarily Puget Sound and the Columbia River ESUs.

Almost 80 percent of the impacts are expected to occur on stocks from Oregon and California, primarily Klamath/Trinity (27%) and Southern Oregon/Northern California (23%). The ESUs from the Columbia River, Puget Sound, and other coastal areas have much lower contributions to bycatch.

The magnitude and range of expected annual bycatch is greatest for the Klamath, Northern California, and Oregon Coastal ESUs, ranging from about 1,000 to several thousand Chinook for each of these ESUs depending on the anticipated level of overall bycatch. Estimated bycatch for the other ESUs is generally well under 500 Chinook per year.

*Bigger Tribal Fishery*

Listed Chinook ESUs comprise 21 percent of the bycatch, primarily from Puget Sound and Lower Columbia River ESUs.

Forty-four percent of the bycatch would come from stocks north of the Oregon Coast, primarily British Columbia (16%), Puget Sound (9%), and the Columbia River (18%). As expected, annual bycatch is greater for northern stocks and much lower for the Klamath, Northern California, and Oregon Coastal ESUs than under the current footprint.

The upper end of the range of impacts is about 25 percent less for the Klamath and southern Oregon/Northern California ESUs (i.e., 1,000 to 3,000) compared to the current geographic footprint. Impacts to Central Valley fall, Lower Columbia River, Upper Columbia River spring/summer, Puget Sound, and British Columbia stocks depend on the anticipated level of overall bycatch, ranging from several hundred to 1,500 Chinook for each of these ESU. Estimated annual bycatch for the other ESUs remains similar to the current footprint, generally well under 500 Chinook per year. The impacts to listed ESUs would also increase from a minor to moderate level.

## Conclusions

Chinook bycatch relative to the whiting allocations is expected to generally remain low. The majority of positive Chinook hauls have low bycatch rates but Chinook can accumulate rapidly over a few hauls in certain circumstances. This has more often been the case since 2011. The whiting fishery is likely to approach the 11,000 threshold occasionally under most whiting total allowable catch (TAC) levels examined in the analysis and periodically exceed it when the whiting TAC is at historic highs or under anomalous environmental conditions. Higher bycatch is more likely when fishing occurs later in the year and when fishing is concentrated between Cape Falcon and Cape Blanco even under more typical whiting TACs and at depths out to 200 fm.

Overall whiting catch and bycatch has been very low in the tribal whiting fishery in recent years. If the tribal fishery was to resume at former levels, Chinook bycatch in whiting fisheries could be somewhat higher than the mean estimate. We see a general trend of higher bycatch rate and larger variability in bycatch rate for shallower depths, where extreme catch events tend to occur. Increased annual catch limits (ACLs) beginning in 2017 for some species like canary and widow rockfish could result in more fishing inside 125 fm by the whiting fleet resulting in higher Chinook bycatch. Regulatory changes under consideration for 2017 that permit transfer of darkblotched individual fishing quota to at-sea sectors may allow that sector to spend more time on the slope if needed to avoid species like salmon.

The current geographic footprint reflects a substantial shift to the south consistent with whiting distribution with bycatch primarily occurring between Cape Falcon and Cape Blanco. If this pattern continues, southern Oregon, Northern California, and Klamath stocks will continue to dominate the bycatch. Listed ESUs comprise a relatively minor component of the bycatch with the current fishery footprint.

A more northerly distribution of the fishery would impact a wider number of ESUs with a greater contribution of northern stocks. If this pattern resumes, British Columbia, Puget Sound, and Columbia River stocks would contribute to bycatch in addition to California stocks. Listed ESUs would also increase from a minor to moderate component of the bycatch.

### *Scenario 1B*

Same as Scenario 1A except the whiting fishery's at-sea processing geographic footprint is expanded south of 42ºN latitude and that 10 percent of the at-sea catch, using the most recent 5-year average, is harvested south of 42ºN latitude.

**At its March 2017 meeting the Council determined that in the future the groundfish fishery is not likely to include authorization for at-sea processing south of 42ºN latitude.**

For this reason analytical results are not summarized for this scenario.

### *Scenario 2*

For the bottom trawl fishery, limited entry and open access fixed gear, nonwhiting midwater, and recreational fishery analyze:

1. A 1,000 Chinook bycatch threshold, assuming the same fishing structure and pattern that reflects the most recent 3 years.
2. A 4,500 Chinook bycatch threshold assuming the Rockfish Conservation Area (RCA) is open to trawl fishing, and the geographic distribution of the fleet/harvest is similar to years prior to trawl rationalization.
3. A 9,000 Chinook bycatch threshold assuming the RCA is open to trawl fishing, the geographic distribution of the fleet/harvest is similar to that prior to trawl rationalization, and that there is a midwater yellowtail/widow fishery conducted in a manner similar to historical patterns when such a fishery took place.

## Estimated Chinook Salmon Bycatch

For the analysis two variations of this scenario were evaluated:

- Scenario 2A, with similar-to-recent geographic footprints and catch levels for the fisheries and a Chinook bycatch threshold of 1,000 fish per year
- Scenario 2B, with the RCA open to fishing, an otherwise similar-to-recent geographic footprint, Chinook bycatch thresholds of 4,500 and 9,000 fish per year, and the assumption the burgeoning midwater rockfish trawl fisheries will continue to expand.

For Scenario 2B Chinook bycatch estimates were made using two different data sources:

- **For Scenario 2B(1) a revised estimate of Chinook bycatch will be presented to the Council in April in a separate, supplemental report.** (The original analysis used observer estimates of Chinook bycatch and landings from the WCGOP database from 2012-2014 for the bottom trawl component, and years 2014-15 for the midwater nonwhiting component. The revised analysis will use bycatch data from 2002-2004 to represent the bottom trawl component, because during that period hooded trawl nets were being used instead of selective flatfish trawl nets. Modifications to gear regulations are expected to result in the use of gear more like hooded trawl nets rather than selective flatfish trawl nets.)
- Under Scenario 2B(2) Chinook bycatch estimates are based on Enhanced Data Collection Program data that was collected by the Oregon Department of Fish and Wildlife from 1995 to 1999.

| Projected Catch | Estimated Chinook Bycatch | | |
|---|---|---|---|
| | Min | Mean | Max |
| **Scenario 2A** | | | |
| Min | 336 | 1,009 | 1,777 |
| Mean | 454 | 1,396 | 2,442 |
| Max | 570 | 1,770 | 3,083 |
| **Scenario 2B(1)** | | | |
| Min | Revised bycatch estimates pending | | |
| Mean | | | |
| Max | | | |
| **Scenario 2B(2)** | | | |
| Min | 2,989 | 19,113 | 35,372 |
| Mean | 3,766 | 25,297 | 47,012 |
| Max | 4,483 | 30,665 | 57,073 |

## Stock Composition of Chinook Salmon Bycatch

Under Scenario 2A, listed Chinook ESUs comprise 23 percent of the bycatch (ave. ~ 300/yr), primarily Puget Sound and Columbia River ESUs. Although 69 percent of the Chinook bycatch occurs north of Cape Falcon the stock composition is represented pretty evenly among the primary regional groups coastwide. The diversity of stock representation declines significantly in management areas south of Cape Falcon where Oregon and California stocks dominate.

Coastwide, stocks from British Columbia, Columbia River, and the Oregon Coast account for 63 percent of the bycatch, primarily Southern British Columbia (17%) and Southern Oregon/Northern California (19%). However, Klamath/Trinity is the single largest contributor (21%) across all ESUs, because it is ubiquitous among the management areas. The magnitude and range of expected annual bycatch is greatest for the Klamath, Northern California and Puget Sound ESUs, ranging from less than one hundred to several hundred Chinook for each of these ESUs depending on the anticipated level of overall bycatch. Estimated bycatch for the other ESUs is generally under 100 Chinook per year.

**Based on the revised analysis of Chinook salmon bycatch, a revised estimate of stock composition for Scenario 2B(1) will be presented in a supplemental report.**

For Scenario 2B(2) Oregon and California stocks dominate the bycatch, primarily Klamath/Trinity (33%) and southern Oregon/Northern California (27%). Chinook bycatch ranges from 800 to 18,700 Chinook for the Klamath/Trinity ESU, from 700-16,000 Chinook for the southern Oregon/Northern California ESU, and 350-6,800 for the Oregon Coast ESU. Impacts to other ESUs, including listed ESUs, comprise 5 percent or less of the total bycatch per ESU but this could represent catches of 1,000 or more depending on the bycatch of groundfish and bycatch rate. Bycatch per ESU under the highest observed bycatch of 16,000 Chinook was well below the maximum and mean values estimated in the analysis. For that level, bycatch would range from 2,000 to 5,000 Chinook for the Oregon Coast, southern Oregon/Northern California, and Klamath/Trinity ESUs. Bycatch for the remaining ESUs could be up to several hundred.

### Conclusions

Overall, the results from the nonwhiting trawl analysis depend on the assumptions made, particularly regarding bycatch rate and seasonality of effort. The results in which we have the most confidence indicate that bycatch should remain below the proposed nonwhiting bycatch threshold of 4,500 Chinook, although it may approach that level in years when both groundfish catch and bycatch rates are high.

There is potential for continued high variability in salmon bycatch and uncertainty surrounding distributional bycatch effects with changing ocean conditions and increased access to rebuilt rockfish species. Given the predictions and their high degree of uncertainty for a less constrained fishery in the very near future, bycatch could approach or exceed the 4,500 Chinook bycatch threshold more frequently than suggested by the analysis. The analysis indicates it is unlikely to approach 9,000 Chinook except under conditions replicating the EDCP data (Scenario 2B(2)). Should that occur, our analysis indicates that bycatch would be on the order of 20,000 Chinook or more. We note that Chinook bycatch in 2002 and 2003, just as the RCA was implemented, was 14,000 and 16,000, respectively, so bycatch on the order of 20,000 is not out of the realm of possibility. Results suggest that a 1,000 Chinook bycatch threshold would likely be exceeded under both Scenario 2A and 2B.

## *Scenario 3*

For the whiting and the bottom trawl/LE/OA fixed gear/nonwhiting midwater trawl and recreational sectors analyze:

1. An 11,000 Chinook bycatch threshold for the whiting fishery
2. A combined bottom trawl/LE/OA fixed gear/nonwhiting midwater trawl/recreational bycatch threshold of 4,500 Chinook, and
3. A Chinook bycatch reserve of 5,500 Chinook bycatch[1].

No additional Chinook bycatch estimates were developed for this scenario, because it only focuses on bycatch thresholds and not a characterization of future conditions in the groundfish fishery.

## Conclusions

*Sector specific Chinook bycatch thresholds with a reserve*

The whiting fishery is likely to approach the 11,000 Chinook threshold every so often under most whiting TACs and periodically exceed it when the whiting TAC is at historic highs or under anomalous environmental conditions. Increased ACLs beginning in 2017 for some rebuilt rockfish species like canary rockfish could result in more fishing shoreward of 125 fm by the whiting fleet, and therefore higher Chinook bycatch.

Bycatch is likely to remain well below 9,000 Chinook in the nonwhiting fishery but could approach or exceed the bycatch threshold of 4,500 fish assuming bycatch rates are similar to recent years. Bycatch rates are likely to increase in the near future in response to opportunities presented by newly rebuilt rockfish species.

A reserve could be a valuable tool to promote a viable fishery, accommodate much of the identified uncertainty in fishing patterns, provide continuing incentives to minimize bycatch, and make fishing opportunity more equitable while not unduly constraining groundfish fishing. A reserve of 5,500 should accommodate overages by either the whiting or the nonwhiting fleet in a given year or even by both fleets in many years. However, the reserve might be insufficient in a year in which bycatch in the whiting fishery was at its maximum estimate and if bycatch rates in the nonwhiting fishery were much higher than anticipated in the analysis. The whiting fishery is expected to be more stable than the nonwhiting fishery so the nonwhiting fishery is likely to access the reserve more frequently than the whiting fishery.

The stock composition of Chinook bycatch would depend on which fleet accessed the reserve and where the resulting bycatch occurred. The resulting impacts should be within the range presented in the analyses of the other scenarios.

*Combined threshold of 20,000 Chinook for the whiting and nonwhiting sectors*

The analysis indicates that Chinook bycatch should be well under 20,000 Chinook in all combinations of groundfish landings and Chinook bycatch rates except in years where the maximum bycatch estimates for both whiting and nonwhiting fisheries occurred. Although future bycatch rates for the nonwhiting fishery are uncertain, and could be higher in the future, they would

[1] A reserve is a specified amount of a species (e.g., Chinook) that can be accessed in case the bycatch threshold is exceeded. Often, criteria (e.g., sector specific, bycatch reduction measures) must be met in order to access the reserve.

need to be twice as high as the maximum rate estimates used in the analysis to reach the 20,000 fish threshold.

Differences in the operation and monitoring of the whiting and nonwhiting sectors make managing to a single combined threshold difficult. These differences include the availability of catch data inseason and differences in the location, distribution, and seasonality of the whiting and nonwhiting fleets. These differences can affect both the magnitude and stock composition of the Chinook bycatch.

The stock composition of Chinook bycatch would depend on whether fishing patterns changed in either fleet to access more of the threshold. Significant differences among the whiting and nonwhiting fleets and the sectors within those fleets would significantly deviate from the stock composition results summarized in previous sections. However, we would expect the same general patterns to hold.