

Do Klamath River and Sacramento River fall Chinook ocean fishery harvest rates differ north and south of the Klamath River mouth?

California Klamath Management Zone commercial salmon troll test fishery proposal

October 16, 2015

The California Department of Fish and Wildlife (CDFW) and the Pacific Fishery Management Council (PFMC) received public testimony in early 2015 requesting evaluation of an alternative management boundary within California's portion of the Klamath Management Zone (KMZ). Industry representatives have suggested that Chinook stock distribution and associated ocean fishery harvest rates may differ between the Crescent City and Eureka port areas.

West-coast ocean salmon fishery management is spatially and temporally structured to allow for weak stock management. In the KMZ, the Klamath River fall Chinook (KRFC) age-4 ocean harvest rate, which is used as a proxy for ESA-listed California Coastal Chinook, frequently limits access to more abundant stocks (e.g., Sacramento River fall Chinook [SRFC]). Ideally, geographical fishery management boundaries are selected based on stock distribution and fishery contacts, enabling effective weak stock management. However, existing data are insufficient to determine if stock distribution, and subsequent ocean fishery harvest rates, differs at intermediate geographical points within the California KMZ.

At the request of the California commercial salmon troll fishery, CDFW suggests a test fishery for industry and management consideration that would examine the hypothesis that salmon distribution and associated harvest rates within the KMZ varies between the areas north and south of the Klamath River mouth. Specifically, the distribution and ocean fishery harvest rates of KRFC and SRFC above and below this potential management boundary will be examined. Submittal of this test fishery proposal does not imply CDFW endorsement for 2016 ocean salmon fisheries; however, proposals are required to be submitted pre-season for consideration. A potential California KMZ commercial troll test fishery in conjunction with ocean commercial and recreational fisheries south of Cape Falcon, Oregon and Klamath and Sacramento in-river fisheries will be determined during the annual public salmon season setting process as described by the Federal Salmon Fishery Management Plan.

Project Summary

Klamath Management Zone Boundaries

Since 1992, the KMZ has been defined as the ocean area between Humbug Mountain, Oregon and Horse Mountain, California, with ocean troll fisheries restricted to areas north of Humboldt South Jetty, California beginning in 1996 (Figure 1). Historical and current salmon commercial catch and effort is broken out into two port areas in the California KMZ: Crescent City and Eureka. In addition, state regulations have required that all fish caught north of the Oregon/California border must be landed in Oregon (adopted 2005), and all salmon caught south of the state line must be landed in California (adopted 2011), effectively establishing the state line as a management boundary.

Although other geographical boundaries have been used in the past to differentiate between Crescent City and Eureka port areas (e.g., Point St. George, False Klamath Rock, Big Lagoon), CDFW believes the Klamath River mouth would be the most effective as the management boundary due to the year-round commercial fishery closure of the Klamath Control Zone. This closure area is presently defined in federal law as the ocean area at the Klamath River mouth bounded on the north approximately six nautical miles north of the Klamath River mouth; on the west approximately 12 nautical miles off shore; and on the south approximately six nautical miles south of the Klamath River mouth (Figure 2). The middle of the Klamath Control Zone would be the official management line (41°32'48" N. lat.) and would be used when fishing beyond 12 nautical miles from shore.

Commercial Salmon Fisheries in the Klamath Management Zone

Commercial salmon troll fishing seasons in the KMZ vary by State. In Oregon, troll fisheries are generally permitted April and May without landing restrictions, landing and possession limits, or quotas (i.e., full open fisheries). From June through August small quota fisheries with landing and possession restrictions are ordinarily established. Additionally, Oregon generally allows a state-waters-only fishery in a portion of this area during October.

By comparison, in California's portion of the KMZ, very little commercial salmon fishing opportunity is allowed, generally consisting of a small quota fishery in September and on occasion in August. Fisheries during other months occur rarely, generally coinciding with very high abundance forecasts of Klamath River fall Chinook (e.g., May through September 2013).

Current Fisheries Management Regime

Chinook fishery management within the KMZ is comprised of retrospective and prospective components for Klamath River and Sacramento River fall Chinook. Age-structured cohort reconstructions and stock projections are performed for KRFC, while an aggregate age index and forecast is used for SRFC. Forecasts for September fisheries are not possible, and KRFC and SRFC ocean impacts occurring after August 31 are applied to the following season.

The primary constraint to KMZ troll fisheries in recent years has been the KRFC age-4 ocean harvest rate cap intended to protect ESA-listed California Coastal Chinook. Existing ocean fishery contact and spawning escapement data for California Coastal Chinook is insufficient to evaluate fishery impacts directly, therefore a KRFC age-4 ocean harvest rate proxy is used to establish fishery protections for this weak stock (O'Farrell et al. 2012). This harvest rate cap is calculated for the total fishing season and it is set at 16.0 percent. The total age-4 KRFC ocean harvest rate is a sum of the harvest rates resulting in expectation from each time and area fishery stratum. The projected harvest rates for each specific management area and time differ, thus fishing can be more expensive or less expensive relative to the total harvest rate cap depending on where and when the fishery is executed. Years with very low abundances of KRFC or SRFC have also historically limited fisheries in this area.

Since the late 1980s, catch, effort and CWT recovery data from Eureka and Crescent City port areas have been combined to model California KMZ fishery impacts. Large ocean areas have historically been used when determining fishery impacts due to temporal variation in stock distribution, concerns over modeling error under increasing spatial stratification (PSC 2008), and industry interest in consistent statewide regulations whenever possible.

The 2008 Pacific Salmon Commission (PSC) report on CWT use in ocean salmon fishery management recommended a minimum of 10 CWT recoveries per stratum, given a 20 percent sampling rate on all landed salmon, to result in a tolerable level of sampling error (PSC CWT Workgroup 2008). Because KRFC have two primary age classes exposed to the fishery, a minimum of 20 CWT recoveries per stratum (time-area-fishery) is recommended. Ocean salmon fishery sampling in California strives to meet minimum sample rates (≥ 20 percent of all salmon landed) and representative coded-wire tag recovery. During quota managed fisheries, such as the KMZ commercial troll fishery, sample rates frequently exceed 20 percent.

While genetic stock identification (GSI) data has been useful for informing stock distribution, sample data to-date has been sparse and non-representative of retention fisheries limiting its use in fisheries management. Limited existing GSI data cannot be integrated with CWT-based ocean harvest models (e.g., Klamath Ocean Harvest Model, Sacramento Harvest Model) and is not directly applicable to current management strategies. Parental Based Tagging genetic techniques may provide a feasible alternative to CWTs in the future (Satterthwaite et al. 2015); however, the PSC has recently confirmed its support of CWTs for coast-wide management, in part due to costs associated with existing and proposed new genetic techniques (Hankin et al. 2015). Genetic techniques are not likely to be used as a basis of ocean salmon fishery management in the near future; however, collection of genetic samples may be useful for building long-term data sets allowing for reevaluation of GSI data's use in fisheries management.

Any proposed change to fishery management boundaries would require significant and non-trivial modifications to ocean fishery harvest models, in particular the Klamath Ocean Harvest Model and Sacramento Harvest Model. Substantial changes to any forecasting model used in the process of setting ocean fishery regulations would require review and approval by the Salmon Technical Team, the Model Evaluation Workgroup, and the Scientific and Statistical Committee of the Pacific Fishery Management Council.

Evaluation of existing data

Ocean salmon fisheries in the California KMZ have been severely restricted since 1990 to small quotas primarily during September due to protections for KRFC and threatened California Coastal Chinook. Recent industry interest has been to apply limited impacts to non-quota fisheries south of the KMZ. Thus, little modern data exists for evaluation.

In the California KMZ, fewer than 600 KRFC coded-wire tags have been recovered from the commercial salmon fishery since 1990, primarily from the Eureka area (Table 1). In the 48 time-area strata since 1990, only September 2007 meets minimum CWT recovery goals for both Crescent City and Eureka. Commercial salmon landings in the town of Crescent City have been sporadic and relatively low, especially when compared to Eureka. As such, representative sample data and coded-wire tag recoveries for Crescent City are available for September of 2003 and 2007, although there is some evidence that these Chinook were caught south of the Klamath River mouth. However, in 2003, representative CWT data is not available for Eureka. Eureka also has very little representative CWT data available for analysis, achieving the 20 CWT minimum in only 6 strata since 1990.

Available SRFC CWT recovery data is also limited (Table 2) especially in Crescent City, although more available than KRFC due to the higher proportional abundance, and hence catch, of that stock in most years. No landing restrictions exist within the California KMZ and although a landing may have been sampled dockside in Crescent City, existing data does not validate that the fish were caught near Crescent City (between the Oregon/California border and the Klamath River mouth). Conversely, fish caught near Crescent City may have been landed and subsequently sampled in the Eureka area, although that would be more unlikely. Establishing landing restrictions to the area where fish were caught has long been a concern of the PFMC's Salmon Technical Team (PFMC 2015).

Ocean troll fisheries prior to 1990 were less restricted, particularly in the very early 1980s. While data exists from these landings, the CWT program was in its infancy in California and the level of marking, tagging, and associated management standards have changed. For example, marking and tagging of Sacramento River stocks was extremely limited and non-representative during that time.

An evaluation of alternative data, including reported catch area (block) on commercial landing receipts, was largely uninformative as buyers frequently reported large 100 square mile catch blocks that crossed management boundaries. Troller-reported catch areas when available were also indeterminate and unverifiable.

Limited GSI data is available from non-retention and retention commercial fisheries from 2010-2011, following the collapse of SRFC and resulting fishery restrictions (Satterthwaite et al. 2013). As such, samples taken during these years may not be representative of open fisheries under average abundances. Further, existing genetic techniques are unable to distinguish spring and fall run Klamath stocks and samples assigned to Klamath River include the non-indicator spring run stock. In 2010, genetic samples were stratified by area of catch (i.e., Crescent City or Eureka); however, spatial stratification is not available for 2011 samples. The majority of 2010 GSI samples were taken in the Eureka area (89 percent) during June through September, with little sampling conducted in the Crescent City area. In 2011, GSI data is available for July and August only.

Consideration of Test Fisheries

Existing data are insufficient to adequately inform ocean fishery harvest models under the proposed increase in spatial stratification, and are not applicable to evaluating proposed sub-management area boundaries in the KMZ.

CDFW recommends that the purpose of any proposed test fishery would be to determine if fishery impacts, including the age-4 Klamath River fall Chinook ocean harvest rate, varies from fish caught in the area between the Oregon/California border and the Klamath River mouth and the area between the Klamath River mouth and Humboldt South Jetty. Quota-based retention fisheries could be expected in each month May through September. While a test fishery running May through September is not required, any months that industry representatives would like to evaluate in future fishery planning processes would need to be included in the test fishery for assessment. Sub-area quotas of sufficient size to yield meaningful data, landing and possession limits, and port of landing restrictions would be required. Impact-neutral rollovers from one month to the next would be considered within the California KMZ as a whole, and split between the proposed sub-management areas. No transfer of sub-management quotas between areas to allow for continued fishing in one of the two areas would be allowed.

Proposed quotas must be of adequate size to enable the collection of representative data that allow for the estimation of age- and stock-specific harvest with acceptable levels of precision. Quota sizes would be established based on expected abundances of contributing stocks and other considerations (e.g., predicted KRFC stock proportions). Appendix A outlines a potential test fishery, though the quota sizes and other details of the season structure are only meant to be examples.

CDFW would assume responsibility for quota monitoring and dockside sampling for coded-wire tag collection. CDFW cannot recommend non-retention GSI fisheries at this point in time; although collection of fin-clip samples from non-adipose fin clipped Chinook in conjunction with CWT recovery during retention fisheries would be supported.

To increase efficiency, reduce costs, and acquire the most data possible, CDFW recommends increased reporting requirements during the test fishery. Trollers participating in the KMZ test fishery would be required to notify CDFW within 1 hour of delivery via phone or e-mail. Notification shall include vessel name and number, number of salmon, port of landing and location of delivery, and estimated time of delivery.

Test fisheries would require sub-management area quotas be set aside during the coast wide salmon season setting process. Any proposed test fishery in combination with other ocean fisheries south of Cape Falcon, Oregon would be required to meet Fishery Management Plan objectives and other applicable laws. Any deviation from the Fishery Management Plan would require implementation by emergency rule. Given current

industry interests, the impacts necessary to conduct a test fishery may not be favored over less restrictive fisheries in other times and management areas.

Additionally, following Council Operating Procedure 18 Protocol E.1 Application of Results, CDFW advises that a minimum of three years of data be available prior to consideration for inclusion in any harvest model.

References

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- Pacific Fishery Management Council. 2015. Preseason Report II: Proposed Alternatives and Environmental Assessment Part 2 for 2015 Ocean Salmon Fishery Regulations.
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- Satterthwaite, W. H., E. Anderson, M. Campbell, J.C. Garza, M. Mohr, S. Narum, C. Speir. 2015. Multidisciplinary Evaluation of the Feasibility of Parentage-Based Genetic Tagging (PBT) for Management of Pacific Salmon. Report to the Pacific Salmon Commission, 135 p.

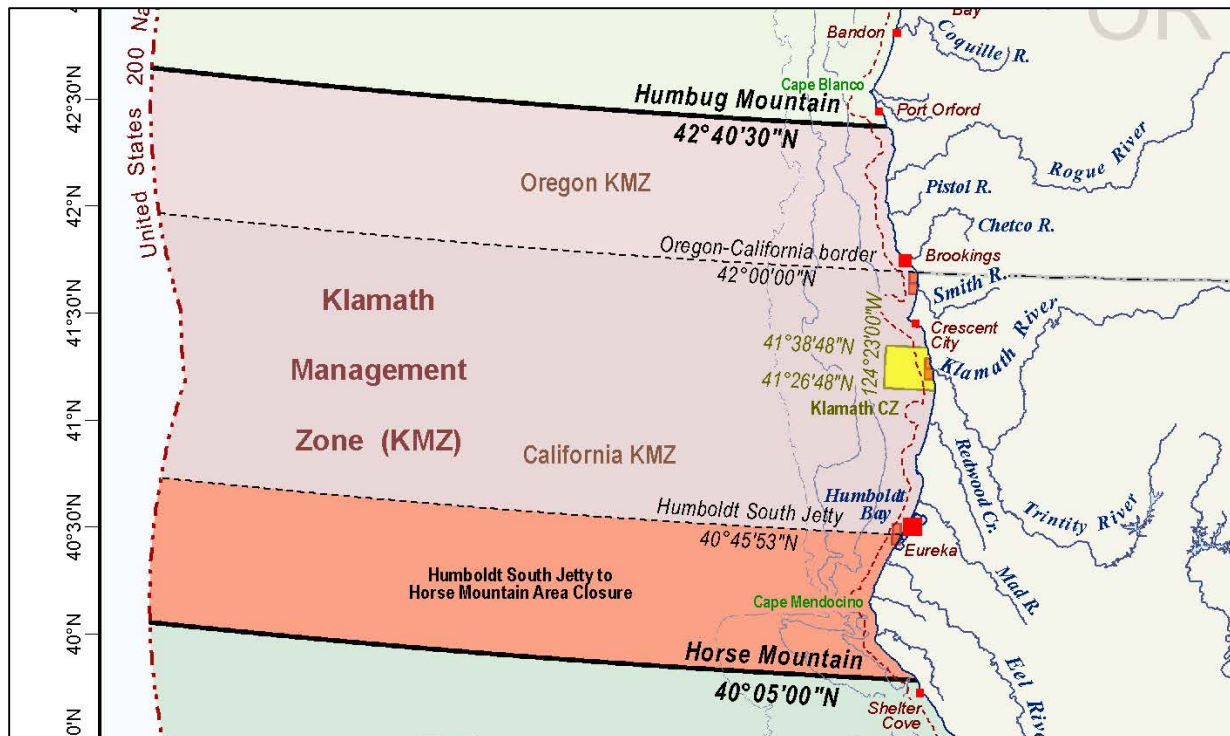


Figure 1. The Klamath Management Zone is defined as the ocean area between Humbug Mountain, Oregon and Horse Mountain, California. Commercial salmon trollers are restricted to the area north of Humboldt South Jetty in Eureka, California. The Klamath Control Zone, a 12-mile square centered on the Klamath River mouth, is additionally closed to salmon fishing. (Map by Washington Department of Fish and Wildlife for Pacific Fishery Management Council use.)

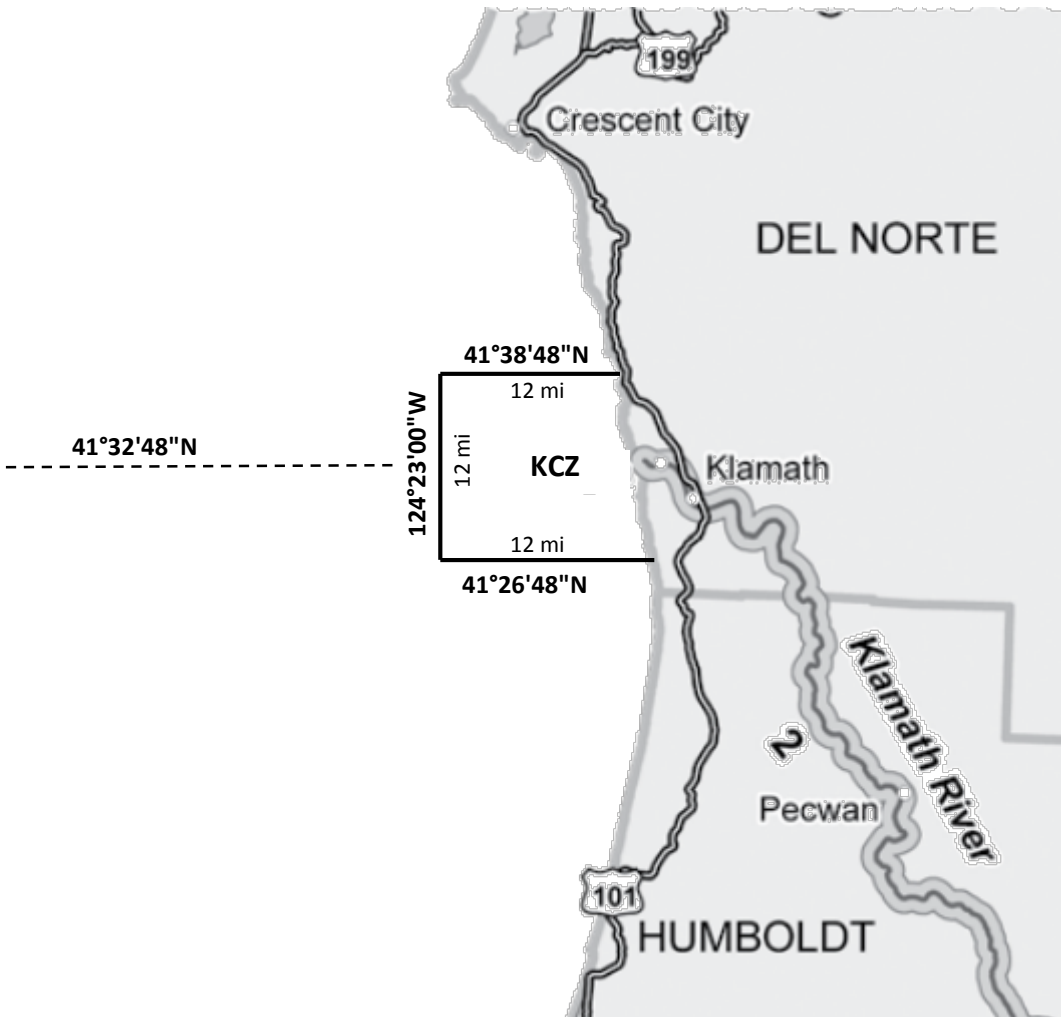


Figure 2. Klamath Control Zone (KCZ): No salmon may be taken in the ocean area surrounding the Klamath River mouth, bounded on the north by 41°38'48" N. lat. (approximately 6 nautical miles north of the Klamath River mouth), on the south by 41°26'48" N. lat. (approximately 6 nautical miles south of the Klamath River mouth), and on the west by 124°23'00" W. long. (approximately 12 nautical miles off shore). The proposed new management line would extend west from the KCZ at 41°32'48" N. lat.

Table 1. Klamath River fall Chinook coded-wire tag (CWT) recoveries stratified by year, month, and area of landing. Dark shading indicates strata where at least 20 CWTs were recovered. Light shading indicates when at least 20 CWT recoveries occurred given the status quo spatial stratification (i.e., the sum of KZ-N and KZ-S CWT recoveries is greater than or equal to 20). Stippled cells indicate strata with little or no fishing (and sampling) effort. Blank cells represent strata where fisheries were completely closed.

KZ-N Crescent City commercial							KZ-S Eureka commercial						
	May	Jun	Jul	Aug	Sep	Total		May	Jun	Jul	Aug	Sep	Total
1990				8	0	8	1990				11	0	11
1991					0		1991					3	3
1992							1992						
1993							1993						
1994							1994						
1995							1995						
1996				0	0		1996				2	8	10
1997					0		1997					0	
1998					0		1998					0	
1999					0		1999					6	6
2000					6	6	2000					8	8
2001					1	1	2001					22	22
2002				2	16	18	2002				1	5	6
2003					23	23	2003					1	1
2004					0		2004					15	15
2005					7	7	2005					8	8
2006							2006						
2007					31	31	2007					167	167
2008							2008						
2009							2009						
2010							2010						
2011				0	4	4	2011			10	8		18
2012					4	4	2012					40	40
2013	1	1	0	0	0	2	2013	56	49	35	15	0	155
2014					0		2014					0	

Table 2. Sacramento River fall Chinook coded-wire tag (CWT) recoveries stratified by year, month, and area of landing. Dark shading indicates strata where at least 10 CWTs were recovered. Light shading indicates when at least 10 CWT recoveries occurred given the status quo spatial stratification (i.e., the sum of KZ-N and KZ-S CWT recoveries is greater than or equal to 10). Stippled cells indicate strata with little or no fishing (and sampling) effort. Blank cells represent strata where fisheries were completely closed.

KZ-N Crescent City							KZ-S Eureka						
	May	Jun	Jul	Aug	Sep	Total		May	Jun	Jul	Aug	Sep	Total
1990				8	0	8	1990				39	8	47
1991					2	2	1991					16	16
1992						0	1992						0
1993						0	1993						0
1994						0	1994						0
1995						0	1995						0
1996				1	0	1	1996				29	90	119
1997					0	0	1997					19	19
1998					0	0	1998					21	21
1999					0	0	1999					45	45
2000					0	0	2000					1	1
2001					1	1	2001					33	33
2002				4	17	21	2002				5	24	29
2003					4	4	2003					1	1
2004					2	2	2004					35	35
2005					0	0	2005					9	9
2006						0	2006						0
2007					0	0	2007					2	2
2008						0	2008						0
2009						0	2009						0
2010						0	2010						0
2011			0	8		8	2011			32	10		42
2012					20	20	2012					222	222
2013	2	4	9	0	0	15	2013	109	164	76	149	10	508
2014					0	0	2014					68	68

Appendix A. California Klamath Management Zone test fishery proposal, sample fishery design

OR/CA Border to Klamath River Mouth and Klamath River Mouth to Humboldt South Jetty

- May 1 through earlier of May 31, or a 1,500 Chinook quota per each sub-management area;
- June 1 through earlier of June 30, or a 1,500 Chinook per each sub-management area;
- July 1 through earlier of July 31, or a 1,000 Chinook quota per each sub-management area;
- August 1 through earlier of August 29, or a 1,000 Chinook quota per each sub-management area;
- September 15 through earlier of September 30, or a 1,500 Chinook quota per each sub-management area.

Five days per week, Friday through Tuesday. All salmon except coho. Chinook minimum size limit of 27 inches total length through August 29, 28 inches thereafter. Landing and possession limit of 20 Chinook per vessel per day. Fishers landing salmon from any quota managed season within this area must notify California Dept. of Fish and Wildlife (CDFW) within 1 hour of delivery by either calling (800) 899-8346 or sending notification via e-mail to OSP@wildlife.ca.gov. Notification shall include vessel name and number, number of salmon, port of landing and location of delivery, and estimated time of delivery. All fish caught in this area must be landed within the area and within 24 hours of any closure of the fishery and prior to fishing outside the area. Klamath Control Zone closed. See California State regulations for additional closures adjacent to the Smith and Klamath rivers. California State regulations require all salmon be made available to a CDFW representative for sampling immediately at port of landing. Any person in possession of a salmon with a missing adipose fin, upon request by an authorized agent or employee of the CDFW, shall immediately relinquish the head of the salmon to the state (California Fish and Game Code §8226). Any remaining portion of the May, June and/or July Chinook quotas may be transferred inseason on an impact neutral basis to the next open quota period. Any remaining portions of the May, June and/or July OR/CA Border to Klamath River mouth Chinook quotas may not be transferred to the area between the Klamath River Mouth to Humboldt South Jetty. Any remaining portions of the May, June and/or July Klamath River Mouth to Humboldt South Jetty Chinook quotas may not be transferred to the area between the OR/CA Border to Klamath River mouth.

Appendix B. Council Operating Procedure 18. Protocol for Industry Sponsored Salmon Test Fishery Proposals

California Klamath Management Zone commercial salmon troll test fishery proposal

October 16, 2015

1. Project Summary - Include a statement of objectives, methods to be employed, and the potential impact of the project. Relate the proposal to the Council Research and Data Needs and the NMFS Strategic Plan for Fisheries Research.

The Klamath Management Zone (KMZ) ocean commercial troll test fishery proposes to evaluate whether Klamath River Fall Chinook (KRFC) and Sacramento River fall Chinook ocean harvest rates vary north and south of the Klamath River mouth. Coded-wire tag and catch area sample data will be collected dockside by California Department of Fish and Wildlife's (CDFW) Ocean Salmon Project during retention quota fisheries in Crescent City and Eureka port areas. If substantial evidence is found that the ocean harvest rates are variable within the California portion of the KMZ, modifications to the Klamath Ocean Harvest and Sacramento Harvest models may be considered for increased spatial stratification of ocean salmon fisheries management.

2. Project Personnel - Identify the project manager (the person responsible for overall coordination of the project from beginning to end), and other staff or organizations necessary to complete the project, including specific responsibilities related to technical, analytical, and management roles. Provide evidence that the work proposed is appropriate for the experience of the investigators.

Sample data will be collected and analyzed by CDFW Ocean Salmon Project staff. Coded-wire tags and other biological data will be recovered from commercial salmon landings. If differential harvest rates are found north and south of the Klamath River mouth, modifications would be required to ocean harvest models maintained in part by NMFS Southwest Fisheries Science Center (SWFSC).

3. Objectives

a. Make a clear statement of the specific purposes of the study (may be stated as a hypothesis in the form of a question).

Do Chinook salmon ocean fishery harvest rates differ north and south of the Klamath River mouth?

b. Benefits - Identify potential benefits to fisheries management and coastal communities, or specific stocks, such as improved estimates of key harvest model

parameters (e.g., stock contact rates, hooking mortality rates, gear selectivity on encounter rates).

Ocean salmon fisheries management is intended to be aligned with the geographical distribution of salmon stocks. Improved understanding of ocean distribution and fishery contact rates can inform ocean harvest models to establish sustainable fisheries that meet FMP objectives.

4. Research Design and Methodology

a. Specify the major elements of the design, including sample size, number of years the test fishery will run, potential limitations of the proposed approach, and geographic scope.

The test fishery is limited to California's portion of the KMZ. Following Council Operating Procedure 18, a minimum of three years of sample data may be collected from May through September in each year. A minimum of 20 KRFC coded-wire tags per stratum are required. Relative KRFC abundance is variable across months, and may constitute a small portion of overall catch in the KMZ. Total catch would need to be substantial enough to result in acceptable levels of precision for age and stock-specific catch estimates.

b. Data Collection - describe sampling methods, personnel, and protocols.

Data collection, including coded-wire tag recovery and fin-clips for genetic assignment, will be conducted by CDFW under existing dockside salmon fishery sampling programs.

c. Data Synthesis and Analysis - describe how the data will be analyzed and evaluated.

Coded wire tag recoveries will be evaluated using methods described in O'Farrell et al. (2015) and by comparisons of stock contribution rates in the KMZ-N versus the KMZ-S subareas.

d. Reporting - provide a time table for delivering report(s) to the Council.

Reports will be made available in February of the following year.

e. Discuss compatibility with existing seasons and other test fisheries, potential difficulties with processors or dealers, additional enforcement requirements, and potential negative impacts of the study (e.g., species listed under the Endangered Species Act, allocation shifts, shortened season length, etc.).

Other sub-management area boundaries have been considered in the recent past (e.g., Point Reyes, Point Sur); however, these boundaries have not been approved for use in ocean fishery modeling or management primarily due to 1)

negligible industry interest in landing restrictions resulting in a lack of applicable data to inform the models, 2) low CWT recovery rates potentially resulting in high modeling error under increased spatial stratification, and 3) an analysis of Genetic Stock Identification data did not support new management boundaries for all months.

Test fisheries would require sub-management area quotas be set aside during the coastwide salmon season setting process. Any proposed test fishery in combination with other ocean fisheries south of Cape Falcon, Oregon would be required to meet Fishery Management Plan objectives and other applicable laws. Any deviation from the Fishery Management Plan would require implementation by emergency rule. Given current industry interests, the impacts necessary to conduct a test fishery may not be favored over less restrictive fisheries in other times and management areas.

5. Ability to Conduct Proposed Research - Identify the total costs (including collection of samples, tissue, and data analysis) associated with the test fishery and sources of funding; identify any existing commitments for participation in, or funding of the project.

Sampling and analysis costs will be assumed by CDFW as a part of ocean salmon fisheries sampling. CDFW would make available all fin-clips to NMFS SWFSC for genetic assignment as funding allows.