Alternatives for Salmon Bycatch Management in the Pacific Coast Groundfish Fisheries

Prepared By National Marine Fisheries Service
Sustainable Fisheries Division
West Coast Region

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LIST OF ACRONYMS

ACL	Annual catch limit
A-SHOP	At-sea Whiting Observation Program
CWT	Coded Wire Tags
EEZ	Exclusive Economic Zone
EFP	Exempted Fishing Permit
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FMP	Fishery Management Plan
fm	Fathom
GAPS	Genetic Analysis of Pacific Salmon Microsatellite Baseline
GMT	Groundfish Management Team
GSI	Genetic Stock Identification
IFQ	Individual fishing quota
INPFC	International North Pacific Fisheries Commission
ITS	Incidental Take Statement
LE	Limited Entry
MPA	Marine Protected Area
MSA	Magnuson-Stevens Fishery Conservation and Management Act
mt	Metric ton
NMFS	National Marine Fisheries Service
NOAA Fisheries	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NORPac	North Pacific fishery database
OA	Open Access
ODFW	Oregon Department of Fish and Wildlife
OSCZ	Ocean salmon conservation zone
OY	Optimum Yield
PacFIN	Pacific Fishery Information Network
PFMC	Pacific Fishery Management Council
RCA	Rockfish Conservation Area
RPA	Reasonable and Prudent Alternative
RMP	Reasonable and Prudent Measure
SFD	Sustainable Fisheries Division
TAC	Total Allowable Catch
U&A	Usual and Accustomed Fishing Area
WCGOP	West Coast Groundfish Observer Program
WCR	West Coast Region

1 INTRODUCTION AND DECISION SUMMARY

Under section 7(a)(1) of the Endangered Species Act (ESA), National Marine Fishery Service West Coast Region (NOAA Fisheries) must carry out programs for the conservation of threatened and endangered species. Federal agencies must consult with NOAA Fisheries, under section 7(a)(2) of the ESA, on activities that may affect a listed species. These interagency consultations, or section 7 consultations, are designed to assist Federal agencies in fulfilling their duty to ensure Federal actions do not jeopardize the continued existence of a species or destroy or adversely modify critical habitat. Should an action be determined by NOAA Fisheries to jeopardize a species or adversely modify critical habitat, NOAA Fisheries will suggest Reasonable and Prudent Alternatives (RPAs). For Federal fishery management actions affecting listed species under NOAA Fisheries authority, NOAA Fisheries is both the action agency (usually the Sustainable Fisheries Division (SFD)) and the consulting Service (either the SFD or Protected Resources Division).

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) at §301(a)(9), fishery conservation and management measures “shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.” This requirement, commonly known as National Standard 9, is a driving principle for NOAA Fisheries’ national fisheries management priorities and is the motivation behind the agency’s efforts to update the 2003 National Bycatch Strategy (http://www.nmfs.noaa.gov/sfa/fisheries_eco/bycatch/strategy.html).

Salmon, some of which are listed under the ESA as threatened or endangered, are caught in the Pacific Coast groundfish fishery (groundfish fishery) managed by the Pacific Fisheries Management Council (Council). Through this action, NOAA Fisheries will consult with the Council on fishery regimes that meet ESA consultation requirements. As part of the Council’s obligations under the MSA, these regimes should also address fishery management actions needed to meet the MSA’s bycatch minimization requirements.

Under the ESA, NOAA fisheries must consult on an “action” that may affect threatened or endangered salmon. In this case, the action is the continued operation of the U.S. West Coast groundfish fisheries. The Council asked NOAA Fisheries to assess alternative Chinook bycatch thresholds and fishing regimes, so that the Council and the public can better understand salmon bycatch in the groundfish fisheries. The Council requested this analysis so that it could clearly define the action for NOAA Fisheries’ ESA consultation on the impacts of the groundfish fishery to listed West Coast salmon species. The document reviews those alternative bycatch thresholds and fishing regimes, and also describes the methodologies used in its assessment and summarizes the results of the analysis.

1.1 How this document is organized

This document addresses the analytical requirements of the ESA and the MSA by providing information on salmonid take in the groundfish fisheries coastwide and over time, and by providing stock composition information on the specific Chinook Evolutionarily Significant Units (ESUs) affected by the groundfish fisheries. Chapter 1 of this document provides an introduction to the issue under Council consideration, summaries of past Council discussions of this issue, and the topics for discussion at this March 2017 meeting. Chapter 2 provides an executive summary of the results of the scenarios and alternatives analyzed. Chapter 3 provides background on the topic including the consultation history, description of the Action Area and description of the approach used to analyze Chinook stock composition and the relationship of Chinook bycatch to Chinook salmon abundance. Chapters 4-6 comprise the technical report of the analysis. Chapter 4 describes the approach, the analyses and results for each of the scenarios and alternatives. Chapter 5 provides source information for the references cited throughout this document. Chapter 6 includes appendices with additional information related to the alternatives analysis.

1.2 ESA-Based Requirement to Initiate Consultation

In a biological opinion, NOAA Fisheries must assess whether a Federal action (such as fisheries occurring within Federal waters or managed under a Federal fishery management plan) is likely to jeopardize the continued existence of ESA-listed species, or result in the destruction or adverse modification of critical habitat. Where appropriate, biological opinions provide an exemption for the take of listed species while specifying the extent of take allowed, the Reasonable and Prudent Measures (RPMs) necessary to minimize impacts from the Federal action, and the Terms and Conditions with which the action agency must comply. The groundfish fisheries in the Exclusive Economic Zone (EEZ) off Washington, Oregon, and California are managed under authority of the MSA. Annual management recommendations are developed under the Pacific Coast Groundfish Fishery Management Plan (FMP) of the Council. The Council provides its management recommendations to the Secretary of Commerce, who implements the measures in the EEZ if they are consistent with the MSA and other applicable law. Because the Secretary, acting through NOAA Fisheries, has the ultimate authority for the FMP, NOAA Fisheries Service is both the action agency and the consulting agency for ESA consultations on impacts to listed salmon species in the groundfish fishery.

A new biological opinion is required where there is a new federal action that would adversely affect a listed species or, in some cases, where there is a substantial amount of new information available for an existing consultation. An existing consultation must be reinitiated where (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; (4) a new species is listed or critical habitat designated that may be affected by the identified action.

NOAA Fisheries first issued a biological opinion for the take of listed salmonids in the groundfish fishery on August 10, 1990. Since then, NOAA Fisheries has reinitiated section 7 consultation and produced a biological opinion seven times for this action. An August 28, 1992 biological opinion includes an incidental take statement of 6,000-9,000 Chinook salmon for the groundfish bottom trawl fishery. A biological opinion published December 15, 1999 includes an incidental take statement and threshold for reinitiating consultation of 11,000 Chinook and 0.05 Chinook salmon/mt whiting in the sectors of the groundfish fishery targeting Pacific whiting. Exceeding amounts in an incidental take statement is a condition that triggers reinitiation of a section 7 consultation. The most recent biological opinion for listed salmonids was published on March 11, 2006, and responded to both: 1) the whiting fishery exceeding the reinitiation triggers and, 2) estimates that the bottom trawl fishery had exceeded the incidental take levels from the 1992 biological opinion.

In January 2013, NOAA Fisheries reinitiated section 7 consultation for listed salmonids to address changes in the groundfish fishery, including the trawl rationalization program and the emerging midwater trawl fishery targeting species other than Pacific whiting. In October 2014, before the consultation was complete, the whiting fishery again exceeded its incidental take limit. To better address the effects on listed salmonids of all fishing under the Groundfish FMP in this most recent section 7 consultation, including the Pacific whiting and non-whiting fisheries and all gears, NOAA Fisheries is conferring with the Council, its advisory bodies and the public. Council recommendations on this action will help NOAA Fisheries in completing its section 7 consultation on the effects of the groundfish fisheries on listed salmonids. More information regarding consultation history is found in section 3.1.

1.3 Previous Council Meetings on This Action

April 2015: NOAA Fisheries staff provided the Council, its advisory bodies and the public with an initial briefing on the agency's intent to reinitiate ESA section 7 consultation on the effects of the groundfish fisheries on listed Chinook salmon stocks. The Council asked that NOAA Fisheries return to a future Council meeting with additional information and analysis, including: a description of past section 7 consultations for the groundfish trawl fishery, a breakdown of Chinook catch by fishery sector, and past and present stock composition estimates for Chinook taken in the fishery.

June 2015: NOAA Fisheries staff reported back to the Council with information on salmon bycatch in the groundfish fishery, addressing the Council's requests from April 2015 in NOAA Fisheries Reports 1 and 2 under Agenda Item D.3.a. After receiving comments from its advisory bodies and the public, the Council endorsed a NOAA Fisheries proposal to convene a July 2015 workshop to brief stakeholders on the development of the biological opinion for ESA-listed Chinook salmon stocks caught in the Pacific coast groundfish fishery, and to obtain input from stakeholders on realistic bycatch estimates in existing and future groundfish fisheries and on potential measures to reduce Chinook salmon bycatch. For its September 2015 meeting, the Council asked that NOAA Fisheries to report back on the workshop's outcomes, so that the Council could use its September 2015 meeting time to develop proposed incidental catch levels for various groundfish fisheries, to be evaluated through the reinitiated ESA section 7 consultation.

July-August 2015: On July 29, 2015, NOAA Fisheries held a public workshop to engage stakeholders on the ESA consultation reinitiation for fishing under the Groundfish FMP. The workshop was well attended by groundfish fishery management entities, and generated ideas and comments from groundfish participants, including Council advisory body members, state and tribal agency staff, stakeholders and from other members of the public. Unfortunately, due to the timing of the workshop during peak salmon fishing season, the salmon fishing community was unable to participate. NOAA Fisheries posted a video recording of the workshop online (http://www.westcoast.fisheries.noaa.gov/fisheries/groundfish/salmon_bycatch_goundfish_fisheries.html) and provided a public comment period through August 7, 2015. NOAA Fisheries summarized the comments it received during this period for the Council at its September 2015 meeting – see NMFS Report 1, under Agenda Item H.6.a. from the Council's September 2016 meeting.

September 2015: In addition to reporting on the July 2015 public workshop and subsequent public input on this issue, NOAA Fisheries reported to the Council in September 2015 with: draft proposals for managing salmon bycatch in the groundfish fisheries (NMFS Report 2, Agenda Item H.6.a.), an analysis of the Chinook catch per unit effort for the bottom trawl and non-whiting midwater trawl fisheries (NMFS Report 3, Agenda Item H.6.a), and on the Chinook bycatch in the at-sea sectors of the Pacific whiting fishery, with a summary of the Chinook genetic stock composition estimates from that fishery's bycatch. After reviewing the NOAA Fisheries reports and comments from its advisory bodies and the public, the Council adopted a motion and provided guidance to NOAA Fisheries for analysis of a range of alternatives to determine the Chinook bycatch thresholds under different groundfish management strategies as needed to define the proposed action. The Council's motion included requests for analysis of alternative management scenarios for the whiting fishery and for the combined bottom trawl, commercial fixed gear, and recreational groundfish fisheries.

March 2016: NOAA Fisheries provided a progress check on this action for its March 2016 meeting, to ensure that the Council's salmon advisory bodies would have an adequate opportunity to review the draft analyses and Council progress on the action. The Council clarified and reaffirmed its comments and motion from its September 2015 meeting.

1.4 Council Direction on Alternatives

Given the evolving nature of the fishery, NOAA Fisheries requested that the Council define the action on which the re-initiated consultation would occur, and that the action reflect the on-going and anticipated changes in the fisheries to the extent feasible.[1] At its September 2015 meeting, the Council adopted a motion describing fishery scenarios for NOAA Fisheries to analyze, taking into account additional verbal guidance provided by the Council, relevant statements from its advisory bodies and comments provided in public testimony. Subsequent informal discussions with members of the Council members and Groundfish Management Team (GMT) further refined details of the alternatives (e.g., year ranges, data sources). The scenarios defined through this process, based on the September motion from the Council are:

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).

Scenario 1B
Same as Scenario 1A except analyze an alternative assuming the whiting fishery's at-sea processing geographic footprint is expanded south of 42º N. Latitude and that 10 percent of the at-sea catch, using the most recent 5-year average, is harvested south of 42º North Latitude.

Scenario 2
For the bottom trawl fishery, limited entry and open access fixed gear, non-whiting midwater, and recreational fishery analyze:

[1] More detailed background about the management of the fisheries and associated salmon bycatch is available in reports cited throughout this document and available through the Pacific Fisheries Management Council website (http://www.pcouncil.org/).

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.

Scenario 3
For the whiting and the bottom trawl/LE/OA fixed gear/non-whiting 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/non-whiting midwater trawl/recreational bycatch threshold of 4,500 Chinook, and
3) A Chinook bycatch reserve of 5,500 Chinook bycatch[2].

If feasible, the analysis should include an enumeration of the impacts on listed stocks overall and a geographic breakdown of where the impacts occur using geographic cells that are currently available using existing modeling tools.

1.5 Council Action for March 2017

At this March 2017 meeting, the Council is scheduled to consider the results of the analytical assessment of the range of scenarios provided at the September 2015 meeting. Based on NOAA Fisheries report, the Council may also make its final recommendations to NOAA Fisheries on the Chinook bycatch thresholds for reinitiating consultation and associated management actions to manage the bycatch thresholds, and to minimize bycatch of both listed and unlisted salmonids. However, a final decision by the Council on the recommended action for consultation is currently scheduled for the April 2017 meeting. When NOAA Fisheries receives final guidance from the Council, it will use the guidance to write a biological opinion to determine if the proposed action meets the requirements of the ESA.

[2] 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.

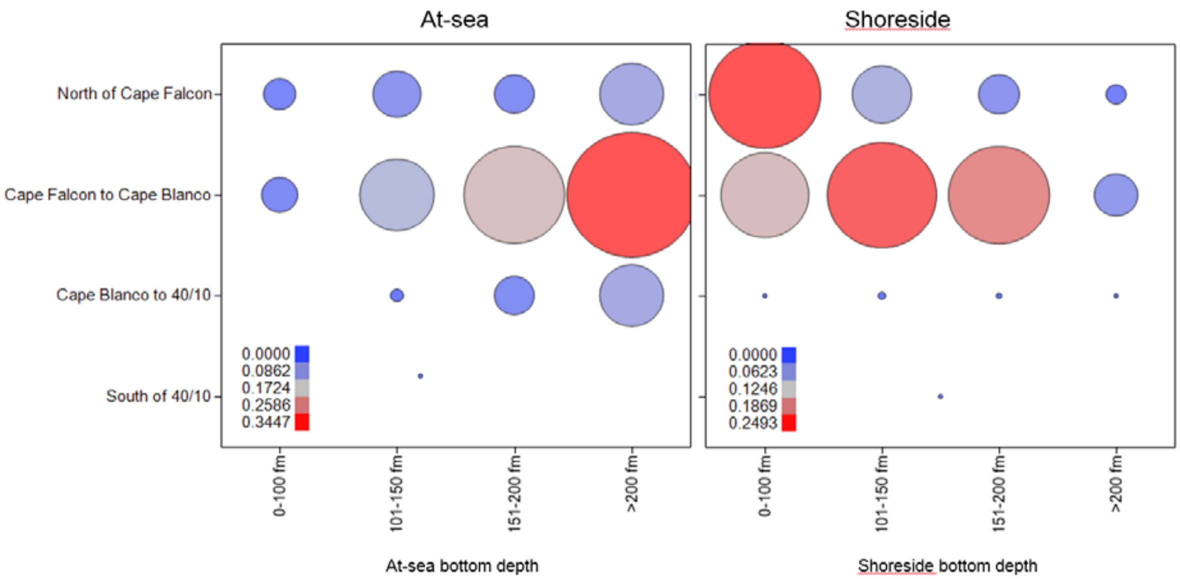
2 EXECUTIVE SUMMARY OF THE RESULTS

In this Chapter 2, we briefly summarize the results of the analysis of the alternatives, so that decision-makers have an easy reference to the results of the more detailed and technical sections of this report. Chapter 3 of this document provides background information that help the Council in its decision-making, including the ESA consultation history for the groundfish fisheries and a description of the Action Area. Chapter 3 also describes the approaches that we used to: identify the stock composition of Chinook taken as bycatch, and analyze the relationship of Chinook bycatch to Chinook salmon abundance. Chapter 4 provides a detailed analysis of the question: What stocks of Chinook tend to be taken as bycatch in which groundfish sectors and where?

At its September 2015 meeting, the Council provided us with Chinook bycatch scenarios for analysis, essentially asking for information on the potential effects of different long-term directions for the multiple groundfish fishery sectors.

2.1 Scenario 1A, Summary of Analysis Results

In Section 4.1, we looked at future fishery conditions assuming a similar-to-recent geographic footprint for the non-tribal whiting fisheries and a more robust tribal whiting fishery (Scenario 1A). Chinook bycatch levels can vary for many reasons, but one influential factor is the size of the annual whiting harvest levels available to the groundfish fisheries. For Scenario 1A, we projected a range of annual Chinook bycatch that could be associated with annual whiting catch levels in the at-sea and shorebased sectors combined ranging from a minimum of 138,131 mt to a maximum of 267,036 mt. At the minimum whiting catch levels, Chinook bycatch is projected to range from 2,383 to 7,736 fish per year. At the maximum whiting catch levels, Chinook bycatch is projected to range from 4,374 to 14,386 fish per year. The results indicate that the whiting fishery is likely to approach the 11,000 Chinook bycatch threshold occasionally under most whiting TACs examined in the analysis and periodically exceed it when the whiting TAC is at historic highs or under anomalous environmental conditions. Chinook bycatch rates tend to be higher in the shorebased fisheries, which commonly operate at shallower depths than the at-sea sectors. 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. We see a general trend of higher bycatch rate and larger variability in bycatch rate for shallower depths, where extreme catch events (ECEs) tend to occur. For the more robust tribal fisheries the Council described for Scenario 1A, we projected that bycatch rates in the tribal fisheries could vary depending upon whether the potential additional participation of Quileuete and Quinault whiting fisheries have Chinook bycatch rates more similar to those of shorebased whiting fisheries or those of at-sea whiting fisheries. For tribal sector annual whiting catch levels ranging from 34,234 mt to 47,907 mt, we projected minimum annual Chinook bycatch levels ranging from 566 fish at minimum whiting harvest levels and Chinook bycatch rates to 4,539 fish at maximum whiting harvest levels and Chinook bycatch rates. However, we concluded that the tribal estimates were not additive with the recent year estimates, since additional commercial sector opportunity due to reapportionment cannot effectively be disentangled. Because of the overriding effect of reapportionment, we relied on the Chinook bycatch estimates from recent years to reflect a reasonable range of expected Chinook bycatch but assumed the fishery would occur further north consistent with tribal U&As. Should the Quileute and Quinault tribes participate, we anticipate that any reapportionment at that time would reflect that broader tribal participation. 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. We see a general trend of higher bycatch rate and larger variability in bycatch rate for shallower depths, where extreme catch events (ECEs) tend to occur. Details on our analyses for tribal and non-tribal fisheries bycatch under Scenario 1A are provided in Section 4.1.1.

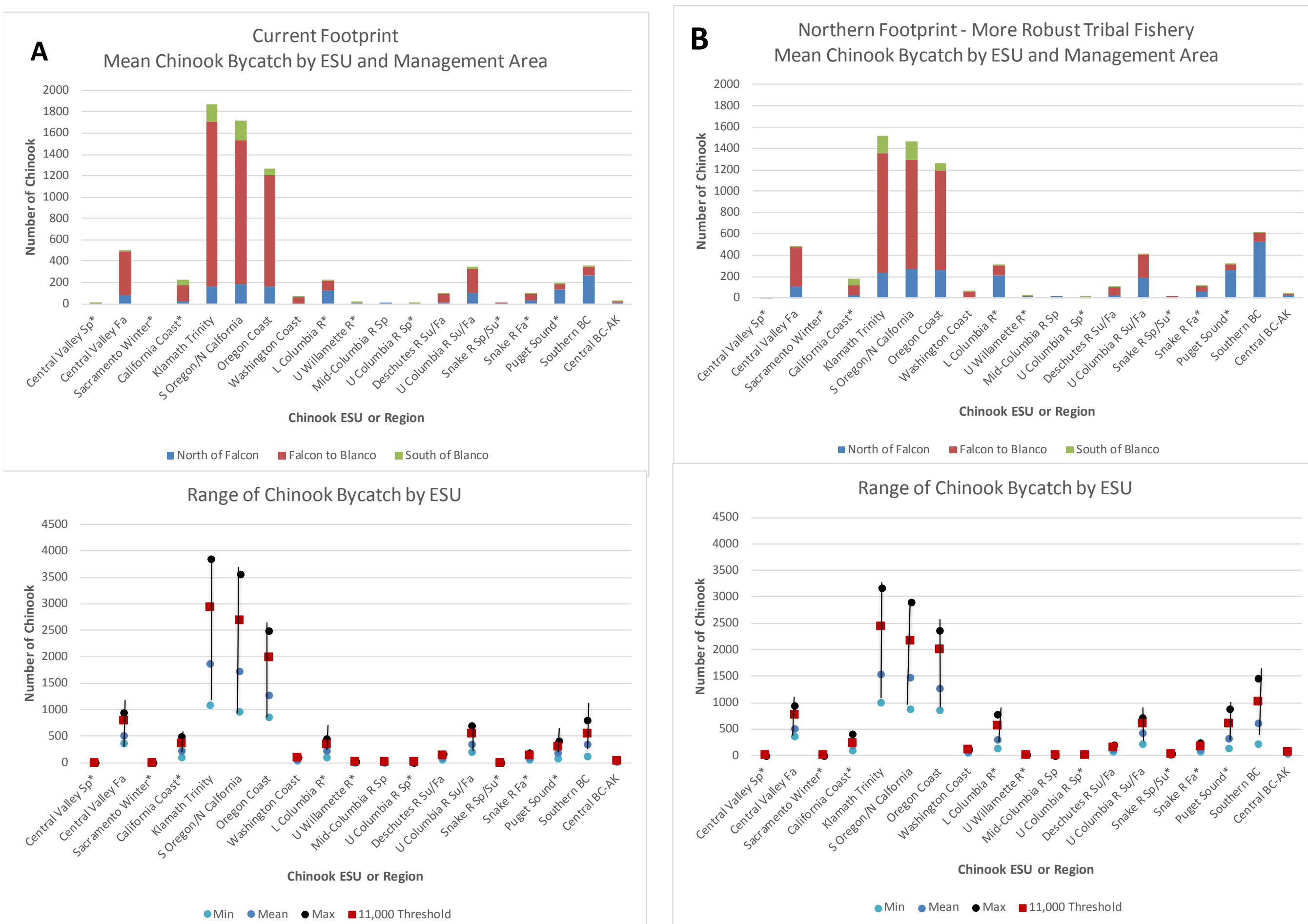


Average proportional distribution of Chinook bycatch along the coast in the whiting fishery within each component. Although color/size scales are similar between the two panels, they are not comparable to each other.

Under all scenarios, including Scenario 1A, the stock composition of Chinook bycatch and the magnitude of impacts to individual ESUs is primarily influenced by location of the fleet. The Scenario 1A current geographic footprint shows bycatch primarily occurring between Cape Falcon and Cape Blanco. Under the current footprint scenario, 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. Under this scenario listed Chinook ESUs comprise 13 percent of the bycatch, primarily Puget Sound and the Columbia River ESUs. 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.

If the fishery were to shift to a more northerly distribution, we project that 44 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%). Under the northern scenario, listed Chinook ESUs comprise 21 percent of the bycatch, primarily from Puget Sound and Lower Columbia River ESUs. 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). Impacts to Central Valley fall, Lower Columbia River, Upper Columbia River spring/summer, Puget Sound and British

Columbia stocks are highly dependent 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. Details on our projections for which Chinook ESUs are more likely to be affected by continued southern or more northern fishing patters are also in Section 4.1.1.

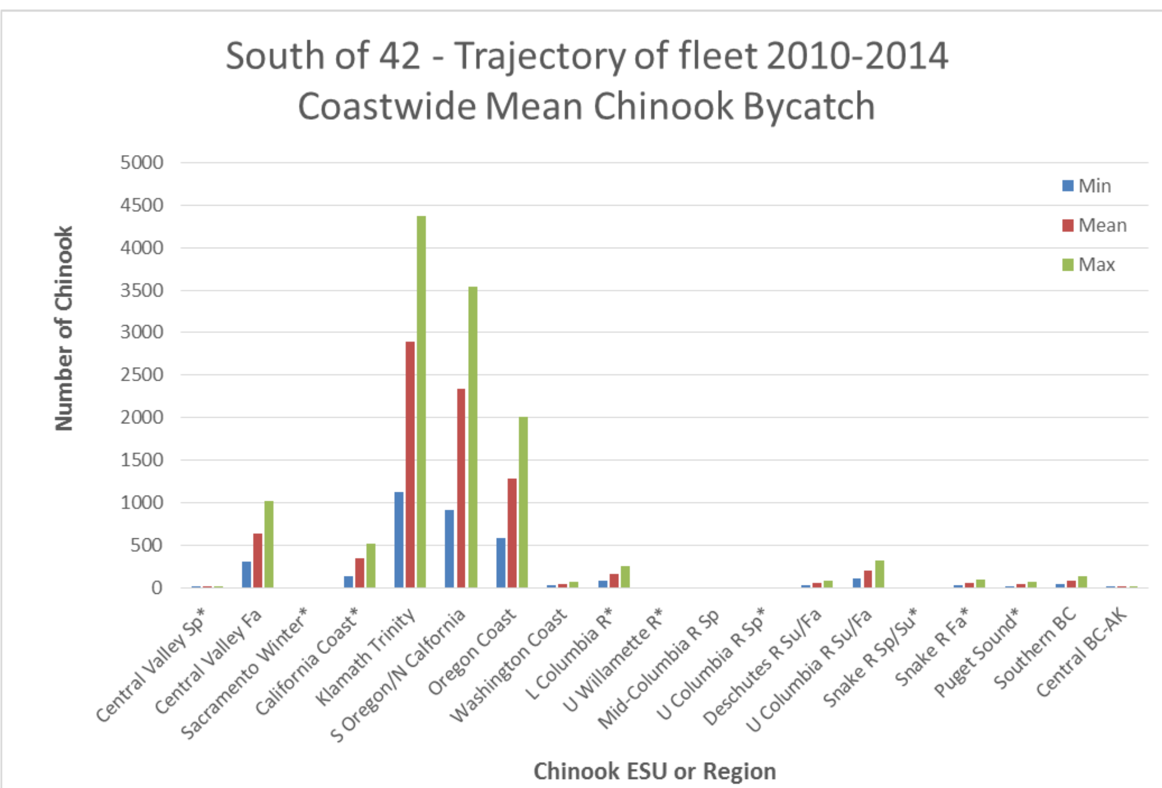


Estimated bycatch in numbers of Chinook and distribution in the whiting fishery based on the mean and range of annual bycatch adjusted to reflect stock composition for the Current Geographical Footprint (Panel A), and Northern Footprint (Panel B). The upper figures show estimated mean annual bycatch by ESU and management area. The bottom figures show the range of estimated annual impacts by ESU including impacts associated with an 11,000 bycatch threshold. Listed ESUs are starred.

2.2 Scenario 1B, Summary of Analysis Results

In Section 4.2, we looked at future fishery conditions assuming an expanded geographic footprint for the non-tribal at-sea whiting fishery south of 42º N. Latitude, with ten percent of the at-sea catch harvested in the southern area (Scenario 1B). Our Scenario 1A analysis of different potential bycatch rates and levels associated with different whiting harvest levels also applies under Scenario 1B. For Scenario 1B, we were additionally interested in how Chinook bycatch might change with a greater emphasis on whiting fishing in southern waters. We projected a range of annual Chinook bycatch coastwide (i.e., northern and southern areas combined) that could be associated with a fishery where ten percent of the whiting catch is harvested south of 42º N. Latitude to be between 3,404 and 12,486 fish annually. The data show substantially higher bycatch rates in the at-sea fishery for the area south of 42º N. Latitude, consistent with those that led to the prohibition. Chinook bycatch overall was higher under this scenario when compared to the results for Scenario 1A (current footprint) by seven to 14 percent. The results indicate that the higher bycatch and bycatch rates under this scenario increase the likelihood that bycatch could exceed 11,000 Chinook. Details on our analyses of Chinook bycatch anticipated under Scenario 1B are provided in Section 4.2.3.

If the prohibition on processing south of 42º N. Latitude were removed, our best estimate of Chinook salmon bycatch stock composition suggests there will be a further decrease in proportion of northern ESUs and a concomitant increase in particular southern ESUs, including Klamath and S. Oregon and N. California Coastal Chinook. Under Scenario 1B, over 90 percent of the impacts are expected to come from stocks in Oregon and California, primarily Klamath/Trinity (34%) and Southern Oregon/Northern California (28%). The ESUs from the Columbia River, Puget Sound and other coastal areas contribute three percent or less. Under this scenario, listed Chinook ESUs comprise only eight percent of the bycatch, primarily from California Coast and Columbia River ESUs. The magnitude and range of expected annual bycatch is greatest for the Klamath, Northern California and Oregon Coastal ESUs, ranging from just over 500 to several thousand Chinook for each of these ESUs depending on the anticipated level of overall bycatch. Under this scenario, estimated bycatch for the other ESUs is generally well under 500 Chinook per year. Details on our projections for which Chinook ESUs are more likely to be affected by a southward shift in whiting fishery operations Section 4.2.3.

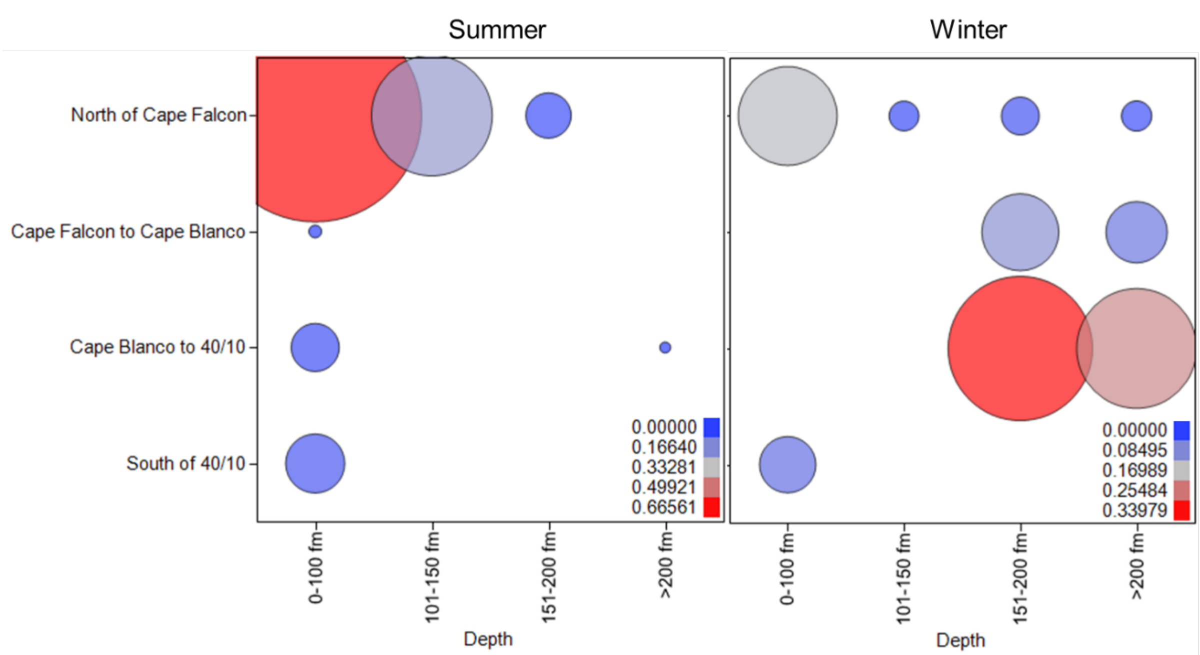


Estimated Chinook stock composition of bycatch by ESU under Scenario 1B.

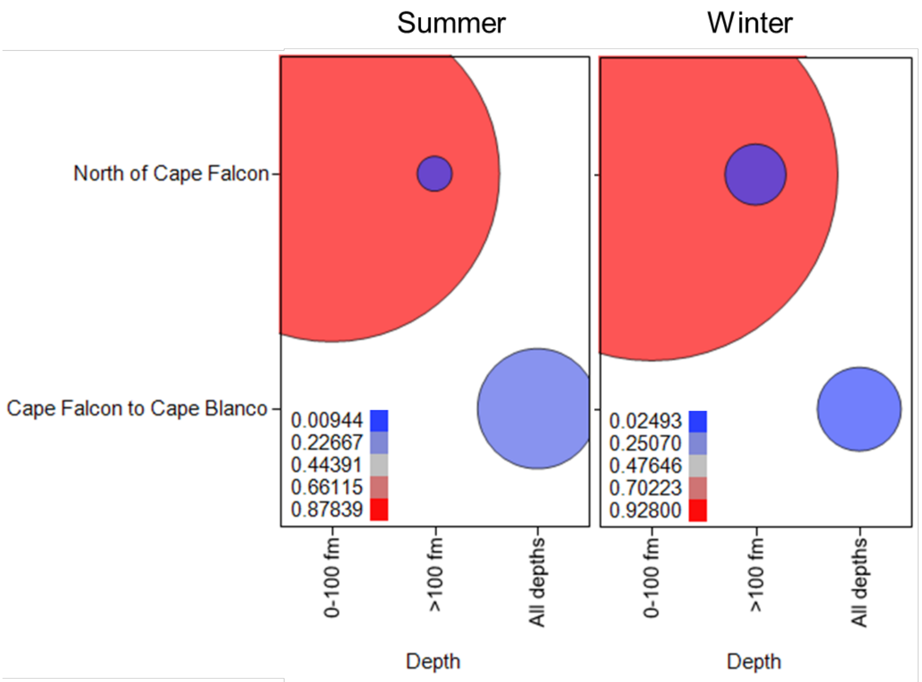
2.3 Scenario 2, Summary of Analysis Results

Section 4.3 moves from whiting to non-whiting groundfish fisheries. Scenario 2 analyzes combinations of several Chinook bycatch levels with different assumptions about fishing structure and pattern for the non-whiting trawl components of the Individual Fisheries Quota (IFQ) Program in the groundfish fishery. The combinations range from a fishery similar to recent years that has been constrained to protect overfished rockfish species to historical fishing patterns with few constraints on the fishery. In Section 4.3, we looked at future fishery conditions for the bottom trawl, limited entry and open access fixed gear, midwater non-whiting trawl, and recreational fisheries combined under the variety of geographic and regulatory conditions described by the Council for Scenario 2 as: 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.

Under Scenario 2A and based on the mean values of recent and baseline groundfish landings and Chinook bycatch rates for the different non-whiting groundfish fisheries, Chinook bycatch is unlikely to remain below an annual 1,000 fish threshold. However, fisheries managed as described for Scenario 2A would likely stay beneath a 4,500 fish threshold if access to shelf groundfish species does not increase. If harvest of shelf groundfish species, like canary rockfish, were to increase, Chinook bycatch in non-whiting groundfish fisheries would also increase over current levels, but would likely remain well below a 9,000 Chinook bycatch threshold. The expected contribution of the midwater non-whiting component to the Chinook bycatch threshold exceeds that of the bottom trawl, due to higher bycatch rates in that component. Area by depth distributions of bycatch differ markedly according to season for bottom trawl. For the midwater non-whiting trawl component, summer and winter distributions are quite similar.



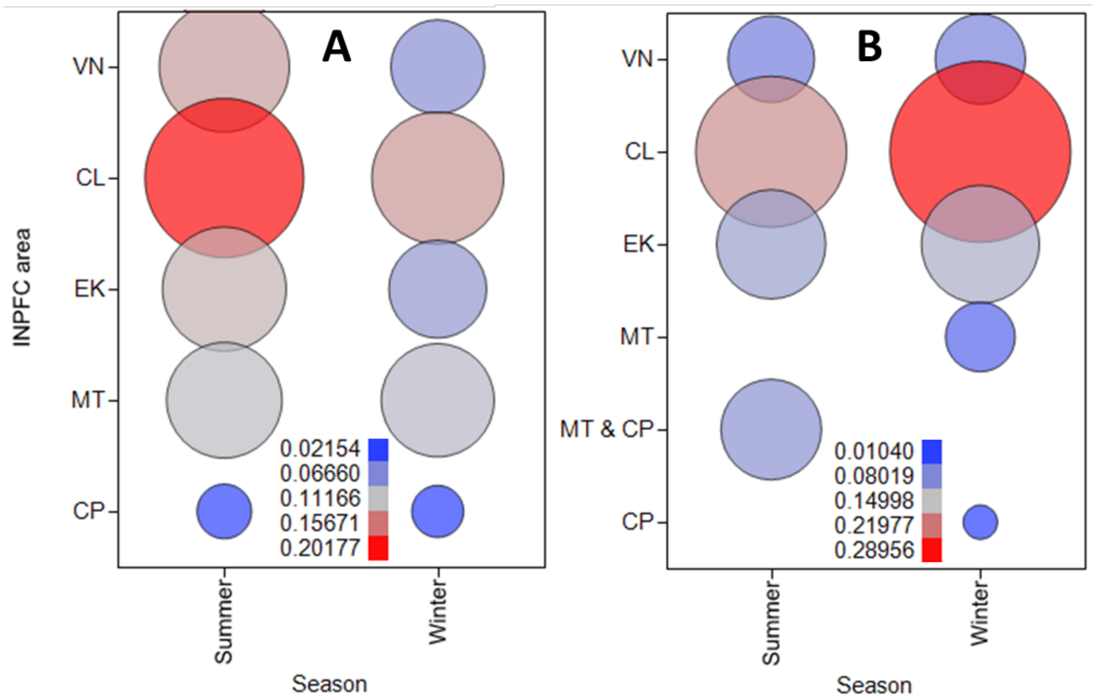
Anticipated coastwide distribution of Chinook catch in the *bottom trawl* component of the IFQ fishery, based on data from years 2012-2014, under Scenario 2A.



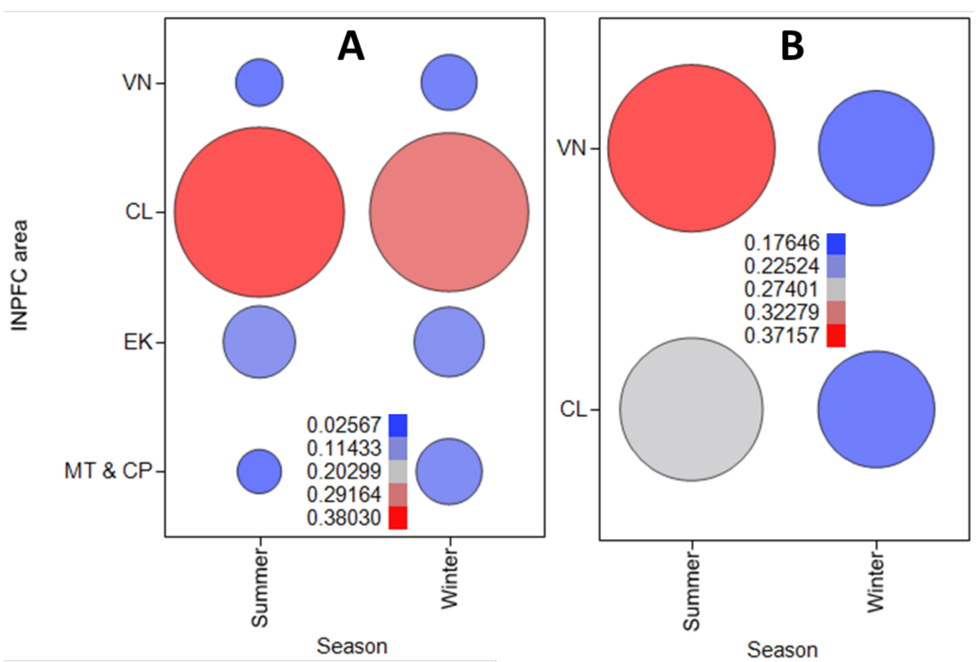
Anticipated coastwide distribution of Chinook catch in the *midwater* component of the IFQ fishery, based on data from years 2012-2015, under Scenario 2A.

Chinook bycatch projections under Scenario 2B are highly uncertain. Under Scenario 2B, we looked at two different fishing patterns to explore the potential effect on bycatch from a less constrained fishery: (A) bycatch rates from the 1990s when there were relatively few constraints on the fishery and prior to the IFQ program, and (B) recent fishing practices and bycatch rates but higher effort and harvest rates on groundfish reflective of less constrained groundfish fisheries. Given the uncertainties and data challenges described in Section 4.3.3, however, we would expect Chinook bycatch levels under Scenario 2B for the non-whiting groundfish fisheries to be in excess of 1,000 fish yet less than 4,500 fish annually. We project that annual Chinook bycatch for these sectors could be highly variable and would likely be closer to the higher end of the 1,000-4,500 fish range. However, given the predictions and their high degree of uncertainty for a less constrained fishery of the very near future, bycatch could approach or exceed the 4,500 Chinook bycatch threshold more frequently than suggested by the analysis. The primary reason that Chinook bycatch in the non-whiting fisheries has so much potential variability is that it is difficult to predict how much and where the non-whiting midwater trawl fishery might expand under a very different fishing regime and Chinook bycatch rates in that sector are relatively high compared to those in other non-whiting groundfish sectors.

As a final caveat, it is worth noting that Chinook bycatch in the non-whiting groundfish fisheries of 2002 and 2003 were just over 14,000 and 16,000 fish, respectively. The analysis indicates bycatch is unlikely to approach 9,000 Chinook except under conditions replicating conditions in the mid to late 1990s, which we think are highly unlikely for the reasons summarized in the report. However, should those conditions occur, our analysis indicates that bycatch would be on the order of 20,000 Chinook or more. As emphasized earlier, caveats and uncertainties in the data as well as changes in fleet behavior and management make the outcomes of this latter scenario unlikely. The higher observed bycatches occurred just as the observer program became operational, the RCA was implemented, and regulatory constraints on rockfish were put in place, so we cannot rule out much higher bycatches if these constraints were lifted as described for Scenario 2B. Details on our analyses for non-whiting fisheries bycatch under Scenario 2 are provided in Section 4.3.

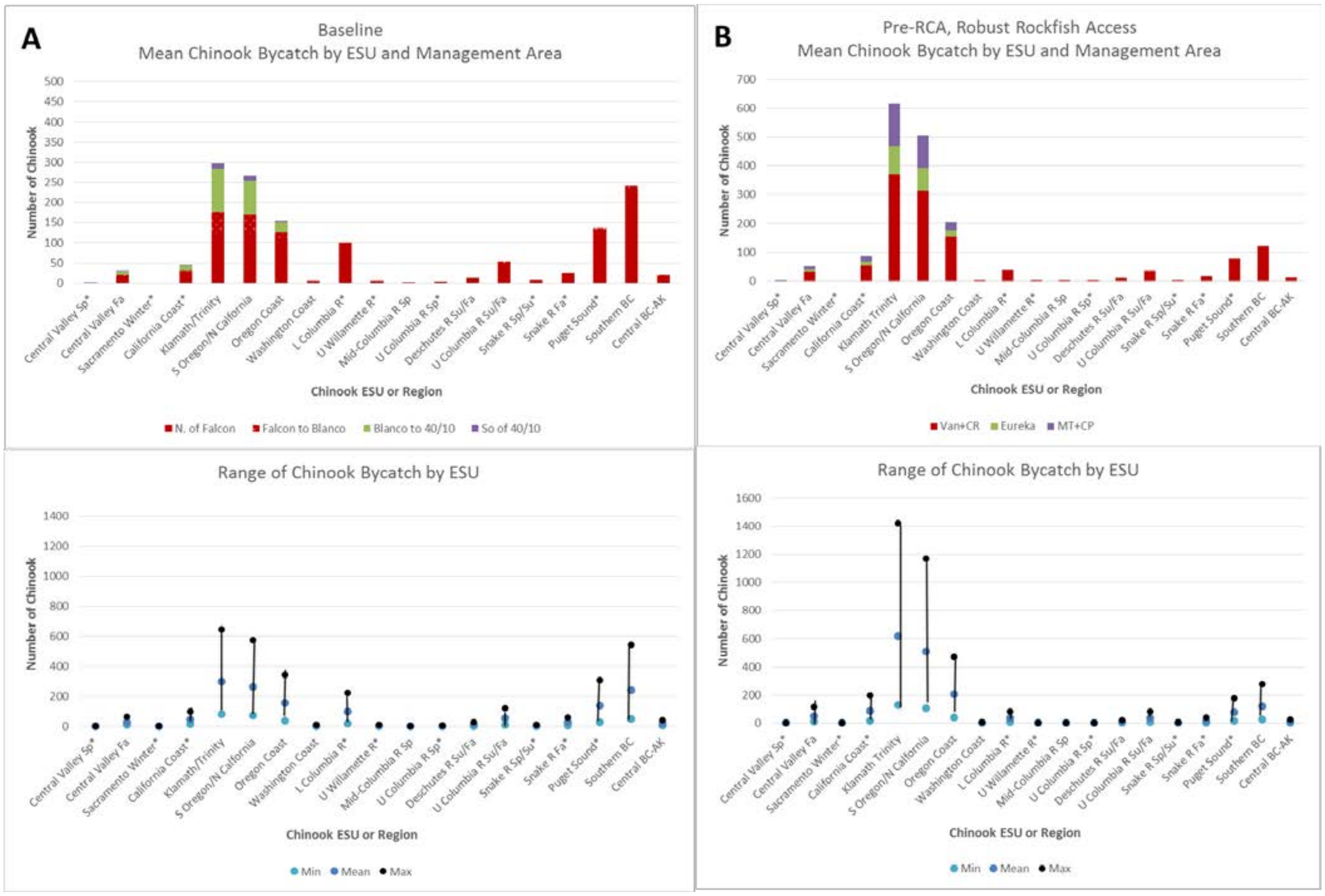


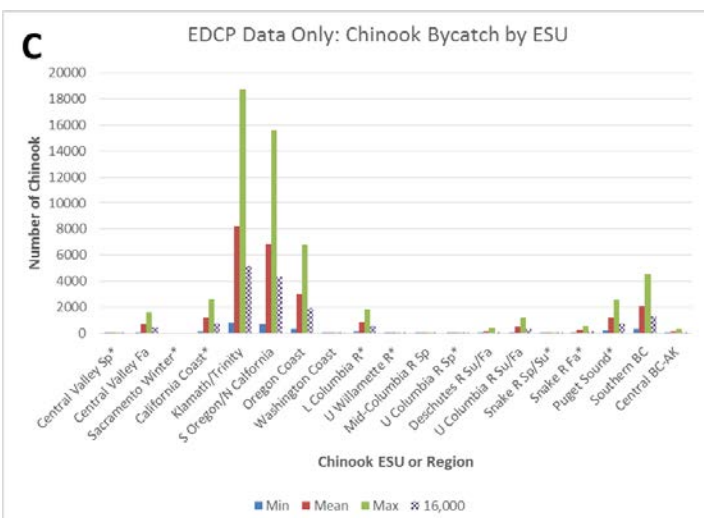
Coastwide distribution of groundfish landings in the *bottom trawl* component of the IFQ fishery, among area and season strata, for 1990s (A, left) and recent (B, right) data under Scenario 2B.



Coastwide distribution of groundfish landings in the midwater non-whiting trawl component of the IFQ fishery, among area and season strata, for 1990s (A, left) and recent (B, right) data under Scenario 2B.

For both Scenarios 2A and 2B, the stock composition of Chinook bycatch and the magnitude of impacts to individual ESUs is primarily influenced by location (latitude and depth), distribution of groundfish catch and the bycatch rate between the different components. Scenario 2A reflects a more northerly fishing pattern with bycatch primarily occurring north of Cape Falcon. Stock composition is diverse with substantial contributions by all regional stock groups, including listed ESUs (23%). 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. Scenario 2B would indicates a more southerly fishing pattern. Bycatch increases and the diversity of stocks in the bycatch decreases to reflect the southern shift in fishing. In this case, southern Oregon, Northern California and Klamath stocks would dominate the bycatch. Listed Chinook ESUs comprise 12 percent of the bycatch. The upper and lower ends of bycatch vary dramatically depending on the data used. Using recent bycatch rates, the upper end of the range of impacts is about 50 percent greater for the Klamath and southern Oregon/Northern California ESUs (i.e., <200 to >1,200). Impacts to Lower Columbia River, Puget Sound and British Columbia stocks decline substantially ranging from tens of fish to 300 or less Chinook for each of these ESUs depending on the anticipated level of overall bycatch. However, use of data available from the prior period indicate Chinook bycatch could range from several hundred to over 15,000 for some ESUs depending on the bycatch of groundfish and bycatch rate. More likely, even in the extreme case is something similar to the highest observed bycatch of 16,000 Chinook. In that case, bycatch would range from several hundred to a few thousand for the dominant ESUs in the bycatch.





Estimated bycatch in numbers of Chinook and distribution in the non-whiting fishery based on the mean and range of annual bycatch adjusted to reflect stock composition for the Baseline (Panel A), pre-RCA, recent bycatch rates (Panel B) and pre-RCA, EDCP data (Panel C) scenarios

2.4 Scenario 3, Summary of Analysis Results

In Section 4.4, we assess two additional alternatives combining bycatch thresholds for the whiting and non-whiting components of the groundfish fisheries. For the first alternative, the Council requested evaluation of a Chinook bycatch threshold for the whiting fishery of 11,000, a non-whiting Chinook bycatch threshold of 4,500, and a reserve of 5,500. For the second, the Groundfish Advisory Subpanel and members of the public suggested evaluation of an overall bycatch threshold of 20,000 Chinook for both the whiting and non-whiting components combined.

Based on our analyses for Scenario 3, 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 address fishing equities without inducing hardship through excessive constraint upon groundfish fishing. The expected relative stability in the whiting fishery and relative instability in the non-whiting fisheries, particularly the midwater non-whiting trawl fishery, leads us to expect that the non-whiting fishery may ultimately access the reserve more frequently than the whiting fishery.

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. The results from the non-whiting analysis indicate that bycatch is likely to remain well below 9,000 Chinook, 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 to access newly rebuilt rockfish species and the high variability in salmon bycatch and uncertainty surrounding distributional bycatch effects with changing ocean conditions is expected to continue. A reserve of 5,500 fish should accommodate overages by either the whiting or the non-whiting fleet individually in a given year or even by both fleets in many years. The reserve might be insufficient in a year in which bycatch in the whiting fishery was at its maximum and bycatch rates in the non-whiting fishery were much higher than anticipated in our analysis. However, maximum bycatch in both fisheries within the same year has not occurred during the data period. 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 previous analyses for these scenarios.

The analysis indicates that Chinook bycatch should be well under 20,000 Chinook in all combinations of groundfish landings and Chinook bycatch rates except if the maximum bycatch estimate for the non-whiting fishery occurred in the same year as the whiting fishery reached its maximum estimated bycatch, particularly for the south of 42º N. Latitude scenario. Differences in the operation and monitoring of the whiting and non-whiting sectors present challenges to managing for a single combined threshold. Chinook bycatch data in the whiting and non-whiting fisheries is now available inseason.[3] Our analysis describes substantial differences in the location, distribution and seasonality of the whiting and non-whiting fleets that are largely tied to difference in their target species, which can affect the magnitude and stock composition of the Chinook bycatch on which we will base our ESA consultation, and any management actions that might be required to respond to high bycatch or bycatch rates. The stock composition of Chinook bycatch would depend on whether fishing patterns changed in either fleet to access more of the threshold. However, we would expect the same general patterns described for

[3] Beginning 2015, salmon bycatch estimates are now available inseason for the non-whiting IFQ fisheries except for the fixed gear sablefish fishery (pers. com. V. Tuttle, January 31, 2017)

prior scenarios to also occur under this scenario. Details on our analyses for alternative bycatch thresholds under Scenario 3 are provided in Section 4.3.

3 BACKGROUND

3.1 Consultation History

NOAA Fisheries has considered the impacts to salmon species listed under the ESA resulting from implementation of the FMP in several previous biological opinions. The sequence of consultation activities on salmon related to the FMP is summarized in Table 1. These opinions included consideration of the impacts of the FMP on salmon and non-salmon species and were revised as new species were listed or bycatch limits were exceeded or fishery characteristics changed. In each case, based on the available information, NOAA Fisheries concluded that operation of the fishery under the FMP was not likely to jeopardize the continued existence of these species. The provisions of the incidental take statement described in the 1999 opinion currently remain in place.

Table 1. ESA section 7 consultation activities related to the PFMC Groundfish FMP.

Date	ESU and/or event considered
August 10, 1990	Sacramento River winter-run Chinook salmon, Steller (Northern) sea lion, Guadalupe fur seal, 7 whale species, 4 turtle species
November 26, 1991	Sacramento River winter-run Chinook salmon
August 28, 1992	Sacramento River winter-run Chinook salmon, Snake River sockeye salmon, Snake River spring/summer Chinook salmon, and Snake River fall Chinook salmon
September 27, 1993	High bycatch of pink salmon, incidental take statement (ITS) revised
May 14, 1996	Bycatch of 14,557 Chinook in the 1995 whiting fishery exceeded ITS, reinitiated
December 15, 1999	Consultation on the effects of the FMP on 22 newly listed ESUs
April 25, 2002	Bycatch of 11,513 Chinook in the 2000 whiting fishery exceeded ITS, reinitiated
March 11, 2006	Bycatch of 11,966 Chinook in the 2005 whiting fishery, and 14,915 in 2002 and 16,460 in 2003 in the trawl fishery exceeded ITS, reinitiated

Chinook salmon comprise the majority of salmon bycatch in the groundfish fishery ranging from 2,800 to 14,400 (whiting fishery) and 53 to 16,400 in the bottom trawl and fixed gear components of the fishery since 2002 (NMFS 2016). Under the terms of the current incidental take statement, the incidental bycatch limits for the whiting fishery are a bycatch rate of 0.05 Chinook/mt of whiting and 11,000 Chinook per year. The bycatch limit for the bottom trawl fishery and other components is 9,000 Chinook, assuming a specific spatial distribution of the catch off the West Coast.[4] For salmon species other than Chinook, bycatch in the groundfish fisheries is very low. Steelhead and sockeye individuals were occasionally observed but estimates of bycatch in most years were zero. For coho and chum, estimates of bycatch averaged less than 300 per year coastwide across all grounfish fishery sectors. The majority of these were presumed to be unlisted hatchery or natural origin fish. The effects on listed sockeye, chum, and coho ESUs, and steelhead DPSs were therefore judged to be negligible (NMFS 1999, NMFS 2006).

[4] Until 2011, the midwater non-whiting trawl fishery was only allowed south of 40º 10' N. Latitude and had negligible to low bycatch that was not explicitly considered in the incidental take limits. Since consultation was initiated in 2013, bycatch in the emerging non-whiting midwater trawl fishery north of 40º10' N. Latitude accrued to the whiting bycatch limit of 11,000 Chinook. In 2016, the Pacific whiting midwater and non-whiting midwater fisheries became distinct fisheries coastwide. Beginning in 2017-2018, increases in midwater non-whiting target species allocations are expected to support a full scale target fishery and the bycatch will accrue to the bottom trawl limit of 9,000 Chinook.

The opinions found that Chinook bycatch was generally well within the bycatch limits in most years although bycatch rates exceeded the bycatch rate limits in some sectors of the whiting fishery. The whiting fishery was closely monitored to provide reasonable assurance of continued compliance, and substantive management actions had been taken to reduce bycatch (e.g., restricted targeted of whiting shoreward of 100 fathoms (183 m) in the Eureka catch area (40°30'- 43°00' N. lat.) year round, delayed start of the at-sea whiting fishery north of 42°00' N. Latitude annually until at least May 15, prohibition on at-sea processing and night fishing south of 42°00' N. Latitude, prohibition on whiting fishing within the nearshore Klamath and Columbia River Salmon Conservation Zones)(NMFS 2006). For the bottom trawl fishery it was also observed that landings and effort in the bottom trawl fishery have declined by about half since the late 1980s. The 2006 opinion also considered additional management measures the Council had adopted that were likely to reduce Chinook bycatch such as the use of selective flatfish gear.

For each opinion, NOAA Fisheries reviewed information about impacts to each of the listed Chinook ESUs. The review relied primarily on observations from coded wire tags (CWTs), and inferences made using salmon fishery management models and the magnitude and distribution of the Chinook bycatch. Information on the bycatch of salmon in the bottom trawl fishery has been very limited, particularly prior to the implementation of the West Coast Groundfish Observer Program (WCGOP) in the early 2000’s. Information available at the time indicated that some ESUs are taken only rarely in the groundfish fishery or not at all (e.g., Upper Columbia River spring Chinook and Snake River spring/summer Chinook). Puget Sound Chinook, Lower Columbia River Chinook, Snake River fall Chinook, and Upper Willamette River Chinook were the ESUs most likely to be subject to measurable catches. The opinions concluded that the expected bycatch of listed Chinook from any of the ESUs is likely very low.

In January 2013, NOAA Fisheries requested reinitiation of the current salmon biological opinion (NMFS 2006) for the groundfish fisheries. The request resulted from the evolution of the trawl fishery operation under the trawl rationalization framework, and from improving conditions for species such as widow rockfish that are expected to change the characteristics of the groundfish fishery. In addition, better estimates had become available of Chinook and coho salmon bycatch in the nearshore fixed gear fisheries (open access and limited entry fisheries). Prior to completion of the consultation, in October 2014, the Pacific whiting fishery exceeded its 11,000 Chinook bycatch threshold, also triggering reinitiation of the consultation. Together with the changes in the fishery identified in the January 2013 reinitiation request, NOAA Fisheries determined that the re-initiation should address all fishing under the Groundfish FMP, including the Pacific whiting and non-whiting fisheries and all gears.

3.2 Action Area

Action area means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For the Pacific Coast Groundfish Fishery the action area includes the EEZ and state waters of the Pacific Ocean, as shown in Figure 1. It is reasonable to expect that future fishing will occur in the same areas, and that future impacts to ESA-listed salmon species will also occur in those areas, because they are areas where the target fish occur.

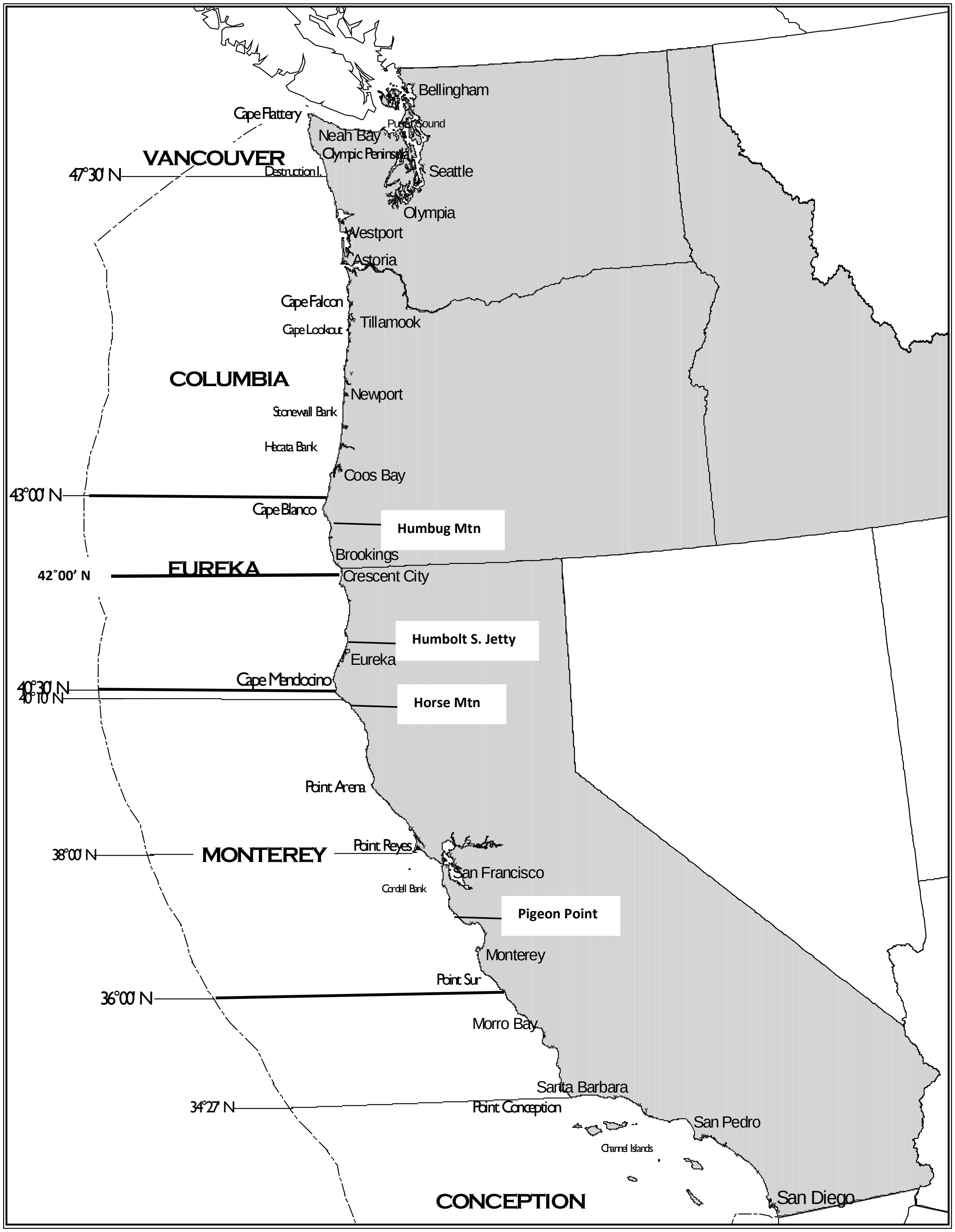


Figure 1. The fishery management area, showing major coastal communities and management areas (PFMCa 2016).

3.3 General Elements of Approach: Chinook Stock Composition Data and Relationship of Chinook Bycatch to Chinook Salmon Abundance

3.3.1 Primary source of stock composition

Coded wire tags (CWT) and genetic stock identification (GSI) are important sources of stock-specific information on Chinook salmon caught in the groundfish fishery. The following section compares the general patterns in genetic stock composition in the at-sea and shorebased whiting catch with CWT data from 2009 to 2014 that was collected by the observer and catch monitor programs. Sampling protocols and more detailed explanations of the results are described in several previous reports (Al-Humaidhi et al. 2012, Moran et al. 2009, Moran and Tuttle 2011, Somers et al. 2014). Although genetic samples have been collected from the shorebased fishery as well, resources have been insufficient to analyze for more than two recent years. Genetic samples collected from the bottom trawl or other components of the groundfish fishery and CWT recoveries are extremely limited and have not been analyzed. Therefore, the following discussion compares the CWTs and genetic information from the at-sea whiting fleet (2009-2014) and shorebased whiting fleet (2013-2014) where available for both sources of information.

It is also important to note that this discussion compares only general patterns in stock distribution between the two data sources. It should not be considered a comparison of true stock composition of the catch between the two data sources. Typically, CWT recoveries allow managers to estimate stock-specific impacts in mixed fisheries. In the case of the groundfish fisheries, limited tag recoveries compromise the ability to make those estimates. Also, although CWT recoveries provide valuable information on the contribution rates of key stocks in a given fishery, CWTs do not provide information on all Chinook salmon stocks harvested in that fishery. Not all stocks or populations present in a fishery are represented by CWTs, particularly wild stocks (e.g., California Coastal Chinook[5]). In some cases, sampling and tagging rates for tag expansion are uncertain or unknown. For the CWT data presented here, samples have been expanded for sampling rate but have not been expanded for the proportion of the stock that is tagged. For these reasons, genetic data is generally considered a better representation of stock composition assuming the baseline information is complete and is the primary source relied on for the analysis of stock composition in this document. However, it should be noted that some fisheries require management at a finer scale than that of our analysis (e.g., Klamath falls and spring are grouped together to represent the Klamath/Trinity ESU) or require age-specific data or comparison of hatchery release strategies that CWTs provide where sample sizes are sufficient. Genetic samples alone do not provide this information and are generally combined with scales samples or other information to derive that information. Broad scale genetic data collection in fisheries is relatively recent; therefore, the data series for GSI information is somewhat limited.

Both data sources demonstrate a similar and strong regional pattern in contribution of Chinook ESUs with a greater proportion of southern Chinook stocks as bycatch when the fleets move south along the coast and similar patterns in the distribution of those stocks between the at-sea and shorebased fleets. Samples from years with a more southerly distribution include more southern stocks and visa versa (Figures 2 and 3). Moreover, some stocks fit this pattern more closely than others (e.g., Puget Sound, Central Valley) due to different migration patterns (tending to migrate differentially north or south). Columbia River Chinook

[5] Age-4 Klamath CWTs are used as the surrogate to manage California Coastal Chinook in salmon fisheries. Comparison with genetics data as shown here indicate similar distributions.

stocks were dominant in the Columbia area. Catches further north included Columbia River and increasing percentages of Puget Sound and Fraser River Chinook stocks.

There are also some consistent differences between the data sources. The CWT data consistently shows a greater presence of Central Valley fall, and to a lesser extent Klamath/Trinity, Chinook and a lower presence of Oregon Chinook stocks than the genetic samples. This pattern becomes more pronounced as the fleet moves south. The opposite is true in northern areas that show somewhat higher levels of British Columbia and Puget Sound stocks in the genetic results than in the CWT results. However, more stocks are represented in the genetic information than in the CWT data, particularly Oregon Coast and Columbia River stocks. Stock composition from genetic analysis may not necessarily align with results from CWT recoveries because of the variability in tagging rates across stocks and hatchery programs. Because of the variability in tagging rates across regions and stocks, CWTs can provide a general picture of the presence of stocks in the bycatch, but genetic data provides a more comprehensive analysis of all the stocks that are part of the bycatch including both hatchery and wild populations within an ESU. The smaller number of stocks represented by the CWTs and difference in tagging rates for the California or British Columbia stocks compared with other stocks present in these areas might explain these differences between the two data sources and provide additional support for use of the genetic data to assess stock composition for the purposes of this analysis.

The genetic analysis of the at-sea Chinook bycatch samples over the entire 2009-2014 period shows that the major contributors of Chinook bycatch on average were Klamath/Trinity Chinook (28%) followed by S. Oregon/N. California (25%), Oregon Coast (10%) and Northern B.C. (11%) Chinook (Figure 3). The shorebased samples showed a contribution from Central Valley Chinook (13%) similar to the Oregon Coast and very low contribution from British Columbia Chinook. The remainder of stocks contributed 5 percent or less of the Chinook bycatch in either fleet on average. In general, the shorebased fishery is focused closer to shore and does not extend as far south as the at-sea fishery. Therefore, the shorebased fishery encounters more northern stocks than the at-sea fishery. The Central Valley Fall run stock is an exception since it was more abundant as shorebased bycatch than in the at-sea fishery. However, the shorebased pattern strongly reflects the southern distribution of the whiting fleet in 2013 and 2014, since these are the only two years for which shorebased samples are available. If results were available from a broader range of years when the fleet was further north, the pattern might show a greater proportion of northern stocks. As the at-sea results indicate, which stocks dominate bycatch will depend on the latitude of the fishery in any year.

From 2009 to 2014, CWTs recovered from bycatch from the at-sea fleet showed a similar pattern to the genetic analysis and were primarily from the Klamath/Trinity River Chinook (38%), followed by Central Valley fall (12%), Snake River fall (11%) and Upper Columbia River summer/fall and British Columbia (6% ea). The remaining stocks made up 5 percent or less of the Chinook total catch with CWT in the at-sea sectors. With the exception of British Columbia, the same stocks dominated the shorebased CWT recoveries. However, the distribution depended heavily on the location of the fleet in any year (Figure 3). Klamath tag recoveries are considered representative of the distribution of California Coastal Chinook although the genetics information indicates the ocean distribution of California Coastal Chinook is intermediate between Klamath and Central Valley Chinook (Satterthwaite et al. 2014). Because it is a surrogate indicator, Klamath CWT recoveries cannot be directly related to a specific number of California Coastal Chinook, but only indicate the likelihood that the fishery may intercept California Coastal Chinook. Therefore, the available information indicate that Klamath Chinook CWTs are a reasonable surrogate to assess distribution and relative impacts where sufficient tags are recovered (e.g., salmon fisheries) but are not a direct assessment of the number of fish or stock contribution of California Coastal

Chinook in a fishery. A more detailed description of the results is found in NMFS 2016. Also similar to the genetics results, which stocks dominate bycatch will depend on the latitude of the fishery in any year.

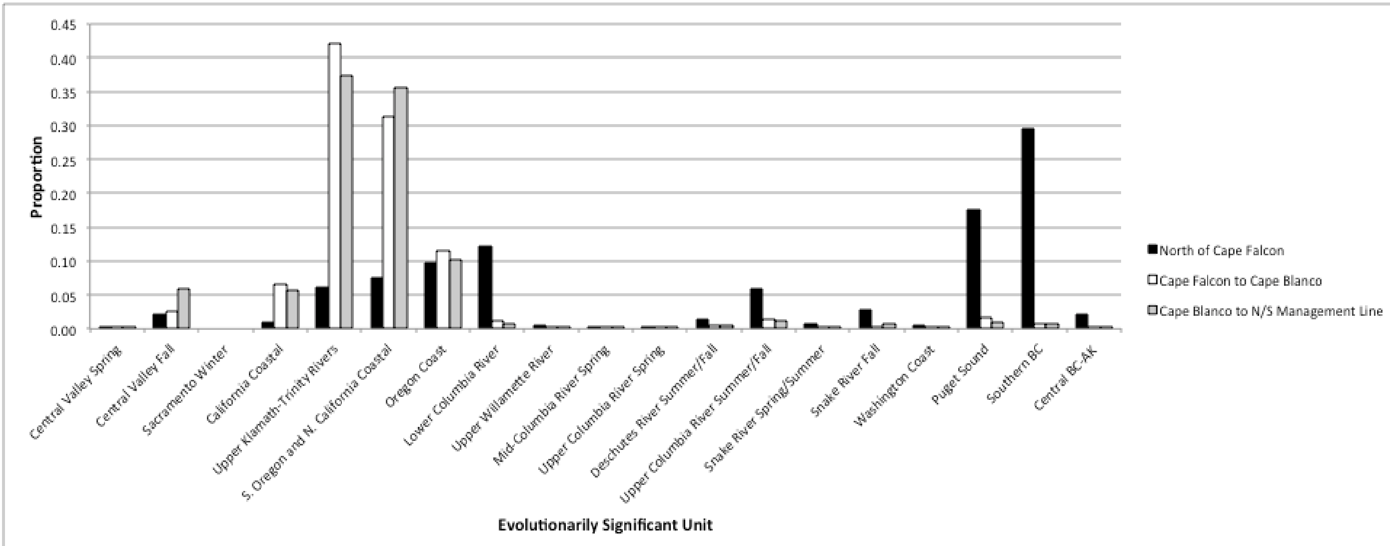


Figure 2. Genetic stock composition of Chinook bycatch caught in the at-sea whiting fishery (2009-2014) stratified by management area shows the strong effect of latitude. North of Falcon Area is quite different from the other two, including more Columbia River and Puget Sound Chinook ESUs.

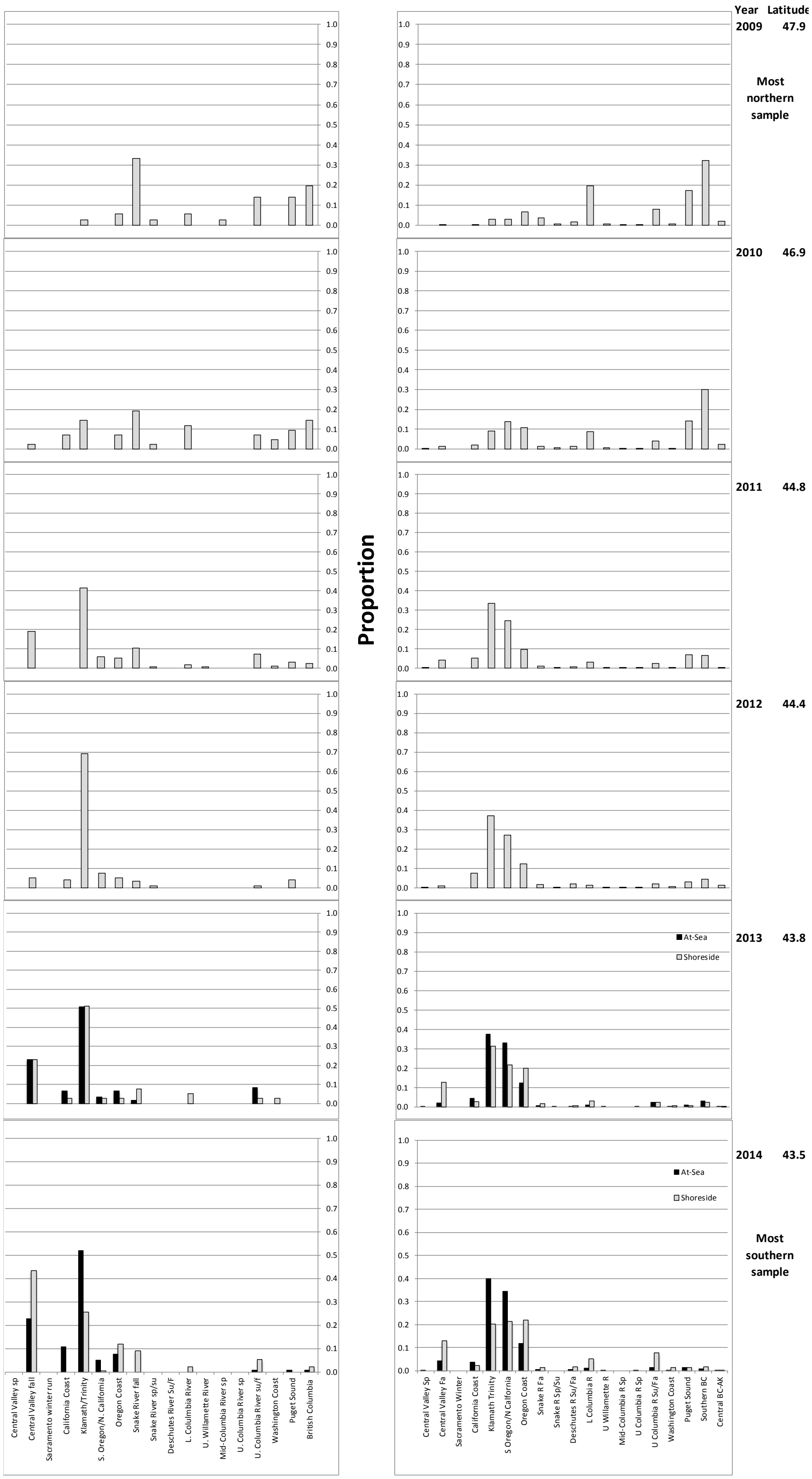


Figure 3. Distribution of coded wire tag recoveries (a) and genetic stock composition of Chinook salmon bycatch (b) in the Pacific whiting fisheries by year, 2009-2014. The results show a strong effect of mean latitude and similarity between the CWT and genetic samples. Years with similar mean latitude of bycatch had similar stock compositions whether inferred from genetics or CWTs.

3.3.2 Background on Chinook Evolutionarily Significant Units

The following table categorizes the Chinook ESUs that are caught as bycatch in the Pacific Coast groundfish fisheries fall. Bolded ESUs are primary contributors to bycatch in the groundfish fisheries based on the available genetic stock composition information.

Chinook Evolutionarily Significant Units as defined under the Endangered Species Act		
Listed/Status		*Not Listed*
Central Valley Spring	Threatened	
Sacramento Winter	Endangered	**Central Valley Fall**
California Coastal	Threatened	**Klamath/Trinity**
Lower Columbia River	Threatened	**Southern Oregon/Northern California**
Upper Willamette River	Threatened	Oregon Coast
Upper Columbia River Spring	Endangered	Washington Coast
Snake River Spring/Summer	Threatened	Mid-Columbia R Spring
Snake River Fall	Threatened	Deschutes R Summer/Fall
Puget Sound	Threatened	**Upper Columbia River Summer/Fall**

For the listed ESUs, NOAA Fisheries has determined that the poor status of those ESUs warrants the protections of the Endangered Species Act. Take (e.g., catch or encounter) of Chinook from these listed ESUs is prohibited without authorization such as that provided by an incidental take statement in a biological opinion. We briefly review the status of the California Coastal, Lower Columbia River and Puget Sound ESUs as well as the Klamath Fall and Sacramento River fall Chinook (component of the Central Valley fall ESU) stocks to provide some additional context for the impacts assessment in our analysis. Impacts of the groundfish fishery to the remaining listed ESUs will be considered in the biological opinion but are generally minor contributors to the bycatch in the groundfish fishery.

California Coastal

This ESU includes naturally spawned Chinook salmon originating from rivers and streams south of the Klamath River to and including the Russian River. Data are very limited against which to assess status. The available limited data suggest that many populations have declined in abundance to levels that are well below low-risk abundance targets, and several are, if not already extirpated, likely below the high-risk depensation thresholds specified by Spence *et al.* (2008)(cited in NMFS 2016b). The most recent 5-year status review indicated that patterns in population trends are mixed (NMFS 2016b). Concern remains about the extremely low numbers of spring Chinook salmon in most populations of the North-Central Coast and Central Coast strata, which diminishes connectivity across the ESU. Because California Coastal Chinook are not coded-wire tagged and information is so limited, ocean salmon fisheries are managed to not exceed an ocean harvest rate based on age-4 Klamath River fall Chinook.

Lower Columbia River

The ESU includes all naturally-produced populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, with the exception of spring-run Chinook salmon in the Clackamas River. Population abundance ranges from less than 1,000 to over 10,000 Chinook depending on the population. Productivity for many populations has been below replacement in many years (NWFSC 2015). The Lower Columbia River ESU is comprised of spring, late-fall and fall populations. The spring populations are considered extirpated or nearly so (NWFSC 2015). However, reestablished access to historical spawning grounds and recolonization may provide an opportunity to reestablish native runs. Two of the late-fall populations are the only populations in the ESU that are considered viable or nearly so although additional progress is needed. Abundance trends on these populations are generally stable. There has been an overall improvement in the status of a number of fall-run populations from baseline conditions, although most are still far from the recovery plan goals (NWFSC 2015). Increases in abundance were noted in about 70% of the fall-run populations with increased contribution from wild fish for several populations. Lower Columbia River Chinook are a general constraint on ocean salmon fisheries and the distribution of bycatch of this ESU in the groundfish fishery has been a consideration in past biological opinions on the groundfish fishery.

Puget Sound
The ESU includes all naturally spawning populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Strait of Juan de Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington, as well as numerous artificial propagation programs. Population abundance ranges from about 100 to several thousand Chinook depending on the population. Productivity for many populations has been below replacement in recent years (NWFSC 2015). Most Puget Sound Chinook populations are well below escapement levels and productivity goals identified as required for recovery to low extinction risks. Trends for wild spawners from 1999 to 2014 were negative for 17 of 22 populations in the ESU (NWFSC 2015). Wild escapements for eight populations are below their critical thresholds including both populations in three of the five biogeographical regions comprising the ESU. Puget Sound Chinook have been a constraint on some ocean salmon fisheries in recent years.

Unlisted Chinook ESUs
The remaining ESUs are managed to meet conservation objectives under the Pacific Coast Salmon FMP. The status of Klamath stocks in particularly has constrained salmon fisheries regularly since the 1990s and concerns regarding impacts to this stock in the groundfish fishery have been a driver for actions taken in the groundfish fishery to reduce bycatch in some management areas, particularly off California. This ESU includes fall- and spring-run Chinook salmon in the Klamath and Trinity River Basin upstream of the confluence of the Klamath and Trinity Rivers. Klamath River fall Chinook escapement is generally in the 10s of thousands, exceeding 100,000 in some years. Klamath fall Chinook are managed to exceed a natural area spawner escapement of at least 30,909 adults under the salmon FMP. That goal was not met in 2015 and was projected to be just met in 2016 (PFMC 2016a, PFMC 2016e). The Central Valley Fall, late-Fall Chinook ESU includes all naturally spawned fall Chinook in the San Joaquin and Sacramento Basins, east of Carquinez Strait, California. Sacramento River Fall Chinook (a component of the Central Valley Chinook ESU) also constrains salmon fisheries in some years. Since 2010, spawning escapements have ranged between 112,000 and 406,000 Chinook. It is managed under the salmon FMP to achieve a minimum of 122,000 hatchery and natural area adult spawners. That goal was not met in 2015 and was projected to be exceeded in 2016 (PFMC 2016a, PFMCe).

3.3.3 Relationship of Chinook salmon bycatch to Chinook salmon abundance

We investigated whether there was a relationship between Chinook salmon abundance and Chinook salmon bycatch in the at-sea whiting fleet for 1995 to 2015. Bycatch and bycatch rates of Chinook salmon in the groundfish fisheries vary by year, fishery, gear type and area. Generally, Chinook salmon bycatch is very low in relation to the amount of groundfish landed (Table 2). With the exception of 2002-03, the majority of the Chinook salmon bycatch has occurred in the whiting fishery (Table 11 in NMFS 2016). The most extensive data set on Chinook salmon bycatch was from the whiting fishery and provided a broad range of data types (e.g. time, area, depth). At-sea data was used because there is better fine scale and location information in the haul specific information than for other sectors. If we could identify a relationship between overall Chinook abundance or the abundance of key Chinook stocks and bycatch in the groundfish fisheries, managers might be able to manage Chinook bycatch in the groundfish fisheries as a function of the preseason forecasts of Chinook salmon abundance. For example, the allowable Chinook salmon bycatch could be scaled to the preseason forecasts.

Because of the ages vulnerable in the salmon fisheries and different target fishing zones/areas, landed salmon catch by itself is not a suitable measure of Chinook salmon abundance encountered by the whiting fleet. Data on Chinook salmon abundance in the ocean by time, area, and depth contours similar to those used for groundfish management are not available. Catch in salmon fisheries is a crude estimate of abundance that can identify years with high, low and average abundance of fish vulnerable to the size limits in the fishery. Most salmon fisheries can retain fish that are usually age 3 to 5 years old. Age 2 fish are often less than legal-size and must be released. The traditional salmon fisheries are not necessarily located in the same areas or depths as the whiting fishery.

A more promising index of Chinook salmon abundance for the analysis is the number of maturing fish that return to the rivers, salmon that may be intercepted by the whiting fleet as they migrate to their natal rivers. These data are often in terms of the number of "adult" and "jack" Chinook salmon returning to specific rivers or basins. The adult fish are usually age 3 and older; the jacks are commonly age 2 which align with one of the dominant age classes in the bycatch. Indices of Chinook salmon abundance that are based on the number of mature fish returning are not available for all stocks and/or age groups (by age class or adult vs jack). Therefore, the cases where salmon bycatch or bycatch rates can be related to Chinook salmon abundance is limited to those stocks with a time series of mature run sizes (3 years and older).

To further refine our analysis, we used CWT and GSI data from Chinook salmon bycatch to identify the key stocks that make up the bycatch associated with the north-south distribution of the whiting fleet. CWT data also showed that the bulk of the bycatch is composed of age-2 and age-3 Chinook salmon (NMFS 2016). We then focused our analysis on those stocks which should have the best chance of defining a reliable relationship between Chinook abundance and bycatch in the whiting fishery.

Data sources for Chinook salmon abundance indices include the annual ocean fishery review document published by Pacific Fishery Management Council (PFMC 2016a) for some stocks (e.g., Klamath and mature run size data files used by Chinook Technical Committee (CTC) of the Pacific Salmon Commission for their annual calibration of the Chinook Model for other stocks.

Table 2. Chinook bycatch rates by Pacific whiting sector, 2002-2014 (rates in excess of 0.05 Chinook/mt whiting shown in bold)(A-SHOP/PacFin).

		Year												
		2002	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014 a/**
Chinook	Mothership	707	2,078	417	2,207	1,095	585	226	296	457	1,296	2,300	1,979	2,906
	Catcher Processor	970	570	388	1,756	114	736	496	23	257	2,694	1,932	1,758	3,779
	Tribal	1,018	3,439	3,740	3,985	1,940	2,404	697	2,147	678	906	17	1,025	154
	Shorebased a/ b/	1,062	425	4,206	4,018	839	2,462	1,962	378	2,997	3,727	2,333	1,313	7,554
	Whiting Sector Total	3,759	6,512	8,751	11,966	3,988	6,187	3,381	2,844	4,389	8,624	6,586	6,078	14,395
Whiting (mt)	Mothership	26,593	26,021	24,102	48,571	55,355	47,809	57,432	24,090	35,714	50,051	38,480	52,472	62,098
	Catcher Processor	36,341	41,214	73,175	78,890	78,864	73,263	108,121	34,800	54,292	71,679	55,263	77,950	103,203
	Tribal	21,793	23,454	28,648	34,357	35,441	30,177	31,907	22,381	18,255	18,234	658	4,906	617
	Shorebased a/ b/	45,276	51,061	89,670	97,381	97,297	73,280	50,423	40,293	62,653	90,354	65,280	96,857	97,965
	Whiting Sector Total	130,003	141,750	215,595	259,199	266,957	224,529	247,883	121,564	170,914	230,318	159,681	232,185	263,883
Chinook/mt Whiting	Mothership	0.027	**0.079**	0.017	0.045	0.020	0.012	0.004	0.012	0.013	0.026	**0.060**	0.038	0.047
	Catcher Processor	0.026	0.014	0.005	0.022	0.001	0.010	0.005	0.001	0.005	0.038	0.035	0.023	0.037
	Tribal	0.047	**0.147**	**0.131**	**0.116**	**0.055**	**0.080**	0.022	**0.096**	0.037	**0.050**	0.026	**0.209**	**0.250**
	Shorebased	0.023	0.008	0.047	0.041	0.009	0.034	0.039	0.009	0.048	0.041	0.036	0.014	**0.077**
	Whiting Sector Total	0.029	0.046	0.041	0.046	0.015	0.028	0.014	0.023	0.026	0.037	0.041	0.026	**0.055**

a/ 2014 estimates for the shorebased fishery is based on preliminary data
b/ includes all midwater trawl north of 40°10 N. Latitude.

We selected several combinations of salmon bycatch statistics to Chinook salmon abundance indices based on mature run size in the PFMC ocean review and CTC Chinook model data input files. These indices were selected by choosing the key stocks in the bycatch rate of the mothership and catcher/processors in three whiting fishery regions: 1) Klamath Fishery Management Zone north to Cape Falcon Oregon, 2) Cape Falcon north to Westport Washington, and 3) Westport north to the U.S.-Canada border. The two bycatch rates were Chinook salmon bycatch per metric ton of whiting and the number of hauls with Chinook salmon per the total number of hauls made (Table 2). The comparisons were made on an annual basis starting in 1995. These comparisons are shown in Figures 4, 5, and 6.

As can be seen these figures, there is no relationship between the Chinook salmon abundance indices and salmon bycatch rates in the whiting fishery based on the available information. We investigated other combinations of Chinook salmon abundance indices and bycatch rates and could not find a significant relationship there either. The inability to find a relationship between Chinook salmon abundance and bycatch rates is not surprising given the limitations of Chinook salmon abundance data and the very low and variable bycatch rates from year to year and area by area in the whiting fishery from the at-sea fleet. We concluded that there is no reliable way to link variability in Chinook salmon abundance to bycatch in the whiting fleet, either on a preseason or postseason basis.

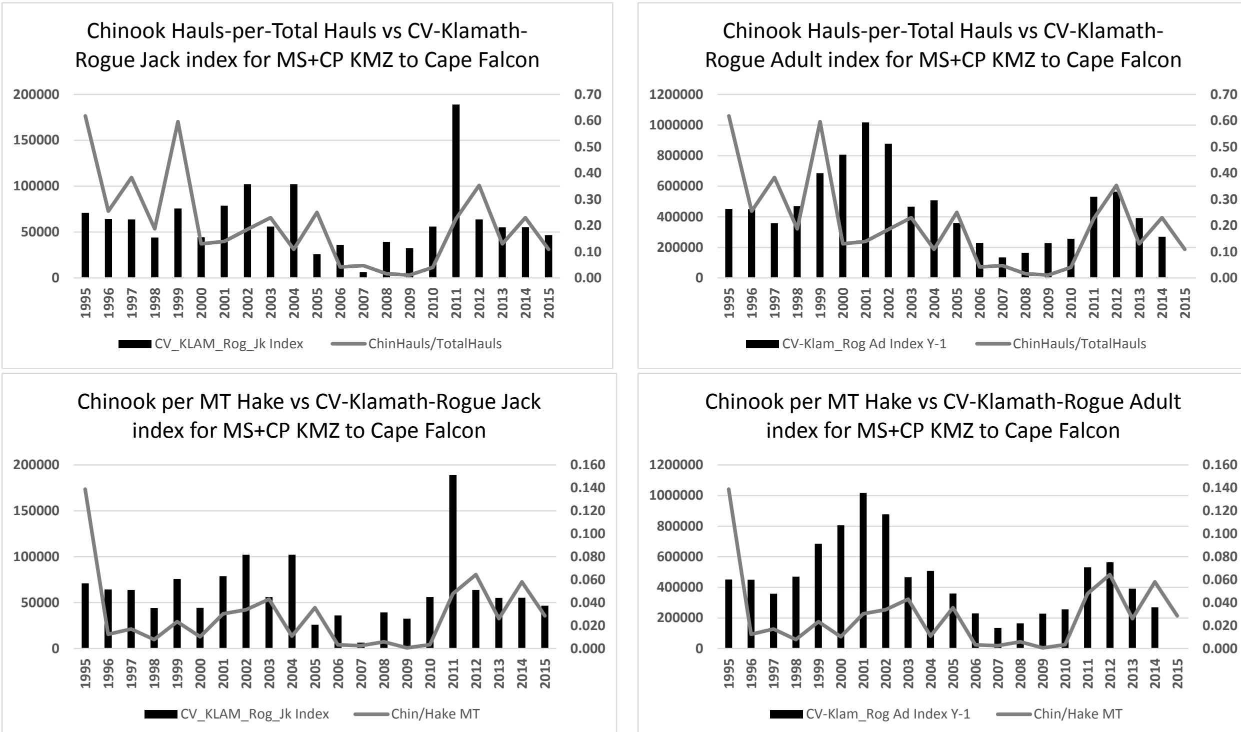


Figure 4. Chinook bycatch statistics (Chinook/mt whiting) in the whiting fishery from the southern boundary of the Klamath Management Zone (salmon) north to Cape Falcon for the mothership and catcher-processor fleet and abundance indices of Chinook salmon (jacks or adults) from the Central Valley, Klamath and Rogue Rivers.

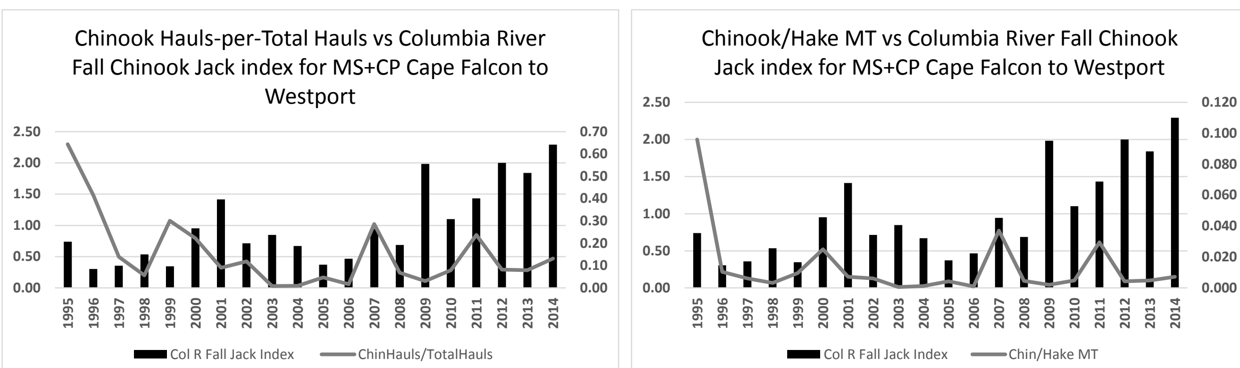


Figure 5. Chinook bycatch statistics (Chinook/mt whiting) in the whiting fishery from Cape Falcon to Westport for the mothership and catcher-processor fleet and abundance index of fall Chinook "jacks" from the Columbia River.

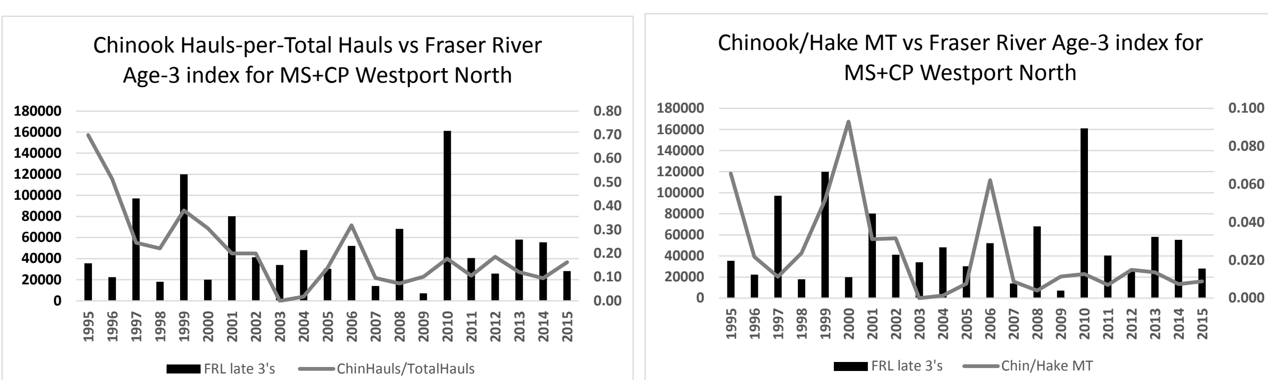


Figure 6. Chinook bycatch statistics (Chinook/mt whiting) in the whiting fishery from Westport to the U.S. – Canada border for the mothership and catcher-processor fleet and abundance indices of age-3 fall Chinook salmon from the Fraser River.

3.3.1 Bycatch of non-Chinook salmon species

The alternatives and analysis in this document focuses on Chinook salmon. Bycatch of salmon species other than Chinook is consistently low (Table 3). Steelhead and sockeye individuals are occasionally observed, but estimates of bycatch in most years were zero. For coho and chum, estimates of bycatch averaged on the order of 100-300 per year. Although pink salmon bycatch has exceeded 1,000 on occasion, that bycatch is compared to millions of pink salmon returning to west coast river systems in those years. The majority of the bycatch of non-Chinook species was presumed to be unlisted hatchery or natural origin fish based on the magnitude of hatchery releases and unlisted natural fish of these species compared with the population sizes of the listed ESUs coastwide. We presume that pattern will persist in whiting fisheries north of 42º N. Latitude and non-whiting fisheries but that monitoring of the fisheries will continue to track bycatch of all salmon species. Impacts to all listed salmon will be assessed in the ESA consultation for the proposed action that the Council ultimately provides.

It is important to note that the table does not include bycatch prior to implementation of the prohibition against at-sea processing of Pacific whiting south of 42° N. Latitude or other alternatives that would substantial increase fishing off of California. Such alternatives might result in increased bycatch of coho compared to the available data and additional impacts to affected listed ESUs such as Southern Oregon/Northern California and Central California Coast coho. Central California Coast coho are listed as an endangered species. As described above, there is a strong latitudinal pattern for stock composition of Chinook bycatch, i.e., proportions of southern stocks in the bycatch increase with more southern movement of the groundfish fleet. This pattern is also commonly observed in salmon fisheries and reflects the migratory patterns of salmon in relation to their natal regions of origin. We expect that this pattern would also be reflected for other salmon stocks in the bycatch like coho. Should the Council adopt one of these scenarios, fisheries should be closely monitored and sampled to detect increased impacts to these stocks and consider what actions could be taken to reduce bycatch in the event that occurs.

Table 3. Salmon mortality (number of fish) by species and fishing sector in Pacific Coast Groundfish Fisheries, 2002-2014 (NMFS 2016)

Fishery	Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014 a/
At-Sea whiting	Chinook	1,679	2,648	805	3,963	1,209	1,321	722	319	714	3,990	4,232	3,737	6,685
	Coho	146	3	1	86	28	227	21	12	0	5	17	6	108
	Chum	24	11	52	20	88	170	60	41	10	46	53	26	4
	Pink	0	17	0	48	0	34	0	2	0	12	22	37	0
	Sockeye	0	0	0	0	0	0	2	0	2	0	0	0	0
Shorebased whiting /b	Chinook	1,062	425	4,206	4,018	839	2,462	1,962	378	2,997	3,727	2,333	1,313	7,554
	Coho	14	0	8	37	18	141	10	37	16	137	15	33	175
	Chum	72	0	43	6	3	113	8	2	8	42	3	8	4
	Pink	0	0	0	49	0	47	7	26	0	6,113	2	2	0
	Sockeye	0	0	0	0	0	0	0	0	0	2	0	0	1
	Steelhead	0	0	0	0	0	0	0	0	0	0	0	0	2
Tribal whiting c/	Chinook	1,018	3,439	3,740	3,985	1,940	2,404	697	2,147	678	906	17	1,025	154
	Coho	23	193	207	344	3	107	21	57	5	27	0	91	0
	Chum	51	9	11	2	24	8	11	11	1	23	0	1	0
	Pink	0	3,766	0	384	0	513	9	129	0	1,190	0	5	0
	Sockeye	0	0	0	0	0	0	0	0	0	2	0	0	0
Bottom trawl d/	Chinook	14,915	16,460	2,221	1,242	175	317	324	299	53	175	304	323	NA
	Coho	25	31	65	5	48	13	0	0	31	20	27	49	NA
	Chum	14	36	4	0	0	0	0	0	0	0	0	0	NA
	Pink	0	0	0	0	0	0	0	2	0	0	2	0	NA
	Sockeye	0	0	0	0	0	0	0	0	0	1	0	0	NA
Non-trawl gear	Chinook	0	41	33	32	20	0	0	22	33	40	66	404	NA
	Coho	0	5	38	6	0	15	42	71	42	64	16	581	NA
	Chum	0	0	0	0	0	0	0	0	0	0	0	0	NA
	Pink	0	0	0	0	0	0	0	0	0	0	0	0	NA
	Sockeye	0	0	0	0	0	0	0	0	0	0	0	0	NA

a/ At-sea whiting in final data review, these fisheries data are preliminary data
b/ Includes approximately 19 Chinook in 2011, 69 Chinook in 2012, and 78 Chinook in 2013 from midwater non-whiting targeting north of 40°10' north latitude.
c/ Tribal non-whiting values were not available
d/ Between 2011 and 2013 includes 1-2 Chinook from vessel targeting Pacific whiting with bottom trawl

4 ALTERNATIVES

This section of the document describes the approach for each alternative and summarizes the results of the analysis. Because non-Chinook salmon species are taken in such low numbers in the groundfish fisheries, the analysis focuses on Chinook salmon. The summary includes overall Chinook bycatch and bycatch rates by fishing sector, geographic area commonly used in groundfish management and depth; geographic distribution of Chinook bycatch by regional stock grouping and an assessment of impacts to listed Chinook ESUs. The results for the non-whiting components are reported for two time periods: winter (November 1 to April 30) and summer (May 1 to October 31) because of differences in fishery operation and Chinook bycatch patterns.

The analysis assumes that current salmon bycatch reduction measures and closures remain in place for the whiting fishery (see text box) except as noted in the Council motion. For bottom trawl and all other gears, the analysis assumes that the management measures in place in 2015 remain in place except as noted in the Council motion.

Chinook bycatch measures for the Pacific Whiting Fishery:

- *Targeted harvest of Pacific whiting is restricted shoreward of 100 fm (183 m) in the Eureka area year round*
- *The start of the at-sea Pacific whiting fisheries north of 42°00' is delayed until May 15.*
- *The start of the shorebased IFQ whiting fishery begins April 15 south of 40°30' with the coastwide fishery beginning on May 15. No more than 5% of the allocation may be taken and retained south of 42° before the start of the coastwide season.*
- *At-sea processing is prohibited south of 42°00'*
- *Night fishing is prohibited south of 42°00' (midnight to one hour after official sunrise)*
- *All Pacific whiting fishing is prohibited within the nearshore Klamath and Columbia River Salmon Conservation Zones.*
- *Ocean salmon conservation zones – allows for the closure of fishing for Pacific whiting shoreward of 100 fathoms if and when NOAA Fisheries determines that the bycatch of Chinook is likely to exceed the 11,000 Chinook bycatch threshold*

4.1 Whiting Fishery – Scenario 1A – conditions representing historic geographic footprint of the fishery

This scenario has two primary considerations:

1) *Assume that recent conditions will continue, including historical geographic footprint of the fisheries, and bycatch rates. Focus primarily on viability of a Chinook bycatch threshold of 11,000 fish per year.*

2) *Assume a more substantial tribal fishery than observed in recent years including broader participation.* After consultation with the affected tribes, we projected Chinook catch for a more substantial tribal whiting fishery than what has occurred in recent years. We used the tribal fishery patterns that occurred in 2008-2011 and included a potential whiting fishery by the Quinault and Quileute tribes in their U&A fishing areas, according to the likely amounts of whiting harvest they advised may incur. For the Quileute and Quinault fishery, we applied the typical operating depths for the type of boats they would likely use, and accompanying bycatch rates using data from representative tribal fisheries.

4.1.1 Conditions representing recent geographic footprint

4.1.1.1 Approach

Full geographic footprint

Our approach was to make a range of projections for Chinook bycatch (as counts) based on recent data, highlighting two main axes of uncertainty, Chinook bycatch rates (number of Chinook per metric ton of whiting) and whiting catch. We then estimated the average recent coastwide distribution of Chinook bycatch, among sector, latitude and depth strata, with uncertainty, so that those amounts could be apportioned among different Chinook ESUs. During this period, whiting vessels were prohibited from at-sea processing south of 42° N. Latitude. Although catcher vessels in the mothership sector may fish south of 42° N. Latitude, the fishing activity is very limited because the vessels can only fish a short distance from the mothership.

The analysis considers the full north/south distribution of the whiting fleet in recent years that provides the most accurate Chinook bycatch and stock composition information. Statistics on whiting catch and Chinook bycatch used in the analysis included the years 2009-2015 for at-sea whiting sectors, and 2011-2014 for shorebased whiting sectors. Although we examined information back to the 1990s, the chosen time periods capture the full north/south distribution of the fleet similar to the earlier years, while also using the best available information on stock composition and salmon bycatch. Whiting distribution has moved south since the mid-1990s (Figure 7) with a corresponding movement in whiting fishing operation (Figure 8). The southern distribution of the fleet has been particularly pronounced since 2012 (Figure 8). Using earlier years could capture some additional variability in footprint, but would be offset by limited and lower quality stock composition data and less reliable bycatch information. WCGOP data with sufficient coverage to estimate salmon bycatch are only available since 2002, and genetic stock composition data since 2008 for the at-sea and 2013 for the shorebased whiting fleets. Additionally, the number of CWT recoveries in the earlier years prior to the observer program are inadequate to represent the distribution of bycatch and stock composition. We chose the shorter time period for the shorebased fishery because of changes in the California fishery affecting distribution of the fleet that are likely to continue into the future, i.e., effects of the buyback program and implementation of the individual fishing quota (IFQ) program.

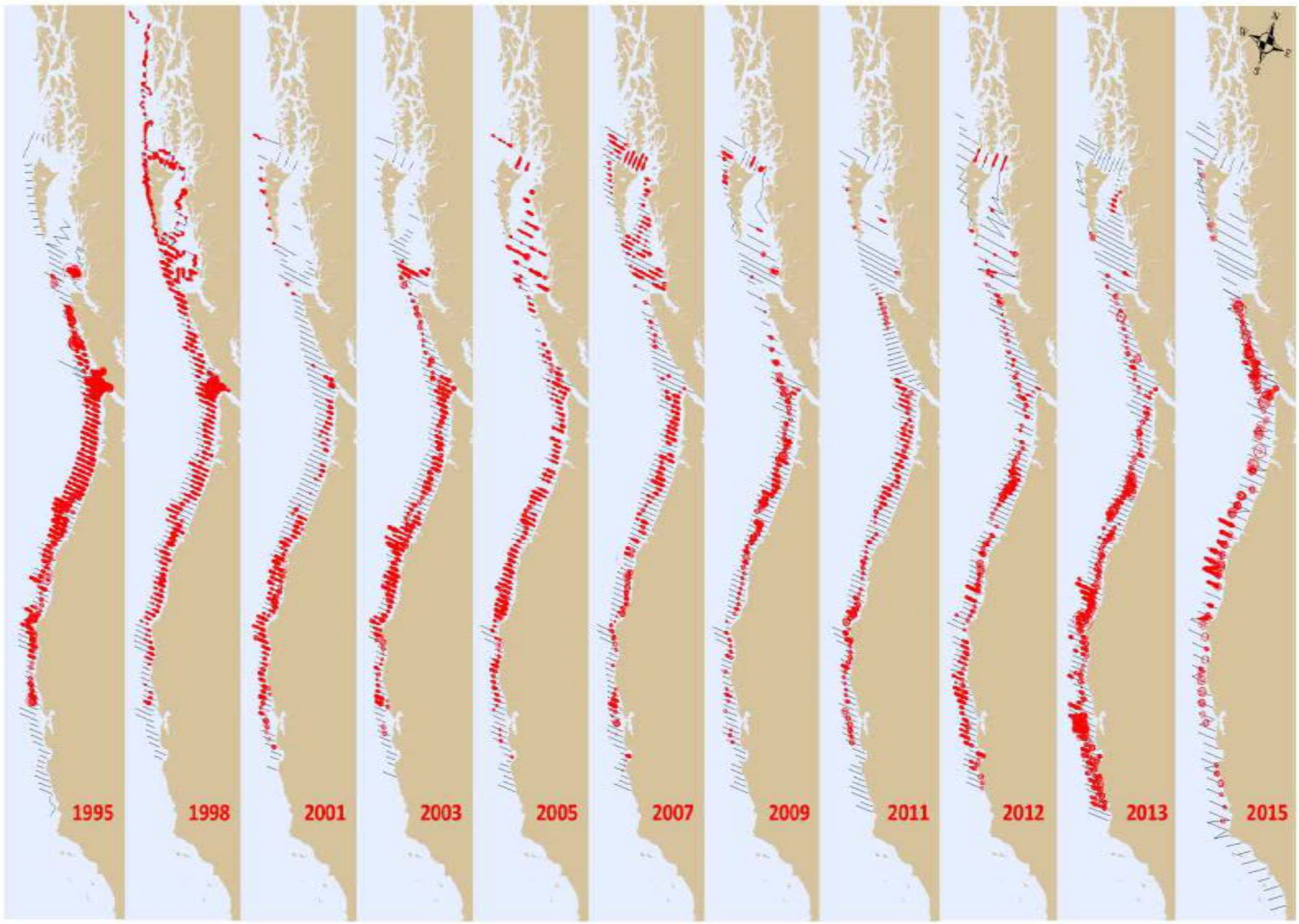


Figure 7. Spatial distribution of acoustic backscatter attributable to Pacific whiting from joint US-Canada acoustic surveys 1995-2015.
Source: Grandin et al. 2016

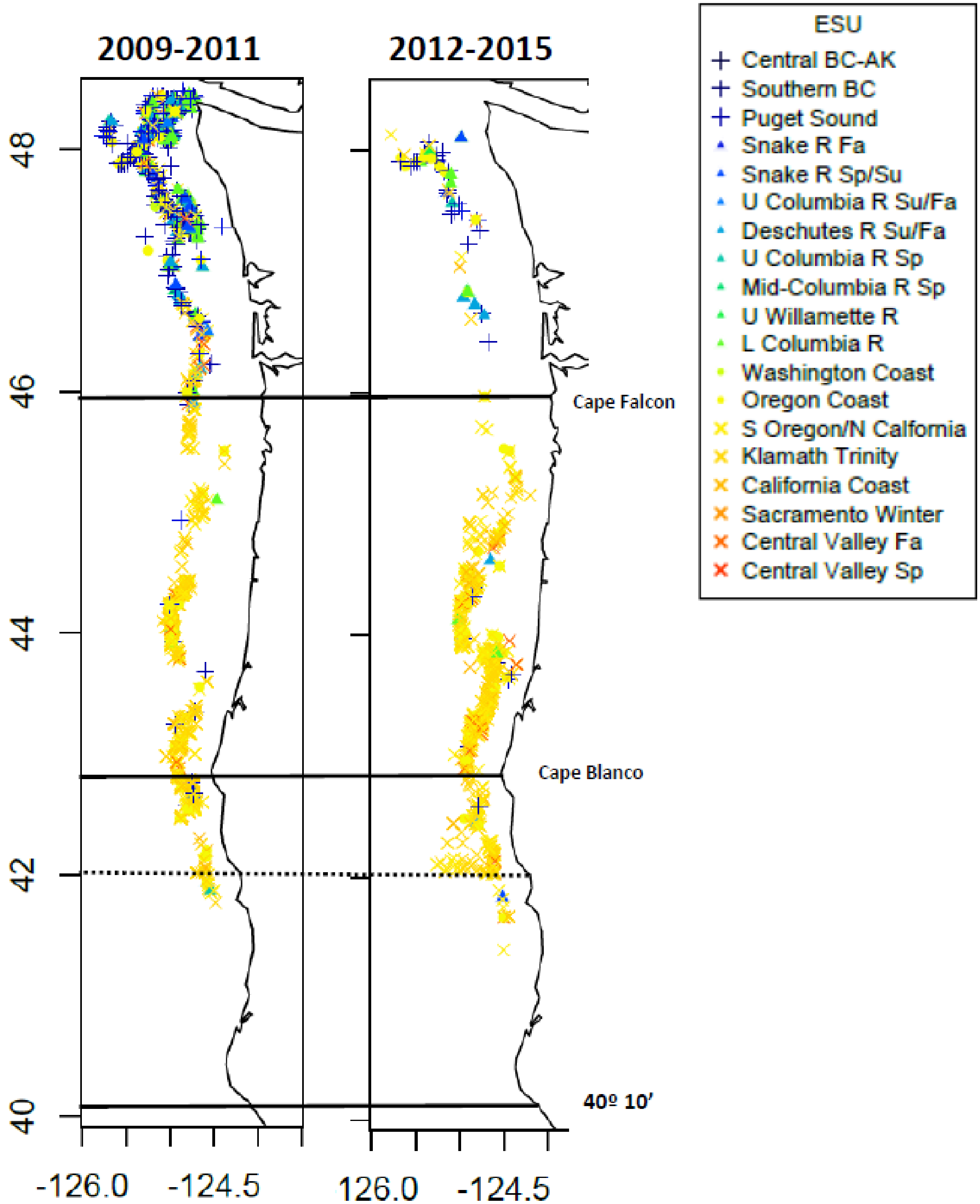


Figure 8. Distribution of the genetic samples from Chinook bycatch in the at-sea whiting fleet. Comparison of the two time periods illustrates the southerly shift in the fishery since 2011 in the most recent yeas and resulting change in stock composition of the Chinook bycatch. Note that processing south of 42° N. Latitude has been prohibited during these time frames.

Resumption of robust tribal fishery with broader tribal participation

The tribes are constrained to fishing within their U&A fishing areas which are north of Cape Falcon for all three tribes that may participate in the whiting fishery. Since 2006, tribal catch has been processed both at-sea and in shorebased plants. To date, only the Makah have fished for Pacific whiting. There is the possibility of greater tribal participation in the whiting fishery in the future should the Quileute and Quinault tribes join the fishery. Distribution of whiting since 2012 has resulted in minimal tribal fisheries in part because whiting distribution has been further south, outside tribal U&As. If a more robust tribal fishery were to resume and the participation to widen, it could incur additional Chinook impacts and the stock composition of the bycatch would more resemble that of the 2009-2011 period with higher proportions of northern ESUs in the bycatch. The whiting analysis based on data, from 2009-2015 for at-sea, and 2011-2014 for shorebased, only includes an active tribal component during the initial years of that period, in which effort has been quite low since 2012. The Makah tribe implemented salmon bycatch reduction measures starting in 2008 which they expect to remain in place for the foreseeable future (pers com. R. Svec). Chinook bycatch greatly declined after these measures were put in place. The tribal fishery also shows a shift to deeper depths in 2008 and the more recent at-sea/shorebased pattern. For the tribal scenarios, we used the four year span between 2008 and 2011 as the most recent period with substantial tribal effort to represent this scenario. Should the tribal fishery remain limited, our analysis could overestimate the likely bycatch of Chinook salmon and impacts to listed ESUs.

Also important to note is that unused tribal allocation is reapportioned to the commercial sectors. Reapportionment usually happens after September 15th. Catch reapportioned to the at-sea fisheries generally results in bycatch occuring in deeper depths and further south than is typical for tribal fisheries. Shallower depths typically coincide with higher Chinook bycatch. Historically, tribal whiting fishing effort peaks in the summer, which also tends to coincide with higher Chinook bycatch rates. Therefore, resumption of a typical tribal whiting fishery and with broader participation would likely have greater Chinook impact on more northern stocks than the current pattern reflective of reapportionment.

The Quinault and Quileute tribes have recently expressed an interest in carrying out a whiting fishery in the near future. Both of these tribes' U&A fishing areas are off the northern coast of Washington. Discussions with tribal representatives and staff indicate that the expected catch is approximately 8,000 mt of whiting per year for each tribe, and that their strategy would resemble a mothership operation, but would likely be prosecuted with small vessels, indicating relatively shallow bottom depths. However examination of the boundaries of the relevant U&A fishing areas (81 FR 36806, June 8, 2016) indicate access by both tribes to substantial area with deeper bottom depths (greater than 200fm). These conditions could enable more typical mothership operation of the fishery that typically tends to show lower bycatch rates than the shorebased fleet.

4.1.1.2 Methods

Projected Chinook bycatch

We analyzed the five sectors within the aggregate whiting fishery: 1) the at-sea Catcher/processor (CP), 2) the at-sea Mothership (MS), 3) at-sea tribal fishery, 4) the shorebased portion of the IFQ sector that targets whiting (50 percent or more whiting by weight at landing), and 5) the shorebased tribal whiting sector. Our analysis produced a range of projections under this scenario for the directed whiting fisheries to represent continued effort, bycatch rates and latitudinal distribution of effort similar to years for each sector described in Section 4.1.1.1. The projected total Chinook counts for the aggregate whiting fishery (CP + MS + at-sea Tribal + shorebased IFQ + shorebased Tribal) were made using Chinook bycatch rate and whiting catch as axes of uncertainty to produce a range of bycatch. Chinook bycatch rates are reported as count per metric ton of retained whiting, and whiting catch in metric tons (retained).

We took a parsimonious and deterministic approach to estimating Chinook bycatch and basic variation for the near future, given the multiple sectors involved and scenarios to explore. We targeted specific and relatively short time series, in order to best represent expected conditions in the near future, among the sectors and scenarios recommended by the Council. Short time periods of four to seven years warranted use of straight-forward metrics to focus on interannual variation in primary factors responsible for variation in Chinook salmon bycatch, including depth, area, sector and whiting catch. Estimates reflect aggregately and separately estimated combinations of mean, minimum and maximum whiting and Chinook catch over the time periods used. A stochastic model-based approach was not feasible, given 1) the fragmented, multifaceted nature of the whiting fisheries and the variety of scenarios proposed for analysis, 2) existing, approved stochastic models do not currently exist that would sufficient for the task, and available time was not sufficient to develop one. Annual estimates of retained whiting catch (mt) and Chinook salmon (counts) were queried from the Pacific Fisheires Information Network (PacFIN) database, using the North Pacific fishery databased (NORPAC) 4900 Comprehensive Table.

First, annual mean, minimum and maximum retained whiting catch and Chinook bycatch were calculated for the sum of the three at-sea sectors, and again for the sum of the two shorebased sectors. The resulting Chinook bycatch rates were calculated for each sector group and the resulting ranges of Chinook bycatch rates and whiting catch amounts were arranged to calculate a three-by-three matrix with nine estimates of annual Chinook counts for each sector group of the directed whiting fisheries and the combined aggregate. The matrix shows a potential range of Chinook bycatch, based on the years in the time series that spans from the minimum bycatch rate applied to the minimum whiting catch, to the maximum bycatch rate applied to the maximum whiting catch, and all combinations in between. The results explore the uncertainty in expectations informed by this range of data years.

Ranges of Chinook bycatch for a more robust tribal fishery were projected using the same methodology as described in the preceding section for the 2008-2011 period. Because of the depth profile of the Quileute and Quinault U&A fishing areas, for comparison, for those tribal fisheries, we projected ranges of Chinook bycatch using both tribal shorebased and at-sea bycatch rates.

Stock composition estimates for whiting sectors

Chinook bycatch samples were obtained by NOAA’s At-Sea Hake Observer Program. We used conditional maximum likelihood genetic mixture modeling based on the Genetic Analysis of Pacific Salmon (GAPS) Microsatellite Baseline. Baseline reference populations were aggregated into reporting groups according to membership (genetic affinity) in ESUs (Appendix 1).

Stock composition by Chinook ESU within each management area was applied to the coastwide distribution of Chinook bycatch to assess ESU specific impacts in the groundfish fisheries under varying levels of bycatch. Stock composition by Chinook ESU was determined for each year during 2009-2015 for the at-sea whiting fishery and for 2013 and 2014 in the shorebased fishery based on genetic samples taken in those years within each of the management areas. Sample sizes were not adequate to assess stock composition by depth. Sampling protocols and more detailed explanations of the results are described in detail in several previous reports (Al-Humaidhi et al. 2012, Moran et al. 2009, Moran and Tuttle 2015, Somers et al. 2014). The proportional contributions were then averaged across years for each ESU within each management area for each of the at-sea and shorebased fisheries. Proportional contributions were calculated for the overall time series (2009-2015) and for the years when the fishery was further north (2009-2011), representing the distribution of the bycatch in years with a meaningful tribal component.

For stock composition estimates for the whiting fishery assuming resumption of a robust tribal fishery with broader tribal participation, we first examined the likely stock composition of the tribal component alone. For the Makah fishery, we used stock composition from samples collected in that fishery during 2008-2011 and assumed that fishing would occur in the at-sea and shorebased sectors as it has to date. For the Quinault and Quileute fisheries, where we have no historical data, we used the mean latitude model (Appendix 1) to estimate stock composition based on the central latitude of the respective U&A fishing areas. We compared those results to the stock composition of the full whiting fleet in 2009-2011 when the fishery was further north (text box and Figure 8). The compositions were similar although as expected from the broader fishing distribution of the fishery, the full fleet composition showed a higher contribution of southern ESUs.

Stock Composition 2009-2011		
Chinook ESU	***Tribal only***	***Full fleet***
BC/AK	*36%*	*32%*
Puget Sound	*18%*	*18%*
Washington Coast	*1%*	*1%*
Columbia River	*27%*	*25%*
Oregon Coast	*14%*	*15%*
California	*4%*	*9%*

Next we considered the issues related to Chinook bycatch and whiting catch. Chinook bycatch, whiting allocations and whiting catch have increased in recent years (Table 2). We cannot say whether that has been a function of the distribution of the fleet or ocean conditions that affected resource abundance and availability (i.e., the same pattern would have occurred even if whiting had been distributed further north). However, we observe similar patterns of higher Chinook bycatch and whiting catches in the mid-2000s (Table 2) when whiting were distributed further north (Figure 7) so conclude these patterns could occur in the future regardless of the pattern in whiting distribution. Potential higher bycatch resulting from broader tribal participation would be consistent with the range of bycatch observed over the 2009-2015 period. We previously noted the confounding effects of reapportionment of whiting allocation on Chinook bycatch among tribal and non-tribal sectors. Therefore, given these Chinook bycatch considerations and the similarity in stock composition between the tribal and full fleet fisheries in the 2009-2011 period, we decided the appropriate approach was to use stock composition from the 2009-2011 period to represent resumption of a robust tribal fishery with broader tribal participation in the context of a full fleet fishery.

Stock composition by ESU was then applied to the bycatch results for the 2009-2015 and 2009-2011 periods. The annual mean, minimum and maximum Chinook bycatch by fishery was distributed among the management areas and sectors based on the coastwide distribution of bycatch. Next, the resulting distribution of Chinook bycatch was multiplied by the contribution of each ESU within each management area and sector to determine the magnitude and distribution of impacts by Chinook ESU. Finally the results were combined into an aggregate estimate across sectors by management area for each of the two time periods.

4.1.1.3 Results

Projected Chinook bycatch for whiting sectors

Table 4c shows a range of projected total Chinook counts for the aggregate whiting fishery (CP + MS + Tribal+ shorebased IFQ + shorebased Tribal), using bycatch rate and retained whiting catch as axes of uncertainty, in nine combinations, based on historical means, minima and maxima. Data used were those identified in the Council motion; 2009-2015 for at-sea sectors, and 2011-2014 for shorebased sectors. Chinook bycatch rates were calculated as count per mt of retained whiting catch, and whiting catch is reported as mt (retained).

Although the mean annual projected value for Chinook catch over the analysis period is well within the 11,000 fish threshold under consideration for the whiting fishery, interannual variability has been considerable over this time span, and the 11,000 fish threshold has been exceeded during this period. However, most of that variability can be attributed to 2014, which could be considered an outlier, given that estimates for the previous three years were between 6,000 and 8,600 and that current estimates for 2015 are nearly 4,000 fish. As noted previously, the tribal fishery overall has been very low in recent years (2012-2014), and although much of the uncaught tribal fish is reapportioned to the commercial non-tribal sectors in the fall of each year, it can still lead to some bias in our projections. Also, since tribal catch typically occurs in the summer and further north than the bulk of the non-tribal catch (which both tend to lead to higher Chinook bycatch), if the tribal fishery was to resume at former levels, the Chinook bycatch in all aggregated whiting fisheries could be somewhat higher than those average results.

Harvest levels of whiting can vary according to the Total Allowable Catch (TAC), as well as ocean conditions, distribution and schooling behavior of the fish. Like any species, harvest levels also vary according to market conditions and prices in this and competing fisheries. Annual retained catch of whiting among sectors is shown in Figure 9B. This plot also highlights catch differences among sectors as well as interannual variation for each sector among years. Highest annual catch of whiting tends to be by the shorebased IFQ, followed by the CP, MS, and tribal sectors, with the CP sector showing the largest interannual variation in whiting catch.

Chinook bycatch levels vary considerably among years, although the causes are not as easy to attribute. Annual bycatch rates for whiting sectors, over the years specified, are shown in Figure 9A, which highlights bycatch differences among sectors and shows interannual variation for each sector among years. Median Chinook bycatch rates tend to be somewhat higher in the shorebased fisheries, and the shorebased tribal sector shows a large amount of interannual variation.

Figure 10 illustrates variation in annual Chinook bycatch rates among sectors and depth strata. There is a general trend of higher bycatch rate and larger variability in bycatch rate for shallower depths, where extreme catch events (ECEs) tend to occur. One particularly large annual bycatch rate datum needed to be omitted (in the figure only) in order to visualize the rest of the data, since it produced variation well out of scale of all the rest. It was from the MS sector in the 0-100 fm depth stratum, and resulted from one or more ECEs. Although ECE is a subjective term, one could use the following statistics as a guide. For example, in the CP sector, considering all hauls from 2009-2015, we saw that in 25 percent of hauls, 8 or more Chinook were taken. Numbers as high as 57 Chinook were taken only 2.5 percent of the time, and in only one half of one percent of hauls, were 158 or more Chinook taken, among all years. The latter two metrics may give a good indication of levels that could be considered ECEs. The case in the MS sector was similar, in that 6 or more fish were taken in the top 25 percent of hauls. In only 2.5 percent of hauls were 38 or more Chinook taken, and in only 0.5 percent of the time were greater than 136 Chinook caught. For the commercial shorebased sector, which takes much smaller hauls, but many times more of them, 25 percent of the hauls had more than 1 fish taken, 16 or more Chinook were taken in the top 2.5 percent of hauls, and 55 or more fish were taken in the top 0.5 percent of hauls. So in the at-sea sectors, an ECE could be on the order of more than 150 Chinook, while in the shorebased whiting sector an ECE might be considered something larger than 50 Chinook within one haul. This information suggests that a small number of hauls can account for a disproportionate amount of Chinook bycatch and that these events are more likely to occur in shallower depths. Analysis reported by WDFW indicates the number of Chinook/haul has increased in the at-sea sectors since 2011 (WDFW 2016).

Figure 11 and Table 4 show the average proportional distribution of Chinook catch along the coast by whiting fishery sector group, among depth and area strata. Note that these are not bycatch rates, rather they are mean Chinook counts among years, distributed among depth and area strata and converted to proportions. They show that the bulk of the Chinook bycatch tends to occur in the area between Cape Falcon and Cape Blanco, in the 150 to 200 fm depth zone, and that the two adjoining depths zones in that same area are responsible for slightly lower Chinook catch, but these three strata (where the bulk of whiting fishing occurs) make up substantially higher proportions of the Chinook bycatch than the other strata. They also show less interannual variation than other strata, demonstrating that this pattern is consistent over the years examined. It is worth noting that the Ocean Salmon Conservation Zone has been implemented when Chinook bycatch in the whiting fishery has approached or exceeded the 11,000 bycatch threshold. The intent of the constraint is to move whiting fishing (targeting of whiting) offshore of a boundary line approximating the 100 fm (183-m) depth contour to reduce Chinook salmon bycatch rates. The data available in 2005 at the time the regulation was developed indicated that incidental bycatch rates of Chinook salmon by vessels targeting Pacific whiting tended to be higher in the nearshore areas which could be reflective of the offshore-inshore distribution of whiting and salmon in individual years. Given the results of this bycatch analysis, it may be worth reviewing the efficacy of the regulation to ensure that it continues to achieve its intent or needs revision.

Different patterns of Chinook bycatch and bycatch rates are evident between the shorebased and at-sea sectors of the fishery. First, the shorebased sector shows higher Chinook bycatch rates overall. This feature is explicit from Table 4, yet somewhat elusive from Figure 10, due to the scale of variability therein. The majority of Chinook bycatch by the at-sea sector occurs in the area between Cape Falcon and Cape Blanco, and deeper than 200 fms. The shorebased sector also shows the highest proportion of its Chinook bycatch between Cape Falcon and Cape Blanco, but at shallower depths. This likely reflects its tendency to transit to and from shore (for processing) more frequently than the at-sea vessels, which influences fuel costs and travel time, leading to their optimal depth of fishing being in shallower areas.

The shorebased sector also shows notably high bycatch of Chinook in the area north of Cape Falcon, shallower than 100 fms (Figure 11); this feature is conspicuously absent from the at-sea component of the fishery. Comparing the standard deviations relative to the mean proportions (coefficient of variation) in Table 4, we see that the interannual variability in the proportion of Chinook catch tends to be highest in the area north of Cape Falcon, in depths less than 150 fms for both the at-sea and shorebased components, potentially due to extreme catch events in shallower waters.

Table 4a. 4b. 4c. Range of projected total Chinook counts for the at-sea and shorebased whiting fisheries (at-sea = CP + MS + Tribal; shorebased = IFQ + Tribal), using bycatch rate and retained whiting catch for each fishery separately, as axes of uncertainty, in nine combinations each, based on historical means, minima and maxima. Data used were those identified in the Council motion; 2009-2015 for at-sea sectors, and 2011-2014 for shorebased sectors. Chinook bycatch rates were calculated as count per mt of retained whiting catch, and whiting catch is reported as mt (retained). Sum estimates among the two components span a slightly wider range than when estimated in aggregate.

a. At-sea whiting

Chinook bycatch rates (x)		0.013	0.028	0.045
Projected whiting catch (y)		Minimum	Mean	Maximum
72,239 mt	Minimum	928	2,026	3,273
112,906 mt	Mean	1,451	3,167	5,115
164,963 mt	Maximum	2,120	4,627	7,473

b. Shorebased whiting

Chinook bycatch rates (x)		0.022	0.041	0.068
Projected whiting catch (y)		Minimum	Mean	Maximum
65,892 mt	Minimum	1,455	2,734	4,463
92,121 mt	Mean	2,034	3,822	6,239
102,073 mt	Maximum	2,254	4,234	6,913

c. Sum at-sea and shorebased (a + b).

Sum projected whiting catch (y)		**Sum range of projected Chinook bycatch (a + b)**		
138,131	Minimum	2,383	4,760	7,736
205,027	Mean	3,485	6,989	11,354
267,036	Maximum	4,374	8,861	14,386

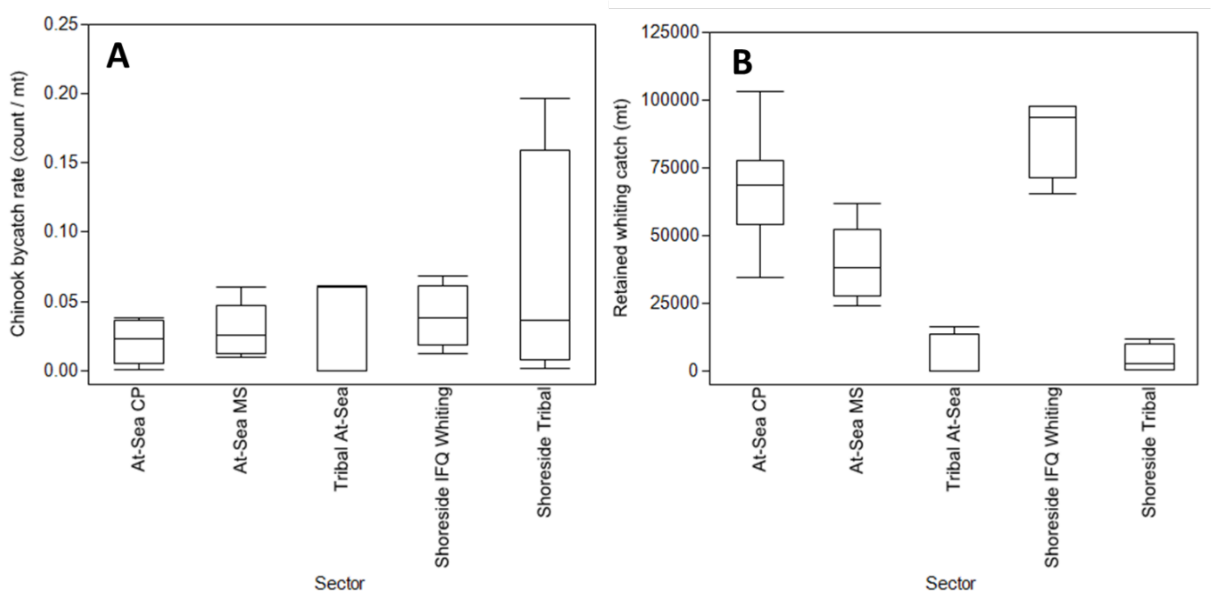


Figure 9. Box plot of Chinook bycatch rates (Panel A, count per mt retained whiting), and retained whiting catch (Panel B, mt) for whiting sectors. Data used were those identified in the Council motion; 2009-2015 for at-sea sectors, and 2011-2014 for shorebased sectors. Chart follows standard box-plot convention: midline = median, box ends = first and third quartiles, whiskers = 1.5*interquartile range, dots = outliers beyond whiskers.

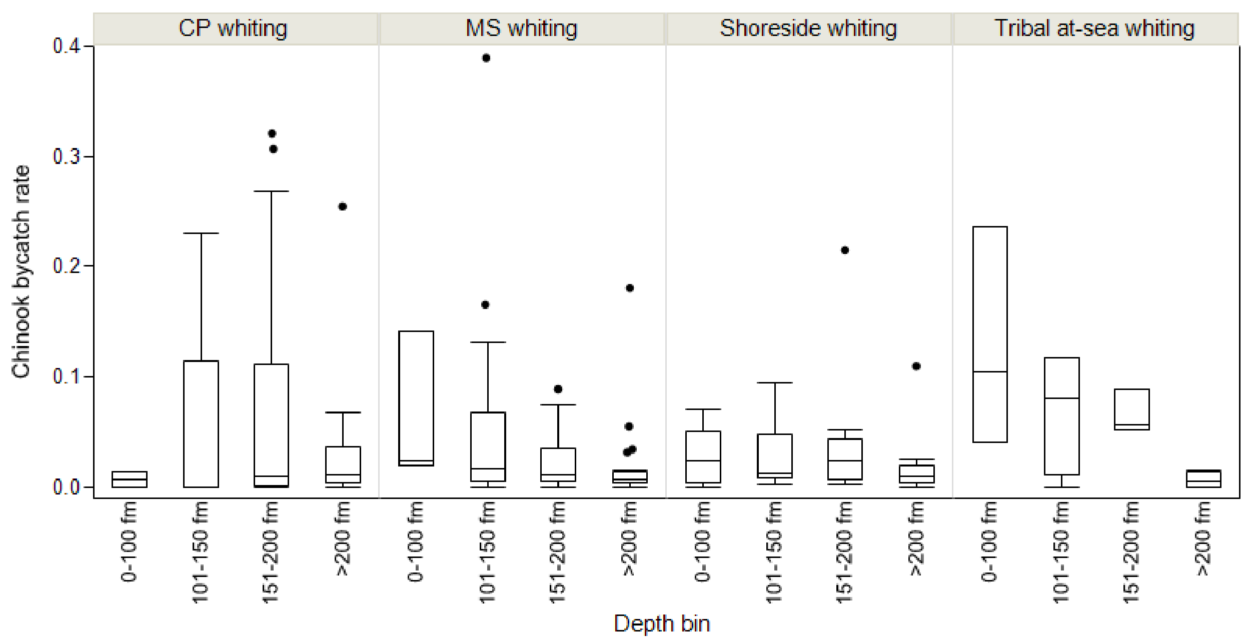
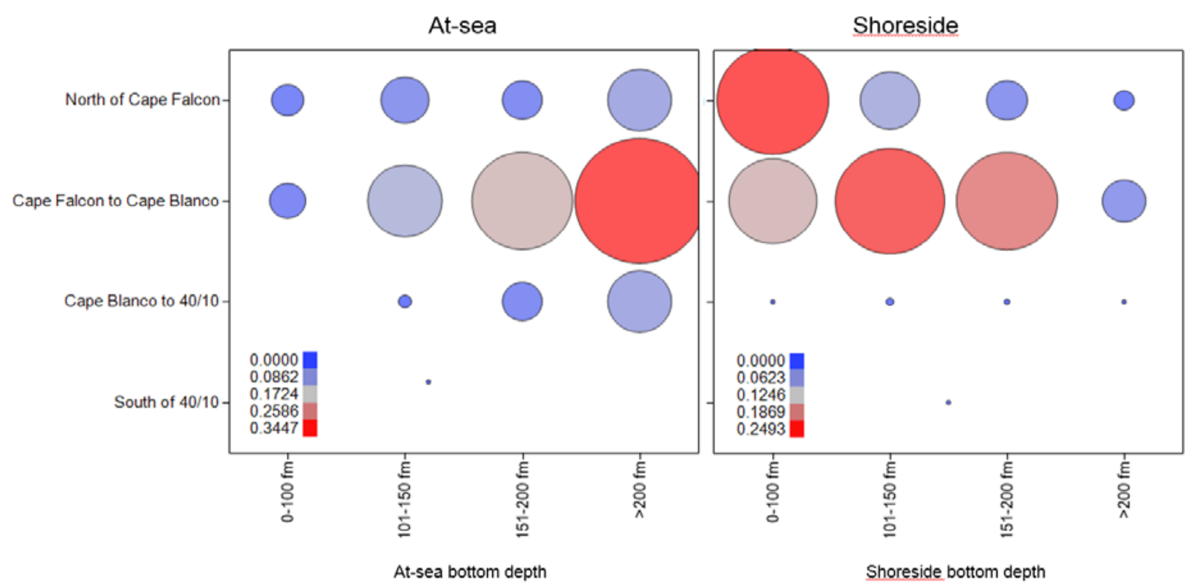


Figure 10. Box plot of Chinook bycatch rates (count per mt retained whiting), and retained whiting catch by depth strata for whiting sectors. Data used were those identified in the Council motion; 2009-2015 for at-sea sectors, and 2011-2014 for shorebased sectors. Chart follows standard box-plot convention: midline = median, box ends = first and third quartiles, whiskers = 1.5*interquartile range, dots = outliers beyond whiskers.

Table 5. Proportional coastwide distribution of Chinook catch in the at-sea and shoreside whiting components of the whiting fishery, among depth and area strata.

Management area	Bottom depth	At-sea		Shoreside	
		Mean proportion	Standard deviation	Mean proportion	Standard deviation
North of Cape Falcon	0-100 fm	0.0213	0.0876	0.2493	0.3318
	101-150 fm	0.0473	0.1612	0.0706	0.1431
	151-200 fm	0.0327	0.0960	0.0333	0.0504
	>200 fm	0.0837	0.1025	0.0081	0.0106
Cape Falcon to Cape Blanco	0-100 fm	0.0269	0.0298	0.1548	0.1803
	101-150 fm	0.1143	0.1103	0.2389	0.0867
	151-200 fm	0.2090	0.1653	0.2047	0.1213
	>200 fm	0.3447	0.2339	0.0381	0.0174
Cape Blanco to 40/10	0-100 fm	0.0000	0.0000	0.0000	0.0000
	101-150 fm	0.0035	0.0184	0.0011	0.0012
	151-200 fm	0.0327	0.0469	0.0006	0.0006
	>200 fm	0.0839	0.1032	0.0004	0.0004
South of 40/10	0-100 fm	0.0000	0.0000	0.0000	0.0000
	101-150 fm	0.0000	0.0000	0.0000	0.0000
	151-200 fm	0.0000	0.0000	0.0000	0.0000
	>200 fm	0.0000	0.0000	0.0000	0.0000

Figure 11. Heat/bubble map showing annual average proportional distribution of Chinook bycatch along the coast in the whiting fishery, among depth and area strata, within at-sea, and shorebased components. The plot illustrates the distribution of Chinook bycatch within each component, and although color/size scales are similar between the two, they are not equal. Data include 2009-2015 for at-sea sectors, and 2011-2014 for shorebased sectors as per the Council motion.



Projected Chinook bycatch for the tribal fishery

Tables 6a. and 6b. show ranges of projected Chinook bycatch for combined tribal whiting fisheries, assuming both a resumption of a viable tribal fishery typical of the years from 2008-2011, and the addition of potential Quinault and Quileute fisheries. Based on the most likely fishing pattern expressed by the tribes, using shorebased bycatch rates for the Quileute and Quinault fisheries, the potential impact of the proposed tribal effort could be to add an annual bycatch of 1,844 Chinook salmon on average to the overall whiting fishery. Simply using minimum and maximum annual rates as bounds, analysis suggests that such a fishery would result in a bycatch of between approximately 627 and 4,539 Chinook.

The tribal estimates presented here are not additive with the full footprint estimates, since additional commercial sector opportunity due to reapportionment cannot effectively be disentangled. Addition of tribal estimates from Table 6 to those in Table 4c would overestimate bycatch at the multisector level, even after subtracting tribal Chinook bycatch estimates during those years that are currently included in Table 4c for the years in which the fishery occurred. In addition, because reapportioned fish may be harvested coastwide and tend to be harvested after September 15th, they do not necessarily reflect the same salmon interactions as seen with fish caught in the tribal U&A fishing areas.

Chinook bycatch was within the ranges shown in Table 4c in past years when the fishery was further north (Table 3) and included a more robust tribal fishery. The ranges in Table 4c include the previous tribal fishery for some of the years represented in that range. Should the Quileute and Quinault tribes participate, we anticipate that any reapportionment at that time would reflect that broader tribal participation but that Table 4c would continue to reflect a reasonable range of expected Chinook bycatch. This is particularly true in that the bycatch in most years is well below the maximums in Table 4c. Therefore, because of the overriding effect of reapportionment, we will rely on the Chinook bycatch estimates in Table 4c to reflect both the footprint and increased tribal participation scenarios and apply the appropriate stock composition as described above to assess impacts to individual ESUs.

Table 6a.-6b. Ranges of projected Chinook bycatch for combined tribal whiting fisheries, assuming <u>both</u> a resumption of viable tribal fishery typical of the years from 2008-2011, <u>and</u> active Quinault and Quileute fisheries.

a. Assumes combined shorebased and at-sea bycatch rates for Makah fisheries, **and shorebased bycatch rates for potential Quileute and Quinault fisheries.**

Bycatch rate (x)	Makah fishery	0.022	0.051	0.096
	Quileute/Quinault	0.014	0.060	0.148
Combined, expected whiting catch for Makah, Quileute and Quinault (mt)		Minimum	Mean	Maximum
34,234	Minimum	627	1,669	3,607
38,696	Mean	724	1,844	3,911
47,907	Maximum	925	2,204	4,539

b. Assumes combined bycatch rates for Makah fisheries, **and at-sea bycatch rates for Quileute and Quinault fisheries.**

Bycatch rate (x)	Makah fishery	0.022	0.051	0.096
	Quileute/Quinault	0.011	0.043	0.061
Combined, expected whiting catch for Makah, Quileute and Quinault (mt)		Minimum	Mean	Maximum
34,234	Minimum	566	1,394	2,222
38,696	Mean	663	1,568	2,526
47,907	Maximum	864	1,929	3,154

Stock composition estimates

Figure 12 summarizes the estimated range of magnitude and distribution of Chinook bycatch by Chinook ESU and management area under the current geographic and northern footprint scenarios. The relative importance of the level of impact depends on the status of the ESU. As described earlier, stock composition varies by management area. Most of the bycatch occurs from Cape Falcon to Cape Blanco where the stock composition is diverse but dominated by California and Oregon stocks. Impacts to stocks north of the Oregon Coast in the area South of Cape Blanco are extremely low.

The current geographic footprint includes a significant southward shift in the fleet in recent years. Under this scenario 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. Under this scenario listed Chinook ESUs comprise 13 percent of the bycatch, primarily Puget Sound, California Coastal and the Columbia River ESUs. 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. Under this scenario, estimated bycatch for the other ESUs is generally 500 or less Chinook per year.

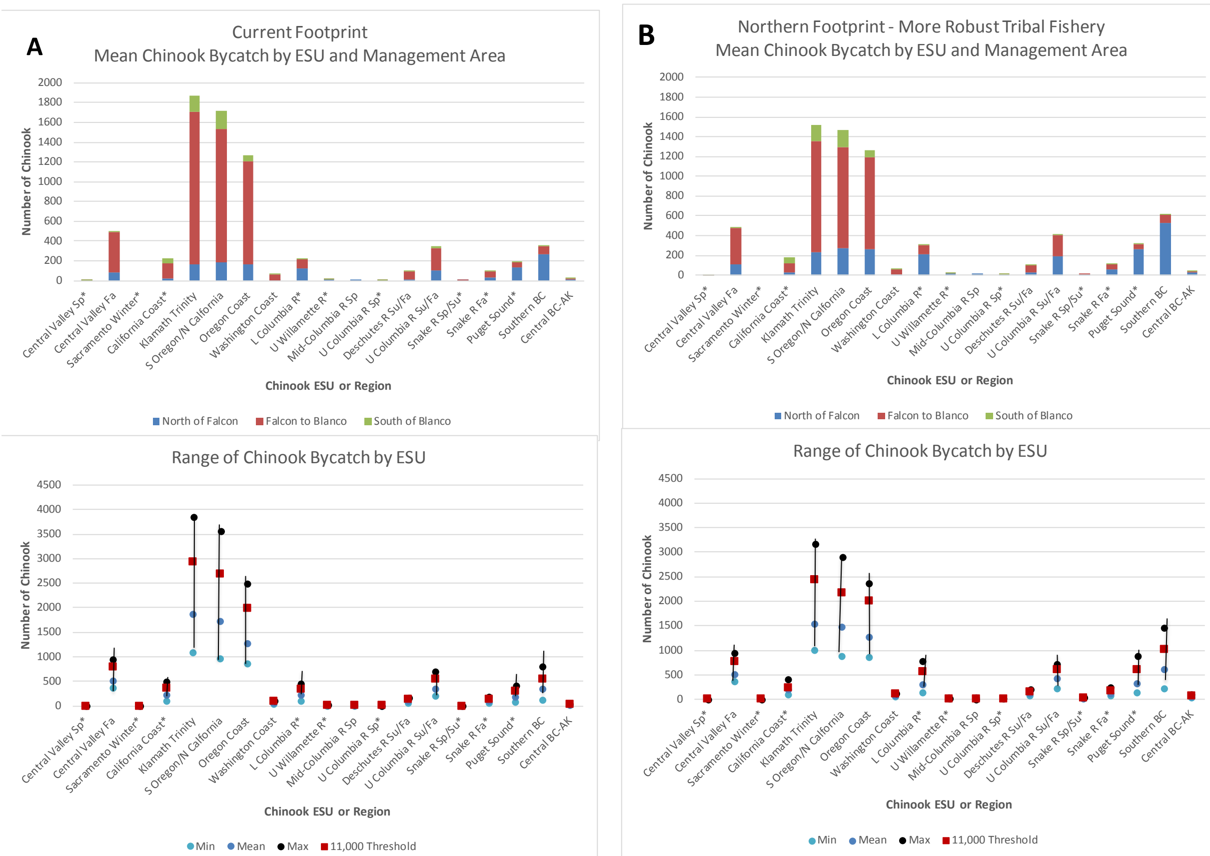


Figure 12. Plots of estimated bycatch in numbers of Chinook and distribution in the whiting fishery based on the mean and range of annual bycatch in Table 4c adjusted to reflect stock composition for the Current Geographical Footprint (Panel A), and Northern Footprint reflecting a more robust tribal fishery (Panel B). The upper figures show estimated mean annual bycatch by ESU and management area. The bottom figures show the range of estimated annual impacts by ESU including impacts associated with a 11,000 bycatch threshold. Listed ESUs are starred.

The northern footprint reflects a return to a northerly distribution of the fleet and a more robust tribal fishery as described in previous sections. Under a more northern fishery, 44 percent of the bycatch is expected to come from stocks north of the Oregon Coast, primarily British Columbia (16%), Puget Sound (9%) and the Columbia River (18%). Under this scenario listed Chinook ESUs comprise 21 percent of the bycatch, primarily from Puget Sound and Lower Columbia River ESUs. The magnitude and range of expected annual bycatch is distributed across a greater number of ESUs than under the current geographic footprint. As expected, annual bycatch is greater for northern stocks and 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. Impacts to Central Valley fall, Lower Columbia River, Upper Columbia River spring/summer, Puget Sound and British Columbia stocks are highly dependent on the anticipated level of overall bycatch, ranging from several hundred to

1,500 Chinook for these ESUs. Estimated annual bycatch for the other ESUs remains similar to the current footprint; generally well under 500 Chinook per year.

4.1.2 Conclusions

The analysis indicates what the range of Chinook bycatch could be in any given year and is consistent with previous assessments. Bycatch of Chinook relative to the amount of whiting 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 particularly in specific circumstances. This has more often been the case since 2011. The whiting fishery is likely to approach the 11,000 occasionally under most whiting TACs examined in the analysis and periodically exceed it when the whiting TAC is at historic highs or under anomalous environmental conditions. The analysis also indicates 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. As noted previously, the tribal fishery overall whiting catch and bycatch has been very low in recent years. If the tribal fishery was to resume at former levels, Chinook bycatch in overall whiting fisheries could be somewhat higher than the average results. We see a general trend of higher bycatch rate and larger variability in bycatch rate for shallower depths, where extreme catch events (ECEs) tend to occur. Increased ACLs beginning in 2017 for some species like canary and widow rockfish could result in more fishing inside 125 fm by the whiting fleet and therefore result in higher Chinook bycatch. Regulatory changes under consideration for 2017 that permit quota transfer of IFQ darkblotched to at-sea sectors may allow the at-sea sector to spend more time on the slope if needed to avoid species like salmon (WDFW 2016).

The stock composition of Chinook bycatch and the magnitude of impacts to individual ESUs is primarily influenced by location of the fleet. 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. Annual Chinook bycatch for these stocks is highly variable with the upper end of the range influenced by high catch events. Bycatch of listed ESUs comprises a relatively minor component of the bycatch in this situation. Bycatch in a more northerly distribution of the fishery reflects impacts to a wider number of ESUs with a greater contribution of northern stocks. If this pattern resumes, a broader diversity of stocks would contribute to the bycatch including British Columbia, Puget Sound and the Columbia River as well as California stocks. The impacts to listed ESUs would also increase from a minor to moderate component of the bycatch although the relative importance of the level of impact depends on the status of the individual ESU.

4.2 Whiting Fishery - Scenario 1B - resumption of at-sea processing south of 42º N. Latitude

Assume that the at-sea whiting fishery's processing footprint is expanded south of 42º North Latitude, and that ten percent of the at-sea catch, using recent optimum yields, is harvested in the southern area.

This alternative is modeled similarly to Scenario 1A except the whiting fishery's at-sea processing geographic footprint is expanded south of 42° N. Latitude and ten percent of the at-sea catch, using the most recent 5-year average, is harvested south of 42° N. Latitude. The Council motion specified a cap of ten percent. At-sea processing has been prohibited south of 42° N. Latitude since 1992 largely based on concerns regarding bycatch of Klamath Chinook salmon, high bycatch rates and how quickly Chinook bycatch accumulated (78 FR 14663, April 22, 1992, Appendix C). At that time, the Council determined that the regulations would minimize the impact of the Pacific whiting fishery on depressed Klamath River and Sacramento Winter run Chinook stocks without undue hardship to the Pacific whiting industry to catch its whiting allocation. Additional background can be found in the Environmental Assessment associated with the regulatory action (PFMC and NMFS 1993). During Council discussion, some members requested that we evaluate a sub-cap amount that would apply regionally just for the California Klamath Management Zone from 42º to 40º 10' N. Latitude and take into consideration the existing midwater closure shoreward of 100 fms in the Eureka area. All Pacific whiting fishing is currently prohibited within the nearshore Klamath area and targeted harvest of Pacific whiting is restricted shoreward of 100 fms in the Eureka area all year. The Council has not proposed removing those prohibitions so we assumed they would remain in place. However, because they were not in place prior to the prohibition, the effects of the regulations on not assessed in our analysis which relies on data prior to 1992.

Examination of the available bycatch information from when a whiting fishery previously occurred south of 42° N. Latitude indicates that a bycatch amount less than ten percent of the at-sea catch could be difficult to manage in real time since most of the bycatch occurred in a low number of hauls (10%) (Table 7) and such a sub-cap could be quickly exceeded. At the time the prohibition was adopted, the regulations noted that within the Eureka Subarea (between 43° and 40°30' N. Latitude), 50 percent of the Chinook bycatch in the at-sea whiting fishery was taken in eight of the 596 hauls observed by NOAA Fisheries observers (78 FR 14664, April 22, 1992). The amount of Chinook bycatch in those few hauls was greater than the upper end of the total Chinook bycatch anticipated under the Council scenario (e.g., 1,300). In addition, the historical data reflected in our analysis indicates that the whiting fishery during 1988-1991 occurred almost exclusively between 42º to 40º 10' N. Latitude and bycatch rates were typically higher south of 42° N. Latitude than in the northern areas.

Table 7. Frequency of Chinook bycatch in whiting hauls south of 42° N. Latitude during 1986-1991.

YEAR	All hauls south of 42	Sampled hauls south of 42	% of all hauls sampled	Sampled hauls south of 42 with Chinook	% of sampled hauls with Chinook	% Chinook in top 25% of hauls	% Chinook in top 10% of hauls
Foreign & JV							
1986	546	403	74%	153	38%	89%	70%
1987	0	0	0%	0	0%	0%	0%
1988	1504	1067	71%	282	26%	72%	50%
1989	3733	2380	64%	407	17%	74%	54%
1990	1349	718	53%	166	23%	86%	68%
Domestic							
1991						74%	54%

4.2.1 Approach

The analysis required two steps to examine the potential impact on Chinook salmon of ending the prohibition on at-sea processing in the area south of 42º N. Latitude. First, a range of Chinook bycatch rates in the at-sea sector was calculated from representative data prior to implementation of the prohibition. Those rates were applied to ten percent of the observed total at-sea whiting harvest based on the average of the past 5 years (2010-2014). Because the prohibition has been in place since April of 1992, the only available data are based on hauls made south of 42º N. Latitude, in the foreign and joint-venture fishery from 1988 to 1990, and in the domestic fishery in 1991. Southern area bycatch rates were calculated May-December to reflect current whiting regulations and fishery behavior. This enabled us to produce a matrix of Chinook bycatch projections for the southern area. We also note that the fishery in those years reflect restrictions on foreign processors to fish farther off shore (i.e., 12 miles) than domestic vessels; whereas, in the mothership sector, the domestic catcher vessels could go into shallower waters. Finally, we combined the at-sea and shorebased Chinook bycatch estimates coastwide to compare against the 11,000 Chinook bycatch threshold for the whiting fishery which comprises both the at-sea and shorebased sectors.

4.2.2 Methods

4.2.2.1 Projected Chinook Bycatch

Similar to Scenario 1A, Chinook bycatch estimates were made spanning two major axes of uncertainty, whiting retained catch and Chinook salmon bycatch rate. In order to estimate bycatch rates south of 42º N. Latitude, we used data from the 1991 domestic at-sea whiting fishery, together with data from 1988 through 1990 in the foreign and joint venture at-sea whiting fishery; together, these represent the most recent and reliable fishery data available, from years in which at-sea processing was allowed south of 42º N. Latitude. The fishery had very high coverage during this period with one observer on every processing vessel. Data from prior years reflected small sample sizes, lack of observer coverage and high variability among vessels. At-sea processing south of 42º N. Latitude has been prohibited since 1992, due in large part to concerns over high bycatch of Chinook salmon (78 FR 14663, April 22, 1992) in the area. The data year 1986, which was a high outlier in terms of Chinook bycatch rate (0.884 Chinook/mt whiting), was excluded from the analysis due to several factors. Depth was only recorded on a small minority of hauls, the remaining hauls showed an unusually shallow mean depth (where bycatch rates are typically higher), and the mean bycatch rate was inexplicably high. The bycatch rate from the 1986 data was more than ten times higher than the other years that we included. Together, these factors made data from 1986 appear unreliable. Even if the depth range is correct, it is unrepresentative of the current fishery. There was no recorded catch in the southern area in 1987. Tribal fisheries would be very limited under this scenario because it assumes whiting would be distributed in southern areas outside tribal U&A fishing areas.

We also examined the level of fishing effort during the period of analysis compared with recent years on a coastwide basis to see whether there might be an effect on bycatch rates (Table 8). A reduction in the number of hauls might indicate less actual fishing time (i.e., nets in the water) and therefore lower Chinook bycatch rates than during the analysis of the early period. Although the number of hauls were substantially higher in the earlier period, the amount of whiting caught per haul is much higher in recent years and average haul duration has not decreased (pers. comm. J. Doerpinghaus). This pattern may reflect great efficiencies in fishery operation. We have not found a relationship between haul duration and Chinook bycatch rate (pers. comm. J. Doerpinghaus). Coastwide, annual Chinook bycatch in the at-sea fishery during the early 1990s is similar to bycatch since 2011. The data do not support a shift in the variability of Chinook bycatch with the change in effort.

	YEAR	Haul count coastwide	AvgOfCATCH_WEIGHT	MinOfCATCH_WEIGHT	MaxOfCATCH_WEIGHT
Foreign	1986	8075	17.95	0.001	124.23
	1987	7767	19.22	0.001	68.71
	1988	6889	21.73	0.01	68.91
	1989	7194	27.75	0.29	92.36
	1990	5385	30.67	0.5	81.91
domestic	1991	5160	39.91	0.19	100.00
	2011	2782	43.76	0.24	127.37
	2012	1972	45.71	0.02	122.75
	2013	2688	48.34	0.14	148.04
	2014	2871	55.28	0.01	146.48

Table 8. Comparison of the number of hauls coastwide by the whiting fleet by year and weight (mt) of whiting in mt per haul. The table compares data during the time period of analysis and for recent years.

4.2.2.2 Stock composition estimates

We characterized the relationship between stock composition of Chinook ESUs and latitudinal distribution of bycatch in the U.S. West Coast, at-sea Pacific whiting fishery to determine the likely stock composition of Chinook bycatch if the current restriction on processing Pacific whiting south of 42° N. Latitude was modified as described above. Our previous observation of genetic stock composition between 2008 and 2014 showed strong differences that could be attributed to the latitudinal distribution of bycatch, as expressed by mean latitude of all bycatch in a given year. Linear regression was used to model the relationship between mean latitude (x) and proportional contribution of each ESU (y) to coastwide bycatch in a given year as described in detail in Appendix B. Because the model as applied in this case used the mean latitude of the coastwide whiting fleet, we were unable to assess the stock composition of the bycatch south of 42° N. Latitude separately from that of the northern area. However a comparison with the results of Scenario 1A illustrates the overall differences in stock composition.

The trend in bycatch since 2011 has been toward lower mean latitudes and increasing proportions of southern stocks. We examined two different latitudinal distributions, illustrated in Figure 13, to infer the likely stock composition of Chinook salmon bycatch if the latitude restriction is rescinded. Our favored estimate used a projected mean latitude of 42° N. Latitude for the distribution of annual bycatch, not because of the restriction itself, but rather based on a projection of the current trend, which again showed a steady southward trend since 2011. An annual bycatch distribution with mean 42° N. Latitude is actually further south than observed in the at-sea fishery, but is nevertheless a reasonable projection of the current trend. Because of the southward movement of the fleet, this projected value seems more likely than a latitude of 43.45° N. Latitude, which was based on the mean distribution from 2010 to 2014, shifted such that 10% fell south of 42° N. Latitude.

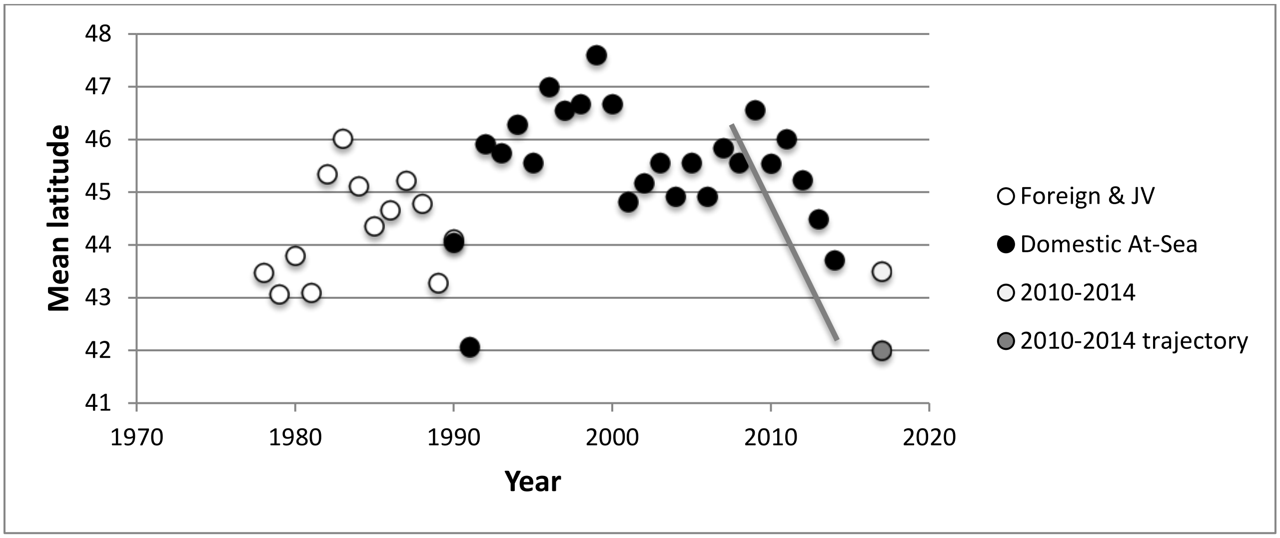


Figure 13. Latitudinal distribution of annual bycatch has moved southward since 2011. Two gray points on the far right represent different anticipated distributions for bycatch if the south of 42˚ N. Latitude restriction were rescinded. The "2010-2014" value used the latitudinal distribution for those years shifted south such that 10% fell south of 42˚ N. Latitude (Council request). The "2010-2014 trajectory" infers a mean latitude based on projection of the trend (gray line) over that 5-year period.

4.2.3 Results

4.2.3.1 Projected Chinook bycatch

Chinook bycatch projections are shown as numbers of Chinook in Tables 9a-9c. We produced revised Chinook bycatch estimates from Table 4a, with the range of whiting catch reduced by ten percent, to account for the portion which was assumed to be caught and processed south of 42º N. Latitude. Finally, we produced combined estimates for the at-sea component under the same conditions by summing the results in Table 9a with 9b. The resulting combined estimates are shown in Table 9c. Finally, we provide expected Chinook bycatch for the coastwide whiting fishery by adding the shorebased estimates from Table 4b to the bycatch estimates in Table 9c.

The data show substantially higher bycatch rates in the at-sea fishery for the area south of 42º N. Latitude, consistent with those that led to the prohibition. The mean annual bycatch rate of Chinook in the southern area was 2.5 times as high, at 0.078 Chinook/mt whiting, than the overall mean bycatch rate for the at-sea fishery from 2010 to 2014 (0.03 Chinook/mt whiting). The minimum annual bycatch rate south of 42º N. Latitude was 5.6 times higher, and the maximum was 2.5 times higher than the recent at-sea fishery.

Chinook bycatch overall was higher under this scenario when compared to the results for Scenario 1A (current footprint). Applying those higher southern bycatch rates to 10 percent of the combined area catch of whiting in the at-sea yielded a range of total projected Chinook catch (in numbers of fish) for the at-sea component which was between 15 and 44 percent higher (mean was 16 percent higher) than the results assuming that processing south of 42 were to remain prohibited. Including both the shorebased and at-sea sectors, the range of combined estimated Chinook bycatch increased by seven to 14 percent. The higher bycatch and bycatch rates under this scenario increase the likelihood that bycatch could exceed 11,000 Chinook.

Table 9. Ranges of projected total Chinook counts for the at-sea, non-tribal whiting sectors, assuming lifting of the prohibition on at-sea processing in the southern area. Bycatch rate and retained whiting catch (mt) were used as axes of uncertainty, in nine combinations each, based on historical means, minima and maxima from each data source (catch = 2010-14; bycatch rates = 1988-1991, see text). Chinook bycatch rates were calculated as count per mt of retained whiting catch, and whiting catch is reported as mt (retained). Southern area bycatch rates were calculated for May-December.

a. Chinook bycatch projections for the at-sea whiting component, south of 42° N. Latitude, assuming 10% of whiting is harvested in the southern area.

Chinook bycatch rates (x)		0.046	0.078	0.111
10% of total at-sea whiting catch (mt)(y)		Minimum	Mean	Maximum
12,024	Mean	549	938	1,339

b. Chinook bycatch projections for the at-sea whiting component, north of 42° N. Latitude, assuming 90% of whiting is harvested in the northern area.

Chinook bycatch rates (x)		0.008	0.031	0.045
90% of total at-sea whiting catch (mt)(y)		Minimum	Mean	Maximum
108,216	Mean	821	3,386	4,908

c. Chinook bycatch projections for the at-sea whiting component, *combined areas*, assuming 10% of whiting harvested south of 42° N. latitude.

100% of total at-sea whiting catch (mt)(y)		Sum cells from a. and b.		
120,240	Mean	1,370	4,323	6,247

d. Sum of bycatch projections for the *combined* at-sea and shorebased whiting sectors and *combined areas*, assuming 10% of whiting harvested south of 42° N. latitude.

100% of total at-sea whiting catch (mt)(y)		Sum mean cells from 9c. and 5b.		
212,361	Mean	3,404	8,145	12,486

4.2.3.2 Stock composition estimates

Figure 14 summarizes the range of Chinook bycatch by ESU based on the information in Table 9d. As discussed previously there is some uncertainty about what mean latitude to anticipate if the prohibition in processing south of 42º N. Latitude is lifted. However, the stock composition does not change dramatically since northern stocks do not appear in significant proportions at these southern latitudes. It is important to note that the relative importance of the level of impact depends on the status of the ESU.

If the prohibition on processing south of 42º N. Latitude were removed, our best estimate of Chinook salmon bycatch stock composition suggests there will be a further decrease in proportion of northern ESUs and a concomitant increase in particular southern ESUs, including Klamath and S. Oregon and N. California Coastal Chinook. Under this scenario over 90 percent of the impacts are expected to come from stocks in Oregon and California, primarily Klamath/Trinity (34%) and Southern Oregon/Northern California (28%). The ESUs from the Columbia River, Puget Sound and other coastal areas contribute three percent or less. Under this scenario, listed Chinook ESUs comprise eight percent of the bycatch, primarily from California Coast and Columbia River ESUs. The magnitude and range of expected annual bycatch is greatest for the Klamath, Northern California and Oregon Coastal ESUs, ranging from just over 500 to several thousand Chinook for each of these ESUs depending on the anticipated level of overall bycatch. Under this scenario, estimated bycatch for the other ESUs is generally well under 500 Chinook per year.

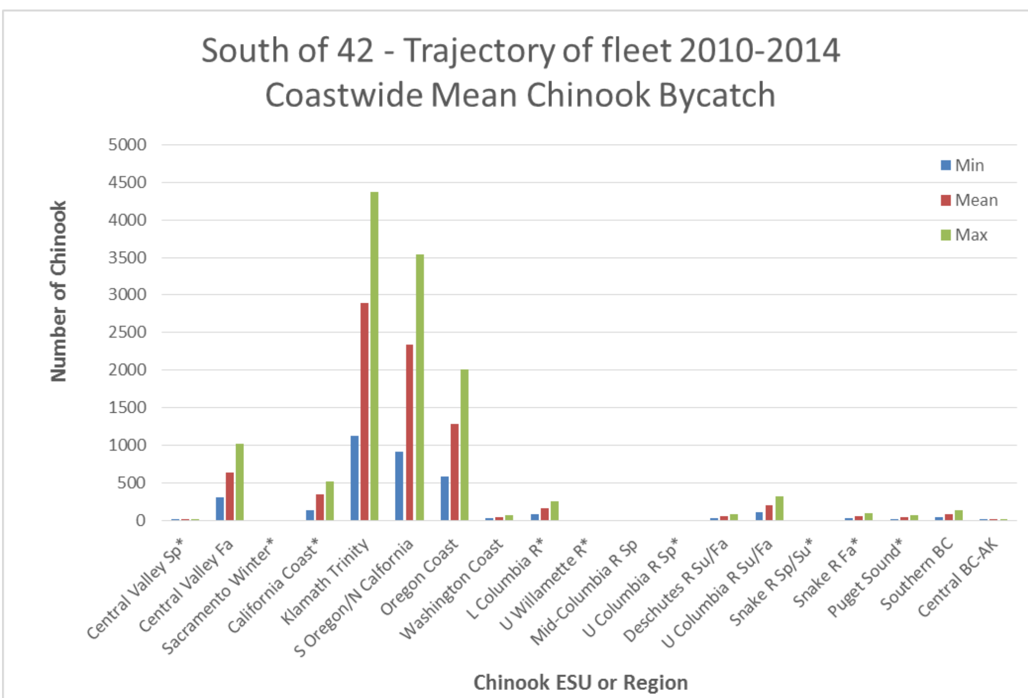


Figure 14. Estimated Chinook stock composition by ESU using the trajectory of mean latitude from 2010 – 2014.

4.3 Non-whiting components - Scenario 2 – variable bycatch thresholds

This scenario analyzes combinations of several Chinook bycatch levels with different assumptions about fishing structure and pattern for the non-whiting trawl components of the Individual Fisheries Quota (IFQ) Program in the groundfish fishery. The combinations range from a fishery similar to recent years that has been constrained to protect overfished rockfish species to historical fishing patterns with few constraints on the fishery. The analysis quantitatively characterizes the range of potential Chinook salmon bycatch and stock composition under two different scenarios of fishery conditions.

For the bottom trawl, LE/OA fixed gear, non-whiting midwater trawl, and recreational fisheries combined, we analyzed the following alternatives provided in the Council's September 2015 motion:

1) A 1,000 Chinook bycatch threshold, assuming the same fishing structure and pattern as the most recent 3 years.
2) A 4,500 Chinook bycatch threshold, assuming the 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 rockfish fishery conducted in a manner similar to historical patterns when such a fishery took place.

4.3.1 Approach

We structured the analysis as closely as possible around the motion and guidance from the Council, and consulted with some members of the Council's GMT. The two approaches described below were refined based on those subsequent discussion and consistent with the intent of the Council's motion and guidance:

A) Scenario 2A assumes conditions are similar to the most recent three years, including the geographic footprint of the fisheries, range of groundfish catch, and Chinook bycatch rates. The data used reflect the effect of regulations in place during this time period. The results are compared against the Chinook bycatch threshold of 1,000 fish per year. We 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 non-whiting component. We used the most recent years available for the midwater non-whiting component because of the trend in increasing Chinook bycatch rates in that component of the fishery.

   This scenario serves as a baseline reflecting the current magnitude of Chinook bycatch, given widespread expectations for increased effort over the next several years, resulting from significant increases to Annual Catch Limits (ACLs) and trawl allocations of canary, widow and darkblotched rockfish for 2017 and 2018 (81 FR 75266, October 28, 2016). We would expect a specific increase in shelf effort (depths less than 150 fm), in both the bottom trawl and midwater non-whiting trawl components, in pursuit of several target species as a result of removal of previous constraints implemented because of low canary rockfish allocations.

Therefore, this scenario explores what is likely the low end of fishery effort for non-whiting components of the IFQ fishery in the near future.

B) Scenario 2B assumes that the RCA is open to fishing, and that harvest levels and the geographic distribution of the fleet are similar to the most recent pre-RCA historical period. Focus primarily on comparison with Chinook bycatch thresholds of 4,500 and 9,000 fish per year. Assume that the burgeoning midwater rockfish component of the IFQ fishery expands to levels similar to those before the RCA and other restrictive groundfish management measures were implemented in the early 2000s, when canary rockfish had a much higher ACL and were not considered overfished, and widow and yellowtail rockfish were significant target species. We used data from the Enhanced Data Collection Project (EDCP) from 1995 through 1999, primarily for bycatch rates of Chinook, together with PacFIN landings of FMP groundfish over the same time period, to represent both bottom trawl, and midwater non-whiting components.

   This scenario mimics a vigorous response by both the bottom trawl and midwater rockfish components of the IFQ fishery to the new, high ACLs for several previously overfished rockfish species. It explores a high level of potential fishery effort for non-whiting IFQ components in the near future. As such, it may overestimate groundfish effort and Chinook bycatch, due to factors discussed in the methods and results sections (e.g. open RCA, era of high fleet capacity before the vessel buyback program was started), although it harnesses the best available data to inform this scenario.

Our general approach was to make a range of projections for Chinook bycatch for the bottom and midwater rockfish components, highlighting two main axes of uncertainty: Chinook bycatch rates (number of Chinook per metric ton of retained groundfish), and the amount of landed groundfish. We then estimated the average recent coastwide distribution of Chinook bycatch, among latitude (salmon management areas), depth and season strata, with uncertainty, so that bycatch estimates could be apportioned among different Chinook stocks. We assumed that the fixed gear component of the IFQ fishery and the recreational sector, which take almost no Chinook bycatch would remain similar to recent levels. Because Chinook bycatch from these sectors is minimal, it is not assessed separately. However, bycatch from these sectors would count toward the thresholds.

4.3.2 Methods

4.3.2.1 Projected Chinook Bycatch

We took a parsimonious and deterministic approach to estimate Chinook bycatch and variability for the near future, given the multiple components involved, sources of uncertainty and scenarios to explore. We targeted specific, short time periods for use as source data in the analysis, in order to best represent the range of potential conditions in the near future. We relied primarily on the Council guidance to identify those periods. Short time periods of two to four years warranted use of straightforward metrics to focus on variation in primary factors related to Chinook salmon bycatch, including depth, area, season, component and amount of groundfish landed (indicative of effort). The year was divided into two seasons, with winter as November 1 to April 30, and summer as May 1 to October 31 to reflect substantial difference in bycatch rates and fishing locations in the two seasons. Estimates reflect stratified combinations of mean, minimum and maximum groundfish landings and Chinook bycatch rates over the time periods used. A stochastic model-based approach was not generally feasible, given the fragmented, multifaceted nature of the multiple fishery components covered in the biological opinion, and the variety of scenarios and often non-overlapping discrete time periods for reference data proposed for analysis. However, we cited results from one bootstrap analysis used during the harvest specifications that explored variability within the most uncertain component, the burgeoning midwater non-whiting trawl fishery. Estimates of landed groundfish catch (mt) were queried from the PacFIN database, and Chinook salmon discard data were supplied by the WCGOP and Pacific States Marine Fisheries Commission.

Interannual mean, minimum and maximum retained groundfish catch and Chinook bycatch were calculated for each component (bottom trawl and midwater non-whiting trawl), among targeted years. The resulting ranges of Chinook bycatch rates and groundfish landings amounts were arranged to produce three-by-three matrices with nine estimates of annual Chinook counts for each non-whiting trawl component and season. Each one shows a potential range of Chinook bycatch, based on the years of recent catch history suggested by the Council; spanning from the minimum bycatch rate applied to the minimum landed groundfish catch, to the maximum bycatch rate applied to the maximum groundfish catch, and all combinations in between; in order to provide intuitive measures of uncertainty surrounding expectations. Matrices were then summed across components, seasons, and all strata.

Different data series and sources were used for each scenario consistent with the Council motion. For the baseline scenario reflecting alternative 1 (Scenario 2A), we used 2012-2014 data for the bottom trawl component, and 2014 and 2015 for the midwater non-whiting component for Chinook bycatch rates and groundfish landings. For Scenario 2B (alternatives 2 and 3), we used two approaches. One used PacFIN landings from 1995-1999, and baseline (2012-2014) bycatch rates. The other used PacFIN landings from 1995-1999, and bycatch rates from the EDCP, conducted by the Oregon Department of Fish and Wildlife (ODFW) from 1995-1999. Although the latitudinal extent of these data is limited to landings within Oregon, it is the state in which the vast majority of groundfish trawling has and continues to occur on the West Coast.

In its motion at the September 2015 meeting (see Agenda Item H.6), the Council recommended an analytical structure for the Scenario 2 alternatives. Refinements of the motion to address gaps in the guidance and facilitate analysis were discussed at the March 2016 Council meetings. Staff from NOAA Fisheries West Coast Region Sustainable Fisheries Division suggested an alternative to the choice of years named in threshold alternatives 2 and 3 under Scenario 2B (Appendix A) which would better meet the stated intent of the analysis, and represents the best available information for Council decision making. Specifically, we substituted years 1995-1999 for the 2000-2005 timespan specified in the motion. Subsequent conversation among Council members and those from the GMT working group supported the substitution, after which we went forward with the analysis.

Several reasons were cited for the suggested alternative choice of years. Although the 2000-2005 period is pre-IFQ, key changes to the trawl fishery occurred during this period that makes it unrepresentative of the stated intent of the motion and the surrounding Council discussion. Changes include 1) the trawl RCA was implemented in 2002, so the 2000-2005 span would not reflect an open RCA; and 2) the WCGOP began reporting total catch (including discards) of groundfish and Chinook salmon in 2002. Fishery discard information, including salmon bycatch, therefore is not available before 2002 with any systematic coverage, making the period from 2000-2005 problematic for analysis.

The period from 1995-1999 fits the criteria of an open RCA, pre-trawl rationalization, and spans the end of an active midwater non-whiting trawl fishery. Discarded and retained catch data, with Chinook counts, were available for bottom and midwater gear types during this time period in logbooks from the EDCP, conducted in Oregon from 1995-1999. Thus, data from these years would better represent the Council's intent under items 3 and 4 of the motion.

Although the EDCP data do not cover a full U.S. coastal range of latitude (north of Cape Blanco from approximately 43° to 48° N. Latitude), they are likely the best available information and reflect the area where most landings still occur. The distribution of effort has changed as a result of the buyback program initiated in 2002. We do not expect substantial fishing in southern areas to return (e.g., south of Crescent City and nearshore areas off of Oregon). The data encompass 1,537 hauls, 134 of which were positive for Chinook salmon. There were 1,504 bottom hauls and 33 midwater hauls. There were 824 Chinook recorded in total. The majority of the trips were observed. The study used enhanced logbooks; in standard trawl logbooks, fishers did not record discards.

We also explored data from the Pikitch study of the late 1980s (Erickson and Pikitch 1994) based on suggestions by the workgroup, and found substantial shortcomings that make it unsuitable for use in the non-whiting analysis. It was comprised of a Discard Study and a Mesh Study. Salmon was only caught in the Mesh Study; just 22 Chinook in total. There were no midwater tows in the Mesh Study out of a total of 836. The Mesh Study used different meshes and shapes under an EFP, and thus doesn't reflect standard fishing operations (pers. com. John Wallace, NWFSC).

4.3.2.2 Stock composition estimates

Estimating stock-specific impacts of the non-whiting fisheries presented a special challenge because of a near absence of either genetic or coded-wire tag recovery data. We knew from extensive analysis of bycatch in the whiting fishery that latitudinal distribution was likely to be the best predictor of Chinook stock composition in any fishery. There are certainly differences among stocks in their depth and distance from shore, and therefore their vulnerabilities to different gear types and fisheries; however these differences are expected to be small compared to latitude. With that logic we estimated the mean latitude of bycatch from various fisheries and groundfish management areas. For example, to estimate the mean latitude of Chinook bycatch taken in the summer bottom trawl in the area north of Cape Falcon, we calculated the mean latitude for all the hauls (2011 – 2014) in that time/area stratum weighted by the number of Chinook per haul. We made that calculation for each management area individually and for each of the three other non-whiting sectors, the winter bottom trawl, and the summer and winter mid-water trawl. These estimates were then used in the at-sea latitudinal model to infer the stock composition of expected bycatch in each time and area. Once stock-composition was estimated for each time/area stratum in each fishery, we could then hold that distribution constant and vary the level of expected bycatch based on different potential harvest levels and bycatch rates associated with the different scenarios.

There are three important caveats to note in our estimation of Chinook salmon bycatch stock composition in the non-whiting fisheries. First, we used the latitudinal model derived from at-sea bycatch to infer stock composition in different fisheries with different gear types and different depth and spatial distribution. Second, as noted elsewhere, because of the limited data available, we sometimes violate a fundamental statistical rule by drawing inferences outside the range of values on which the model is based (i.e., the at-sea fishery does not extend as far south as non-whiting groundfish). Third, the numbers of observations that contribute to a few of the mean latitude estimates for non-whiting fisheries are quite small, even across four years. In each of the cases above we made the best choice possible from limited options. The lack of stock composition data for bycatch in the non-whiting fisheries, and the low overall levels of bycatch on which the estimates are based can make estimating future bycatch imprecise, especially when stratified by time and area.

4.3.3 Results

4.3.3.1 Projected Chinook Bycatch

We explored trends and variability in bycatch rates of Chinook salmon as they relate to several factors, including gear component, season, latitude and depth strata, for recent years, 2012-2014, and preliminary data for 2015, in the case of the midwater non-whiting component. Preliminary 2015 data were included for the midwater non-whiting component specifically because recent effort has been trending steeply upwards (landings rising by an average 72 percent per year since 2012), and inclusion of the most recent data was important to inform the analysis. Chinook bycatch in the midwater non-whiting trawl component has been increasing by an average of nearly 3 times per year (2012 to 2015), although 2014 showed a nine times increase over 2012 and 2013, and in 2015 that bycatch amount fell compared with 2014, despite landings more than doubling.

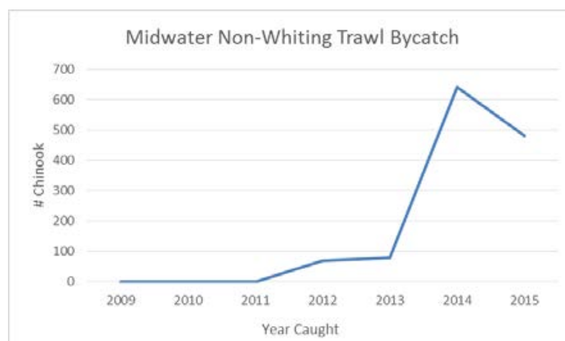


Figure 15 shows annual Chinook bycatch rate by season and non-whiting commercial trawl component; boxes show variation among years. A stark contrast in Chinook bycatch rate is immediately apparent between components, with the midwater non-whiting component showing dramatically higher bycatch rates and variability among years than its bottom trawl counterpart. Summer shows lower rates than winter in the bottom trawl component. In the midwater trawl component, summer shows much higher interannual variability in bycatch rates; exceptionally high bycatch during the summer of 2014 (caught overwhelmingly in the 0-100 fm depth range) contributed substantially to the variability among years, although not solely responsible for it. Whereas neither the degree of fishing effort nor the distribution of that effort was exceptional in 2014, the bycatch rate in that particular depth range was exceptional, even though bycatch is typically high in that stratum for midwater trawl. For example, the year 2015 showed much higher total effort than 2014, even within shallow depths, yet Chinook catch was much higher in 2014. Anomalous ocean conditions (the biological dynamics of which scientists do not yet fully understand) may be one potential driver for high bycatch in 2014. Previous biological opinions also noted unusually high bycatch associated with anomalous ocean conditions (NMFS 2006).

High bycatch events in 2000 and 2005 were associated with anomalous ocean conditions; however, the anomalies were quite different with more productive cold water in 2000 and less productive warm water in 2005. Perhaps the best hypothesis at this time is that anomalous ocean conditions affect the distribution of Chinook and whiting in ways we do not really understand, but nonetheless increase the likelihood of high bycatch tows. Due to the narrow window of years that informs the analysis for this burgeoning component (and given the current trend of warming ocean conditions), it is difficult to know how frequently to expect a year as high as 2014 within a longer time series. Values for Figure 15 are shown in Table 10.

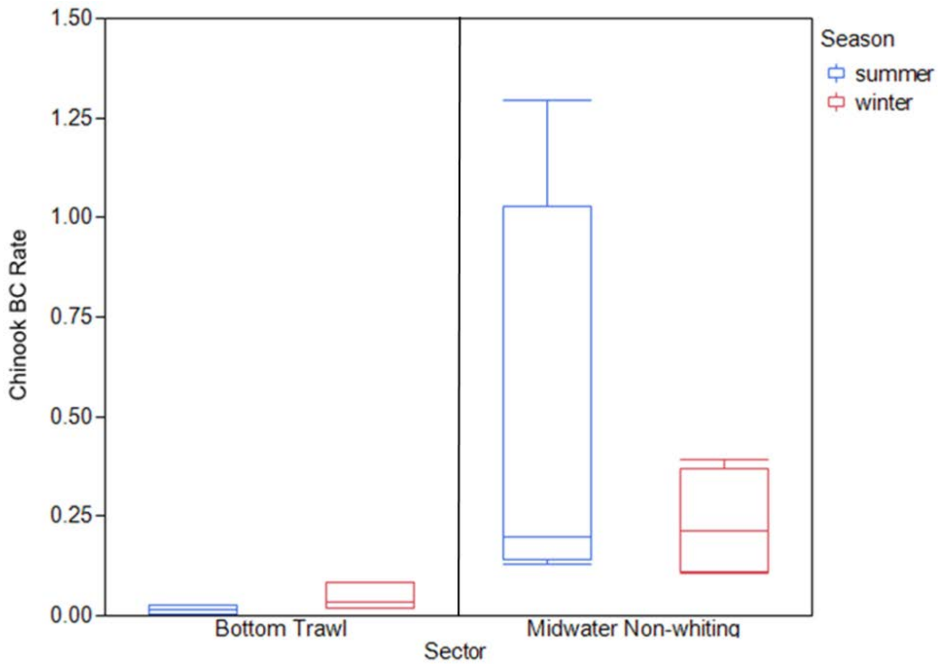


Figure 15. Boxplot of annual Chinook bycatch rate by season and non-whiting commercial trawl component, showing interannual variation. Bottom trawl data 2012-2014; midwater non-whiting data = 2012-2015. and Summer was defined as May 1 to October 31, and winter as November 1 to April 30.

Table 10. Annual Chinook bycatch rate by season and non-whiting commercial trawl component.

Year	**Season**	**Component**	**Chinook count**	**Retained GF mt**	**Chinook BC Rate**
2012	Summer	Bottom Trawl	22	8854.9	0.0025
2013	Summer	Bottom Trawl	139	8804.4	0.0158
2014	Summer	Bottom Trawl	190	6842.4	0.0278
2012	Winter	Bottom Trawl	276	8228.9	0.0335
2013	Winter	Bottom Trawl	180	9831.9	0.0183
2014	Winter	Bottom Trawl	772	9134.5	0.0845
2012	Summer	Midwater Non-whiting	61	349.0	0.1748
2013	Summer	Midwater Non-whiting	38	291.8	0.1298
2014	Summer	Midwater Non-whiting	768	593.3	1.2937

2015	Summer	Midwater Non-whiting	330	1478.1	0.2233
2012	Winter	Midwater Non-whiting	10	33.1	0.3017
2013	Winter	Midwater Non-whiting	40	317.2	0.1265
2014	Winter	Midwater Non-whiting	31	296.1	0.1061
2015	Winter	Midwater Non-whiting	151	386.8	0.3904

Figure 16 shows Chinook bycatch rate by salmon management area and component. Again, the midwater non-whiting component shows much higher bycatch rates and variability in those rates among years than the bottom trawl component. Midwater non-whiting catch was only recorded in areas 1 and 2, north of Cape Blanco, while the bottom trawl component operates in all areas.

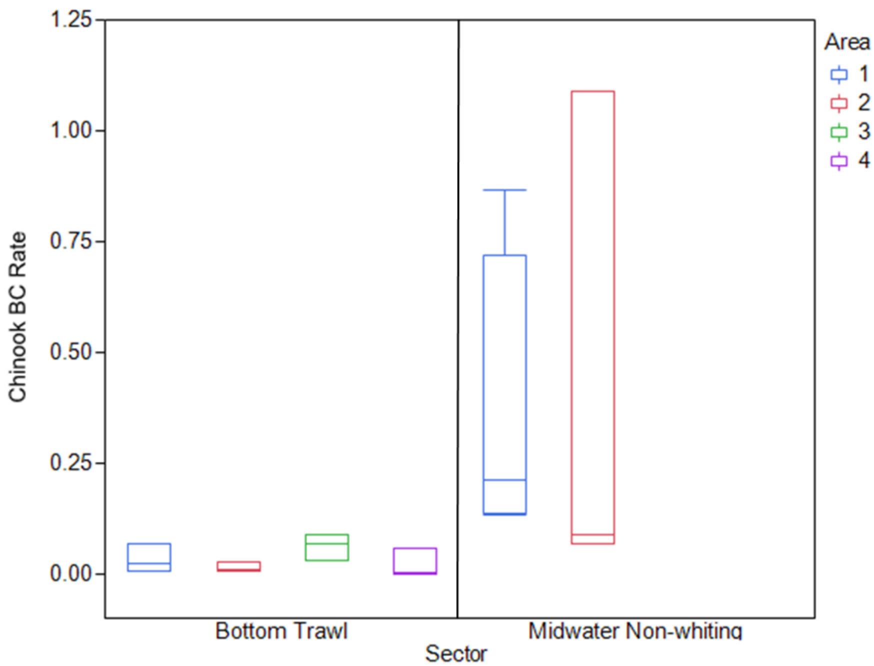


Figure 16. Boxplot of annual Chinook bycatch rate by area and non-whiting commercial trawl component, showing interannual variation. Bottom trawl data 2012-2014; midwater non-whiting data = 2012-2015. Salmon area key; 1 = North of Cape Falcon; 2 = Cape Falcon to Cape Blanco; 3 = Cape Blanco to Cape Mendocino; 4 = South of Cape Mendocino.

Figure 17 shows bycatch rate of Chinook by component and depth strata. The two components show distinctly different profiles of bycatch rate over depth, with the bottom trawl component showing its highest rates and variability in the 150 to 200 fm range. The midwater non-whiting component again shows much higher rates and variability than bottom trawl in general, and a steep cline in bycatch rate with depth; the highest rates and variation in rates among years are seen in the shallowest stratum (1 to 100 fm), and decline with deeper depths. Extremely high bycatch rates during the summer of 2014 contribute to the interannual variation seen in Figure 17 for the midwater non-whiting component in both 0-100 fm and 100-150 fm strata. Despite the summer of 2014, Chinook bycatch rates for this component can still be characterized as high and variable. Winter season bycatch rates (and summer rates for other years) seen in Figure 15 and Table 10 reinforce this assertion.

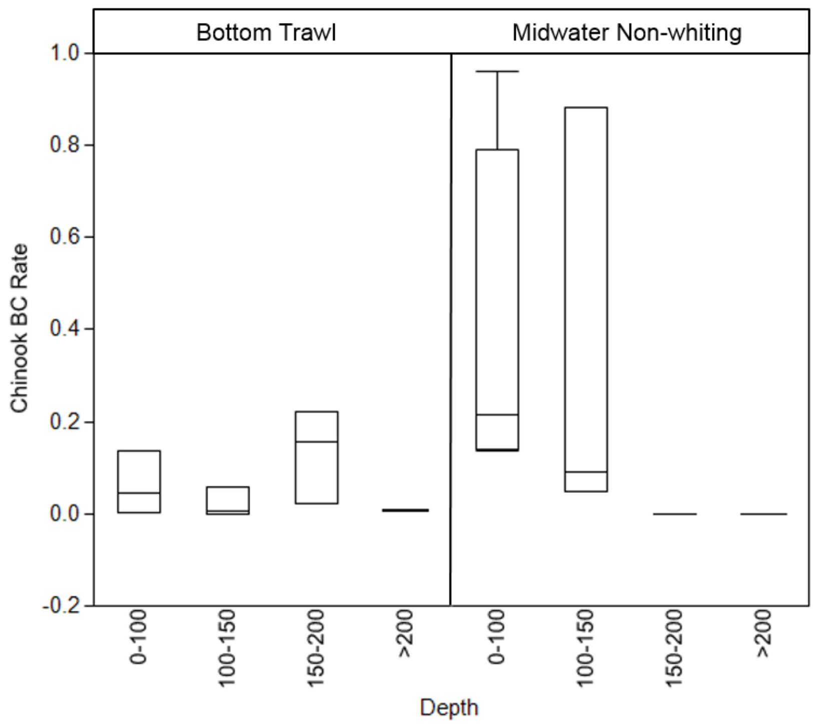


Figure 17. Boxplot of annual Chinook bycatch rate by depth range and non-whiting commercial trawl component, showing interannual variation. Bottom trawl data 2012-2014; midwater non-whiting data = 2012-2015. One ECE was omitted to preserve the central tendency of the bycatch rate by depth relationship.

Scenario 2A: Baseline

Tables 11.a. through 11.i. show annual Chinook bycatch predictions for the recent, or baseline scenario, by components (bottom trawl, and midwater non-whiting trawl), and seasons (summer and winter), with stratified sums. The Council requested a focus on a 1,000 Chinook bycatch threshold under this scenario, and data years of 2012-2014 for bottom trawl, and 2014-2015 for midwater non-whiting trawl, to inform it. If one assumes that the fishery will behave in a similar fashion to the recent years requested by the Council under this scenario, a 1,000 fish threshold would likely be exceeded, based on use of mean values of groundfish landings and Chinook bycatch rates among components and seasons form Table 11.i. A 4,500 fish threshold would likely not be exceeded under this scenario. However, access to many shelf target species is expected to increase (due to rebuilt status of canary rockfish), and thus landings in both components should rise in the coming years, if canary rockfish was as much of a constraint as thought by industry and management. Even with some increase in effort, estimates indicate bycatch would remain well below a 9,000 Chinook bycatch threshold.

Based on these data, the expected contribution of the midwater non-whiting component to the Chinook bycatch threshold exceeds that of the bottom trawl, due to the high bycatch rates experienced in 2014 and 2015 (annual rates of 0.89 and 0.26 respectively), despite its predicted landings being less than one tenth as much as for bottom trawl. Even in years 2012 and 2013, when landings in the component were low, annual bycatch rates were still much higher than bottom trawl

(0.19 and 0.13 Chinook per mt of landed groundfish respectively). Annual bycatch rates for the bottom trawl component over 2012-2014 averaged just 0.03 Chinook salmon per metric ton of retained groundfish; at 0.017, 0.017 and 0.06 respectively. Effort in the midwater non-whiting component is expected to continue to increase, and therefore Chinook bycatch as well. However, that situation is better reflected by the second scenario (see Scenario 2B).

Estimated distributions for the Chinook bycatch in Table 11, by season, area and depth strata are shown in Tables 12 and 13, as well as Figures 19 and 20. Area by depth distributions of bycatch differ markedly according to season for bottom trawl. During summer months, nearly 67 percent of Chinook bycatch occurs north of Cape Falcon, in depths from zero to 100 fms (Table 12, Figure 18). Another 21 percent is taken in the same area in slightly deeper water (100-150 fm). In winter months, the distribution shifts deeper and southward, and becomes more diffuse, with 34 percent being taken from Cape Blanco to 40°10' N. latitude, between zero and 200 fms, and another 23 percent in the same area, but deeper than 200 fm. Sixteen percent is still taken in the shallowest depths North of Cape Falcon, and most of the remainder is found in strata adjoining those two concentrations (Table 12).

For the midwater non-whiting trawl component, summer and winter distributions are quite similar. Chinook bycatch in this component is distributed strongly northward and in shallow depths (Figure 19). Catch only occurs north of Cape Blanco. Unlike target catch and bycatch amounts themselves, which have been trending upward, the distribution of bycatch has been nearly invariant from 2012 through 2015. It was necessary to use more than the two years described in the alternative in order to estimate seasonal area by depth distributions with reasonable confidence and maintain the ability to share publicly, given confidentiality requirements. Since the distributions have been largely unchanged during those years, the result of including those years does not stray from the Council's intent.

Scenario 2B

Chinook bycatch predictions under this scenario are highly uncertain, and many fundamental factors contribute to this uncertainty:

1) <u>Lack of data.</u> The WCGOP has only observed groundfish trawl components since 2002, which does not cover the fishery conditions specified for this scenario: (a) the RCA is open to fishing; and, (b) the geographic distribution of the fleet and harvest levels are similar to the most recent pre-RCA historical period. Also, the fishery constraints of protecting overfished species that have been in place since the early 2000s should not be present, since they will largely be absent in the near future, with rebuilding of many previously overfished stocks (including canary and widow rockfish), and concomitant large increases to ACLs and trawl allocations. These conditions severely restrict the available data on Chinook bycatch, and since logbooks are not reliable as a sole source of information, only the EDCP project was a potential source of information to assess this scenario, since it was directly observed. However, as described earlier, it provided salmon bycatch estimates only for trips landed in Oregon, and participation was voluntary, rather than due to a random or stratified sample design. This means that there may be biases in the data, many of which we are unaware of and unable to correct for. The goals of the EDCP project were primarily to evaluate accuracy of skipper's logbooks as a source for discard information, determine

factors that contributed to variability in discard rates (such as trip limit variability), estimate their relationships, and determine whether the boats that volunteered were representative of the fleet at large. Estimating bycatch rates of salmon was not a stated goal of the project, but since it was the only available source of data for the fishery conditions under this scenario, we made attempts to glean information from it in order to predict future bycatch of Chinook salmon in the non-whiting groundfish trawl components.

2) Different fishery conditions. The most obvious difference between a pre-RCA fishery and the current one is the change to IFQ management. Although salmon are not quota species, quota management of the trawl component has contributed to major decreases in discards and bycatch rates for many groundfish species. It seems plausible that some of these effects may spill over to non-IFQ species. Also, landings for the bottom trawl component during the 1990s were much higher overall than in recent years, especially for certain species (Agenda Item G.5. Five-year Catch Share Program Review. NMFS Report September, 2016 PFMC meeting), and although we expect landings to increase markedly for many of the same species due to increases in harvest specifications (reference specs EA IFQ predictions) those predictions are highly uncertain.

3) Fleet capacity. The vessel buyback program initiated in 2002 resulted in a reduction in fleet capacity of over 30 percent. The higher capacity in previous years likely contributed to the higher landing rates of the 1990s, although given harvest specifications as limits on many species, it is difficult to remove such a factor. The RCA was open in the 1990s, and was implemented at the end of 2002 (this was a stated Council condition for the scenario). Several crucially constraining rockfish species were not yet declared overfished, many of those are again healthy stocks. Yet, yelloweye rockfish remains overfished, and has one of the smallest quotas; it is likely to remain in rebuilding status for many years into the future (Taylor 2011, http://www.pcouncil.org/wp-content/uploads/Yelloweye_2011_Rebuilding.pdf).

All of that being said, we make some basic comparisons in this scenario in hopes to inform potential impacts of actions in the range proposed, as best as the data may support. The EDCP data (although limited in scope) can give us an idea of whether that time period with a less constrained fishery also saw higher bycatch rates of salmon, compared to the recent periods. The PacFIN landings can give us a high end of the range of potential future effort.

We made two types of predictions under this scenario to explore a range of potential impacts to Chinook salmon in a less constrained future non-whiting fishery. One was to apply recent bycatch rates to landings from these components when there were high OYs on recently overfished species. This assumes recent fishing practices and bycatch rates, but with higher effort and harvest rates. Tables 14.a. through 14.i. show annual Chinook bycatch predictions for Scenario 2B by components (bottom trawl, and midwater non-whiting trawl), and seasons (summer and winter), with stratified sums. We used bycatch rate and retained FMP groundfish catch for each component separately, as axes of uncertainty, in nine combinations each, based on interannual means, minima and maxima of the data identified in the Council motion and through discussions with some members of the GMT and management agencies. We used years 1995-1999 for landings (pre-RCA, pre-overfished rockfish stocks, etc), and used the same bycatch rates as in Table 11, those of recent years (see approach and methods sections for justifications and caveats). Chinook bycatch rates were calculated as count per mt of retained grounfish catch, and groundfish catch is reported as mt (retained).

These estimates indicate Chinook bycatch levels generally in excess of 1,000 and less than 4,500 for the non-whiting components. Bycatch approaches 4,500 under only circumstances of maximum groundfish landings and a high Chinook bycatch rate. Most estimates are well below 4,500 Chinook. However, the maximum estimate of nearly 4,500 fish, coupled with the likelihood for increasing bycatch rates in the near future, partially from expected increased effort in shallow water, where bycatch rates tend to be higher, indicate that Chinook bycatch in the future may be at the higher end of the estimates and that a reserve may be a precautionary measure. It is difficult to quantitatively predict how much of an effort shift will take place across depths (given the lack of representative data), and the resulting impact on bycatch rates. The relationship between mean depth and bycatch rate by area is poor for the non-whiting components, and we do not have representative data to direct us as to how much of a shift in depth would be reasonable to expect. In addition, higher groundfish catch does not always result in higher Chinook bycatch rates and we have noted the improvement in bycatch avoidance by the fleets since implementation of the IFQ program. Resulting bycatch will be heavily dependent on the component, seasonality, location and depth of the changes in fishing pattern. Although the canary rockfish allocation is increasing dramatically, the yelloweye rockfish allocation is relatively unchanged, and the constraining influence of this rebuilding shelf stock will likely remain for some time, albeit with different influences on fishing behavior than canary rockfish. The results for the midwater component are nearly equal to that of the GMT in their analysis of salmon bycatch for this component for the groundfish harvest specifications EA (see Figure 18-21) http://www.westcoast.fisheries.noaa.gov/publications/nepa/groundfish/17-18-spex-draft-ea.pdf). Even with an increase in effort or bycatch rates, given the anticipated continuing constraints for yelloweye rockfish, estimates indicate bycatch would remain well below a 9,000 Chinook bycatch threshold.

The second type of prediction applied component-specific bycatch rates from the EDCP data to the landings for each component over the same years. This approach assumes that the EDCP rates are representative for each component. This is not assured, for reasons described earlier. Due to issues like volunteer effects, observer effects, and lack of a systematic sampling design, these bycatch estimates could be prone to sampling effects, and biased in unknown directions and degrees.

Average annual Chinook bycatch rates from EDCP data, by component and season appear in Table 17. Midwater non-whiting seasons were combined to preserve confidentiality and due to low data density. Years 1996-1998 were used (although the study collected samples from 1995-1999); two years (1995 and 1999) were excluded due to insufficient data. We did not estimate depth by area distributions of Chinook bycatch using EDCP, given the previously described shortcomings of the data. We instead examined latitudinal distribution of fishing effort (as groundfish landings) as an indicator. We compared groundfish landings by season, component and area over the period from 1995-1999, with that of the recent period. We used International North Pacific Fisheries Commission (INPFC) management area for area of catch, since neither groundfish management area nor fine haul location were available in the landings data. However, many of the borders are shared between INPFC area and groundfish management areas used in the WCGOP data, including Cape Blanco and Cape Mendocino.

Those results are seen in Figure 20 and Table 15 for the bottom trawl component and in Figure 21 and Table 16 for the midwater non-whiting trawl component. The Monterey and Conception areas needed to be merged in the recent data during the summer (Figure 20, Table 15) for confidentiality. The distributions for bottom trawl are similar between periods in that they show a predominantly northern (Columbia INPFC area) distribution, but differ in that more recent effort has noticeably shifted toward the winter in the Columbia area, and is more concentrated there than in the 1990s, when winter groundfish landings were more evenly distributed.

For midwater trawl, the data indicate a northern shift in effort from the late 1990s to recent years as well (2012 to 2015), with no effort south of the Columbia INPFC area recorded in the recent period. This could change if chilipepper rockfish were to become targeted using midwater gear off California, or if midwater widow or yellowtail rockfish targeting were to extend southward.

The bycatch rates from EDCP data for the bottom trawl component were prohibitively high and produced Chinook bycatch predictions which appear to be unrealistic for evaluating thresholds to support a fishery. For instance, applying mean bycatch rates from Table 17, and mean groundfish landings from Table 14, from the appropriate sub-tables, produced predicted Chinook catch in the bottom trawl component alone exceeding 20,000 fish (20,751; Table 18). The detailed predictions for bottom trawl, using EDCP bycatch rates and PacFIN landings from the late 1990s can be seen in Table 18. We could find no specific reason to exclude the estimates other than their magnitude. Therefore, these extreme estimates are included in the interest of balanced reporting using the best available data. However, we express low confidence in EDCP bycatch rates from the bottom trawl component especially. Bycatch rate estimates from the winter of 1997 were particularly high, and exerted leverage on the mean bycatch rate by season-year (1.8 per mt, versus 0.32 and 0.56 per mt in 1996 and 1998 respectively). There was no specific justification to remove this outlier year, as it also showed the highest amount of groundfish landed, and the largest number of hauls compared to other years. These estimates were also not the result of anomalous ECEs. High bycatch rates were common throughout this season-year-component stratum in the study. We also note that Chinook bycatch in the bottom trawl component in 2002 and 2003, just as the RCA was implemented, was just over 14,900 and 16,400, respectively, so bycatch in the realm of 20,000 Chinook is not out of the realm of possibility.

If the bycatch rate estimates were representative, they could perhaps be due to gear use differences between the 1990s and recent years, such as fishing off-bottom with bottom gear, or different targeting strategies. Also, there was no RCA in the 1990s, and mean bycatch rates of Chinook were approximately three times as high within the RCA as outside of it, within the EDCP bottom trawl data, although the variance was quite high. If the bycatch rate estimates are not representative, as some findings of the EDCP study suggest, this would likely be due to the lack of specific sampling design, and reliance on volunteer boats only. These study attributes, coupled with the comparatively high bycatch rates and very high variability within winter particularly, could easily produce the results that we see in Table 18, through sampling effects. We see high variability in winter bycatch rates for the bottom trawl component in recent observer data, as well as high peak bycatch rates. For years 2012 to 2014, which were 100 percent observed we see much higher bycatch rates and variability in winter than in summer. When mean and CV are calculated across year-area-depth strata, for both seasons, we see a mean winter bycatch rate of 0.56 for winter, versus only 0.007 for summer. The CV for winter is 429 percent, versus 250 percent for summer. Peak bycatch rates per stratum are as high as 13.8 Chinook per mt of groundfish in the winter (2012 and 2014, both in the 150-200 fm depth range, and Cape Blanco to Cape Mendocino area), versus a peak of just 0.07 during the summer. With that level of variability during the winter, sampling effects (from unrepresentative sampling patterns) could produce remarkable results.

The GMT recently conducted an analysis using EDCP data from bottom trawl hauls as one source of information (as well as observer data) to estimate potential Chinook bycatch during a proposed gear exempted fishing permit (EFP). This experimental permit would exempt participants from the selective flatfish net requirement and provide flexibility to use "normal" bottom trawls to target rockfish as some did in the 1980s and 1990s. While a similar type of analysis was done for the harvest specifications (discussed below), there were key differences: (1) the EFP analysis used bottom trawl hauls, while the harvest specifications analysis used midwater hauls; (2) EFP hauls used heavily filtered data to match the conditions of the EFP (e.g., shoreward of RCA, north of 40°10' N. Latitude. and others). Given the much narrower goal, the resultant heavy filtering of the EDCP data in that analysis might have increased the reliability and specificity of those estimates, compared with the broader purpose of this analysis. That analysis can be found here:
http://www.pcouncil.org/wp-content/uploads/2016/11/F5a_Sup_GMT_Rpt_NOV2016BB.pdf

For the midwater non-whiting component, the Chinook bycatch prediction was just over 4,500 but the uncertainty interval was large (4,545, ±4,731). The interval reflects plus or minus one standard deviation of the annual bycatch rate for the component. The prediction for this component benefits from the fact that effort and bycatch rates were similar during the 1990s as they have been in the most recent two years (2014 and 2015), and the prediction might not suffer from the same degree of bias as the one for bottom trawl. Furthermore, the targets in the midwater component are predominantly limited to just two species, widow rockfish and yellowtail rockfish. The bottom trawl has several times more target species, within the 30 species categories of IFQ. Although model-based predictions were made for the overall IFQ fishery for harvest specifications, the IFQ model is inclusive of the four subcomponents within it (bottom trawl, midwater non-whiting, shorebased whiting, and IFQ fixed gear). Parsing out the total predicted landings per component would be difficult and uncertain, especially given additional non-IFQ groundfish species not included in the IFQ model.

The prediction for the midwater component under this scenario is also nearly identical to the one produced by Patrick Mirick of ODFW and the GMT for the 2017-2018 harvest specifications EA using an independent method ("Re-emergence of the mid-water trawl rockfish fishery" in Section 4 of the draft EA (see Figure 5-7
http://www.westcoast.fisheries.noaa.gov/publications/nepa/groundfish/17-18-spex-draft-ea.pdf). That estimate was for approximately 4,500 Chinook, (±800) and was based on a resampling technique using the predicted catch of yellowtail rockfish and widow rockfish from the IFQ projection model (Matson and Taylor 2015, see previous link, also Appendix A, http://www.pcouncil.org/groundfish/fishery-management-plan/groundfish-amendments-in-development/#a27), and component-specific bycatch rates from EDCP data, using predetermined numbers of hauls needed to reach the predicted attainment rates for these two target species. It also

assumed that all of the catch of these two species would come from the midwater component, a factor that has the potential to bias the prediction somewhat high.

Table 11.a. through 11.i. Annual Chinook bycatch predictions for recent baseline scenario by components (bottom trawl, and midwater non-whiting trawl), and seasons (summer and winter), with stratified sums. Refer to labels in the table for identities of stratified estimates. We used bycatch rate and retained FMP groundfish catch for each fishery separately, as axes of uncertainty, in nine combinations each, based on interannual means, minima and maxima of the data: 2012-2014 for bottom trawl, and 2014-2015 for midwater non-whiting trawl component. Chinook bycatch rates were calculated as count per mt of retained whiting catch, and groundfish catch is reported as mt (retained).

a. Bottom trawl, summer.

Bycatch rates (x)		0.002	0.015	0.028
GF landings (y)		Min	Mean	Max
6,842	Min	17	105	190
8,167	Mean	20	125	227
8,855	Max	22	136	246

b. Midwater non-whiting trawl, summer.

Bycatch rates (x)		0.230	0.762	1.294
GF landings (y)		Min	Mean	Max
593	Min	137	452	768
1,014	Mean	233	772	1,311
1,434	Max	330	1,092	1,855

c. Sum components, summer.

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
7,436	Min	154	557	958
9,181	Mean	254	898	1,538
10,289	Max	352	1,228	2,101

d. Bottom trawl, winter.

Bycatch rates (x)		0.018	0.045	0.085
GF landings (y)		Min	Mean	Max
8,229	Min	151	374	695
9,065	Mean	166	412	766
9,832	Max	180	447	831

e. Midwater non-whiting trawl, winter

Bycatch rates (x)		0.106	0.263	0.420
GF landings (y)		Min	Mean	Max
296	Min	31	78	124
328	Mean	35	86	138
360	Max	38	95	151

f. Sum components, winter

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
8,525	Min	182	452	820
9,393	Mean	201	498	904
10,192	Max	218	541	982

g. Sum seasons, bottom trawl.

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
15,071	Min	168	479	885
17,232	Mean	186	538	993
18,687	Max	202	583	1,077

h. Sum seasons, non-whiting midwater.

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
889	Min	168	530	892
1,341	Mean	268	858	1,449
1,794	Max	368	1,187	2,006

i. Sum seasons and components.

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
15,961	Min	336	1,009	1,777
18,574	Mean	454	1,396	2,442
20,480	Max	570	1,770	3,083

Table 12. Projected proportional coastwide distribution of Chinook catch in the _bottom trawl_ component of the IFQ fishery, among depth and area strata, divided into summer and winter seasons, based on data from years 2012-2014. Note that these are not bycatch rates, rather proportional mean annual Chinook counts distributed among depth and area strata, with accompanying standard deviation, showing variation among years. Some cells merged for confidentiality. Each column of mean proportions sums to one.

Management area	Bottom depth	Summer			Winter		
		Mean proportion	Standard deviation	CV	Mean proportion	Standard deviation	CV
North of Cape Falcon	0-100 fm	0.6656	0.3403	0.5112	0.1593	0.1414	0.8877
	101-150 fm	0.2145	0.3654	1.7032	0.0145	0.0251	1.7321
	151-200 fm	0.0303	0.0525	1.7321	0.0234	0.0280	1.1961
	>200 fm	0.0000	0.0000	0.0000	0.0149	0.0043	0.2912
Cape Falcon to Cape Blanco	0-100 fm	0.0024	0.0041	1.7321	0.0000	0.0000	0.0000
	101-150 fm	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	151-200 fm	0.0000	0.0000	0.0000	0.0967	0.0164	0.1695
	>200 fm	0.0000	0.0000	0.0000	0.0613	0.0528	0.8603
Cape Blanco to 40/10	0-100 fm	0.0340	0.0458	1.3496	0.3415	0.2564	0.7507
	101-150 fm	0.0000	0.0000	0.0000			
	151-200 fm	0.0000	0.0000	0.0000			
	>200 fm	0.0018	0.0030	1.7321	0.2340	0.1896	0.8103
South of 40/10	0-100 fm	0.0515	0.0590	1.1456	0.0517	0.0865	1.6718
	101-150 fm	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	151-200 fm	0.0000	0.0000	0.0000	0.0013	0.0022	1.7321
	>200 fm	0.0000	0.0000	0.0000	0.0013	0.0022	1.7321

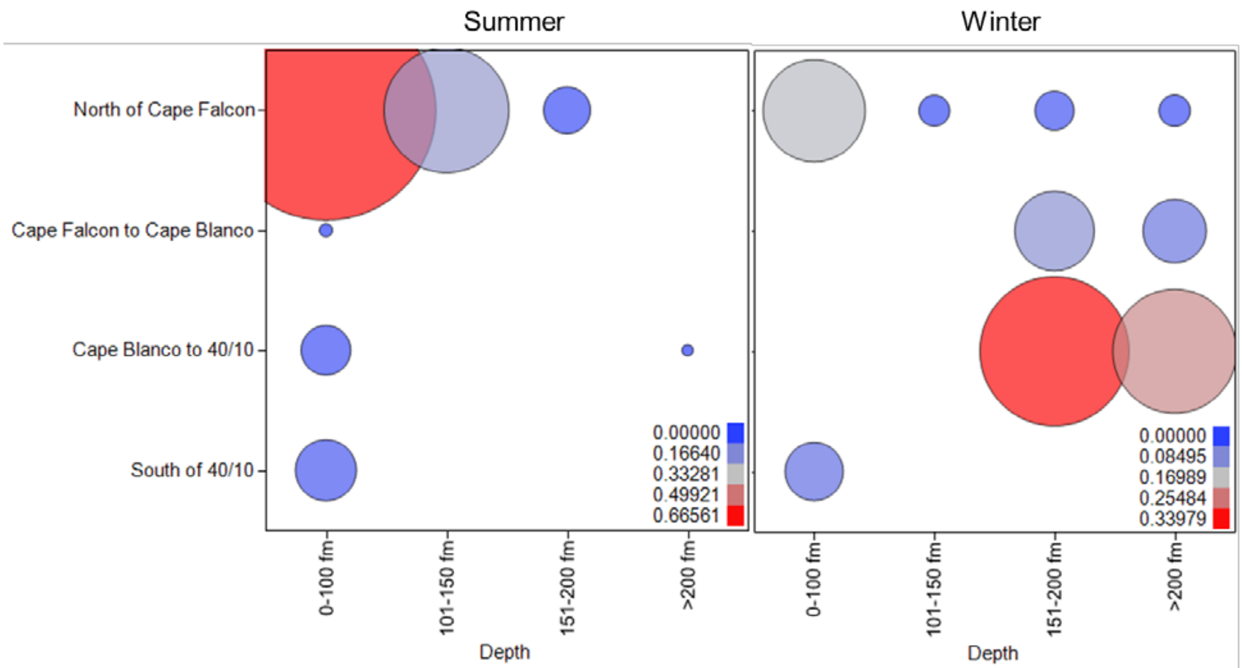


Figure 18. Projected proportional coastwide distribution of Chinook catch in the *<u>bottom trawl</u>* component of the IFQ fishery, among depth and area strata, divided into summer and winter seasons, based on data from years 2012-2014. Note that these are not bycatch rates, rather mean annual Chinook counts distributed among depth and area strata, with accompanying standard deviation, showing variation among years. Bubbles denote non-confidential and non-zero estimates, see Table 11 for estimates omitted due to confidentiality. Bubble size is comparable within plot, but not between them (summer vs winter). Refer to Table 11 for actual values.

Table 13 a and 13b. Projected proportional coastwide distribution of Chinook catch in the *<u>midwater</u>* non-whiting trawl component of the IFQ fishery between summer and winter seasons, based on data from years 2012-2015. Note that these are not bycatch rates, rather mean annual Chinook counts distributed among depth and area strata, with accompanying standard deviation, showing variation among years. Data are stratified for confidentiality. Each column of mean proportions sums to one.

a. Summer

Area	Depth	Mean	Std. Dev.	CV
North of Cape Falcon	0-100 fm	0.8784	0.1042	0.1187
	>100 fm	0.0094	0.0122	1.2885
Cape Falcon to Cape Blanco	All depths	0.1122	0.1148	1.0233

b. Winter

Area	Depth	Mean	Std. Dev.	CV
North of Cape Falcon	0-100 fm	0.9280	0.1059	0.1141
	>100 fm	0.0249	0.0499	2.0000
Cape Falcon to Cape Blanco	All depths	0.0471	0.0598	1.2702

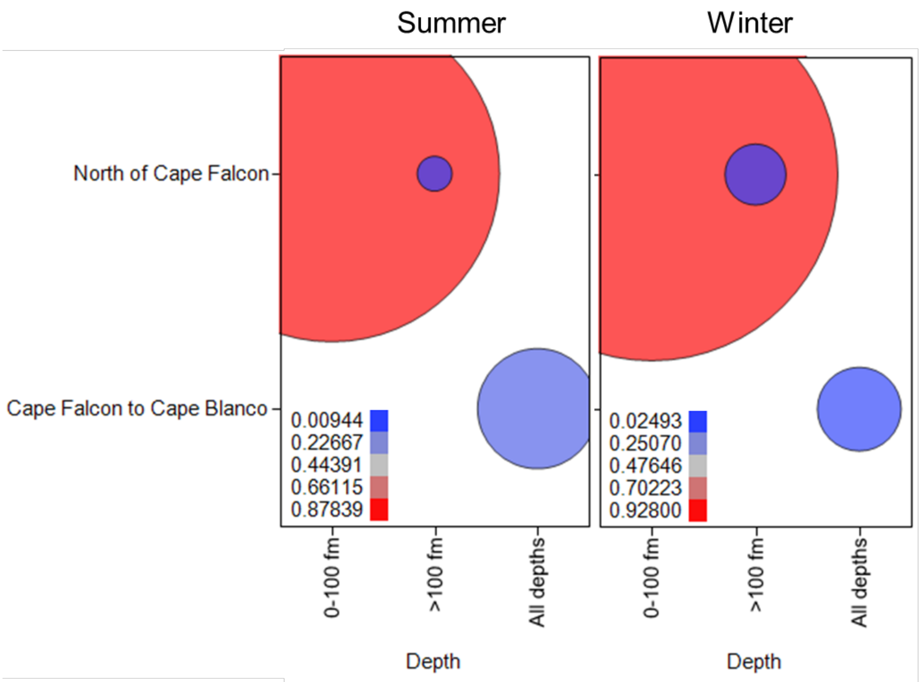


Figure 19. Projected proportional coastwide distribution of Chinook catch in the *midwater* non-whiting trawl component of the IFQ fishery, among depth and area strata, divided into summer and winter seasons, based on data from years 2012-2015. Note that these are not bycatch rates, rather mean annual Chinook counts distributed among depth and area strata, with accompanying standard deviation, showing variation among years. Bubbles denote non-confidential and non-zero estimates, see Table 11 for estimates omitted due to confidentiality. Bubble size is comparable within plot, but not between them (summer vs winter). Refer to Table 11 for actual values. Bubbles overlap in this plot as a result of expanding bubble size to adequately represent the smallest bubbles for the area north of Cape Falcon.

Table 14a through 14 i. Annual Chinook bycatch predictions for Scenario 2B by components (bottom trawl, and midwater non-whiting trawl), and seasons (summer and winter), with stratified sums. We used bycatch rate and retained FMP groundfish catch (mt) for each component separately, as axes of uncertainty, in nine combinations each, based on interannual means, minima and maxima. We used years 1995-1999 for landings (pre-RCA, pre-overfished rockfish stocks, etc), and used the same bycatch rates as in Table 11, those of recent years. See text for justifications and caveats. Chinook bycatch rates were calculated as count per mt of retained whiting catch, and groundfish catch is reported as mt (retained).

a. Bottom trawl, summer.

Bycatch rates (x)		0.002	0.015	0.028
GF landings (y)		Min	Mean	Max
20,482	Min	51	315	569
24,470	Mean	61	376	679
28,522	Max	71	438	792

b. Midwater non-whiting trawl, summer.

Bycatch rates (x)		0.230	0.762	1.294
GF landings (y)		Min	Mean	Max
329	Min	76	251	426
750	Mean	173	572	971
1,060	Max	244	807	1,371

c. Sum components, summer.

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
20,811	Min	127	566	995
25,221	Mean	234	948	1,650
29,581	Max	315	1,246	2,163

d. Bottom trawl, winter.

Bycatch rates (x)		0.018	0.045	0.085
GF landings (y)		Min	Mean	Max
12,669	Min	232	576	1,071
17,233	Mean	315	783	1,456
21,091	Max	386	959	1,782

e. Midwater non-whiting trawl, winter

Bycatch rates (x)		0.106	0.263	0.420
GF landings (y)		Min	Mean	Max
267	Min	28	70	112
803	Mean	85	211	337
1,319	Max	140	347	554

f. Sum components, winter

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
12,936	Min	260	646	1,183
18,036	Mean	401	994	1,793
22,410	Max	526	1,305	2,336

g. Sum seasons, bottom trawl.

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
33,151	Min	283	890	1,639
41,703	Mean	376	1,159	2,136
49,613	Max	457	1,397	2,574

h. Sum seasons, non-whiting midwater.

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
597	Min	104	321	538
1,553	Mean	258	783	1,308
2,379	Max	384	1,154	1,924

i. Sum seasons and components.

GF landings (y)		Bycatch rates (x)		
		Min	Mean	Max
33,748	Min	387	1,212	2,178
43,257	Mean	634	1,942	3,444
51,991	Max	841	2,551	4,499

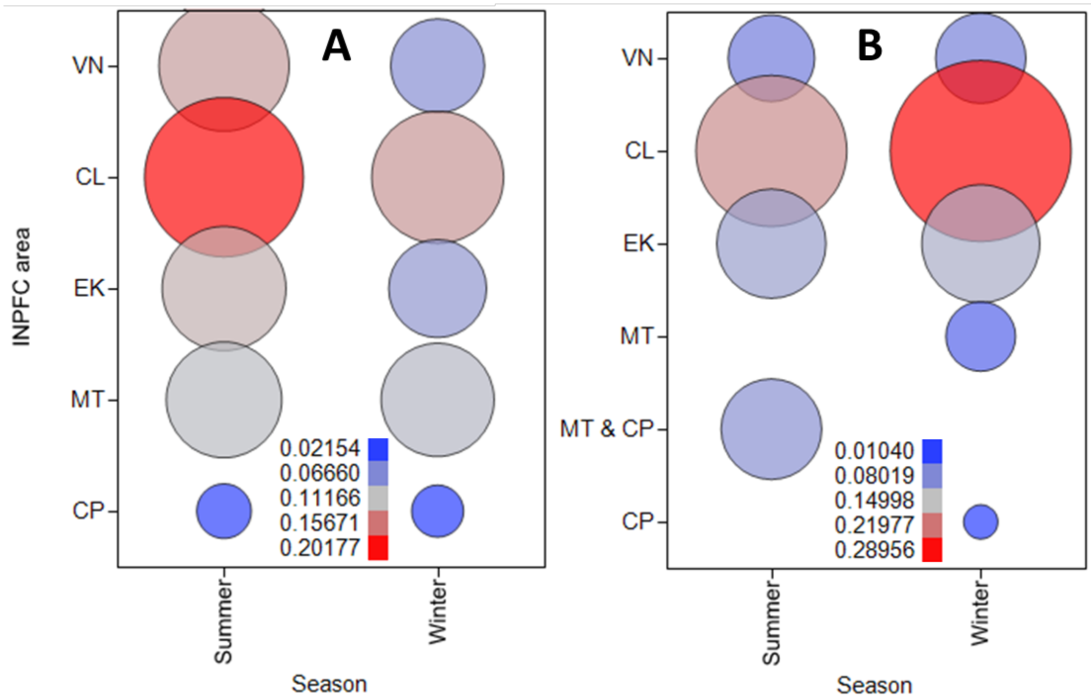


Figure 20. Mean proportional coastwide distribution of groundfish landings in the _bottom trawl_ component of the IFQ fishery, among area and season strata, for 1990s (A, left) and recent (B, right) data. Steps were taken to ensure confidentiality, including merging MT and CP areas for summer in the bottom trawl component during recent years (right panel), and omission of trace amounts of data in one area and season from the midwater non-whiting trawl.

Table 15a. and 15b. Mean proportional coastwide distribution of groundfish landings in the _bottom trawl_ component of the IFQ fishery, among area and season strata, for 1990s (a) and recent (b) data. Steps were taken to ensure confidentiality, including merging MT and CP areas for summer in the bottom trawl component during recent years (right panel), and omission of trace amounts of data in one area and season from the midwater non-whiting trawl.

a. Years 1995-1999.

Period	Component	Season	INPFC area	Mean	Stdev	CV
1990s	Bottom trawl	Summer	Vancouver	0.1355	0.0398	0.2939
1990s	Bottom trawl	Summer	Columbia	0.2018	0.0186	0.0922
1990s	Bottom trawl	Summer	Eureka	0.1226	0.0165	0.1348
1990s	Bottom trawl	Summer	Monterey	0.1066	0.0130	0.1222
1990s	Bottom trawl	Summer	Conception	0.0238	0.0066	0.2757
1990s	Bottom trawl	Winter	Vancouver	0.0706	0.0057	0.0810
1990s	Bottom trawl	Winter	Columbia	0.1391	0.0160	0.1153
1990s	Bottom trawl	Winter	Eureka	0.0764	0.0131	0.1719
1990s	Bottom trawl	Winter	Monterey	0.1021	0.0147	0.1442
1990s	Bottom trawl	Winter	Conception	0.0215	0.0049	0.2298

b. Years 2012-2015.

Period	Component	Season	INPFC area	Mean	Stdev	CV
Recent	Bottom trawl	Summer	Vancouver	0.0664	0.0122	0.1840
Recent	Bottom trawl	Summer	Columbia	0.2010	0.0301	0.1496
Recent	Bottom trawl	Summer	Eureka	0.1056	0.0063	0.0600
Recent	Bottom trawl	Summer	Monterey and Conception	0.0895	0.0034	0.0379
Recent	Bottom trawl	Winter	Vancouver	0.0720	0.0032	0.0451
Recent	Bottom trawl	Winter	Columbia	0.2896	0.0259	0.0895
Recent	Bottom trawl	Winter	Eureka	0.1227	0.0238	0.1941
Recent	Bottom trawl	Winter	Monterey	0.0428	0.0128	0.2979
Recent	Bottom trawl	Winter	Conception	0.0104	0.0065	0.6213

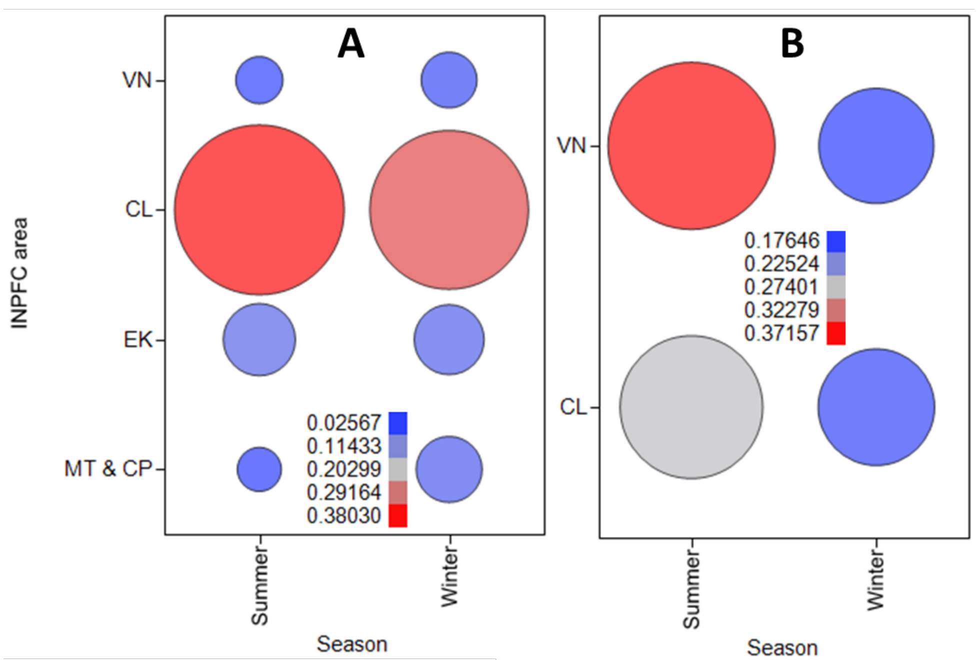


Figure 21. Mean proportional coastwide distribution of groundfish landings in the midwater non-whiting trawl component of the IFQ fishery, among area and season strata, for 1990s (A, left) and recent (B, right) data. Steps were taken to ensure confidentiality, including merging MT and CP areas for summer in the bottom trawl component during recent years (right panel), and omission of trace amounts of data in one area and season from the midwater non-whiting trawl.

Table 16. Mean proportional coastwide distribution of groundfish landings in the midwater non-whiting trawl component of the IFQ fishery, among area and season strata, for 1990s (a) and recent (b) data. Steps were taken to ensure confidentiality, including merging MT and CP areas for summer in the midwater component during the 1990s (a), and omission of trace amounts of data in one area and season.

a. Years 1995-1999.

Period	Component	Season	INPFC sort	Mean	Stdev	CV
1990s	Midwater non-whiting	Summer	Vancouver	0.0293	0.0393	1.3411
1990s	Midwater non-whiting	Summer	Columbia	0.3803	0.0744	0.1957
1990s	Midwater non-whiting	Summer	Eureka	0.0688	0.0411	0.5977
1990s	Midwater non-whiting	Summer	Monterey and Conception	0.0257	0.0288	1.1224
1990s	Midwater non-whiting	Winter	Vancouver	0.0411	0.0279	0.6794
1990s	Midwater non-whiting	Winter	Columbia	0.3328	0.1232	0.3702
1990s	Midwater non-whiting	Winter	Eureka	0.0645	0.0267	0.4132
1990s	Midwater non-whiting	Winter	Monterey and Conception	0.0576	0.0500	0.8681

b. Years 2012-2015.

Period	Component	Season	INPFC sort	Mean	Stdev	CV
Recent	Midwater non-whiting	Summer	Vancouver	0.3716	0.2508	0.6750
Recent	Midwater non-whiting	Summer	Columbia	0.2711	0.2654	0.9790
Recent	Midwater non-whiting	Winter	Vancouver	0.1765	0.1402	0.7948
Recent	Midwater non-whiting	Winter	Columbia	0.1808	0.1023	0.5658

Table 17. Chinook bycatch rates from EDCP data, by component and season. Midwater non-whiting seasons were summed to preserve confidentiality. Years 1996-1998 were used (although the study collected samples from 1995-1999); two years were excluded due to insufficient data. Bycatch rates were extremely high compared to the midwater component or recent years for either component.

Component	Season	Mean -1 S.D.	Mean	Mean +1 S.D.
General bottom trawl	Summer	0.0885	0.2069	0.3254
General bottom trawl	Winter	0.0930	0.9104	1.7277
Groundfish midwater	All	-0.0108	0.2637	0.5382

Table 18.a. through 18.e. Annual Chinook bycatch predictions for Scenario 2B by components (bottom trawl, and midwater non-whiting trawl), and seasons (summer and winter), with stratified sums. We used bycatch rate and retained FMP groundfish catch for each component separately, as axes of uncertainty, in nine combinations each, based on interannual means, minima and maxima of the data: years 1995-1999 for landings (pre-RCA, pre-overfished rockfish stocks, etc), and bycatch rates from EDCP data. See text for justifications and caveats. Chinook bycatch rates were calculated as count per mt of retained whiting catch, and groundfish catch is reported as mt (retained). **These estimates are highly uncertain, and although bycatch rates from the EDCP were the best (only) available for that time period, the reliability of the resultant Chinook bycatch predictions is questionable, as described in the text. They are included in the interest of showing a range of estimates, both low and high, for Chinook bycatch.** Predictions for non-whiting midwater trawl were made for the whole year, rather than seasonally, due to low data density.

a. Bottom trawl, summer.

	BC rates (x)	0.088	0.207	0.325
GF landings (y)		-1 S.D.	Mean	+1 S.D.
20,482	-1 S.D.	1,812	4,238	6,665
24,470	Mean	2,164	5,063	7,962
28,522	+1 S.D.	2,523	5,902	9,281

b. Bottom trawl, winter.

	BC rates (x)	0.093	0.910	1.728
GF landings (y)		-1 S.D.	Mean	+1 S.D.
12,669	-1 S.D.	1,178	11,533	21,889
17,233	Mean	1,602	15,688	29,774
21,091	+1 S.D.	1,961	19,200	36,440

c. Sum seasons, bottom trawl.

GF landings (y)		Bycatch rates (x)		
		-1 S.D.	Mean	+1 S.D.
33,151	-1 S.D.	2,989	15,771	28,553
41,703	Mean	3,766	20,751	37,737
49,613	+1 S.D.	4,483	25,102	45,720

d. Sum seasons, non-whiting midwater.

BC rates (x)		0	0.26375	0.5382473
GF landings (y)		-1 S.D.	Mean	+1 S.D.
-1 S.D.	Min	0	3,341	6,819
Mean	Mean	0	4,545	9,276
+1 S.D.	Max	0	5,563	11,352

e. Sum seasons and components.

GF landings (y)		Bycatch rates (x)		
		-1 S.D.	Mean	+1 S.D.
33,748	-1 S.D.	2,989	19,113	35,372
43,257	Mean	3,766	25,297	47,012
51,991	+1 S.D.	4,483	30,665	57,073

4.3.3.2 Stock Composition Estimates

Figure 22 summarizes the estimated magnitude and distribution of Chinook bycatch by Chinook ESU and management area under the baseline (Scenario 2A) and pre-RCA scenarios. Because of the limitations in the bycatch data when using the EDCP only data set, we did not estimate bycatch by management area. These results should be viewed as a general picture of the probable contribution of stocks rather than as a precise accounting because 1) there are no direct estimates of stock composition for the non-whiting components, and 2) of the uncertainties associated with the Chinook bycatch estimation to which the stock composition is applied (see previous sections). Given the expectation of change in these components both in fishing pattern and intensity, additional monitoring will be important to obtain direct estimates of stock composition (particularly genetic sampling) that can inform management decisions.

Under the baseline scenario, 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 (Figure 22A). Coastwide, stocks from British Columbia, Columbia River and the Oregon Coast account for 63 percent of the bycatch, primarily Southern B.C. (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. Under this scenario, listed Chinook ESUs comprise 23 percent of the bycatch (ave. ~ 300/yr), primarily Puget Sound and Columbia River ESUs. 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. Under this scenario, estimated bycatch for the other ESUs is generally under 100 Chinook per year.

Scenario 2B1 (pre-RCA, recent bycatch rates) reflects higher intensity, broader fishing patterns of the fleet as described in previous sections (Figure 22B). Fishing shifts south along the coast, bycatch increases and the diversity of stocks in the bycatch decreases to reflect the southern shift in fishing. Under Scenario 2B1, 82 percent of the impacts are expected to come from stocks in Oregon and California, primarily Klamath/Trinity (35%) and southern Oregon/Northern California (28%). Under this scenario listed Chinook ESUs comprise 12 percent of the bycatch from a diversity of ESUs (5% or less/ESU). Bycatch is distributed across fewer ESUs than under the baseline scenario and the magnitude and range of expected annual bycatch is much higher for each of those ESUs. The upper end of the range of impacts is about 50 percent greater for the Klamath and southern Oregon/Northern California ESUs (i.e., <200 to >1,200). Impacts to Lower Columbia River, Puget Sound and British Columbia stocks decline substantially ranging from tens of fish to 300 or less Chinook for each of these ESUs depending on the anticipated level of overall bycatch. Estimated annual bycatch for the other ESUs remains similar to the current footprint; representing tens of Chinook per year.

Scenario 2B2 (use of EDCP data only) reflects the same broader fishing pattern of the fleet as described for Scenario 2B1 above, but an even higher intensity of fishing (Figure 22C). Chinook bycatch increases substantially and the diversity of stocks in the bycatch decreases to reflect a likely southern shift in fishing. As emphasized earlier, caveats and uncertainties in the data as well as changes in fleet behavior and management make the outcomes of this scenario unlikely. Bycatch of this magnitude has not been observed, but bycatches in 2002 and 2003 in the non-whiting component were just over 14,000 and 16,000, respectively. This occurred just as the observer program was operational, the RCA was implemented and regulatory constraints on rockfish were put in place, so we cannot rule out much higher bycatches if these constraints were lifted. Therefore, along with the range of bycatches resulting from the bycatch assessment, we also present results consistent with the higher bycatch observed (16,000 Chinook).

Stock composition under Scenario 2B2 is similar to that of Scenario 2B1 because we assumed a similar fishing pattern. Oregon and California stocks dominate the bycatch, primarily Klamath/Trinity (33%) and southern Oregon/Northern California (27%). However, the magnitude and range of expected annual bycatch is much higher for each of those ESUs than under Scenario 2B1 (Figure 22C). 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 five 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 as shown in Figure 22C. In that case, 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.

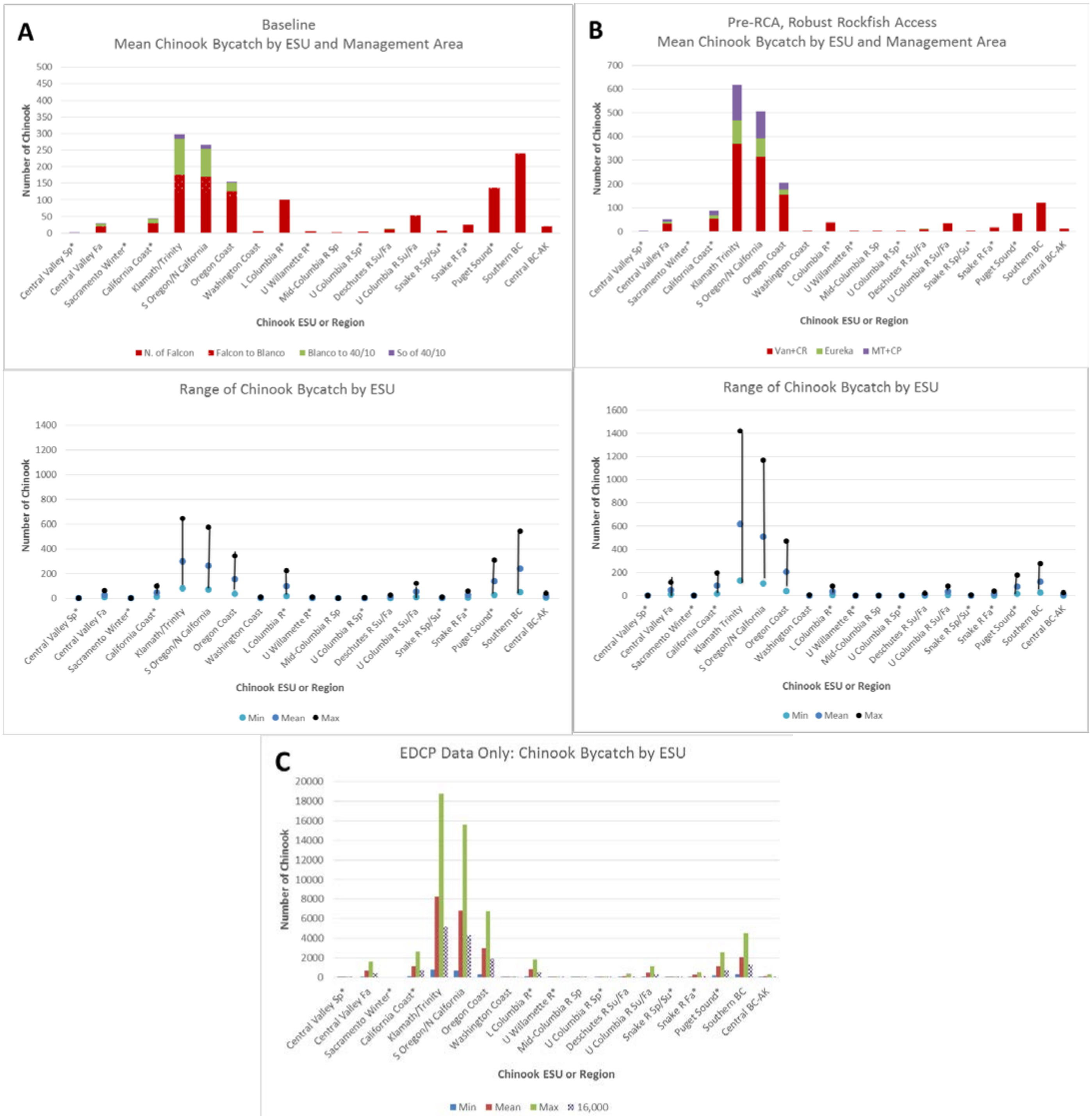


Figure 22. Plots of estimated bycatch in numbers of Chinook and distribution in the non-whiting fishery based on the mean and range of annual bycatch in Tables 11, 14 and 18 adjusted to reflect stock composition for the Baseline (Panel A), pre-RCA, recent bycatch rates (Panel B) and pre-RCA, EDCP data (Panel C) scenarios. The upper figures of Panels A and B show estimated mean annual bycatch by ESU and management area. The North of Falcon and Falcon to Blanco areas are in red so they are comparable to the combined Vancouver and Columbia River combined areas. The bottom figures show the range of estimated annual impacts by ESU. ESUs listed under the Endangered Species Act are starred.

4.3.4 Conclusions

Overall, the results from the non-whiting trawl analysis are highly dependent 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 non-whiting bycatch threshold of 4,500 Chinook, although it may approach that level in years when both groundfish catch and bycatch rates are high. Our results are supported by auxiliary analyses conducted by the GMT related to the 2017-18 specifications. However, 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 of 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, which we think are highly unlikely for the reasons summarized below. 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 it is not out of the realm of possibility. Results suggest that a 1,000 Chinook bycatch threshold would likely be exceeded under both fishing scenarios.

1) The two non-whiting trawl components show distinct differences in Chinook bycatch rates and location of fishing. Bycatch rates are much higher and more variable in the midwater non-whiting component than the bottom trawl component, particularly at shallower depths. Anomalous ocean conditions often have coincide with much higher Chinook bycatch. Both components show seasonal differences in location, depth and bycatch rates.

2) The applicability of the bottom trawl predictions of Chinook bycatch for Scenario 2B relying on the EDCP data alone to the IFQ fishery in the near future is questionable, particularly in the winter. The EDCP bycatch rate estimates themselves are the greatest source of uncertainty, given the comparatively high magnitude and variance, sampling issues inherent in the project, and conclusions regarding fleet representativeness from the report. Alternatively, these high bycatch rates could legitimately result from one or more factors that include different gear use in the 1990s, some hauls from within the current RCA where bycatch rates tended to be much higher than outside. Additional factors, including approximately 30 percent higher fleet capacity in the 1990s (high landings), and trip limit management of the fishery during that period could also play a role. However, given significant differences in fleet behavior to explicitly avoid bycatch of sensitive species and capacity between the 1990s and recent years, we have low confidence that the results using the EDCP bycatch rates provide a reasonable expectation of Chinook bycatch under this scenario.

3) The bottom trawl predictions derived from recent bycatch rates, but still using component-specific groundfish landings in the late 1990s were more statistically reliable, but likely represent a low-end estimate. This is because we expect additional effort on the shelf due to increasing ACLs for key species and the potential for changes in RCAs, which should increase Chinook bycatch rates. This is in accordance with recent bycatch rate, and latitudinal distribution patterns of Chinook bycatch, coupled with coarse agreement between historical and recent effort distributions. The midwater prediction using recent bycatch rates should also be considered a low end estimate.

4) The midwater predictions using EDCP bycatch rates appear more reasonable than the bottom trawl predictions using the same source, and useful for informing management decisions, partially given that two independent methods arrived at nearly identical results. Even so, they also hinge upon the predictions for groundfish landings in the component, which are predominantly made up of widow and yellowtail rockfish targets.

5) The EDCP data themselves, which were the only information available for salmon bycatch rates under the relatively unconstrained scenario requested by the Council (see introduction), are inherently problematic, and may not be representative of the fleet as a whole, as noted in the project report (Sampson 2002). However, we have made the best use of them, identified their limitations, and they appear to provide some useful information. Results for the midwater trawl component using EDCP bycatch appear the most believable, although the same statistical concerns apply to them as well.

6) Both high and low-end sets of predictions for Scenario 2B assume that higher attainment of the increased ACLs and allocations is achieved, comparable to that of the late 1990s. To what degree that assumption is realized will have a large impact on where actual Chinook bycatch falls within the range of predictions. The late 1990s represented the highest trawl landings of the past 20 years for many target species, including Dover sole, lingcod, widow rockfish, arrowtooth flounder, English sole, sablefish (northern). Several factors that may reduce attainment of some groundfish species remain in place at this time, including RCAs and stocks that are still rebuilding, such as yelloweye rockfish.

7) In these scenarios the stock composition of Chinook bycatch and the magnitude of impacts to individual ESUs is primarily influenced by location (latitude and depth), distribution of groundfish catch and the bycatch rate between the different components. The baseline scenario (Scenario 2A) reflects a more northerly fishing pattern with bycatch primarily occurring north of Cape Falcon. Stock composition is diverse with substantial contributions by all regional stock groups, including listed ESUs (23%). 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.

8) If fishing were to more closely resemble patterns prior to implementation of the RCA and constraints on rockfish that are now rebuilt (Scenario 2B), the analysis indicates a more southerly fishing pattern. Bycatch increases and the diversity of stocks in the bycatch decreases to reflect the southern shift in fishing. In this case, southern Oregon, Northern California and Klamath stocks would dominate the bycatch. Listed Chinook ESUs comprise 12 percent of the bycatch. The upper and lower ends of bycatch vary dramatically depending on the data used. Using recent bycatch rates, the upper end of the range of impacts is about 50 percent greater for the Klamath and southern Oregon/Northern California ESUs (i.e., <200 to >1,200). Impacts to Lower Columbia River, Puget Sound and British Columbia stocks decline substantially ranging from tens of fish to 300 or less Chinook for each of these ESUs depending on the anticipated level of overall bycatch. However, use of data available from the prior period indicate Chinook bycatch could range from several hundred to over 15,000 for some ESUs depending on the bycatch of groundfish and bycatch rate. More likely, even in the

extreme case is something similar to the highest observed bycatch of 16,000 Chinook. In that case, bycatch would range from several hundred to a few thousand for the dominant ESUs in the bycatch.

9) As emphasized earlier, caveats and uncertainties in the data as well as changes in fleet behavior and management make the outcomes of this latter scenario unlikely. Bycatch of this magnitude has not been observed, but bycatches in 2002 and 2003 in the non-whiting component were just over 14,000 and 16,000, respectively. This occurred just as the observer program was operational, the RCA was implemented and regulatory constraints on rockfish were put in place so we cannot rule out much higher bycatches if these constraints were lifted.

4.4 Scenario 3

In this section we assess two additional alternatives combining bycatch thresholds for the whiting and non-whiting components. For the first alternative, the Council requested evaluation of a Chinook bycatch threshold for the whiting fishery of 11,000, a non-whiting Chinook bycatch threshold of 4,500, and a reserve of 5,500. For the second, the Groundfish Advisory Subpanel and members of the public suggested evaluation of an overall bycatch threshold of 20,000 Chinook for both the whiting and non-whiting components combined. We examine both of those possibilities in the following discussion.

4.4.1 Approach

To examine these possibilities we relied on the results of the analyses described in the previous sections for the whiting and non-whiting components. The Council did not provide additional guidance as to whether the reserve would be available to all components or only to specific components of the groundfish fishery or rules regarding access to the reserve. Those issues are beyond the scope of this analysis but would need to be defined should the Council include this alternative in its Proposed Action. Our understanding is that the reserve would not be an entitlement but a safety net to minimize disruption to the fishery where actions that were already being taken to actively reduce bycatch were insufficient because of sudden increases in bycatch. Otherwise it would just represent an increased bycatch threshold. Therefore our assessment focuses on the characteristics of the fisheries and the magnitude of anticipated bycatch relative to the thresholds similar to the above analysis. In making our assessment we took into account both the general bycatch patterns and results assuming the highest bycatch rates. For the non-whiting fishery, we focused on the results from Scenario 2B using EDCP data with recent bycatch rates because the results using the full EDCP data set alone would exceed the thresholds in this scenario for the combined fleets.

4.4.2 Sector specific Chinook bycatch thresholds with a reserve

Chinook bycatch

The analysis indicates that 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 address fishing equities without inducing hardship through excessive constraint upon groundfish fishing. The whiting fishery is expected to be more stable in the near future than the non-whiting fishery, based on the results of our analysis and regulatory changes under consideration by the Council. As such, we would expect that the non-whiting fishery would access the reserve more frequently than the whiting fishery although the uncertainty is sufficiently high that we cannot estimate how often that would occur.

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. Otherwise, the results indicate that the fishery should remain well below the threshold. Increased ACLs beginning in 2017 for some rebuilt rockfish species like canary could result in more fishing shoreward of 125 fm by the whiting fleet, and therefore higher Chinook bycatch although other regulatory changes could mitigate that effect. The results from the non-whiting analysis indicate that bycatch is likely to remain well below 9,000 Chinook 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 to access newly rebuilt rockfish species and the high variability in salmon bycatch and uncertainty surrounding distributional bycatch effects with changing ocean conditions is expected to continue.

Our analysis indicates that a reserve of 5,500 should accommodate overages by either the whiting or the non-whiting fleet individually in a given year or even by both fleets in many years. Under the most reliable estimates of bycatch for the non-whiting fishery, the reserve would accommodate a doubling of the maximum estimated bycatch of 4,499 Chinook (i.e., high groundfish landings and maximum bycatch rates). The reserve would also accommodate both fisheries under their combined maximum estimates because the non-whiting fleet is not expected to exceed 4,500 Chinook. However, the reserve might be insufficient in a year in which bycatch in the whiting fishery was at its maximum estimated in the analysis (4,000 to 5,000 greater than the 11,000 threshold) and bycatch rates in the non-whiting fishery were much higher than anticipated in our analysis. In two of the three years in which the whiting fleet exceeded its threshold, the amount was much less than the reserve, i.e., 500-1,000 Chinook and our analysis of the non-whiting fishery generally relies on the highest bycatch rates observed. Assuming overages in both fisheries would be generally less than the maximum estimates in any year and bycatch rates in the non-whiting fishery would not be excessively higher, the reserve should accommodate most years when both fleets exceed their thresholds, particularly in combination with actions taken to actively manage bycatch. Maximum bycatch in both fisheries within the same year has not occurred during the data period.

The stock composition 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 previous analyses for these scenarios.

4.4.1 Combined threshold of 20,000 Chinook for the whiting and non-whiting 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 where the maximum bycatch estimate for the non-whiting fishery occurred in the same year as the whiting fishery reached its maximum estimated bycatch, particularly for the south of 42º N. Latitude scenario. We acknowledge the uncertainty in the bycatch rates for the non-whiting fishery and that they could be higher in the future but they would need to be twice as high as the maximum rates used in the analysis to reach 20,000, which already incorporate the highest observed rates. The fishery has exceeded 20,000 once since the observer program began estimating salmon bycatch in 2002.

Differences in the operation and monitoring of the whiting and non-whiting sectors present challenges to managing for a single combined threshold. Inseason information seems more readily available for the whiting than non-whiting sectors. Our analysis describes substantial differences in the location, distribution and seasonality of the whiting and non-whiting fleets that are largely tied to difference in their target species (Figures 10, 11, 16, 17-20). These differences can affect the magnitude and stock composition of the Chinook bycatch on which we will base our ESA consultation, and any management actions that might be required to respond to high bycatch or bycatch rates.

The stock composition would depend on whether fishing patterns changed in either fleet to access more of the threshold. Significant differences among the whiting and non-whiting 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.

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6 APPENDICES

6.1 Appendix A: Council motion and associated transcript

Motion:
Council request NOAA Fisheries to expand the analysis of Proposal One, contained in the NOAA Fisheries Power Point presentation on salmon bycatch in the groundfish fishery, by adding the following parameters:

For the Whiting Fishery:

1) Base the analysis on an 11,000 fish threshold for the whiting fishery

2) Assume the whiting fishery's geographic footprint is unchanged and alternatively,

3) Analyze an alternative assuming that the whiting fishery's at-sea processing geographic footprint is expanded south of 42 degrees and that 10 percent of the at-sea catch, using the most recent 5-year average, is harvested south of 42 degrees.

For the bottom trawl, LE/OA fixed gear, and recreational fishery:

1) Analyze three threshold values including 1,000, 4,500, and 9,000 Chinook salmon.

2) For the 1,000 threshold value, assume the same fishing structure and pattern that reflects the most recent 3 years.

3) For the 4,500 threshold value, assume the RCA is open to trawl fishing, and that the geographic distribution of the fleet/harvest is similar to 2000-2005.

4) For the 9,000 threshold value, assume the RCA is open to trawl fishing, the geographic distribution of the fleet/harvest is similar to the 2000-2005 timeframe, and that there is a midwater yellowtail/widow fishery conducted in a manner similar to historical patterns when such a fishery took place.

Other options and considerations:

• Add a suboption that includes a whiting threshold value of 11,000, a bottom trawl threshold of 4,500 and a 5,500 fish reserve.

• If feasible, the analysis should include an enumeration of the impacts on listed stocks overall and a geographic breakdown of where the impacts occur using the available geographic cells that are currently available using existing modeling tools.

• Include the reports from the GAP and GMT in the documents that are conveyed to NOAA Fisheries on this matter.

• include the key points made in public testimony.

Phil Anderson/Rich Lincoln (Motion carried Ms. Yaremko abstained).

6.2 Appendix B. Analysis of Chinook bycatch in more southerly Pacific whiting fishery

The following characterizes the relationship between stock composition of Chinook salmon Evolutionarily Significant Units (ESUs) and latitudinal distribution of bycatch in the US West Coast, at-sea, Pacific whiting fishery to determine the likely composition of Chinook salmon ESUs in bycatch if the current restriction on processing Pacific whiting south of latitude 42 is modified as described in the Council motion.

Chinook bycatch samples were obtained by NOAA's At-Sea Hake Observer Program. We used conditional maximum likelihood genetic mixture modeling based on the GAPS Microsatellite Baseline. Baseline reference populations were aggregated into reporting groups according to membership (genetic affinity) in ESUs (Table A2). Full description of sample collection, laboratory procedures, and data analysis are described in more detail in Moran and Tuttle (2011).

Our previous observation of genetic stock composition between 2008 and 2014 showed strong differences that could be attributed to the latitudinal distribution of bycatch, as expressed by mean latitude of all bycatch in a given year (Figure A1). Linear regression was used to model the relationship between mean latitude (*x*) and proportional contribution of each ESU (*y*) for bycatch in a given year (Table B1). Those point estimates and regression lines are shown in Figure B2.

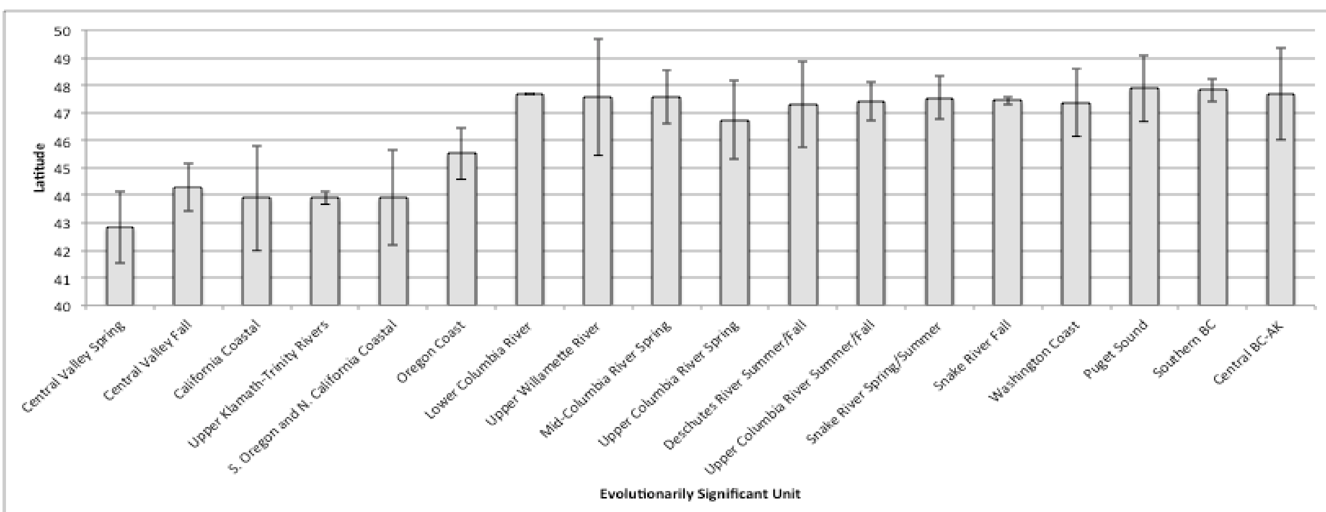

Figure B1. Mean latitude of encounter for each Chinook ESU (A-SHOP samples, all years)

Table B1. Linear regression models used to infer stock composition at a more southerly latitude (mean latitude of bycatch, 42°), in the absence of the current latitude-42 processing restriction

ESU	Proportion at latitude 42	Linear model	r^2 (adj)	*P* value
Central Valley Sp	0.0004	y = -7.114e-05x + 0.003	-0.17	0.7374
Central Valley Fa	0.0332	y = -0.006x + 0.273	0.20	0.1729
Sacramento Winter	NA	NA		
California Coast	0.0584	y = -0.011x + 0.532	0.52	0.0416
Klamath Trinity	0.4433	y = -0.093x + 4.448	0.97	4.53E-05
S Oregon/N California	0.3510	y = -0.067x + 3.266	0.98	1.66E-05
Oregon Coast	0.1121	y = -0.007x + 0.436	0.08	0.2746
Washington Coast	0.0000	y = 0.0012x - 0.052	0.53	0.0384
L Columbia R	0.0000	y = 0.038x + -1.676	0.86	0.0016
U Willamette R	0.0000	y = 0.001x - 0.060	0.86	0.0016
Mid-Columbia R Sp	0.0000	y = 0.0002x - 0.009	-0.13	0.6008
U Columbia R Sp	0.0000	y = 0.0007x - 0.028	0.68	0.0138
Deschutes R Su/Fa	0.0016	y = 0.002x - 0.082	0.25	0.1429
U Columbia R Su/Fa	0.0000	y = 0.012x - 0.504	0.73	0.0086
Snake R Sp/Su	0.0000	y = 0.0016x - 0.068	0.96	0.0001
Snake R Fa	0.0000	y = 0.006x - 0.240	0.62	0.0213
Puget Sound	0.0000	y = 0.039x - 1.702	0.98	1.40E-05
Southern BC	0.0000	y = 0.076x - 3.327	0.93	0.0003
Central BC-AK	0.0000	y = 0.005x - 0.220	0.83	0.0027

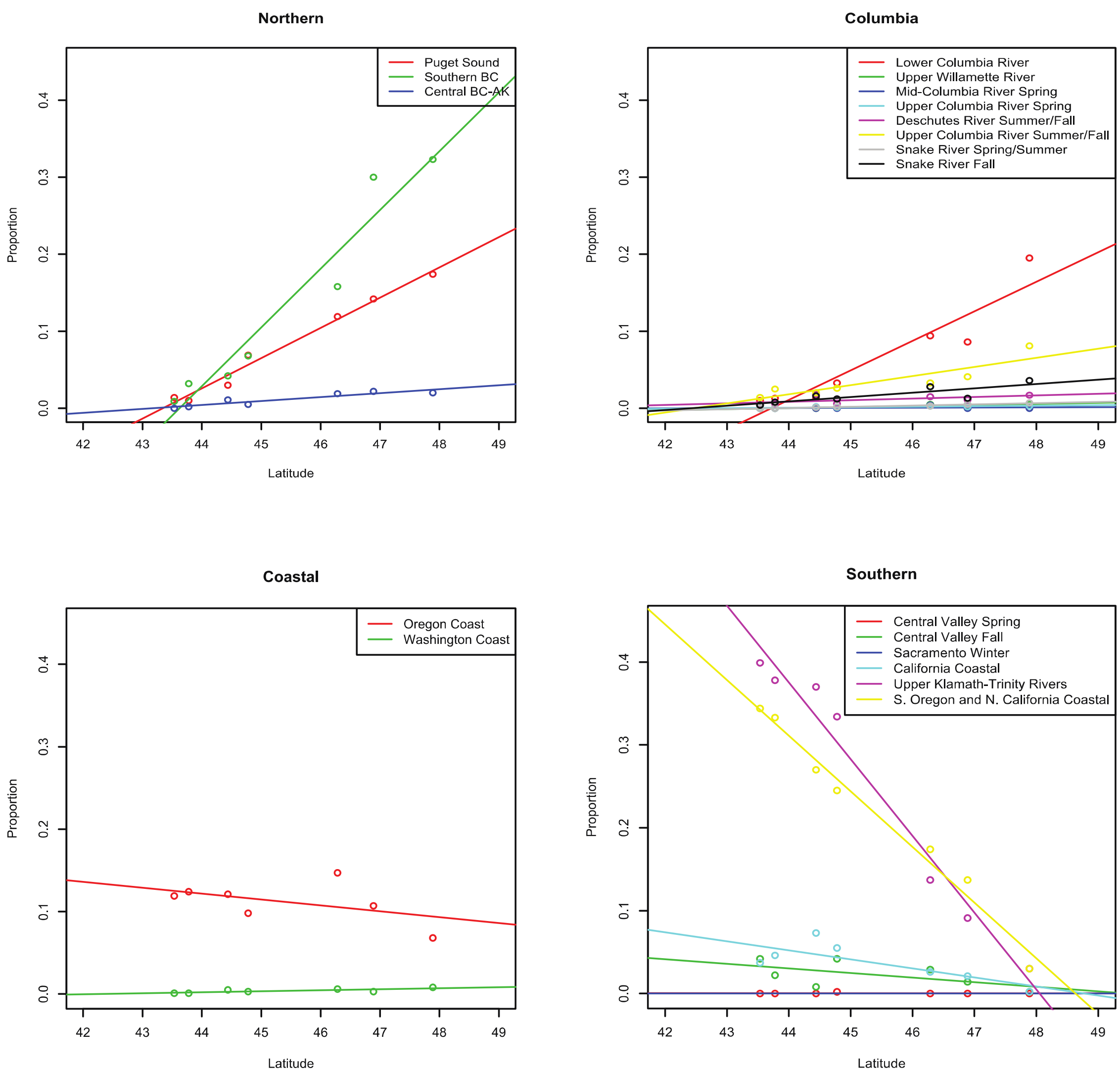

Figure B2. Chinook salmon ESU proportions are highly dependent on the mean latitude of annual bycatch in West Coast, At-Sea, whiting fisheries (2008 - 2014, N = 3964).

The trend in bycatch since 2011 has been toward more southerly mean latitudes and increasing proportions of southern stocks. We used those observations to model the relationship between latitude and stock composition. To help evaluate our model, we used the observed mean latitude for each of 5 representative years and compared the estimated stock compositions from our model with the observed stock compositions in those sample years (Figure B3, not true cross validation, rather a visualization of residuals).

Cross validation from independent data was carried out on a newly available 2015 Chinook salmon bycatch sample, not included in the model (Figure B4). Those modeled and observed values were broadly concordant but with a few divergent estimates for individual ESUs. The most concerning of those was the substantial underestimate of the ESA-listed Lower Columbia River ESU. However, the proportion of that ESU was relatively low (0.024) at that latitude (43.5).

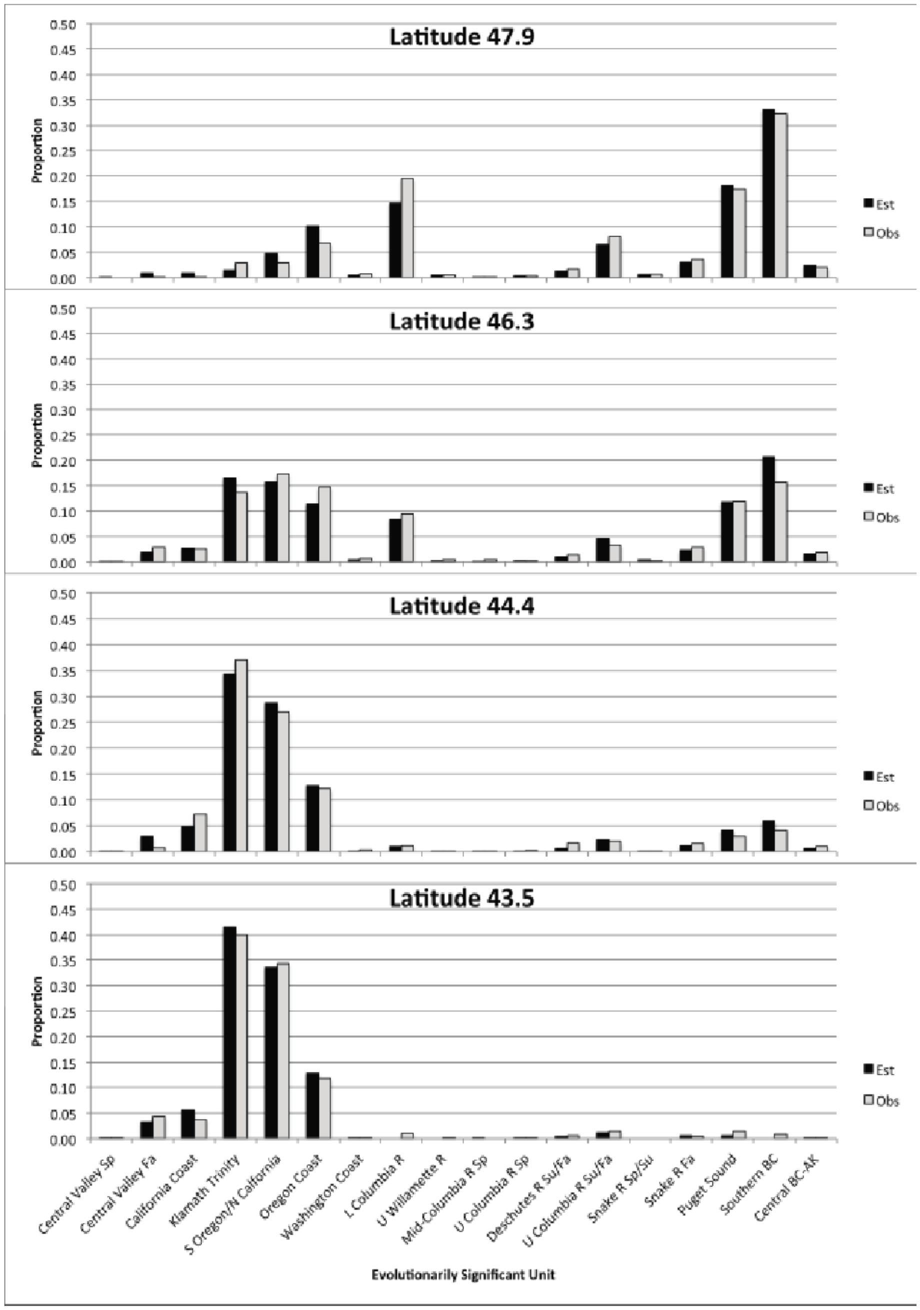

Figure B3. Estimated and observed stock composition showed high concordance at a broad range of mean latitudes for Chinook salmon bycatch in the US West Coast At-Sea whiting fishery. The example plots reflect the mean latitude of bycatch samples obtained in each of 4 selected years (2009, 2008, 2012, and 2014, respectively), which span the mean annual latitudes observed in the 7-year period on which the model is based. Coincidentally, 43.5˚ N. Latitude, observed in 2014, matches exactly the bycatch scenario requested by the Council.

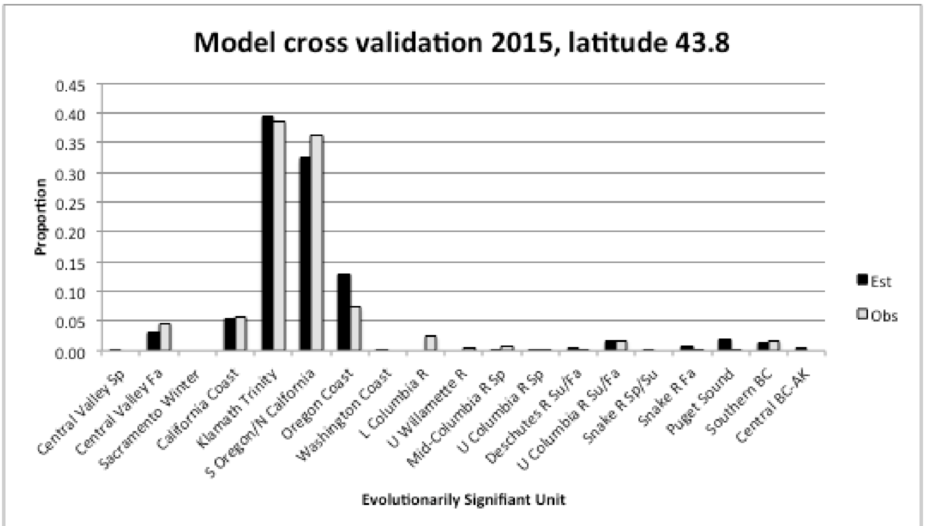

Figure B4. Independent cross validation from 2015 data not used in model development showed broad concordance between estimated and observed stock composition estimates.

The mean latitude of bycatch in 2015 was identical to the value observed in 2013 (43.8˚ N. Latitude). That coincidence allowed an evaluation of inter-annual variation in stock composition (Figure B5). The difference observed between estimated and observed stock composition in 2015 (Figure B4) was essentially the same as the difference between years at the same latitude (Figure B5) (mean squared error 0.00031 versus 0.00025, respectively).

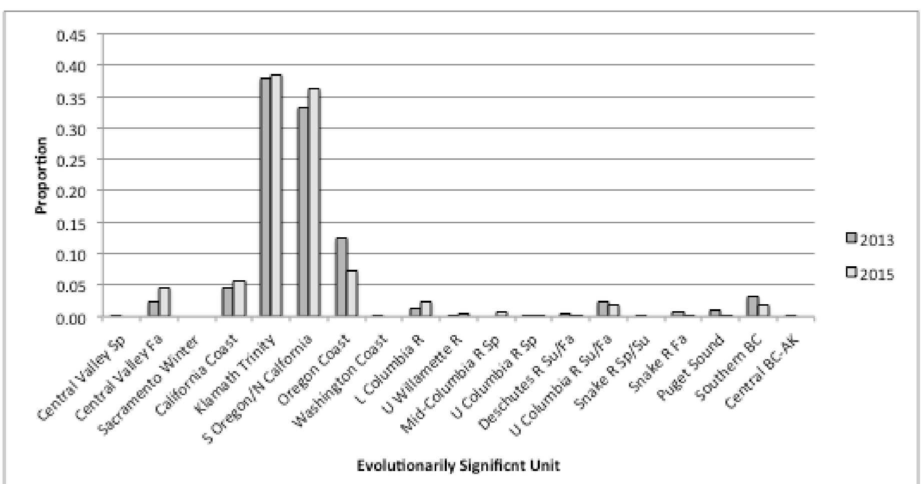

Figure B5. Comparison of annual bycatch replicate samples taken in 2013 and 2015, years that had identical mean latitude (43.8). Mean squared error was similar between the model cross validation (Figure B4) and comparison of empirical estimates in this plot.

We used three different latitudinal distributions, illustrated in Figure B6, to infer the likely stock composition of Chinook salmon bycatch if the latitude restriction is rescinded. Our favored estimate used a mean latitude of 42° N. Latitude for the distribution of annual bycatch (Figure B7), not because of the restriction itself, but rather based on a projection of the current trend, which again showed steady decline since 2011 (Figure B6). An annual bycatch distribution with mean 42° N. Latitude is actually further south than ever observed in the at-sea fishery, but is nevertheless a reasonable projection of the current trend (Fig. B6). This projected value seems more likely than a latitude of 43.45, which was based on the mean distribution from 2010 to 2014, shifted such that 10% fell south of 42° (requested by the Pacific Fishery Management Council). These two different estimates, spanning three latitudes, provide managers with a range of values for consideration. Although there is uncertainty in what mean latitude to anticipate if the restriction is modified, it is worth noting that stock composition does not change dramatically, since more northern stocks are present at very low rates at these southern latitudes (Figure 2 and B7).

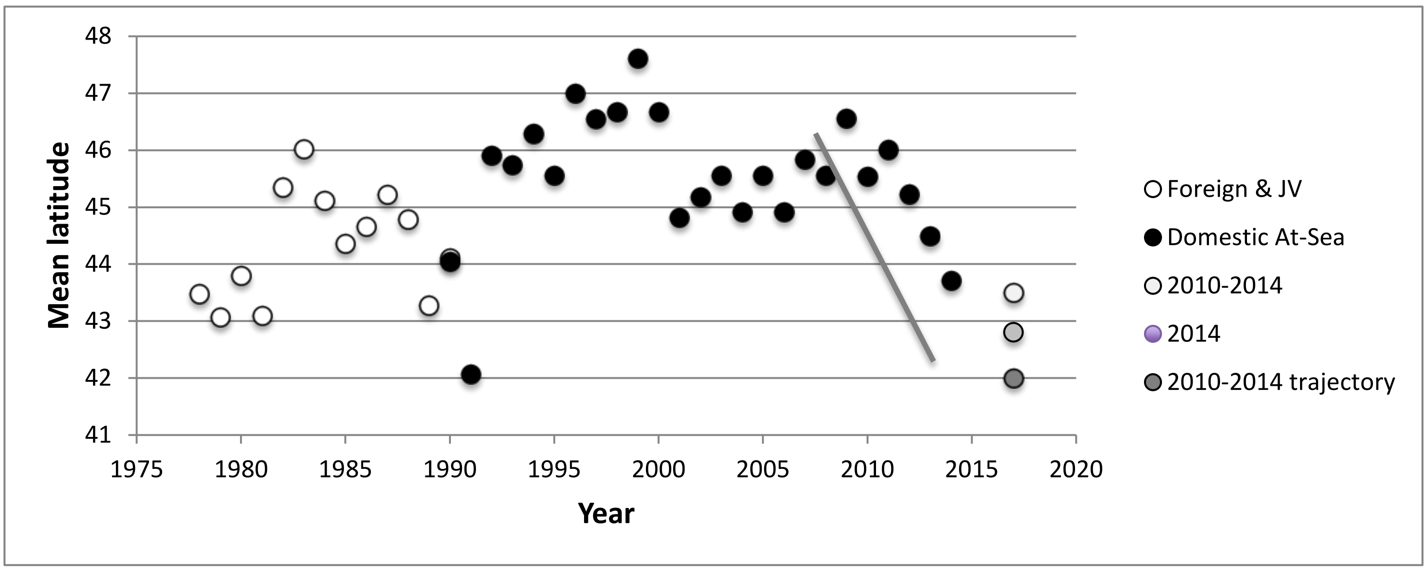

Figure B6. Latitudinal distribution of annual bycatch has moved southward since 2011. Three gray points represent different anticipated distributions for bycatch, if the latitude-42 restriction is rescinded. The “2010-2014” value used the latitudinal distribution for those years shifted south such that 10% fell south of latitude 42 (Council request). (see Fig. 2). The “2010-2014 trajectory” infers a mean latitude based on projection of the trend (gray line) over that 5-year period.

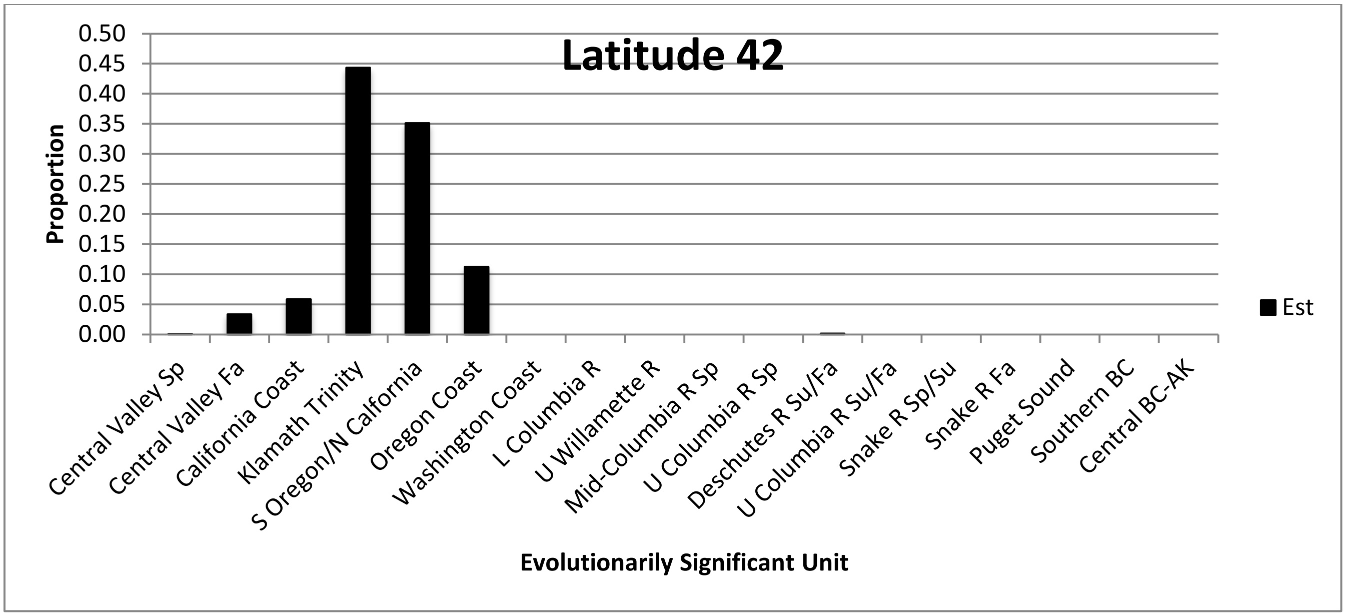

Figure B7. The favored stock composition estimate used the trajectory of mean latitude from 2010 – 2014 (Figure B6). If the processing south of 42˚ N. Latitude restriction is removed for processing Pacific whiting, our best estimate of Chinook salmon bycatch stock composition suggests there will be a further decrease in proportion of northern ESUs and a concomitant increase in particular southern ESUs, including Upper Klamath-Trinity Rivers and S. Oregon and N. California Coastal (see Table 1). No estimate is possible for Central Valley winter run because this stock had never been observed in the samples.

Table B2. Reference populations and reporting group structure for genetic mixture analysis based on Evolutionarily Significant Units (pers. com. J. Myers, January 2016). Populations from Seeb et al. (2007). Status: E = Endangered, T = Threatened, C = Candidate, NW = Not Warranted.

Genetic baseline population	ESU reporting group	Status
Mill Cr sp	Central Valley Spring	T
Butte Cr Sp	Central Valley Spring	T
Deer Cr sp	Central Valley Spring	T
Feather H sp	Central Valley Spring	T
Stanislaus R	Central Valley Fall	C
Butte Cr f	Central Valley Fall	C
Feather H fa	Central Valley Fall	C
Battle Cr	Central Valley Fall	C
Sacramento H	Sacramento Winter	E
Russian R	California Coastal	T
Eel R	California Coastal	T
Trinity H f	Upper Klamath-Trinity Rivers	NW
TrinityH sp	Upper Klamath-Trinity Rivers	NW
Klamath R fa	Upper Klamath-Trinity Rivers	NW
Chetco R	S. Oregon and N. California Coastal	NW

Genetic baseline population	ESU reporting group	Status
Cole Rivers H	S. Oregon and N. California Coastal	NW
Applegate Cr	S. Oregon and N. California Coastal	NW
Siuslaw R	Oregon Coast	NW
Umpqua H	Oregon Coast	NW
Millicoma R	Oregon Coast	NW
Coos H	Oregon Coast	NW
SCoos H	Oregon Coast	NW
Elk H	Oregon Coast	NW
Sixes R	Oregon Coast	NW
S Umpqua H	Oregon Coast	NW
Coquille R	Oregon Coast	NW
Alsea R	Oregon Coast	NW
Nehalem R	Oregon Coast	NW
Siletz R	Oregon Coast	NW
Kilchis R	Oregon Coast	NW
Necanicum H	Oregon Coast	NW
Nestucca H	Oregon Coast	NW
Salmon R f	Oregon Coast	NW
Trask R	Oregon Coast	NW
Wilson R	Oregon Coast	NW
Yaquina R	Oregon Coast	NW
Cowlitz H sp	Lower Columbia River	T
Kalama H sp	Lower Columbia River	T
Lewis H sp	Lower Columbia River	T
Sandy R	Lower Columbia River	T
Cowlitz H fa	Lower Columbia River	T
Lewis R f	Lower Columbia River	T
McKenzie H	Upper Willamette River	T
NSantiam H	Upper Willamette River	T
Spring Cr H	Lower Columbia River	T
U Yakima H	Mid-Columbia River Spring	NW
Warm Springs H	Mid-Columbia River Spring	NW
Wenatchee R sp	Upper Columbia River Spring	E
Wenatchee H sp	Upper Columbia River Spring	E
Carson H	Upper Columbia River Spring	N/A
John Day R	Upper Columbia River Spring	E
U Deschutes R	Deschutes River Summer/Fall	NW
L Deschutes R	Deschutes River Summer/Fall	NW
Methow R	Upper Columbia River Summer/Fall	NW
Wells H	Upper Columbia River Summer/Fall	NW
Wenatchee R sf	Upper Columbia River Summer/Fall	NW

Genetic baseline population	ESU reporting group	Status
Hanford Reach	Upper Columbia River Summer/Fall	NW
Minam R	Snake River Spring/Summer	T
Rapid R H	Snake River Spring/Summer	T
Secesh R	Snake River Spring/Summer	T
Tucannon H	Snake River Spring/Summer	T
Tucannon R	Snake River Spring/Summer	T
Newsome Cr	Snake River Spring/Summer	T
WF Yankee Frk	Snake River Spring/Summer	T
EF Salmon R	Snake River Spring/Summer	T
Imnaha R	Snake River Spring/Summer	T
Lyons Ferry H	Snake River Fall	T
Queets R	Washington Coast	NW
Sol Duc H	Washington Coast	NW
Forks Cr H	Washington Coast	NW
Hoh R	Washington Coast	NW
Humptulips H	Washington Coast	NW
Makah H	Washington Coast	NW
George Adams H	Puget Sound	T
Hamma Hamma R	Puget Sound	T
Elwha H	Puget Sound	T
Elwha R	Puget Sound	T
Dungeness R	Puget Sound	T
Voights H	Puget Sound	T
Soos H	Puget Sound	T
White H	Puget Sound	T
Hupp Sp H	Puget Sound	T
Clear Cr H	Puget Sound	T
S Prairie Cr	Puget Sound	T
Skagit R	Puget Sound	T
U Skagit R	Puget Sound	T
U Sauk R	Puget Sound	T
L Sauk R	Puget Sound	T
Suiattle R	Puget Sound	T
Marblemount H sp	Puget Sound	T
Marblemount H su	Puget Sound	T
U Cascade R	Puget Sound	T
Samish H	Puget Sound	T
Snoqualmie R	Puget Sound	T
Wallace H	Puget Sound	T
Skykomish R	Puget Sound	T
NF Stillaguam H	Puget Sound	T

Genetic baseline population	ESU reporting group	Status
NF Nooksack H	Puget Sound	T
Birkenhead H	Southern BC	N/A
W Chilliwack H	Southern BC	N/A
Maria Slough	Southern BC	N/A
Nicola H	Southern BC	N/A
Spius H	Southern BC	N/A
M Shuswap H	Southern BC	N/A
L Adams H	Southern BC	N/A
L Thom R	Southern BC	N/A
Raft R	Southern BC	N/A
Deadman H	Southern BC	N/A
Clearwater R	Southern BC	N/A
Louis Cr	Southern BC	N/A
Nechako R	Southern BC	N/A
Quesnel R	Southern BC	N/A
Stuart R	Southern BC	N/A
U Chilcotin R	Southern BC	N/A
Chilko R	Southern BC	N/A
Morkill R	Southern BC	N/A
Salmon R sp	Southern BC	N/A
Swift R	Southern BC	N/A
Torpy R	Southern BC	N/A
Big Qualicum H	Southern BC	N/A
Quinsam H	Southern BC	N/A
Nanaimo H f	Southern BC	N/A
Puntledge H f	Southern BC	N/A
Cowichan H	Southern BC	N/A
Marble H	Southern BC	N/A
Nitinat H	Southern BC	N/A
Robertson H	Southern BC	N/A
Sarita H	Southern BC	N/A
Tahsis R	Southern BC	N/A
Tranquil R	Southern BC	N/A
Conuma H	Southern BC	N/A
Porteau Cove H	Southern BC	N/A
Klinaklini R	Southern BC	N/A
Wannock H	Central BC-AK	N/A
Atnarko H	Central BC-AK	N/A
Kitimat H	Central BC-AK	N/A
Ecstall R	Central BC-AK	N/A
L Kalum R	Central BC-AK	N/A

Genetic baseline population	ESU reporting group	Status
Bulkley R	Central BC-AK	N/A
Sustut R	Central BC-AK	N/A
Babine H	Central BC-AK	N/A
Owegee R	Central BC-AK	N/A
Damdochax R	Central BC-AK	N/A
Kincolith R	Central BC-AK	N/A
Kwinageese R	Central BC-AK	N/A
L Tahltan R	Central BC-AK	N/A
Nakina R	Central BC-AK	N/A
Tatsatua Cr	Central BC-AK	N/A
U Nahlin R	Central BC-AK	N/A
Kowatua Cr	Central BC-AK	N/A
Chickamin/White H	Central BC-AK	N/A
Chickamin R	Central BC-AK	N/A
Chickamin H	Central BC-AK	N/A
Clear Cr	Central BC-AK	N/A
Cripple Cr	Central BC-AK	N/A
Keta R	Central BC-AK	N/A
King Cr	Central BC-AK	N/A
Andrew Cr	Central BC-AK	N/A
Andrew/Mac H	Central BC-AK	N/A
Andrew/Med H	Central BC-AK	N/A
Andrew/Cry H	Central BC-AK	N/A
King Salmon R	Central BC-AK	N/A
Tahini R	Central BC-AK	N/A
Tahini/Mac H	Central BC-AK	N/A
Big Boulder Cr	Central BC-AK	N/A
Klukshu R	Central BC-AK	N/A
Situk R	Central BC-AK	N/A

6.3 Appendix C: Regulations – Prohibition on processing south of 42º N. Latitude

Whiting – bycatch regulations

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§ 227.21 Threatened salmon.

(a) *Prohibitions.* The prohibitions of section 9 of the Act (16 U.S.C. 1538) relating to endangered species apply to the threatened species of salmon listed in § 227.4 (e), (g) and (h) of this part, except as provided in paragraph (b) of this section.

(b) *Exceptions.* (1) The exceptions of section 10 of the Act (16 U.S.C. 1539) and other exceptions under the Act relating to endangered species, and the provisions of regulations issued under the Act relating to endangered species (such as 50 CFR part 222, subpart C—Endangered Fish or Wildlife Permits), also apply to the threatened species of salmon listed in § 227.4 (e), (g) and (h) of this part. This section supersedes other restrictions on the applicability of 50 CFR part 222, including, but not limited to, the restrictions specified in §§ 222.2(a) and 222.22(a).

(2) The prohibitions of paragraph (a) of this section relating to threatened species of salmon listed in § 227.4 (g) and (h) of this part do not apply to activities specified in an application for a permit for scientific purposes or to enhance the propagation or survival of the species *provided that* the application has been received by the Assistant Administrator by May 22, 1992. This exception ceases upon the Assistant Administrator's rejection of the application as insufficient, upon issuance or denial of a permit, or on December 31, 1992, whichever occurs earliest.

§ 227.72

50 CFR Part 663

[Docket No 920403-2103]

Pacific Coast Groundfish Fishery

AGENCY: National Marine Fisheries Service (NMFS), NOAA, Commerce.

ACTION: Emergency interim rule; request for comments.

SUMMARY: The Secretary of Commerce (Secretary) issues an emergency interim rule to restrict operations in the Pacific whiting fishery. These regulations are intended to minimize the impact of the Pacific whiting fishery on Pacific salmon stocks without undue hardship to the Pacific whiting industry. This action is necessary because many Pacific salmon stocks appear to be at record low levels, and some stocks may not meet 1992 escapement goals even if no fishery were conducted.

EFFECTIVE DATES: This emergency rule is effective from April 16, 1992 at 1700 hours, e.d.t., until 2400 hours (local time) July 21, 1992, and may be extended for an additional 90 days. Comments will be accepted through May 7, 1992.

ADDRESSES: Comments on this emergency rule may be submitted to Rolland A. Schmitten, Director, Northwest Region, National Marine Fisheries Service, 7600 Sand Point Way N.E., Bin C15700, Seattle WA 98115–0070; or E. Charles Fullerton, Director, Southwest Region, National Marine Fisheries Service, 501 West Ocean Blvd., suite 4200, Long Beach, CA 90802–4213.

FOR FURTHER INFORMATION CONTACT: William L. Robinson at 206–526–6140, or Rodney R. McInnis at 310–980–4040.

SUPPLEMENTARY INFORMATION:

Background

In 1991, the Pacific whiting (whiting) fishery was completely "Americanized." The joint venture fishery (U.S. catcher vessels delivering whiting to foreign processing vessels at sea), which in the previous year had taken over 93 percent of the whiting quota, was completely displaced by a domestic at-sea catching and processing fleet. The domestic at-sea processing fleet is permitted to operate in areas that had been prohibited to foreign processing vessels south of 39° N. latitude. Those areas have been closed to foreign processing vessels due to concerns over the bycatch of salmon and rockfish and for national security reasons. In addition, domestic catcher vessels have been allowed to fish from 0-200 nautical miles (nm) offshore, whereas foreign trawl vessels could only fish seaward of 12 nm.

Whiting are found in fishable concentrations off California in the spring. The fishery follows the stock northward until it is predominantly in Canadian waters or offshore in the fall. The 1992 Pacific whiting season begins on April 15. An earlier fishery could be expected to increase effort in waters near the Cordell Bank and the Gulf of the Farallones National Marine Sanctuaries off the Coast of California, and could increase the likelihood of interception of Sacramento winter-run chinook salmon that have been listed as "threatened" under the Endangered Species Act (ESA). Chilipepper and bocaccio rockfish, which are also caught as bycatch in the whiting fishery, are found in these waters as well and used in fish meal. Otherwise, in a directed fishery for rockfish, chilipepper and bocaccio would generate a significantly higher price. In part to alleviate these concerns, an April 15 opening date was established for the whiting fishery beginning in 1992. This opening date approximates the traditional start of the fishery and was meant to maintain the historical season structure by counteracting the 1991 trend of beginning to fish for whiting early in the year and in the southernmost area of the fishery.

Although the April 15 opening date helps to reduce impacts on some salmon stocks, particularly Sacramento winter-run chinook salmon, further review of the fishery data for 1991 indicates that the bycatch of Sacramento winter run chinook and other salmon stocks, most notably Klamath River fall chinook, could be reduced further without undue hardship on the whiting fishery.

Recently completed salmon stock assessments for 1992 indicate that the abundance of Klamath River fall chinook salmon is predicted to be at a record low level and is not expected to meet the minimum escapement level or "escapement floor" of 35,000 even in the absence of all fishing. This year will mark the third consecutive year of underescapement and will thus require the Pacific Fishery Management Council (Council) to conduct a review of the depressed status of the stock to determine the cause of the stock decline and its relationship to fishing. Because of the depressed status of the Klamath River fall chinook stock, the Council is considering, for the first time, severely restrictive fishing options for the commercial and recreational salmon fisheries, one of which is a prohibition of ocean salmon fishing along a substantial portion of the Oregon and California coasts. These circumstances prompted the Council to consider further ways to minimize the bycatch of salmon in the whiting fishery.

Between 1980 and 1991, the bycatch of salmon in the whiting fishery was consistently higher in the Eureka area than in other areas. (These bycatch statistics included data from the foreign directed-trawl fishery, the joint venture, and the 1991 domestic at-sea processing fleet.) The southern part of the Eureka region, from 42° N. latitude to Cape Mendocino (40°30' N. lat.), tended to record the highest salmon bycatch. In 1991, approximately 66,000 metric tons (mt) of whiting were caught by the at-sea processing fleet in the Eureka subarea (between 43° and 40°30' N. lat.), 34 percent of the total whiting catch. Associated with this catch, approximately 4,800 chinook salmon were taken, 76 percent of the total salmon catch taken by the at-sea processing fleet.

It is generally observed that a majority of the bycatch occurs in a few hauls. Within the Eureka Subarea, 50 percent of the salmon were taken in 8 of the 596 hauls observed by NMFS-certified observers. Coastwide only 16 percent of all observed withing tows contained salmon; this percentage increases to about 25 percent in the Eureka Subarea. Although salmon avoidance measures voluntarily adopted by the at-sea processing fleet kept the coastwide incidence of salmon to approximately 0.03 salmon per mt of whiting in 1991 (one salmon in about 30 mt of whiting), well below the voluntary goal of 0.05, the catch and catch rate were higher in the Eureka area (0.07 salmon per mt of whiting).

At its March 9–13, 1992, meeting, the Council recommended a number of management measures designed to reduce further the bycatch of salmon without imposing undue hardship on the whiting fishery. These management measures are described below. Because of the extremely poor salmon returns expected in 1992, the Council requested the Secretary to implement these regulations as emergency regulations under section 305(c) of the Magnuson Fishery Conservation and Management Act (Magnuson Act) before the 1992 whiting season begins on April 15.

Prohibit At-Sea Processing South of 42° N. Latitude

To protect the southern part of the Eureka area, the area of highest salmon bycatch, the Council recommended that whiting not be processed at sea south of 42° N. lat. This would shift the high-capacity at-sea processing fleet, which was able to take over 25,000 mt of whiting in a single week in 1991, to more northerly fishing areas where salmon interception historically has been lower. It also would shift operations away from the waters near Cordell Bank and the Gulf of the Farrallones Islands which experienced high bycatch of chilipepper rockfish (over 500 mt) in 1991.

This restriction would move the largest part of the whiting fleet (the at-sea catcher/processors, motherships and their catcher vessels) northward, removing the largest potential impact on Klamath River fall chinook and Sacramento winter-run chinook. Because of the mobility of these vessels, a shift to more northern waters is not expected to limit the at-sea processing fleet's ability to catch whiting, although it may slow their initial operations somewhat if whiting are not fully dispersed along the coast. However, whiting are expected to be migrating into the more northerly areas by April 15, and effort by the at-sea fleet is expected to be sufficient to harvest any amount of whiting that is available to them.

Catcher vessels that deliver whiting to shoreside processing plants will not be subject to this restriction. The shore-based fleet cannot follow whiting as freely because vessels need to stay within approximately 12 hours of the processing plants to maintain the quality of the fish. Unlike the at-sea processing fleet, shoreside processing plants are at fixed locations and depend on whiting caught locally; obviously; these plants are not able to follow the whiting as they migrate north. In addition, the amount of whiting expected to be harvested for delivery to shoreside processing plants is considerably less than the at-sea processing fleet would harvest in the area; consequently, the shore-based fleet's aggregate salmon bycatch is also expected to be relatively small. Thus, extending the prohibition against catchers that deliver to shoreside processors south of 42° N. lat. would unduly impact their ability to participate in the fishery, but would protect only a relatively small amount of salmon and rockfish.

The definition of processing for the purpose of this rule means the preparation of packaging of whiting to render it suitable for human consumption, industrial uses or long-term storage, except for heading and gutting unless additional preparation is done.

Close the Klamath and Columbia River Conservation Zones to Fishing for Whiting

The Klamath River and Columbia River conservation zones have been closed to the commerical and recreational salmon fisheries for some years in order to conserve salmon stocks returning to these rivers. The Klamath River Salmon Conservation Zone extends approximately 6 nm north and 6 nm south of the Klamath River mouth and 12nm seaward. The Columbia River Salmon Conservation Zone is roughly a square, 6 nm on each side, off the mouth of the Columbia River. Operators of whiting vessels voluntarily agreed not to operate in these relatively small areas in 1991. Given the record low levels of salmon, these zones will again be closed to the whiting fishery in 1992, this time through emergency rule to insure against any whiting fishing occurring in these zones.

Prohibit Directed Fishing for Whiting Shoreward of the 100-Fathom Contour in the Eureka Subarea

Another pattern evident from the analysis of the historical salmon bycatch data is the tendency for bycatch rates to be higher in shallower, nearshore areas. An analysis of the bycatch rate inside and outside of the 100-fathom contour in the Eureka Subarea from 1988 to 1990 indicated that salmon bycatch rates were 9 to 16 times higher shoreward of the 100-fathom contour. Most, if not all, of the 1991 whiting harvest in the Eureka Subarea, the area of greatest salmon bycatch and bycatch rates, was taken seaward of 100 fathoms. Concerned that a shift in the whiting fishery to more nearshore waters could increase the bycatch of Klamath River salmon and other stocks above 1991 levels, the Council recommended that all fishing for whiting be prohibited in waters shoreward of the 100-fathom contour in the Eureka Subarea.

Although catcher vessels that deliver whiting to shoreside processing plants are not subject to the 42° N. lat. restriction applied to the at-sea processing fleet, the restriction against fishing shoreward of the 100-fathom contour in the Eureka area applies to all catcher vessels in the whiting fishery. The Council's recommendation was aimed at the fishery that targets whiting because of the magnitude and intensity of that fishery, and data which indicate that a significant amount of the salmon bycatch in the whiting fishery occurs shoreward of 100 fathoms and in the Eureka Subarea.

Trawl vessels fishing for other groundfish species inside 100 fathoms, primarily bottom trawl vessels, often have a bycatch of Pacific whiting. In order to prevent forcing these vessels to disrupt their fishing operations by having to sort and discard incidentally caught whiting without providing any additional protection to salmon, the Secretary has modified the Council's recommendation to provide an xception to allow them to take, retain, .nd land up to 2,000 pounds of whiting from areas shoreward of the 100-fathom contour. Although little is known about the bycatch of salmon by non-whiting groundfish vessels, it is thought that most of their bycatch occurs during the winter, not during the whiting season.

The prohibition against fishing for whiting shoreward of the 100-fathom contour applies only in the Eureka Subarea. The prohibition was not extended to more northerly areas because the 100-fathom contour extends much further offshore in more northerly areas, which could adversely impact the whiting fleet's ability to harvest whiting. Incidences of higher whiting abundance can occur shoreward of 100 fathoms in the more northerly areas. If the fishery were forced seaward of 100 fathoms in these areas, some vessels would be pushed outside of their normal operating range and be unable to make whiting deliveries to shoreside processing plants. In addition, the immediate salmon bycatch problem is only in the Eureka Subarea, although some concern exists that with a greater amount of whiting effort being shifted to the north, the salmon bycatch rate on other salmon ·tocks may increase. The Council tends to monitor the salmon bycatch ates of both the at-sea processing and the shoreside sectors of the fishery in 1992, and may make future adjustments in response to additional information.

Prohibit Night Fishing

Traditionally, the catcher vessels supplying the foreign joint venture processors did not operate at night until the high-capacity surimi processors appeared in 1988. In 1991, some harvesting did occur throughout the night. An analysis of the 1991 catch rate of salmon by time of day (determined by the time the net began to be retrieved, or "haulback") revealed that salmon were most likely to be taken in the whiting fishery between midnight and 6 a.m. coastwide. Consequently, the Council recommended that fishing for whiting be prohibited coastwide between midnight and one half hour after sunrise.

Classification

The Assistant Administrator for Fisheries, NOAA (Assistant Administrator), has determined that, in light of new information regarding the depressed status of Pacific coast salmon stocks in the Klamath, Columbia, and ·cramento rivers, the bycatch of .mon in the whiting fishery must be .educed as much as practicable in order to protect the salmon stocks. In order to be effective, this rule must be implemented before the start of the whiting season on April 15. This action is consistent with the Magnuson Act and other applicable law. The Assistant Administrator finds that the reasons justifying promulgation of this rule on an emergency basis also make it impracticable and contrary to the public interest to provide prior notice and opportunity for comment, or to delay for 30 days the effective date of this rule, as generally required by section 553 (b) and (d) of the Administrative Procedure Act. The public had opportunities to comment on the substance of this emergency rule during the meeting of the Council and its advisory committees in March 1992. Furthermore, the public participated in the September 1991 Council meetings during which reports were presented that examined the bycatch of salmon and rockfish in the whiting fishery by time of day, month, and geographical area, and which resulted in a delay in the whiting season opening until April 15. The public also will have an opportunity to comment on the emergency measures during the comment period provided by this rule.

This emergency rule is exempt from the normal review procedures of Executive Order 12291 as provided in section 8(a)(1) of that order. This rule is being reported to the Director of the Office of Management and Budget with an explanation of why it is not possible to follow the regular procedures of that order.

An environmental assessment (EA) has been prepared for this action and the Assistant Administrator concluded that there will be no significant impact on the human environment. A copy of the EA is available from the Regional Directors (see ADDRESSES).

This emergency rule does not contain a collection of information for purposes of the Paperwork Reduction Act.

The Regulatory Flexibility Act does not apply to this rule because, as an emergency rule, it was not required to be promulgated as a proposed rule.

This emergency rule does not contain policies with known federalism implications sufficient to warrant preparation of the federalism assessment under Executive Order 12612. Washington, Oregon, and California are expected to implement state regulations compatible with the Federal rule.

The Council has requested that the States of Washington, Oregon, and California concur with its finding that the proposed action is consistent with the States' approved coastal management programs.

List of Subjects in 50 CFR Part 663

Administrative practices and procedures, Fisheries, Fishing, Reporting and recordkeeping requirements.

Authority: 16 U.S.C. 1801 *et seq.*

Dated: April 16, 1992.

Michael F. Tillman,

Acting Assistant Administrator for Fisheries, National Marine Fisheries Service.

For the reasons stated in the preamble, from April 16, 1992 at 1706 hours, e.d.t., until 2400 hours (local time), July 21, 1992, 50 CFR part 663 is amended as follows.

PART 663—[AMENDED]

1. The authority citation for part 663 continues to read as follows:

Authority: 16 U.S.C.1801 *et seq.*

2. A new § 663.23(b)(4) is added to read as follows:

§ 663.23 Catch restrictions.

* * * * *

(b) * * *

(4) *Pacific whiting—1992 bycatch restrictions.*—(i) *Closed Areas.* Pacific whiting may not be taken and retained in the following portions of the Fishery Management Area:

(A) *Klamath River Salmon Conservation Zone:* The ocean area surrounding the Klamath River mouth bounded on the north by 41°38'48" N. latitude (approximately six nautical miles (nm) north of the Klamath River mouth), on the west by 124°23'00" W. longitude (approximately 12 nm from shore), and on the south by 41°26'48" N. latitude (approximately 6 nm south of the Klamath River mouth);

(B) *Columbia River Salmon Conservation Zone:* The ocean area surrounding the Columbia River mouth bounded by a line extending for 6 nm due west from North Head along 46°18'00" N. latitude to 124°13'18" W. longitude, then southerly along a line of 167 True to 46°11'06" N. latitude and 124°11'00" W. longitude (Columbia River Buoy), then northeast along Red Buoy Line to the tip of the south jetty;

(ii) No more than 2,000 pounds of Pacific whiting may be taken and retained, possessed, or landed by a vessel that at any time during the same fishing trip fished in the Fishery Management Area shoreward of the 100-fathom contour (as shown on NOAA Charts 18580, 18600, and 18620 in the Eureka subarea (from 43°00'00" N. lat. to 40°30'00" N. lat.).

(iii) Pacific whiting may not be processed at sea south of 42°00'00" N. latitude (Oregon-California border). For purposes of this paragraph (b)(4)(iii), "processing" means the preparation or packaging of Pacific whiting to render it suitable for human consumption, industrial uses, or long-term storage, including but not limited to cooking, canning, smoking, salting, drying, filleting, freezing, or rendering into meal or oil, but does not mean heading and gutting unless additional preparation is done.

(iv) *Time of day.* Pacific whiting may not be taken and retained by any vessel in the Fishery Management Area on any morning between 0001 hours to one-half hour after official sunrise. Official sunrise is determined, to the nearest 5° latitude, in The Nautical Almanac for the Year 1992 issued by the Nautical Almanac Office, United States Naval Observatory under the authority of the Secretary of the Navy, and available from the U.S. Government Printing Office.

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[FR Doc. 92-9304 Filed 4-16-92; 8:45 am]

BILLING CODE 3510-22-M

50 CFR Part 663

[Docket No. 920 109-2009]

Pacific Coast Groundfish Fishery

AGENCY: National Marine Fisheries Service (NMFS), NOAA, Commerce.

ACTION: Notice of fishing restrictions, and request for comments.

SUMMARY: NOAA announces a reduction in the daily trip limit for sablefish taken with nontrawl gear from 500 pounds to 250 pounds. This action is authorized by the regulations implementing the Pacific Coast Groundfish Fishery Management Plan (FMP). The trip limit is necessary to keep landings within the nontrawl harvest guideline for this species while extending the fishery as long as possible during the year. This 250-pound daily trip limit will remain in effect until the regular season begins on May 12, 1992.

DATES: Effective from 0001 hours (local time) April 17, 1992. Comments will be accepted through May 7, 1992.

ADDRESSES: Submit comments to Rolland A. Schmitten, Director, Northwest Region, National Marine Fisheries Service, NOAA, 7600 Sand Point Way NE., BIN C15700—Bldg. 1, Seattle, Washington 98115-0070; or Charles E. Fullerton, Director, Southwest Region, National Marine Fisheries Service, NOAA, 501 West Ocean Blvd; suite 4200, Long Beach, California 90802-4213.

FOR FURTHER INFORMATION CONTACT: William L. Robinson at (206) 526-6140; or Rodney McInnis at (310) 980-4030.

SUPPLEMENTARY INFORMATION: The notice of 1992 groundfish fishery specifications and management measures (57 FR 1654; January 15, 1992) announced a two-tier scheme of trip landing limits for the nontrawl sablefish fishery that began in January and was intended to extend until the beginning of the regular nontrawl sablefish season. The fishing year began with a 500-pound daily trip limit that was increased to 1,500 pounds on March 1, 1992, with the stipulation that, if 440 metric tons (mt) of the 3,612 mt designated for the nontrawl sablefish fishery was taken prior to the beginning of the regular season, the 500-pound daily trip limit would be reimposed. On March 20, 1992, the 440 mt was projected to have been exceeded, and the daily trip limit was reduced to 500 pounds (57 FR 10429; March 26, 1992).

In early April, the Pacific Fishery Management Council (Council) found that due to increased effort in the fishery, the catch was much higher than initially expected, approximately 1,400 mt before the 500-pound trip limit was reimposed. The trip limits preceding the "regular" season were intended to allow small incidental catches to be landed and to allow small fisheries to operate year-round (57 FR 1654; January 15, 1992). They also were intended to prevent discards (55 FR 52055; December 19, 1990). However, it became apparent that the 1,500-pound daily trip limit had attracted unprecedented levels of new effort and was sustaining a viable and growing target fishery. At its April meeting, the Council heard testimony that substantial targeted effort was likely to continue even under the 500-pound trip limit. The best available April data also support this trend.

Consequently, the Council recommended that the 500-pound daily trip limit be reduced to 250 pounds, so that most of the remainder of the harvest guideline would be available for the regular season to last more than a few weeks. The Council noted that discards would be reduced if target fishing is curtailed, because fewer vessels would be trying to bring in the maximum allowable amount; when fishermen target on small trip limits, they often exceed the trip limit and discard the surplus at sea. The Council also recommended that the 250-pound daily trip limit be reimposed at the end of the regular season, on the date necessary to extend the nontrawl sablefish fishery as long as possible during the year. To maintain the Council's original intention, NOAA is imposing a 250-pound daily trip limit until the beginning of the regular season on May 12, 1992, and announces its intent to reimpose the 250-pound daily trip limit after the end of the regular season. All weights are in round weight or round weight equivalents.

Secretarial Action

The Secretary of Commerce concurs with the Council's recommendations, and for the reasons stated above announces:

(1) From 0001 hours (local time) April 17, 1992, until 2400 hours (local time) May 11, 1992, the daily trip limit for sablefish caught with nontrawl gear is 250 pounds. This trip limit applies to sablefish of any size.

(2) Following the regular season, at 0001 hours on a date to be announced in the **Federal Register**, the daily trip limit for sablefish caught with nontrawl gear will be 250 pounds, which applies to sablefish of any size.

(3) The restrictions apply to all sablefish caught with nontrawl gear between 3 and 200 nautical miles offshore Washington, Oregon, and California. All sablefish caught with nontrawal gear and possessed within 0 to 200 nautical miles offshore Washington, Oregon, and California are presumed to have been taken and retained between 3 and 200 nautical miles offshore Washington, Oregon, or California, unless otherwise demonstrated by the person in possession of those fish.

Classification

The determination to reduce the daily trip limit for the nontrawl sablefish fishery is based on the most recent data available. The aggregate data upon which the determination is based are available for public inspection at the Office of the Director, Northwest Region (see **ADDRESSES**) during business hours until May 4, 1992.

Because any delay in the implementation of this action would result in a continued excessive harvest in the nontrawl sablefish fishery prior to the beginning of the regular season, the Secretary finds that no delay should occur in its effective date. The Secretary therefore finds good cause to waive the 30-day delayed effectiveness requirement of the Administrative Procedure Act.

This action was authorized by Amendment 4 to the FMP for which a Supplemental Environmental Impact